FINAL DRAINAGE REPORT

FOR

Everhome Suites Water Quality Facility
Superior, CO

Original Submittal: January 5, 2024
Revised Submittal: April 22, 2024

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E.E.S. Job No. KTD005.01

I. CERTIFICATION:

I hereby certify that this drainage assessment report for the Town of Superior Town Center Everhome Suites Water Quality Facility was prepared under my direct supervision in accordance with the provisions of Town of Superior Standards & Specifications (2021) and was designed to comply with the provisions thereof.

Krysta M. Houtchens P.E.
Registered Professional Engineer
State of Colorado No. 49550

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I. General Location and Description

A. Site Location

The Everhome Suites project site is located east of McCaslin Boulevard and Marshall Road and east of the Element Hotel within the Superior Town Center. The Vicinity Map below shows the general vicinity of the property area.

VICINITY MAP

i. Township, Range, ¼ Section. Everhome Suites Water Quality Facility is located in the NW 1/4, Section 19, Township 1 South, Range 69 West of 6th PM in the Town of Superior, Boulder County, Colorado.

ii. Street Location. Everhome Suites is located within the Superior Town Center Park which is bounded by US 36 on the north and east, the Element Hotel to the west, and Coal Creek on the south.

iii. Major Drainageways and Facilities. Coal Creek flows west to east through the Superior Town Center Park.

iv. Tributary Developments. There are no offsite triburtary areas to the proposed water quality facility. The tributary area is limited to on-site runoff from the Everhome Suites.

B. Description of Property

The project site is at Lot 3B, Block 1, Superior Town Center Filing No. 1B Replat No. 3. More specifically the site address is 3 S. Marshall, Superior, CO 80227 and is a 1.97 acre

parcel. Lot 3B is currently zoned Planned Development (PD) and will remain as such for the proposed development.

Matrix Design Group (Matrix) evaluated the Old Town tributary watershed, reviewed previous design reports, and analyzed the existing drainage system to define the on-going needs for stormwater management – See "Superior Town Center Park, Detention Basin #11, Drainage Assessment," dated April 18, 2018.

Basin #11 provided regional stormwater controls for detention and water quality. As development occurred in the watershed, stormwater was managed by individual sub-basins on-site for each development area with detention and water quality per Town of Superior Drainage Criteria, rather than regionally. With most of the watershed developed and the upstream detention and water quality basins in-place, the requirement for detention and water quality at the outfall has significantly diminished.

The Town of Superior waived detention requirements for a facility immediately adjacent to the receiving major drainageway of Coal Creek. Waiving detention of this 1.97-acre watershed will not have any adverse flood impacts to downstream properties. Only water quality is required to be provided for stormwater runoff. The watershed needs a minimum of 0.053 acre-feet of Water Quality Capture Volume (WQCV) for an Extended Dry Detention facility.

Important Design Facts:
• Tributary Area – 1.97 acres
• Tributary Composite Imperviousness – 76.1%
• WQCV only for Underground Extended Dry Detention (no flood control detention)
• 40 hour drain time
• Design Volume 0.053 acre-feet
• Inlet pipes 12", 15" with 100-year capacity

Proposed construction will consist of a four-story, 59,971 GSF extended stay hotel building and 114 parking spaces located on a 1.97 acres parcel. The area disturbed will be 1.97 acres. In addition to the hotel and the parking lot, drive aisles, landscaping and utility services will also be constructed. In the existing condition as an undeveloped site, the project site is 2% impervious. The site imperviousness increases by 74.1% in the proposed condition for an impervious value of 76.1%. The report details the stormwater measures incorporated to account for the site impervious increase.

The site in the existing condition contains 2% impervious area. The site in the proposed condition contains 1.58 acres (68,868 SF) of impervious area.

C. Description of the Watershed

i. Tributary Watershed. See the Drainage Basin Map for the watershed boundary.

ii. Tributary Area. 1.97 acres of developed area.

iii. Ground Cover and Soils. The watershed is currently vacant and covered with native weeds and grasses. Proposed land uses are commercial developments, roadways, and parking lots. NRCS hydrologic soil groups (HSG) are Type B soils for the watershed which have moderate infiltration rates.

iv. Major Drainageways. Coal Creek is the receiving major drainageway. The

contributing drainage area of the Coal Creek waterway at McCaslin Boulevard is 25.7 square miles, as referenced in the 2014 *Flood Hazard Area Delineation*.

D. Groundwater Investigation

A *Geotechnical Engineering Study and Pavement Thickness Design* was completed by Kumar & Associates, Inc., dated November 13, 2023. Per the above reference geotechnical report ground water was encountered in Borings 1 and 2 at depths of about 19 feet and 14 feet, respectively. The remaining four borings were found to be dry. Borings 1 through 4 were left open to allow for a follow-up groundwater level measurement with Borings P-1 and P-2 backfilled subsequent to drilling. Stabilized groundwater was measured in Borings 1, 3, and 4 at depths of about 16.5, 22.5, and 22 feet, respectively when measured 7 days subsequent to drilling. Groundwater was not present in Boring 2 at the time of the follow-up measurement. The open borings were backfilled upon completion of the follow-up measurements. Based on the above listed findings, groundwater is not anticipated to have an impact on the proposed development.

E. Subsurface Soils Analysis

The *Geotechnical Engineering Study and Pavement Thickness Design* was completed by Kumar & Associates, Inc., dated November 13, 2023 determined the onsite soil to be a relatively thin layer of topsoil underlain by existing fill extending to naturally deposited (native) granular soils at depths ranging from about 4 feet to 6 feet in Borings 1 through 4 and the the maximum explored depth of about 5 feet in Borings P-1 and P-2. The native granular soils extended to claystone bedrock at depths ranging from about 14 feet to 21 feet below existing grades at the time of drilling. The claystone continued to the maximum explored depths of about 25 feet or 30 feet.

The recommendation from Kumar & Associates, Inc. is that the existing fill should be removed from beneath foundations and soil-supported slabs, movement-sensitive exterior flatwork, and pavements consistent with the recommendations for fill removal presented in specific sections of their report and replaced with structural fill. The structural fill should meet the material and placement requirements presented in their report.

II. Floodplain

A. Major Drainageway – Designated Floodplain

According to the FEMA Flood Insurance Rate Map number 08013C0583K, effective date August 15, 2019, the site is located in Zone X which is within of the 100-year flood plain.

A LOMR-F, case number 19-08-0084A, effective date December 3, 2018, removes the majority of the site from the 100-year flood plain. The proposed Finished Floor Elevation is set at 5475.50, which is well above the base flood plain elevation in this location.

III. Drainage Basins and Sub-Basins

A. Major Drainage Basins

The total tributary area to the proposed Everhome Suites facility is 1.97 acres. See Drainage Area Map. The site in the historic condition consists of one major drainage basin (H1), and the general historic drainage pattern at this site is runoff entering the site from the western property line and sheet flowing to the east. There is approximately 10 feet of

fall from the western property line to the eastern property line where the runoff is collected into a riprap swale that conveys the runoff into Coal Creek.

Everhome Suites Improvements include a treated outfall to the major drainageway of Coal Creek.

Basin H1: Basin H1 is 1.97 acres and consists of the undeveloped lot with an impervious value of 2.0%. The 5-year and 100-year C values were determined to be 0.16 and 0.20, respectively; and anticipated 5-year runoff flows of 0.81 CFS and 100-year runoff flows of 1.93 CFS. Flows from Basin H1 are directed to a riprap swale that conveys the runoff into Coal Creek.

B. Minor Drainage Basins

The site in the proposed condition consists of 6 total basins (A1-A5, BY-E) which direct flows towards Coal Creek. The stormwater is conveyed through on-site stormwater inlets and the existing riprap swale at the southeast corner of the site. The following is a description of the proposed drainage basins.

Basin A1: Basin A1 is 0.34 acres and consists of the footprint of the proposed Everhome Suites Hotel for an impervious value of 90.0%. The 5-year and 100-year C values were determined to be 0.85 and 0.90, respectively; and anticipated 5-year runoff flows of 1.31 CFS and 100-year runoff flows of 2.67 CFS. Flows from Basin A1 are directed underground through 6” roof drains and will connect directly into the proposed stormwater manhole. Flows will continue towards the ADS water quality system. Captured runoff will be conveyed from the ADS system via a proposed 18” RCP storm pipe towards a proposed riprap swale at the southeastern corner of the site that will ultimately flow into Coal Creek.

Basin A2: Basin A2 is 0.06 acres and consists of the landscape area on the northwest corner of the site and parking stalls for an impervious value of 14.6%. The 5-year and 100-year C values were determined to be 0.25 and 0.29, respectively; and anticipated 5-year runoff flows of 0.06 CFS and 100-year runoff flows of 0.12 CFS. Flows from Basin A2 are conveyed via sheet flow and drainage swale to a 12” Nyloplast inlet where the developed runoff is fully captured. The captured runoff is then conveyed underground through a 6” PVC pipe to the proposed ADS water quality system.

Basin A2.1: Basin A2.1 is 0.03 acres and consists of the landscape area on the northwest corner of the site and sidewalk for an impervious value of 28.0%. The 5-year and 100-year C values were determined to be 0.35 and 0.39, respectively; and anticipated 5-year runoff flows of 0.03 CFS and 100-year runoff flows of 0.07 CFS. Flows from Basin A2.1 are conveyed via sheet flow and drainage swale to a 12” Nyloplast inlet where the developed runoff is fully captured. The captured runoff is then conveyed underground through a 6” PVC pipe to the proposed ADS water quality system.

Basin A3: Basin A3 is 0.04 acres and consists of the ramp and landscaped area between the western face of the Everhome Suites building and the property line for an impervious value of 70.2%. The 5-year and 100-year C values were determined to be 0.66 and 0.71, respectively; and anticipated 5-year runoff flows of 0.13 CFS and 100-year runoff flows of 0.26 CFS. Flows from Basin A3 are conveyed via sheet flow and drainage swale to a 12” Nyloplast inlet and ADS slotted drain system where the developed runoff is fully captured. The captured runoff is then conveyed underground through a 6” PVC pipe to the proposed ADS water quality system.

Basin A4: Basin A4 is 0.10 acres and consists of the drive aisle, parking stalls, sidewalk, and landscaped area at the southwestern corner of the site for an impervious value of 87.6%. The 5-year and 100-year C values were determined to be 0.79 and 0.84, respectively; and anticipated 5-year runoff flows of 0.34 CFS and 100-year runoff flows of 0.70 CFS. Flows from Basin A4 are directed to a type 13 combo inlet, then underground through a 12" RCP pipe to the proposed ADS water quality system.

Basin A5: Basin A5 is 0.13 acres and consists of the parking lot, landscaped islands and sidewalk for an impervious value of 91.2%. The 5-year and 100-year C values were determined to be 0.82 and 0.86, respectively; and anticipated 5-year runoff flows of 0.50 CFS and 100-year runoff flows of 1.01 CFS. Flows from Basin A5 are directed to a Type 13 combination inlet, then underground through a 12" RCP pipe to the proposed ADS water quality system.

Basin A6: Basin A6 is 0.97 acres and consists of the parking lot, landscaped islands and sidewalk for an impervious value of 96.3%. The 5-year and 100-year C values were determined to be 0.85 and 0.90, respectively; and anticipated 5-year runoff flows of 3.67 CFS and 100-year runoff flows of 7.45 CFS. Flows from Basin A6 are directed to four Type 13 combination inlets, then underground through a 12" RCP pipe to the proposed ADS water quality system.

Basin BY-E: Basin BY-E is 0.23 acres and consists of the undisturbed area between the parking lot and the property line for an impervious value of 2.0%. This basin will remain in the existing condition. The 5-year and 100-year C values were determined to be 0.16 and 0.20, respectively; and anticipated 5-year runoff flows of 0.22 CFS and 100-year runoff flows of 0.52 CFS. Flows from Basin BY-E are directed to the existing riprap swale and into Coal Creek.

IV. Drainage Design Criteria

A. Criteria

This project's storm drainage design follows the regulations, standards, and criteria of the Town of Superior's Standards & Specifications (2021) and the Mile High Flood District's Urban Storm Drainage Criteria Manual, Volumes I, II, and III ('USDCM').

B. Calculations

i. Hydrologic Criteria

Peak runoff values were calculated using the rational method:

$$Q = CIA$$

Q = Storm runoff in cubic feet per second (cfs)
C = Rainfall coefficients - ratio runoff to rainfall
I = Rainfall intensity in inches per hour
A = Drainage area in acres

The minor (5-year) and major (100-year) storm events were calculated using the

Rainfall Intensity Frequency Values from the criteria. The runoff coefficient values "C" were taken from the UDSCM, Volume 1. Composite "C" values were determined for each basin and times of concentration (tc) calculated using UDSCM methods also described in the referenced Volume 1 document. All hydrologic calculations for the 5-year and 100-year frequency events are included in the Appendix.
Hydrologic summary of the data and methods utilized in this report includes:

- Design Rainfall: 1-hour point rainfall depths of 1.34 and 2.57 for the 5-year and 100-year storm events, respectively. Depths were obtained from Table 5.2 of the criteria.
- Hydrologic Soil Group: NRCS hydrologic soil group B
- Conveyance System Design Storm Recurrence Intervals: 5-year and 100-year
- Detention is per the USDCM, Volume 2 full spectrum detention design guidelines as aided by the MHFD Excel design tool "Detention Design" available through the district's website.

ii. Hydraulic Criteria

Inlet capacities have been analyzed per the procedures of the USDCM, Volume 1 street, inlet, and storm drain guidelines as aided by the MHFD Excel design tool "Street Capacity and Inlet Sizing" available through the district's website. Hydraulic Grade Line analysis was completed utilizing Bentley StormCAD software.
Hydraulic data and analysis methods in this report include:

- Inlets and storm drains sized for the 100-year event.
- Drains sized with a manning's 'n' value of 0.011 for PVC and 0.013 for RCP

iii. Storm Water Quality Criteria

The on-site water quality pond will be provided with an Extended Detention Basin facility, satisfying all Town of Superior permit requirements. Design is per the USDCM, Volume 3 guidelines and is aided by the aforementioned "Detention Design" tool.

C. Detention Design

The Town of Superior Land Use Code Section 16-26-20 (d) indicates that drainage and flood control measures should use the most restrictive criteria of SMD-1 Rules and Regulations, Urban Drainage & Flood Control District (UDFCD) Criteria, or Boulder County Criteria. This project used criteria outlined by UDFCD.

In general, detention is necessary to minimize impacts from development to downstream properties. According to the UDFCD Urban Storm Drainage Criteria Manual, "Planning and design of stormwater drainage systems should not be based on the premise that problems can be transferred from one location to another. Urbanization tends to

increase downstream peak flow by increasing runoff volumes and velocities. Stormwater runoff can be stored and slowly released via detention facilities to manage peak flows, thereby reducing the drainage capacity required immediately downstream." However, it is generally accepted that exemptions for flood control detention can be made for development of an area immediately adjacent to a major drainageway that is capable of conveying the fully developed basin 100-year flood. The peak stormwater runoff from the 1.97-acre watershed will have no impact on the peak flows from the 25.7 square mile Coal Creek watershed. This is commonly referred to as "beat the peak" where the peak flow from the small watershed will have arrived and ended prior to the peak flow from the much larger watershed. UDFCD staff generally concur that detention is not required by the Town at this location, although it does provide some minor benefit to match historic release rates into Coal Creek. However, water quality must be provided for developed areas, regardless, and cannot be waived in accordance with the Town's MS4 permit.

D. Water Quality Design

The water quality capture volume was generated with a contributing watershed area of 1.97 acres and 76.1% impervious. The proposed water quality treatment system is required to have a water quality capture volume of 2,309 CF. To achieve this volume, a proposed ADS Stormtech chamber system with a surface area of 727 SF will be utilized. The water quality pond will utilize an outlet structure with three (3), one-half-inch (1/2") orifices.

Water Quality within the ADS system will be handled by the isolation row within the ADS system. The ADS system also includes a 2' sump at the manhole where flow enters the system. There are currently three different third party tests for this product, all showing a minimum of 80% TSS removal; The City of Charlotte field testing report for Isolator Row, 2006 Tennessee Tech Lab Report, and University of New Hampshire Test Report.

E. Maintenance

The detention facilities will be private and maintenance of the facilities will be the responsibility of the property owner. For the underground facility, inspection ports will be provided for access to the system. Refer to general maintenance and inspection guidelines in the appendix for more information.

V. Conclusions

A. Compliance with Standards

This drainage report presents the drainage analysis for an Everhome Suites at 3 S. Marshall Road and complies with the regulations, standards, and criteria of the Town of Superior's Standards & Specifications (2021) and the Mile High Flood District's Urban Storm Drainage Criteria Manual, Volumes I, II, and III ('USDCM').

B. Impact of Proposed Development

The proposed development will improve upon the historical condition as it exists today. The embankment that goes to Coal Creek will see less erosion and degradation than it currently does which will benefit the downstream water quality.

VI. References

The following drainage studies were used in the current drainage report for the Superior Town Center Park:

• *Preliminary Drainage Report for Superior Town Center Planned Development,* Town of Superior, November 2012, Civil Resources, LLC

• *Drainage Report Update for Superior Town Center Phase 1 and Discovery Office Park,* RC Superior Metro District and Aweida Properties Inc., September 2015, Civil Resources, LLC

• *Superior Town Center Park Detention Basin #11, Drainage Assessment,* Matrix Design Group, April 18, 2018

• *Drainage Letter, Superior Town Center – Block 1 Lot 3 – Hotel Site.* Civil Resources, LLC, dated August 22, 2016

Appendix A – Reference Materials

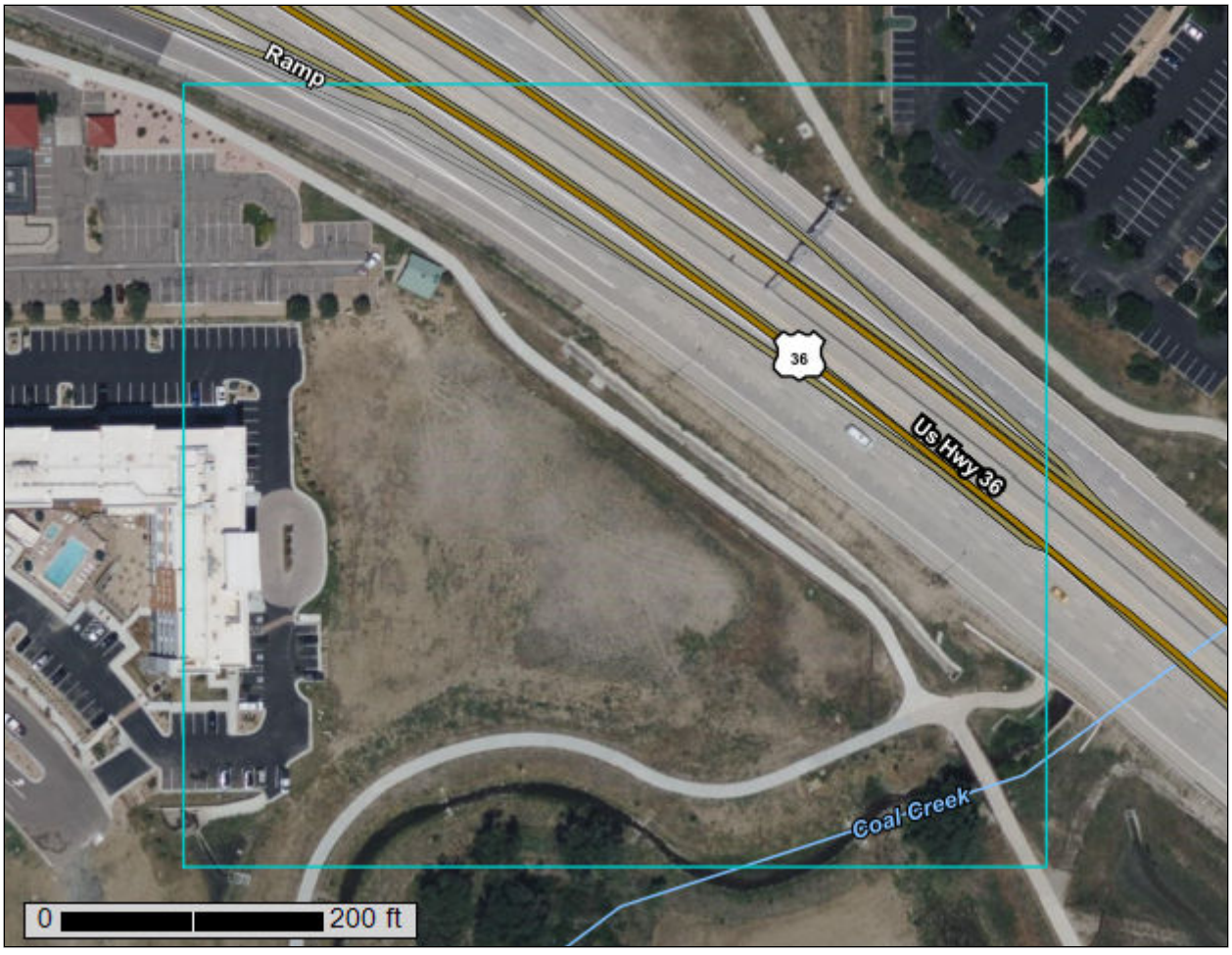
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Boulder County Area, Colorado



January 3, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

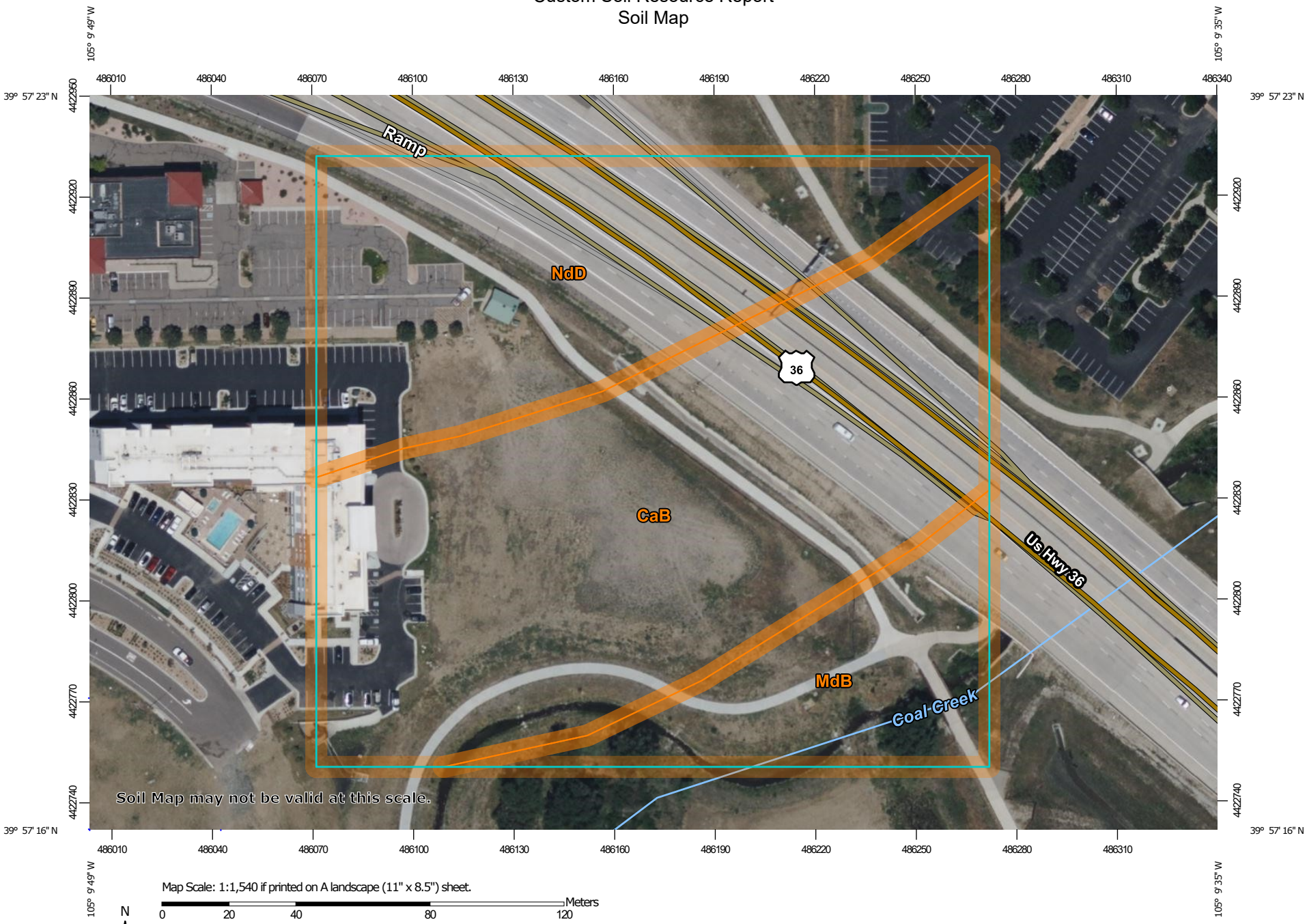
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,540 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Boulder County Area, Colorado
Survey Area Data: Version 20, Aug 24, 2023

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

Date(s) aerial images were photographed: Jul 1, 2020—Jul 2, 2020

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
CaB	Calkins sandy loam, 1 to 3 percent slopes	4.8	53.3%
MdB	Manter sandy loam, 1 to 3 percent slopes	1.3	14.6%
NdD	Nederland very cobbly sandy loam, 1 to 12 percent slopes	2.9	32.1%
Totals for Area of Interest		**9.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Boulder County Area, Colorado

CaB—Calkins sandy loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: jprc
Elevation: 4,900 to 5,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 140 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Calkins and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calkins

Setting

Landform: Terraces, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

H1 - 0 to 14 inches: sandy loam
H2 - 14 to 60 inches: sandy loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B
Ecological site: R067BY031CO - Sandy Bottomland
Hydric soil rating: No

Minor Components

Valmont

Percent of map unit: 6 percent
Ecological site: R067BY042CO - Clayey Plains
Hydric soil rating: No

Mcclave

Percent of map unit: 6 percent
Ecological site: R067BY035CO - Salt Meadow
Hydric soil rating: No

Nunn

Percent of map unit: 3 percent
Ecological site: R067BY042CO - Clayey Plains
Hydric soil rating: No

MdB—Manter sandy loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: jps3
Elevation: 4,900 to 5,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 140 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Manter and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manter

Setting

Landform: Terraces
Landform position (three-dimensional): Side slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy eolian deposits and/or outwash

Typical profile

H1 - 0 to 6 inches: sandy loam
H2 - 6 to 16 inches: fine sandy loam
H3 - 16 to 60 inches: sandy loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Calkins

Percent of map unit: 8 percent
Ecological site: R067BY031CO - Sandy Bottomland
Hydric soil rating: No

Ascalon

Percent of map unit: 7 percent
Ecological site: R067BY002CO - Loamy Plains
Hydric soil rating: No

NdD—Nederland very cobbly sandy loam, 1 to 12 percent slopes

Map Unit Setting

National map unit symbol: jps7
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 15 to 20 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 140 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Nederland and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nederland

Setting

Landform: Alluvial fans, terraces
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Cobbly loamy alluvium

Typical profile

H1 - 0 to 7 inches: very cobbly sandy loam
H2 - 7 to 20 inches: very cobbly sandy clay loam
H3 - 20 to 60 inches: very cobbly sandy loam

Properties and qualities

Slope: 1 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R049XY213CO - Cobbly Foothill
Hydric soil rating: No

Minor Components

Valmont

Percent of map unit: 20 percent
Hydric soil rating: No

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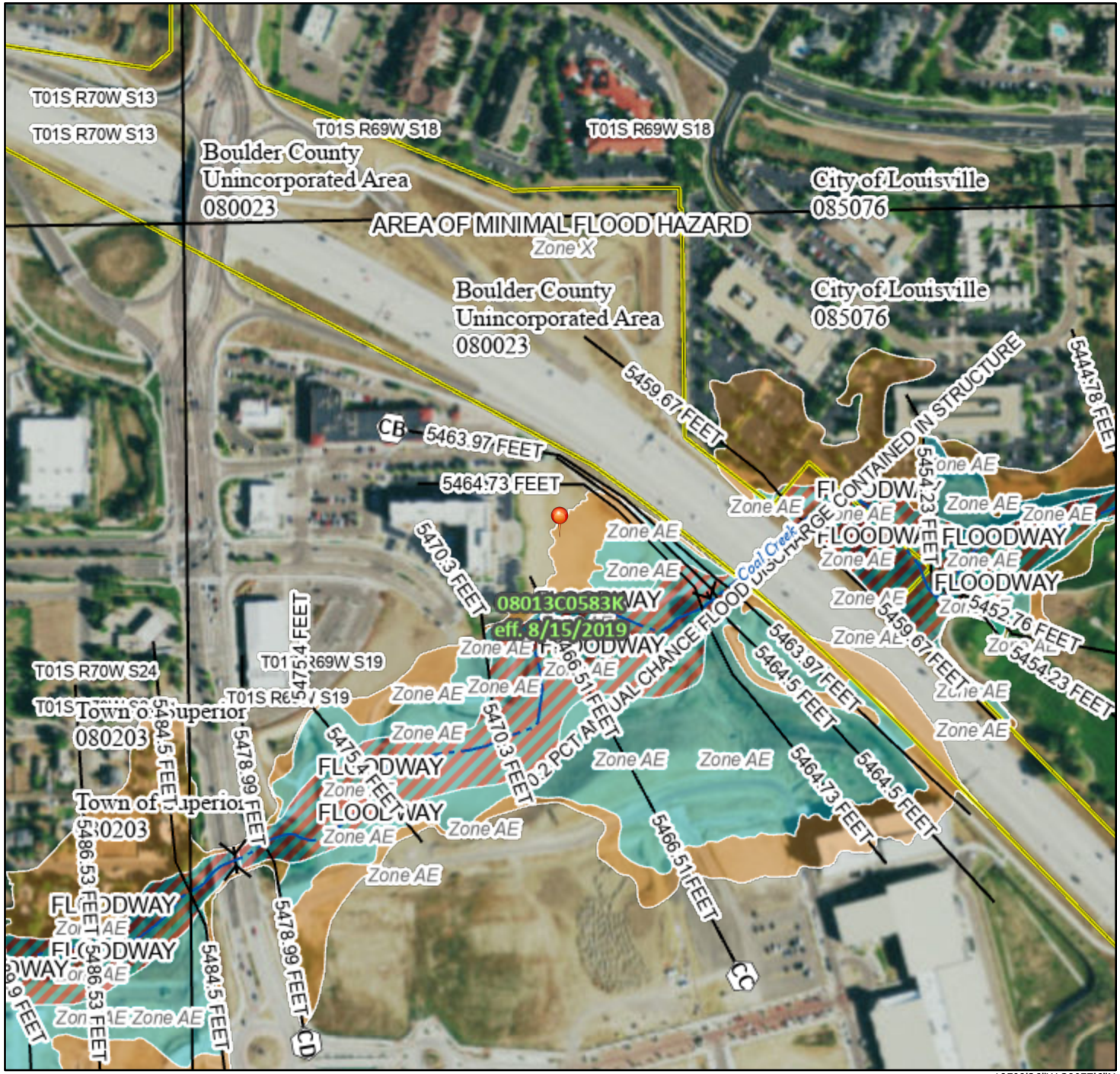
National Flood Hazard Layer FIRMette

FEMA

105°10'3"W 39°57'33"N



105°9'26"W 39°57'6"N

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

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/5/2023 at 6:54 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION BASED ON FILL DETERMINATION DOCUMENT (REMOVAL)

COMMUNITY AND MAP PANEL INFORMATION		LEGAL PROPERTY DESCRIPTION
COMMUNITY	TOWN OF SUPERIOR, BOULDER COUNTY, COLORADO	A portion of Lot 3B, Block 1, Superior Town Center Filing No. 1B Replat No. 3, as shown on the Plat recorded as Document No. 03560623, in the Office of the County Clerk and Recorder, Boulder County, Colorado The portion of property is more particularly described by the following metes and bounds:
	COMMUNITY NO.: 080203	
AFFECTED MAP PANEL	NUMBER: 08013C0583J	
	DATE: 12/18/2012	

FLOODING SOURCE: COAL CREEK

APPROXIMATE LATITUDE & LONGITUDE OF PROPERTY:39.955476, -105.162202
SOURCE OF LAT & LONG: LOMA LOGIC **DATUM: NAD 83**

DETERMINATION

LOT	BLOCK/ SECTION	SUBDIVISION	STREET	OUTCOME WHAT IS REMOVED FROM THE SFHA	FLOOD ZONE	1% ANNUAL CHANCE FLOOD ELEVATION (NAVD 88)	LOWEST ADJACENT GRADE ELEVATION (NAVD 88)	LOWEST LOT ELEVATION (NAVD 88)
3B	1	Superior Town Center Filing No. 1B Replat 3	3 Marshall Road	Portion of Property	X (shaded)	--	--	5466.6 feet

Special Flood Hazard Area (SFHA) - The SFHA is an area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood).

ADDITIONAL CONSIDERATIONS (Please refer to the appropriate section on Attachment 1 for the additional considerations listed below.)

LEGAL PROPERTY DESCRIPTION REVISED BY LETTER OF MAP REVISION
PORTIONS REMAIN IN THE FLOODWAY
FILL RECOMMENDATION

This document provides the Federal Emergency Management Agency's determination regarding a request for a Letter of Map Revision based on Fill for the property described above. Using the information submitted and the effective National Flood Insurance Program (NFIP) map, we have determined that the described portion(s) of the property(ies) is/are not located in the SFHA, an area inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood). This document revises the effective NFIP map to remove the subject property from the SFHA located on the effective NFIP map; therefore, the Federal mandatory flood insurance requirement does not apply. However, the lender has the option to continue the flood insurance requirement to protect its financial risk on the loan. A Preferred Risk Policy (PRP) is available for buildings located outside the SFHA. Information about the PRP and how one can apply is enclosed.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, Engineering Library, 3601 Eisenhower Ave Ste 500, Alexandria, VA 22304-6426.

Luis V. Rodriguez, P.E., Director
Engineering and Modeling Division
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION BASED ON FILL DETERMINATION DOCUMENT (REMOVAL)

ATTACHMENT 1 (ADDITIONAL CONSIDERATIONS)

LEGAL PROPERTY DESCRIPTION (CONTINUED)

BEGINNING at the Northwest corner of said Lot 3B and assuming the North line of Lot 3B as bearing North 88°42'50" East a distance of 110.00 feet with all other bearings contained herein relative thereto; THENCE along the Northerly line of said Lot 3B, North 88°42'50" East a distance of 110.00 feet to the beginning point of a non-tangent curve; THENCE along the arc of a curve concave to the Southwesterly an arc distance of 151.23 feet, a Radius of 5574.64 feet, a Delta of 01°33'16" and is subtended by a Chord bearing South 55°24'31" East a distance of 151.23 feet to a line non-tangent to this curve; THENCE departing said Northerly line, South 46°25'13" East a distance of 87.76 feet; THENCE South 49°21'50" East a distance of 47.10 feet; THENCE South 35°35'12" East a distance of 34.35 feet; THENCE South 09°22'00" West a distance of 32.35 feet; THENCE South 43°25'53" West a distance of 33.62 feet; THENCE South 53°55'27" West a distance of 38.93 feet to a point on the Southerly line of said Lot 3B; THENCE along said Southerly line, South 70°48'10" West a distance of 78.11 feet; THENCE departing said Southerly line, North 85°08'26" West a distance of 41.14 feet to a point on the Southerly line of Lot 3B;THENCE along Southerly and Westerly lines of said Lot 3B the next Seven (7) courses; THENCE North 72°34'13" West a distance of 57.78 feet; THENCE South 59°24'46" West a distance of 134.83 feet; THENCE North 01°17'10" West a distance of 41.28 feet; THENCE North 59°24'46" East a distance of 20.64 feet; THENCE North 01°17'10" West a distance of 169.95 feet; THENCE South 88°42'50" West a distance of 18.00 feet; THENCE North 01°17'10" West a distance of 134.00 feet to the POINT OF BEGINNING.

PORTIONS OF THE PROPERTY REMAIN IN THE FLOODWAY (This Additional Consideration applies to the preceding 1 Property.)

A portion of this property is located within the Special Flood Hazard Area and the National Flood Insurance Program (NFIP) regulatory floodway for the flooding source indicated on the Determination/Comment Document while the subject of this determination is not. The NFIP regulatory floodway is the area that must remain unobstructed in order to prevent unacceptable increases in base flood elevations. Therefore, no construction may take place in an NFIP regulatory floodway that may cause an increase in the base flood elevation, and any future construction or substantial improvement on the property remains subject to Federal, State/Commonwealth, and local regulations for floodplain management. The NFIP regulatory floodway is provided to the community as a tool to regulate floodplain development. Modifications to the NFIP regulatory floodway must be accepted by both the Federal Emergency Management Agency (FEMA) and the community involved. Appropriate community actions are defined in Paragraph 60.3(d) of the NFIP regulations. Any proposed revision to the NFIP regulatory floodway must be submitted to FEMA by community officials. The community should contact either the Regional Director (for those communities in Regions I-IV, and VI-X), or the Regional Engineer (for those communities in Region V) for guidance on the data which must be submitted for a revision to the NFIP regulatory floodway. Contact information for each regional office can be obtained by calling the FEMA Map Assistance Center toll free at (877) 336-2627 (877-FEMA MAP) or from our web site at http://www.fema.gov/about/regoff.htm.

Luis V. Rodriguez, P.E., Director
Engineering and Modeling Division
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION BASED ON FILL DETERMINATION DOCUMENT (REMOVAL)

ATTACHMENT 1 (ADDITIONAL CONSIDERATIONS)

FILL RECOMMENDATION (This Additional Consideration applies to the preceding 1 Property.)

The minimum NFIP criteria for removal of the subject area based on fill have been met for this request and the community in which the property is located has certified that the area and any subsequent structure(s) built on the filled area are reasonably safe from flooding. FEMA's Technical Bulletin 10-01 provides guidance for the construction of buildings on land elevated above the base flood elevation through the placement of fill. A copy of Technical Bulletin 10-01 can be obtained by calling the FEMA Map Assistance Center toll free at (877) 336-2627 (877-FEMA MAP) or from our web site at http://www.fema.gov/mit/tb1001.pdf. Although the minimum NFIP standards no longer apply to this area, some communities may have floodplain management regulations that are more restrictive and may continue to enforce some or all of their requirements in areas outside the Special Flood Hazard Area.

REVISED BY LETTER OF MAP REVISION (This Additional Consideration applies to the preceding 1 Property.)

The effective National Flood Insurance Program map for the subject property, has since been revised by a Letter of Map Revision (LOMR) dated 11/16/2017. The 11/16/2017 LOMR has been used in making the determination/comment for the subject property.

This attachment provides additional information regarding this request. If you have any questions about this attachment, please contact the FEMA Map Information eXchange (FMIX) toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, Engineering Library, 3601 Eisenhower Ave Ste 500, Alexandria, VA 22304-6426.

Luis V. Rodriguez, P.E., Director
Engineering and Modeling Division
Federal Insurance and Mitigation Administration

TITLE EXCEPTIONS:

1. Any facts, rights, interests, or claims thereof, not shown by the Public Records but that could be ascertained by an inspection of the Land or that may be asserted by persons in possession of the Land.

2. Easements, liens or encumbrances, or claims thereof, not shown by the Public Records.

3. Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the Title that would be disclosed by an accurate and complete land survey of the Land and not shown by the Public Records.

4. Any lien, or right to a lien, for services, labor or material heretofore or hereafter furnished, imposed by law and not shown by the Public Records.

5. Defects, liens, encumbrances, adverse claims or other matters, if any, created, first appearing in the public records or attaching subsequent to the effective date hereof but prior to the date of the proposed insured acquires of record for value the estate or interest or mortgage thereon covered by this Commitment.

6. (a) Taxes or assessments that are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the Public Records; (b) proceedings by a public agency that may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the Public Records.

7. (a) Unpatented mining claims; (b) reservations or exceptions in patents or in Acts authorizing the issuance thereof; (c) water rights, claims or title to water.

8. EXISTING LEASES AND TENANCIES, IF ANY.

9. AN UNDIVIDED ONE HALF INTEREST IN AND TO ALL COAL AND OTHER MINERALS, INCLUDING OIL AND GAS, AS RESERVED BY ATKINSON, IN DEED RECORDED OCTOBER 16, 1948 IN BOOK 835 AT PAGE 30, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.

(AFFECTS THE W1/2 NW1/4 SECTION 19–1S–69W)
Includes all of the subject property. Not plotted.

10. AN UNDIVIDED ONE HALF INTEREST IN AND TO ALL COAL AND OTHER MINERALS, INCLUDING OIL AND GAS, AS RESERVED BY BROWN, IN DEED RECORDED OCTOBER 16, 1948 IN BOOK 835 AT PAGE 33, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.

(AFFECTS THE W1/2 NW1/4 SECTION 19–1S–69W)
Same description as exception 9. Includes all of the subject property. Not plotted.

11. THOSE MINERAL INTERESTS, TOGETHER WITH ANY RIGHTS OF INGRESS AND EGRESS FOR THE PURPOSE OF MINING, DRILLING, AND EXPLORATION, AS CONVEYED OR AS EVIDENCED BY MINERAL DEEDS RECORDED MARCH 9, 1964 IN BOOK 1325 AT PAGE 120; APRIL 7, 1977 UNDER RECEPTION NO. 217506; JULY 1, 1980 UNDER RECEPTION NO. 401365; JULY 29, 1988 UNDER RECEPTION NO. 00932643; MAY 7, 1997 UNDER RECEPTION NO. 1696587; MARCH 30, 2012 UNDER RECEPTION NO. 3213069 AND MARCH 12, 2013 UNDER RECEPTION NO. 3296444.

(AFFECTS THE W1/2 NW1/4 SECTION 19–1S–69W)
Ruffenach and Rosenbaums Addition lies north of the subject property. The south 16 acres of the Northwest Quarter of the Northwest Quarter of Section 19 does include part of the subject property. Plotted.

12. OIL, GAS AND OTHER MINERAL RIGHTS AS RESERVED BY DENISON, MALCZYK, DEUEL AND CABLE, IN DEEDS RECORDED MAY 23, 1979 UNDER RECEPTION NOS. 338662, 338663, 338664 AND 338665, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.

(AFFECTS THE W1/2 NW1/4 SECTION 19–1S–69W)
Includes all of the subject property. Not plotted.

13. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS OF TOWN OF SUPERIOR ANNEXATION, AS EVIDENCED IN TOWN OF SUPERIOR ORDINANCE #98–O–1 AND MAP RECORDED FEBRUARY 23, 1998 UNDER RECEPTION NOS. 1773928 AND 1773929.
Includes all of the subject property. Not plotted.

14. ANY TAX, LIEN, FEE, ASSESSMENT OR EFFECT OF INCLUSIONS OF SUBJECT PROPERTY IN THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT, AS EVIDENCED BY ORDER OF THE DISTRICT COURT, RECORDED JULY 22, 1999 UNDER RECEPTION NO. 1963438 AND ORDER RECORDED OCTOBER 18, 2002 UNDER RECEPTION NO. 2345200.
Includes all of the subject property. Not plotted.

15. REQUEST FOR NOTICE OF SURFACE DEVELOPMENT BY NRC–CO 1 LLC, RECORDED SEPTEMBER 28, 2009 UNDER RECEPTION NO. 3032258.

(AFFECTS THE NW1/4 SECTION 19–1S–69W)
Includes all of the subject property. Not plotted.

16. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN SUPERIOR TOWN CENTER PLANNED DEVELOPMENT PLAN (ZONING), EVIDENCED BY RECORD OF APPROVAL BY THE TOWN OF SUPERIOR RECORDED FEBRUARY 04, 2013 UNDER RECEPTION NO. 3287102 AND AMENDMENT THERETO, EVIDENCED BY RECORD OF APPROVAL BY THE TOWN OF SUPERIOR RECORDED MAY 20, 2015 UNDER RECEPTION NO. 3446671, AND FURTHER AMENDMENT THERETO, EVIDENCED BY RECORD OF APPROVAL BY THE TOWN OF SUPERIOR RECORDED JUNE 22, 2016 UNDER RECEPTION NO. 3525749. (THE PLANS ARE NOT RECORDED)
Includes Superior Town Center. Appears to include all of the subject property. Not plotted.

17. EASEMENTS AS SET FORTH ON THE PLAT OF SUPERIOR TOWN CENTER FILING NO. 1 RECORDED FEBRUARY 4, 2013 UNDER RECEPTION NO. 3287103.

NOTE: THE LOCATION OF SAID EASEMENTS ARE PURPORTEDLY SHOWN AND PLOTTED ON ALTA/NSPS LAND TITLE SURVEY PREPARED BY KING SURVEYORS, JOB # 20160578–A, DATED FEBRUARY 1, 2017.
The 25' trail easement shown on this plat which included part of the subject property has been vacated. Not plotted. The 25' Superior Metro District easement shown on this plat does not include any of the subject property, and is plotted.

18. EASEMENTS, TERMS, CONDITIONS AND NOTES ON THE PLAT OF SUPERIOR TOWN CENTER FILING NO. 1B RECORDED FEBRUARY 25, 2014 UNDER RECEPTION NO. 3367475.

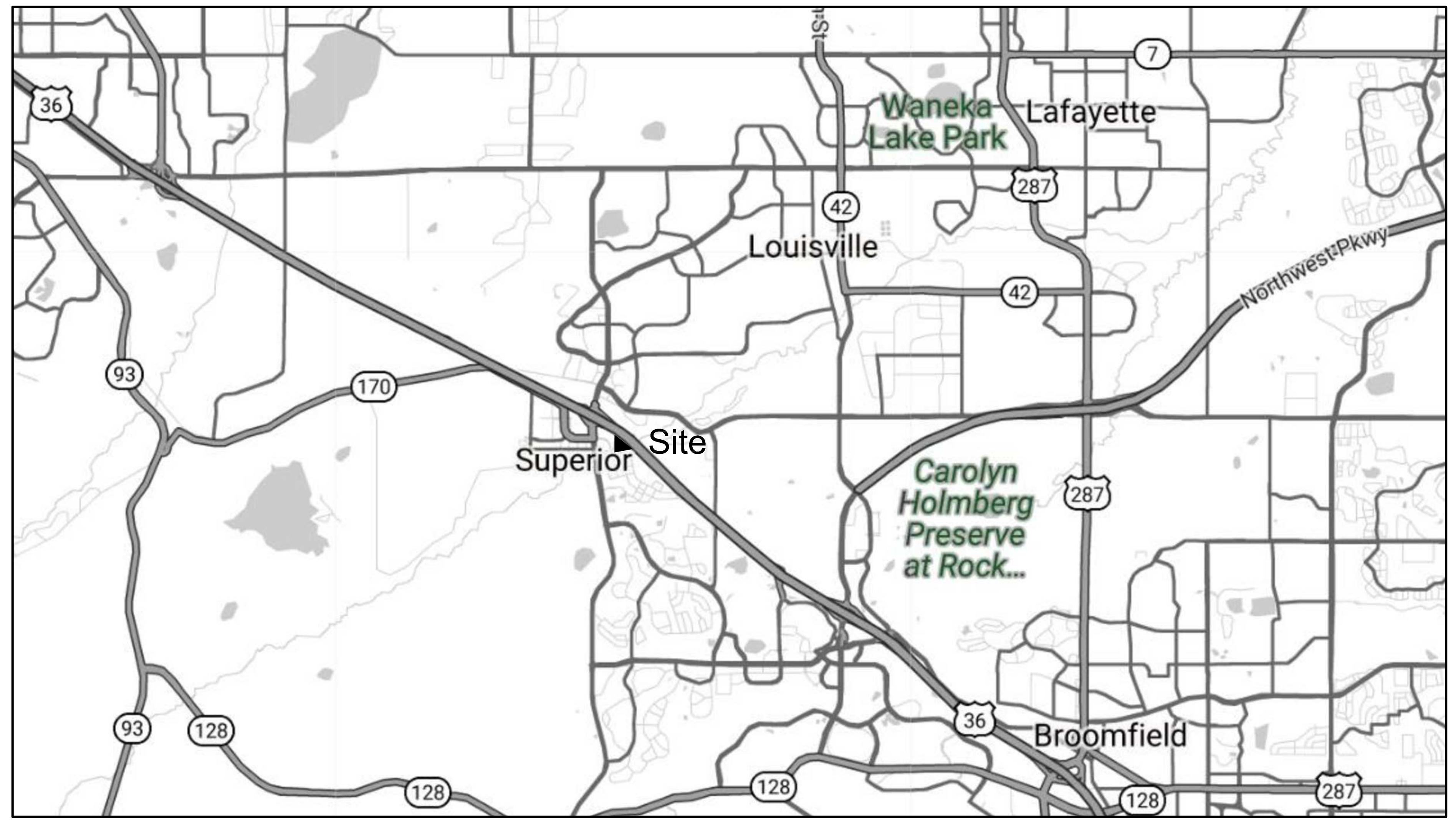
NOTE: THE LOCATION OF SAID EASEMENTS ARE PURPORTEDLY SHOWN AND PLOTTED ON ALTA/NSPS LAND TITLE SURVEY PREPARED BY KING SURVEYORS, JOB # 20160578–A, DATED FEBRUARY 1, 2017.

ADDENDUM TO FINAL PLAT RECORDED NOVEMBER 14, 2014 UNDER RECEPTION NO. 3413028.

NOTE: RATIFICATION AND CONFIRMATION OF PLATS RECORDED APRIL 14, 2015 UNDER RECEPTION NO. 03439335.
Easements include part of the subject property, except the portion of the trail easement that has been vacated. Plotted.

19. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN FINAL DEVELOPMENT PLAN – PHASE 1 FOR THE SUPERIOR TOWN CENTER, EVIDENCED BY RECORD OF APPROVAL BY THE TOWN OF SUPERIOR RECORDED MARCH 11, 2014 UNDER RECEPTION NO. 03369753. (THE PLANS ARE NOT RECORDED)
Includes Superior Town Center. Appears to include all of the subject property. Not plotted.

20. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN SUBDIVISION IMPROVEMENT AGREEMENT BY AND BETWEEN TOWN OF SUPERIOR AND RC SUPERIOR, LLC, RECORDED MARCH 11, 2014 UNDER RECEPTION NO. 03369754, FIRST AMENDMENT RECORDED JANUARY 14, 2014 UNDER RECEPTION NO. 3413029 AND UNRECORDED SECOND AMENDMENT DATED NOVEMBER 9, 2015 STORED AS OUR IMAGE 21366425, AND THIRD AMENDMENT THERETO RECORDED NOVEMBER 16, 2016 UNDER RECEPTION NO. 03557512.
Includes Superior Town Center. Appears to include all of the subject property. Not plotted.



VICINITY MAP 1" = 5000'

TITLE EXCEPTIONS (Cont'd):

21. RESTRICTIVE COVENANTS, WHICH DO NOT CONTAIN A FORFEITURE OR REVERTER CLAUSE, BUT OMITTING ANY COVENANTS OR RESTRICTIONS, IF ANY, BASED UPON RACE, COLOR, RELIGION, SEX, SEXUAL ORIENTATION, FAMILIAL STATUS, MARITAL STATUS, DISABILITY, HANDICAP, NATIONAL ORIGIN, ANCESTRY, OR SOURCE OF INCOME, AS SET FORTH IN APPLICABLE STATE OR FEDERAL LAWS, EXCEPT TO THE EXTENT THAT SAID COVENANT OR RESTRICTION IS PERMITTED BY APPLICABLE LAW, AS CONTAINED IN MASTER DECLARATION OF COVENANTS, CONDITIONS AND RESTRICTIONS FOR SUPERIOR TOWN CENTER BY RC SUPERIOR, LLC, RECORDED APRIL 14, 2015, UNDER RECEPTION NO. 03439339 AND FIRST AMENDMENT IN CONNECTION THEREWITH WAS RECORDED OCTOBER 18, 2021 UNDER RECEPTION NO. 03921592.

CONFIRMATION OF BUILDER DESIGNATION IN CONNECTION THEREWITH WAS RECORDED JANUARY 26, 2017 UNDER RECEPTION NO. 03571646.

CONFIRMATION OF BUILDER DESIGNATION IN CONNECTION THEREWITH WAS RECORDED FEBRUARY 2, 2017 UNDER RECEPTION NO. 03572998.

CORRECTIVE AMENDMENT OF CONFIRMATION OF BUILDER DESIGNATION IN CONNECTION THEREWITH WAS RECORDED FEBRUARY 3, 2017 UNDER RECEPTION NO. 03573103.

CONFIRMATION OF BUILDER DESIGNATION IN CONNECTION THEREWITH WAS RECORDED MARCH 20, 2017 UNDER RECEPTION NO. 03581164 AND 03581160.

CONFIRMATION OF BUILDER DESIGNATION IN CONNECTION THEREWITH WAS RECORDED MARCH 29, 2017 UNDER RECEPTION NO. 03583192.

CONFIRMATION OF BUILDER DESIGNATION IN CONNECTION THEREWITH WAS RECORDED MARCH 29, 2019 UNDER RECEPTION NO. 03703627.

CONFIRMATION OF BUILDER DESIGNATION IN CONNECTION THEREWITH WAS RECORDED JUNE 06, 2019 UNDER RECEPTION NO. 03716742.

CONFIRMATION OF BUILDER DESIGNATION IN CONNECTION THEREWITH WAS RECORDED FEBRUARY 19, 2020 UNDER RECEPTION NO. 03766889.

CONFIRMATION OF BUILDER DESIGNATION IN CONNECTION THEREWITH WAS RECORDED JANUARY 05, 2021 UNDER RECEPTION NO. 03847644.

CONFIRMATION OF BUILDER DESIGNATION IN CONNECTION THEREWITH WAS RECORDED DECEMBER 05, 2022 UNDER RECEPTION NO. 03990813.
Includes Superior Town Center. Appears to include all of the subject property. Not plotted.

22. EASEMENTS, CONDITIONS, COVENANTS, RESTRICTIONS, RESERVATIONS AND NOTES ON THE PLAT OF SUPERIOR TOWN CENTER FILING NO. 1B REPLAT NO. 3, RECORDED DECEMBER 1, 2016 UNDER RECEPTION NO. 03560623.
Easements include part of the subject property. Plotted.

23. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN SUBDIVISION IMPROVEMENT AGREEMENT (FDP1–PHASE III) RECORDED SEPTEMBER 01, 2016 UNDER RECEPTION NO. 03541132.
Includes Superior Town Center. Appears to include all of the subject property. Not plotted.

24. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN SUBDIVISION IMPROVEMENT AGREEMENT RECORDED OCTOBER 12, 2016 UNDER RECEPTION NO. 03550038.
Includes Superior Town Center. Appears to include all of the subject property. Not plotted.

25. ANY TAX, LIEN, FEE, OR ASSESSMENT BY REASON OF INCLUSION OF SUBJECT PROPERTY IN THE STC METROPOLITAN DISTRICT NO. 3, AS EVIDENCED BY INSTRUMENT RECORDED FEBRUARY 2, 2017 UNDER RECEPTION NO. 03572956.
Includes Lot 3A adjoining to the west. Not plotted.

26. TERMS, CONDITIONS, PROVISIONS, BURDENS, OBLIGATIONS AND EASEMENTS AS SET FORTH AND GRANTED IN RECIPROCAL EASEMENT AGREEMENT BY AND BETWEEN RC SUPERIOR LLC AND QC GLACIER STANDBY SUPERIOR LLC, RECORDED FEBRUARY 2, 2017 UNDER RECEPTION NO. 03572997.
Includes part of the subject property. Easement is not defined mathematically. Not plotted.

27. THE EFFECT OF VACATION EXHIBIT, RECORDED APRIL 20, 2017, UNDER RECEPTION NO. 03587780.
The 25' trail easement which included part of the subject property has been vacated. Not plotted.

28. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN INCLUSION AGREEMENT FOR STC METROPOLITAN DISTRICTS NOs. 1, 2, AND 3 RECORDED DECEMBER 18, 2019 UNDER RECEPTION NO. 03755495.
Includes all of the subject property. Not plotted.

29. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN AMENDED AND RESTATED DECLARATION OF THE SUPERIOR TOWN CENTER PAYMENT IN LIEU OF TAXES RECORDED DECEMBER 19, 2019 UNDER RECEPTION NO. 03755979.
Includes all of the subject property. Not plotted.

30. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN DECLARATION OF COVENANTS IMPOSING AND IMPLEMENTING THE SUPERIOR TOWN CENTER PUBLIC IMPROVEMENTS FEE RECORDED DECEMBER 22, 2020 UNDER RECEPTION NO. 03844551.
Includes all of the subject property. Not plotted.

GENERAL NOTES:

1. Statute of limitations disclosure required per 13–80–105, C.R.S.:
Notice: According to Colorado law you MUST commence any legal action based upon any defect in this survey within three years after you first discover such defect. In no event may any action based upon any defect in this survey be commenced more than ten years from the date of the certification shown hereon.

2. Statement of lineal units required per 38–51–106(1)(l), C.R.S.: Lineal unit of measure used in this survey is U.S. Survey Foot.

3. The boundary lines shown on this survey represent a professional opinion by this surveyor as to where the boundary lines hereby retraced were originally laid out on the ground and subsequently accepted by the affected land owners. The discovery of additional evidence may result in a different opinion.

4. All copyrights to publications by Foresight West Surveying, Inc. are reserved. Additionally, all field books, notes, sketches and electronic files are instruments of service and shall remain the sole property of Foresight West Surveying, Inc. If this survey is deposited with the County in compliance with 38–51–107, C.R.S., Foresight West Surveying, Inc. accepts no liability from proprietary or confidential information disclosed to the public by the contents herein.

5. Preservation of Boundary Monumentation: Any person who knowingly removes, alters or defaces:
1) any public land survey monument (defined by 38–53–103(18), C.R.S. as any land boundary monument established on the ground by a cadastral survey of the United States government and any mineral survey monument established by a United States mineral surveyor and made a part of the United States public land records), or
2) any land survey corner (defined by 38–53–103(6), C.R.S. as any land survey corner the position of which controls the location of the boundaries of a tract or parcel of land), or a restoration of any such monument, even if said person has title to the land on which said monument is located, commits a class 2 misdemeanor punishable by a fine of up to $1,000 and/or 1 year in jail unless, prior to such removal, said person has caused a Colorado professional land surveyor to establish at least two witness corners or reference marks for each such monument removed and has filed or caused to be filed a monument record pursuant to article 53 of title 38, C.R.S. (18–4–508, C.R.S.)

6. Oil, gas, coal, mineral, water, ditch, reservoir, geothermal, avigation, grazing or other rights, as well as development, zoning, lease, fire district or other restrictions, both recorded and unrecorded, may affect this property and not be plottable graphically hereon.

7. The locations of any underground utilities shown hereon are not to be considered all–inclusive and may be inaccurate. Underground utility locations may have been determined from available construction plans and as–built maps, surface markings established by independent locators or utility companies, or from surface features. Underground utilities shown hereon have not been exposed by this firm and may vary in actual location, usage, material, size and/or existence. This firm accepts no liability for inaccurate work by utility locators. Per Title 9, Article 1.5, C.R.S., underground utilities must be marked prior to any digging or drilling by submitting a request to the Utility Notification Center of Colorado. Call (811) at least 72 hours in advance.

8. All users of this survey are hereby notified that this survey in no way constitutes a title search by Foresight West Surveying Inc. for determination of (a)right to title, (b)chain of title/abstract, (c)the historical compatibility of all descriptions of this property with all descriptions of adjoining properties, and (d)easements, rights–of–way and other instruments of record that may impact title to this property. Additionally, unwritten rights to this property may exist which are unknown to this firm. A reasonable effort was made to research the records for this property and the adjoining properties in accordance with the usual and customary standard of care for land surveyors practicing in Colorado.

9. Title Policy Reference: For all information regarding right to title and easements, rights–of–way or other title burdens affecting such right to title to this property, this survey relied upon title commitment issued by Land Title Guarantee Company/Old Republic National Title Insurance Company, Order Number: ABZ70822737, with an effective date of 09/28/2023.

10. Building Setback notice: Due to frequent changes in and differing interpretations of zoning ordinances, the owner is urged to contact the governing municipality(ies) for guidance relating to setback requirements prior to planning future improvements on this property. No zoning report or letter citing setback restrictions was provided.

11. Basis of bearings statement required per 38–51–106(1)(e), C.R.S.:
Bearings are based upon the northeasterly line of Lot 3B, Block 1, Superior Town Center Filing No. 1B Replat No. 3, said line being an arc with a record chord bearing of North 54°18'05" West as shown on said plat. The monuments are described hereon.

12. Elevations are based upon a post–processed static GNSS connection made to NGS Bench Mark W 413 (PID KK1549) utilizing Geoid12B to model the ellipsoid separation. Elevation: 5459.62 (NAVD 88).

13. This parcel lies within Zone X and Special Flood Hazard Zone AE as shown on FEMA FIRM map no. 08013C0583K, revised 8/15/2019. Flood zone limits shown hereon were scaled and are not to be relied upon for accuracy.

14. Measured dimensions shown hereon reflect the results of a least squares adjustment of the field measurements.

15. No evidence of recent earth moving work, building construction or building additions was observed in the process of conducting the field work.

16. No proposed changes in street right of way lines was provided. No evidence of recent street or sidewalk constructions or repairs was observed in the process of conducting the field work.

17. All found and set monuments are fairly close to ground surface unless noted otherwise.

18. Any monuments shown hereon that are not tied to this survey were not used as control corners and are shown for posterity only.

LEGAL DESCRIPTION:

LOT 3B, BLOCK 1, SUPERIOR TOWN CENTER FILING NO. 1B REPLAT NO. 3, ACCORDING TO THE PLAT THEREOF RECORDED DECEMBER 1, 2016 UNDER RECEPTION NO. 03560623, COUNTY OF BOULDER, STATE OF COLORADO

SURVEYOR'S CERTIFICATION:

This certification does not extend to any unnamed persons or legal entities without written recertification expressly naming such persons or legal entities.

To KT DEVELOPMENT LLC, A COLORADO LIMITED LIABILITY COMPANY and LAND TITLE GUARANTEE COMPANY/OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY:

This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2021 Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes Items 1, 2, 3, 4, 5, 6(a), 6(b), 8, 11(b), 13, 16 and 17 of Table A thereof. The fieldwork was completed on October 26, 2023.

Pursuant to Colorado Revised Statute 38–51–106 (1)(d) and Colorado State Board of Licensure for Professional Land Surveyors Rule 1.6(B)(2), the undersigned further certifies that this survey was performed under my responsible charge, is based upon my knowledge, information and belief, is in accordance with applicable standards of practice, and this certification is not a guaranty or warranty, either expressed or implied.

Lester J. Ludeman, PLS 25636
Email: lludeman@foresightwest.com
Signature and date through seal:
(Required by Colorado law)

COLORADO LICENSED PROFESSIONAL LAND SURVEYOR
LESTER J. LUDEMAN
25636
07 Nov 2023
Embedded Electronic Signature

Sheet 1 of 3

Project No. 2023141

Project Description: Lot 3B Superior Town Center 1B

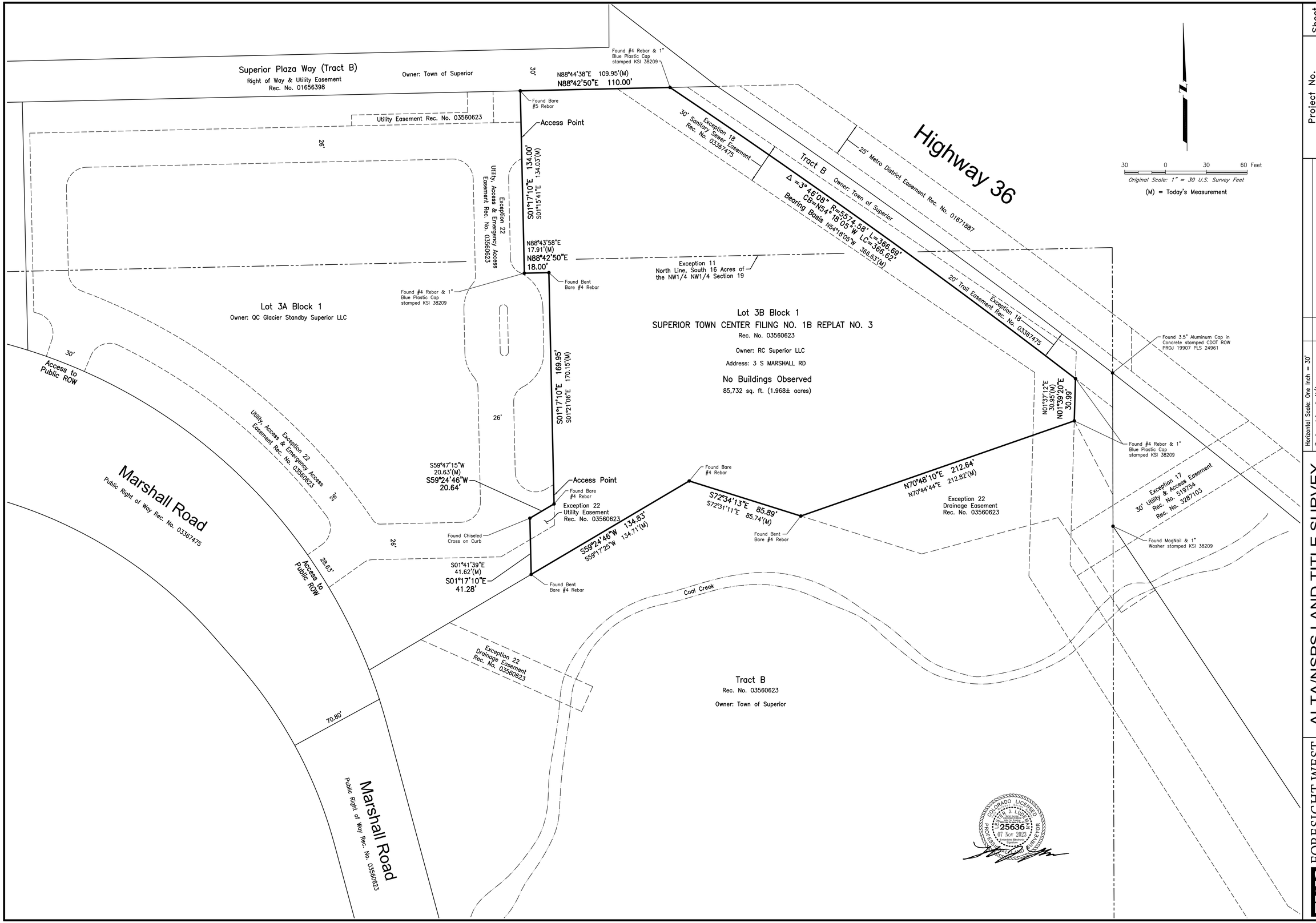
Revisions | By

Horizontal Scale: One Inch = 5000'
Contour Interval: N/A
Surveyed By: KAP
Calculated: LJL
Drawn: LJL
An electronic seal is embedded in the cover page and applies to all attached pages bearing the Foresight West logo

ALTA/NSPS LAND TITLE SURVEY

PART OF THE NORTHWEST QUARTER OF SECTION 19, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE 6th P.M., TOWN OF SUPERIOR, BOULDER COUNTY, COLORADO

FWS FORESIGHT WEST SURVEYING INC.
1309 S. Inca Street, Denver, CO 80223 303-504-4440 ForesightWest.com
Boundary Control Construction Oil and Mineral Global Positioning



Sheet 2 of 3

Project No. 2023141

Project Description
Lot 3B Superior Town Center 1B

Revisions	By

Horizontal Scale: One Inch = 30'
Contour Interval: N/A
Surveyed By: KAP
Calculated: LJL
Drawn: LJL

An electronic seal is embedded in the cover page and each of the following pages bearing the Foresight West logo.

ALTA/NSPS LAND TITLE SURVEY

PART OF THE NORTHWEST QUARTER OF SECTION 19, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE 6th P.M., TOWN OF SUPERIOR, BOULDER COUNTY, COLORADO

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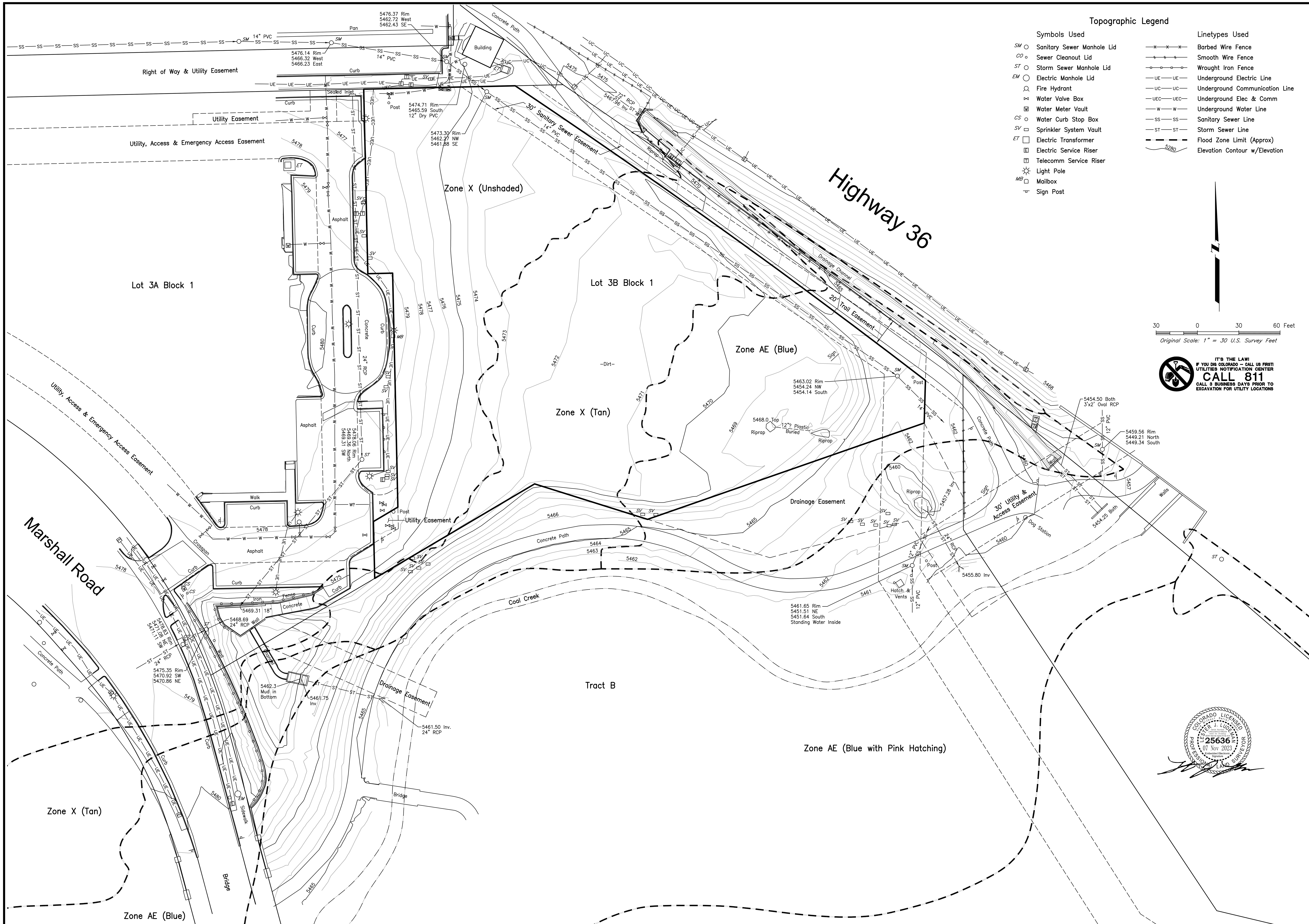


ALTA/NSPS LAND TITLE SURVEY

PART OF THE NORTHWEST QUARTER OF SECTION 19, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE 6th P.M., TOWN OF SUPERIOR, BOULDER COUNTY, COLORADO

Sheet 3 of 3

Project No. 2023141

Project Description: Lot 3B Superior Town Center 1B

Revisions | By

Horizontal Scale: One Inch = 30'
Contour Interval: 1 Foot
Surveyed By: KAP
Calculated: LJL
Drawn: LJL

An electronic seal is embedded in the cover page and applies to all attached pages bearing the Foresight West logo

COLORADO LICENSED PROFESSIONAL LAND SURVEYOR 25636 — 07 Nov 2023

FWS FORESIGHT WEST SURVEYING INC.
1309 S. Inca Street, Denver, CO 80223 303-504-4440 ForesightWest.com
Boundary Control Construction Oil and Mineral Global Positioning

Appendix B – Hydrologic Computations

Runoff Coefficients

Corridor / Design Package: KT Dev - Hotels
System Name: Historic Condition

Computed: AMG Date: 3/29/2024
Checked: KMH Date: 3/29/2024

Sub-Basin Data			Composite C			Sub Area (Pavement)				Sub Area (Roof)				Sub Area(Lawns C Group soils)			
Basin ID	Description	Total Area (ac)	C_5	C_{100}	i	C_5	C_{100}	i	Area (ac)	C_5	C_{100}	i	Area (ac)	C_5	C_{100}	i	Area (ac)
H1	SITE TO COAL CREEK	1.97	0.16	0.20	2.0	0.88	0.93	100	0.000	0.85	0.90	90	0.000	0.16	0.20	2	1.970
Improvements Composite		1.97	0.16	0.20	2.0	0.88	0.93	100	0.000	0.85	0.90	90	0.000	0.16	0.20	2	1.970
COMPOSITE ZONE LOT =		1.97	0.16	0.20	2.0												

Runoff Coefficients

Corridor / Design Package: KT Dev - Hotels
System Name: Developed Condition

Computed: AMG Date: 3/29/2024
Checked: KMH Date: 3/29/2024

Sub-Basin Data			Composite C			Sub Area (Pavement)				Sub Area (Roof)				Sub Area(Lawns C Group soils)			
Basin ID	Description	Total Area (ac)	C_5	C_{100}	i	C_5	C_{100}	i	Area (ac)	C_5	C_{100}	i	Area (ac)	C_5	C_{100}	i	Area (ac)
A1	Everhome Suites Hotel	0.34	0.85	0.90	90.0	0.88	0.93	100	0.000	0.85	0.90	90	0.340	0.16	0.20	2	0.000
A2	NW Landscape Area	0.06	0.25	0.29	14.6	0.88	0.93	100	0.008	0.85	0.90	90	0.000	0.16	0.20	2	0.056
A2.1	NW Landscape Area	0.03	0.35	0.39	28.0	0.88	0.93	100	0.007	0.85	0.90	90	0.000	0.16	0.20	2	0.019
A3	SW Ramp Area	0.04	0.66	0.71	70.2	0.88	0.93	100	0.030	0.85	0.90	90	0.000	0.16	0.20	2	0.013
A4	SW Parking and Drive Aisle	0.10	0.79	0.84	87.6	0.88	0.93	100	0.083	0.85	0.90	90	0.000	0.16	0.20	2	0.012
A5	Parking Lot and SW Drive Aisle	0.13	0.82	0.86	91.2	0.88	0.93	100	0.122	0.85	0.90	90	0.000	0.16	0.20	2	0.012
A6	Parking Lot	0.97	0.85	0.90	96.3	0.88	0.93	100	0.933	0.85	0.90	90	0.000	0.16	0.20	2	0.037
BY-E	Towards Trail and Coal Creek	0.30	0.16	0.20	2.0	0.88	0.93	100	0.000	0.85	0.90	90	0.000	0.16	0.20	2	0.297
Improvements Composite		1.97	0.71	0.76	76.1	0.88	0.93	100	1.184	0.85	0.90	90	0.340	0.16	0.20	2	0.446
COMPOSITE ZONE LOT =		1.97	0.71	0.76	76.1												

Standard Form SF-1 . Time of Concentration

Corridor / Design Package: KT Dev - Hotels
System Name: Developed Condition

Computed: AMG Date: 3/29/2024
Checked: KMH Date: 3/29/2024

SUB-BASIN DATA				INITIAL/OVERLAND FLOW (t_i)			TRAVEL TIME (t_t) Type of Land Surface							Total	Tc CHECK (Urbanized basins)				FINAL Tc (min)
Basin ID	Description	C_s	Area (ac)	Length (ft)	Slope (ft/ft)	t_i (min)	Length (ft)	Slope (ft/ft)	Code	Description	Convey Coef (C_v)	V	t_t (min)	$t_c = t_i + t_t$ (min)	Urban (Yes /No)	Length (ft)	$T_{c\,max}$ (min)	$Tc_{max} > t_c$	
A1	Everhome Suites Hotel	0.85	0.34	100	0.02	3.6	0.0	0.02	6	Paved areas and shallow paved swales	20	2.828	0.00	3.59	Yes	100	0.56	Regional Tc	5.00
A2	NW Landscape Area	0.25	0.06	90	0.02	11.5	0.0	0.02	6	Paved areas and shallow paved swales	20	2.828	0.00	11.55	Yes	90	0.50	Regional Tc	11.55
A2.1	NW Landscape Area	0.35	0.03	90	0.02	10.2	0.0	0.02	6	Paved areas and shallow paved swales	20	2.828	0.00	10.20	Yes	90	0.50	Regional Tc	10.20
A3	SW Ramp Area	0.66	0.04	75	0.02	5.5	0.0	0.01	6	Paved areas and shallow paved swales	20	2	0.00	5.46	Yes	75	0.42	Regional Tc	5.46
A4	SW Parking and Drive Aisle	0.79	0.10	54	0.03	2.9	15.0	0.02	6	Paved areas and shallow paved swales	20	2.828	0.09	2.96	Yes	69	0.38	Regional Tc	5.00
A5	Parking Lot and SW Drive Aisle	0.82	0.13	192	0.03	5.0	0.0	0.01	6	Paved areas and shallow paved swales	20	2	0.00	4.95	Yes	192	1.07	Regional Tc	5.00
A6	Parking Lot	0.85	0.97	244	0.03	4.9	72.0	0.01	6	Paved areas and shallow paved swales	20	2	0.60	5.45	Yes	316	1.76	Regional Tc	5.45
BY-E	Towards Trail and Coal Creek	0.16	0.30	40	0.25	3.7	0.0	0.02	6	Paved areas and shallow paved swales	20	2.828	0.00	3.71	Yes	40	0.22	Regional Tc	5.00

Standard Form SF-2 . Storm Drainage System Design (Rational Method Procedure)

Corridor / Design Package: KT Dev - Hotels
System Name: Developed Condition

Computed: AMG Date: 3/29/2024
Checked: KMH Date: 3/29/2024

Design Storm: Proposed 5-yr P = 1.34 in

LOCATION		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C.A. (AC)	IIN / HR	Q (CFS)	t_c (MIN)	SUM (C*A)(AC)	I(IN / HR)	Q(CFS)	SLOPE(%)	STREETFLOW (C	DESIGNFLOW (C	SLOPE(%)	PIPE SIZE(in)	LENGTH(FT)	VELOCITY(FPS)	t_t (MIN	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A2	NW Landscape Area		A2	0.06	0.25	11.55	0.016	3.42	0.06					--	--	--	--	--	--	--		
A2.1	NW Landscape Area		A2.1	0.03	0.35	10.20	0.009	3.60	0.03					--	--	--	--	--	--	--		
	A2 and A2.1	1								11.55	0.025	3.42	0.09									
A1	Everhome Suites Hotel		A1	0.34	0.85	5.00	0.289	4.55	1.31					--	--	--	--	--	--	--		
		2								11.55	0.314	3.42	1.07									
A3	SW Ramp Area		A3	0.04	0.66	5.46	0.028	4.44	0.13					--	--	--	--	--	--	--		
A4	SW Parking and Drive Aisle		A4	0.10	0.79	5.00	0.075	4.55	0.34					--	--	--	--	--	--	--		
		3								5.46	0.104	4.44	0.46									
A5	Parking Lot and SW Drive Aisle		A5	0.13	0.82	5.00	0.109	4.55	0.50					--	--	--	--	--	--	--		
		4								11.55	0.527	3.42	1.80									
A6	Parking Lot		A6	0.97	0.85	5.45	0.827	4.44	3.67					--	--	--	--	--	--	--		
		5								11.55	1.354	3.42	4.63									
BY-E	Towards Trail and Coal Creek		BY-E	0.30	0.16	5.00	0.048	4.55	0.22													
	BASIN TOTAL								6.26													

Design Storm: Proposed 100-yr P = 2.57 in

LOCATION		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C.A. (AC)	IIN / HR	Q (CFS)	t_c (MIN)	SUM (C*A)(AC)	I(IN / HR)	Q(CFS)	SLOPE(%)	STREETFLOW (C	DESIGNFLOW (C	SLOPE(%)	PIPE SIZE(in)	LENGTH(FT)	VELOCITY(FPS)	t_t (MIN	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A2	NW Landscape Area		A2	0.06	0.29	11.55	0.02	6.56	0.12					--	--	--	--	--	--	--		
A2.1	NW Landscape Area		A2.1	0.03	0.39	10.20	0.01	6.90	0.07					--	--	--	--	--	--	--		
		1								11.55	0.029	3.42	0.10									
A1	Everhome Suites Hotel		A1	0.34	0.90	5.00	0.31	8.72	2.67					--	--	--	--	--	--	--		
		2								11.55	0.335	3.42	1.14									
A3	SW Ramp Area		A3	0.04	0.71	5.46	0.03	8.51	0.26					--	--	--	--	--	--	--		
A4	SW Parking and Drive Aisle		A4	0.10	0.84	5.00	0.08	8.72	0.70					--	--	--	--	--	--	--		
		3								5.46	0.110	4.44	0.49									
A5	Parking Lot and SW Drive Aisle		A5	0.13	0.86	5.00	0.12	8.72	1.01					--	--	--	--	--	--	--		
		4								11.55	0.561	3.42	1.92									
A6	Parking Lot		A6	0.97	0.90	5.45	0.88	8.51	7.45					--	--	--	--	--	--	--		
		5								11.55	1.437	3.42	4.91									
BY-E	Towards Trail and Coal Creek		BY-E	0.30	0.20	5.00	0.06	8.72	0.52					--	--	--	--	--	--	--		
	BASIN TOTAL								12.80													

(1) Basin Description linked to C-Value Sheet
(2) Basin Design Point
(3) Enter the Basin Name from C Value Sheet
(4) Basin Area linked to C-Value Sheet
(5) Composite C linked to C-Value Sheet
(6) Time of Concentration linked to C-Value Sheet
(7) =Column 4 x Column 5
(8) =28.5*P/(10+Column 6)^0.786
(9) =Column 7 x Column 8
(10) =Column 6 + Column 21
(11) Add the Basin Areas (7) to get the combined basin AC
(12) =28.5*P/(10+Column 10)^0.786
(13) Sum of Qs
(14) Additonal Street Overland Flow
(15) Additonal Street Overland Flow
(16) Design Pipe Flow
(17) Pipe Slope
(18) Pipe Size
(19) Additional Flow Length
(20) Velocity
(21) =Column 19 / Column 20 / 60

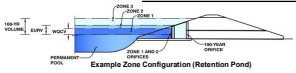
Appendix C – Hydraulic Computations

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Everhome Suites - Superior

Basin ID:



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	1.97	acres
Watershed Length =	402	ft
Watershed Length to Centroid =	201	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	76.10%	percent
Percentage Hydrologic Soil Group A =	18.9%	percent
Percentage Hydrologic Soil Group B =	81.1%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Superior - Town Hall	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.050	acre-feet	
Excess Urban Runoff Volume (EURV) =	0.171	acre-feet	
2-yr Runoff Volume (P1 = 0.8 in.) =	0.084	acre-feet	inches
5-yr Runoff Volume (P1 = 1.08 in.) =	0.120	acre-feet	inches
10-yr Runoff Volume (P1 = 1.34 in.) =	0.155	acre-feet	inches
25-yr Runoff Volume (P1 = 1.75 in.) =	0.222	acre-feet	inches
50-yr Runoff Volume (P1 = 2.1 in.) =	0.276	acre-feet	inches
100-yr Runoff Volume (P1 = 2.49 in.) =	0.341	acre-feet	inches
500-yr Runoff Volume (P1 = 3.53 in.) =	0.507	acre-feet	inches
Approximate 2-yr Detention Volume =	0.087	acre-feet	
Approximate 5-yr Detention Volume =	0.124	acre-feet	
Approximate 10-yr Detention Volume =	0.163	acre-feet	
Approximate 25-yr Detention Volume =	0.203	acre-feet	
Approximate 50-yr Detention Volume =	0.228	acre-feet	
Approximate 100-yr Detention Volume =	0.257	acre-feet	

Define Zones and Basin Geometry

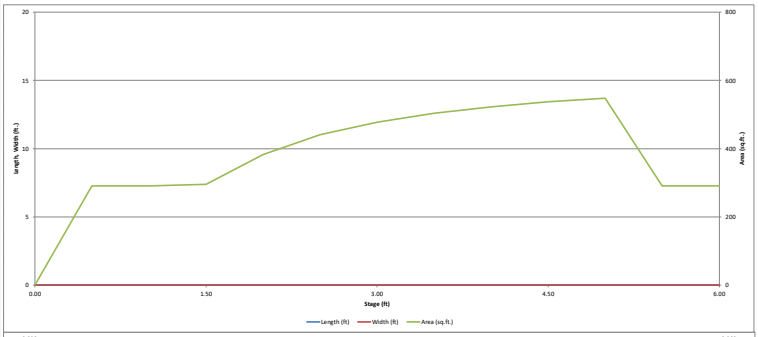
Zone 1 Volume (WQCV) =	0.050	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.050	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

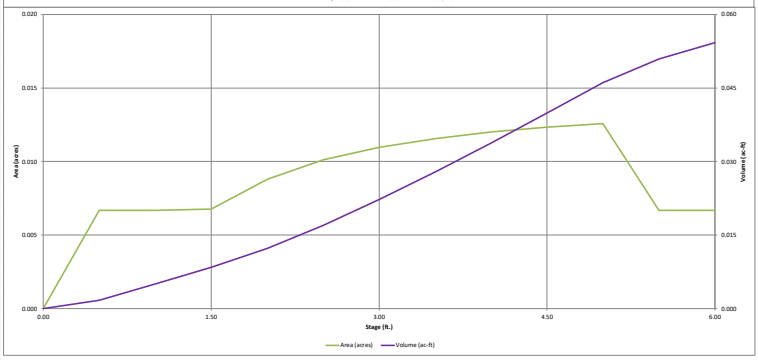
Total detention volume is less than 100-year volume.

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

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
5462.50	--	0.50	--	--	--	291	0.007	73	0.002
5463.00	--	1.00	--	--	--	291	0.007	218	0.005
5463.50	--	1.50	--	--	--	295	0.007	365	0.008
5464.00	--	2.00	--	--	--	382	0.009	534	0.012
5464.50	--	2.50	--	--	--	441	0.010	740	0.017
5465.00	--	3.00	--	--	--	477	0.011	969	0.022
5465.50	--	3.50	--	--	--	503	0.012	1,214	0.028
5466.00	--	4.00	--	--	--	523	0.012	1,471	0.034
WQ Elevation	--	4.50	--	--	--	537	0.012	1,736	0.040
5467.00	--	5.00	--	--	--	548	0.013	2,007	0.046
5467.50	--	5.50	--	--	--	291	0.007	2,217	0.051
5468.00	--	6.00	--	--	--	291	0.007	2,362	0.054





DETENTION BASIN STAGE-STORAGE TABLE BUILDER

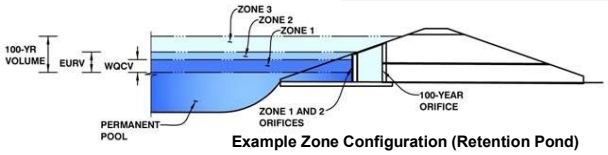
MHFD-Detention, Version 4.06 (July 2022)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Everhome Suites - Superior**

Basin ID:



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	5.40	0.050	Orifice Plate
Zone 2			
Zone 3			
Total (all zones)		0.050	

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

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

Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft^2

Underdrain Orifice Centroid = feet

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

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 5.81 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = 4.00 inches

Orifice Plate: Orifice Area per Row = 0.20 sq. inches (diameter = 1/2 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row = 1.389E-03 ft^2

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

Elliptical Slot Area = N/A ft^2

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	0.30	0.60	0.90	1.20	1.50	1.80	2.10
Orifice Area (sq. inches)	0.20	0.20	0.20					

	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)	2.40	2.70	3.00	3.30	3.60	3.90	4.20	4.50
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
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

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
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)

	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			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 Type =			
Debris Clogging % =			%

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected	
Height of Grate Upper Edge, H_t =			feet
Overflow Weir Slope Length =			feet
Grate Open Area / 100-yr Orifice Area =			
Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Open Area w/ Debris =			ft^2

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

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =			ft^2
Outlet Orifice Centroid =			feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	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

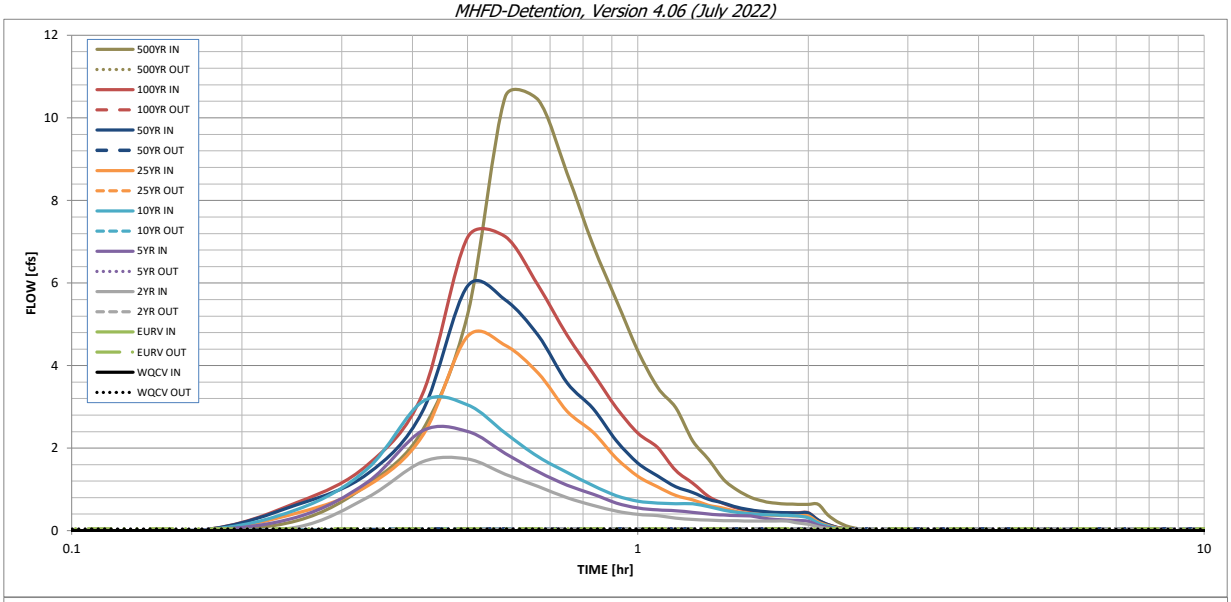
Routed Hydrograph Results

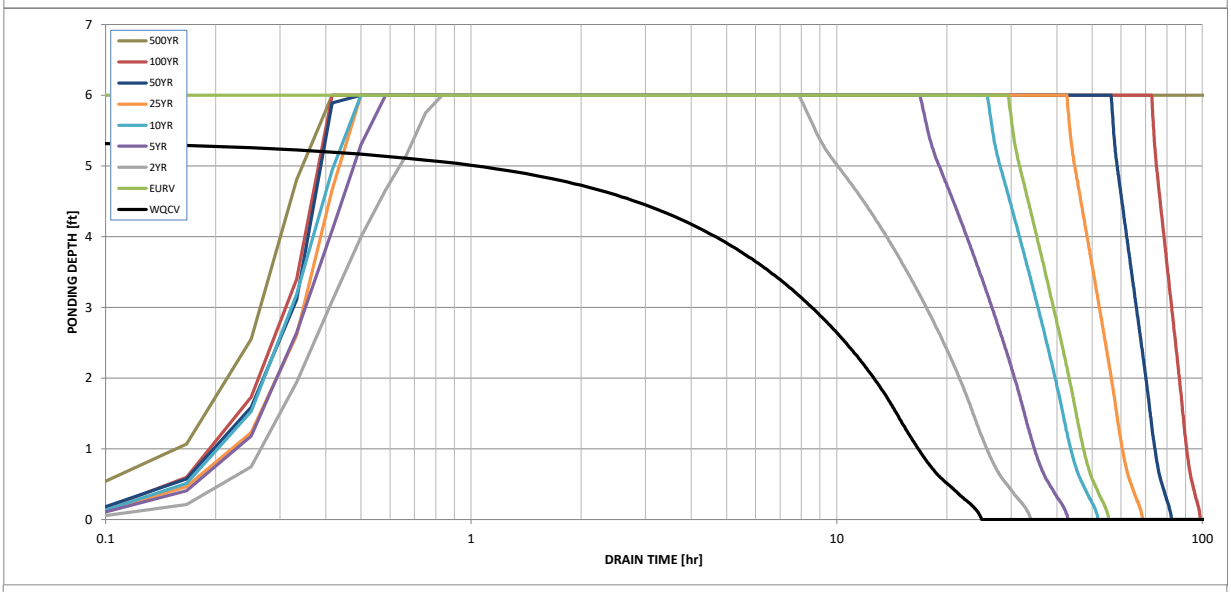
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

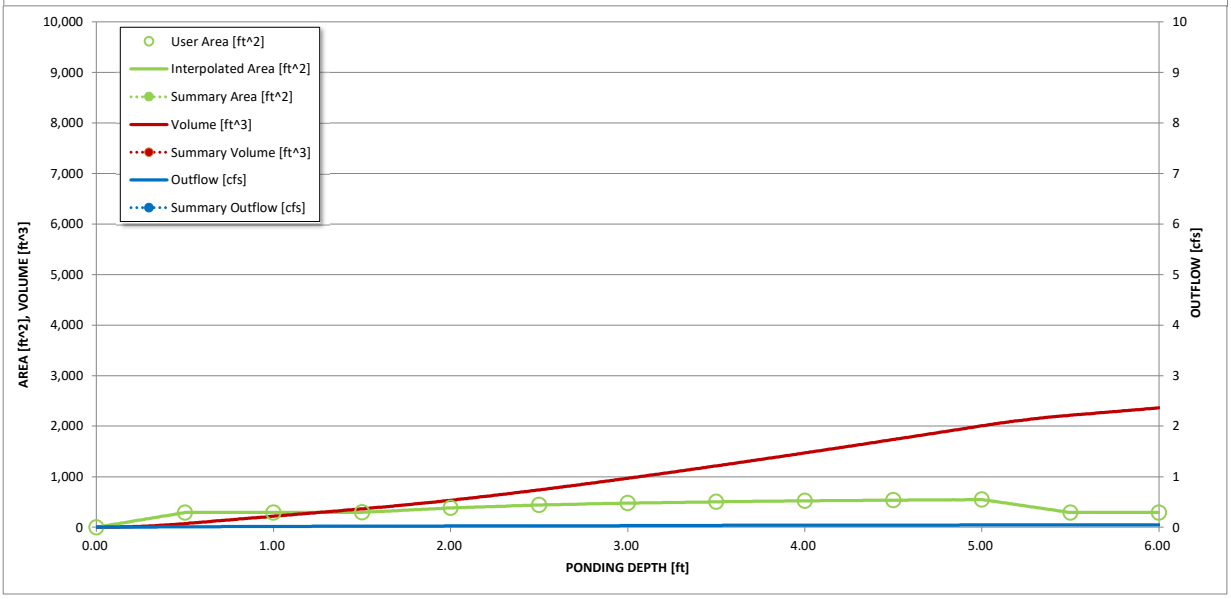
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.80	1.08	1.34	1.75	2.10	2.49	3.53
CUHP Runoff Volume (acre-ft) =	0.050	0.171	0.084	0.120	0.155	0.222	0.276	0.341	0.507
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.084	0.120	0.155	0.222	0.276	0.341	0.507
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.2	1.3	2.0	2.9	4.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.11	0.65	1.01	1.45	2.48
Peak Inflow Q (cfs) =	N/A	N/A	1.7	2.4	3.1	4.7	5.9	7.1	10.5
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	0.2	0.0	0.0	0.0	0.0
Structure Controlling Flow =	Plate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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) =	20	47	28	36	44	59	72	88	>120
Time to Drain 99% of Inflow Volume (hours) =	**23**	51	31	39	47	63	76	92	>120
Maximum Ponding Depth (ft) =	5.39	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Area at Maximum Ponding Depth (acres) =	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Maximum Volume Stored (acre-ft) =	0.050	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet A4	Inlet A5
Site Type (Urban or Rural)	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	In Sump	In Sump
Inlet Type	CDOT/Denver 13 Combination	CDOT/Denver 13 Valley Grate

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.3	0.5
Major Q_{Known} (cfs)	0.7	1.0

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)		
Percent Impervious		
NRCS Soil Type		

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**0.3**	**0.5**
Major Total Design Peak Flow, Q (cfs)	**0.7**	**1.0**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A

Minor Storm (Calculated) Analysis of Flow Time

C	N/A	N/A
C_5	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A
Overland Flow Time, Ti	N/A	N/A
Channel Travel Time, Tt	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A
Regional T_c	N/A	N/A
Recommended T_c	N/A	N/A
T_c selected by User	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A

Major Storm (Calculated) Analysis of Flow Time

C	N/A	N/A
C_5	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A
Overland Flow Time, Ti	N/A	N/A
Channel Travel Time, Tt	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A
Regional T_c	N/A	N/A
Recommended T_c	N/A	N/A
T_c selected by User	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet A6
Site Type (Urban or Rural)	URBAN
Inlet Application (Street or Area)	STREET
Hydraulic Condition	In Sump
Inlet Type	CDOT/Denver 13 Combination

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	3.7
Major Q_{Known} (cfs)	7.5

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)	0.97
Percent Impervious	100
NRCS Soil Type	B

Watershed Profile

Overland Slope (ft/ft)	0.300
Overland Length (ft)	244
Channel Slope (ft/ft)	0.200
Channel Length (ft)	72

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**3.7**
Major Total Design Peak Flow, Q (cfs)	**7.5**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A

Minor Storm (Calculated) Analysis of Flow Tir

C	N/A
C_5	N/A
Overland Flow Velocity, Vi	N/A
Channel Flow Velocity, Vt	N/A
Overland Flow Time, Ti	N/A
Channel Travel Time, Tt	N/A
Calculated Time of Concentration, T_c	N/A
Regional T_c	N/A
Recommended T_c	N/A
T_c selected by User	N/A
Design Rainfall Intensity, I	N/A
Calculated Local Peak Flow, Q_p	N/A

Major Storm (Calculated) Analysis of Flow Tir

C	N/A
C_5	N/A
Overland Flow Velocity, Vi	N/A
Channel Flow Velocity, Vt	N/A
Overland Flow Time, Ti	N/A
Channel Travel Time, Tt	N/A
Calculated Time of Concentration, T_c	N/A
Regional T_c	N/A
Recommended T_c	N/A
T_c selected by User	N/A
Design Rainfall Intensity, I	N/A
Calculated Local Peak Flow, Q_p	N/A

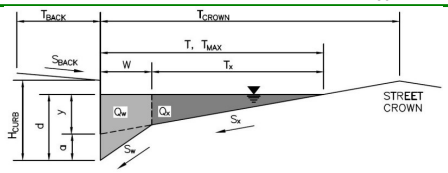
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: Inlet A4



Gutter Geometry (Enter data in the blue cells)

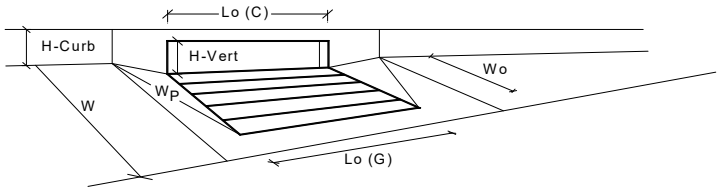
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	3.000	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} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT/Denver 13 Combination	Type =	CDOT/Denver 13 Combination	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	2.00	2.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0 inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L_o (G) =	3.00	3.00 feet
Width of a Unit Grate		W_o =	1.73	1.73 feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.43	0.43
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	3.30	3.30
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.60	0.60
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	3.00	3.00 feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.50	6.50 inches
Height of Curb Orifice Throat in Inches		H_{throat} =	5.25	5.25 inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	0.00	0.00 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00 feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.70	3.70
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.66	0.66
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	0.523	0.523 ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.33 ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.94	0.94
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	0.94	0.94
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**3.6**	**3.6 cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	0.3	0.7 cfs

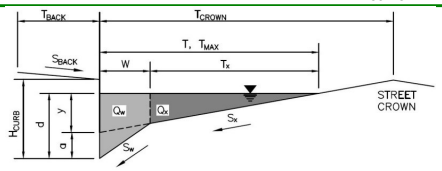
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: Inlet A5



Gutter Geometry (Enter data in the blue cells)

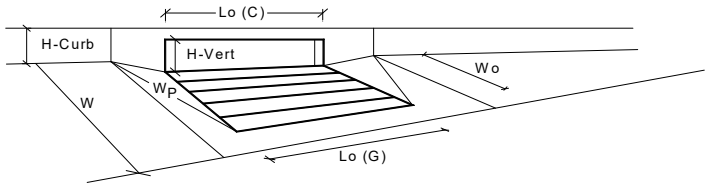
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	3.000	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} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT/Denver 13 Valley Grate)	Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.50	0.50	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	5.3	5.3	cfs
Interception with Clogging	Q_{wa} =	2.6	2.6	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	7.8	7.8	cfs
Interception with Clogging	Q_{oa} =	3.9	3.9	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	6.0	6.0	cfs
Interception with Clogging	Q_{ma} =	3.0	3.0	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**2.6**	**2.6**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**N/A**	**N/A**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	3.00	3.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	2.1	2.1	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	0.94	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.6**	**2.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.5	1.0	cfs

Warning 5: The width of unit is greater than the gutter width.

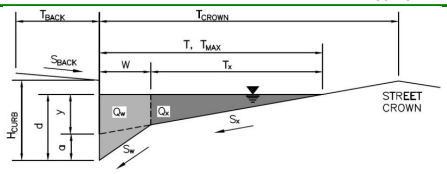
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: Inlet A6



Gutter Geometry (Enter data in the blue cells)

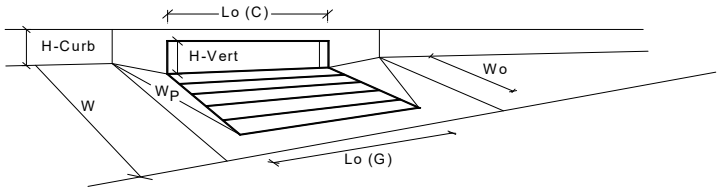
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	3.000	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} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT/Denver 13 Combination			
		MINOR	MAJOR	
Type of Inlet	Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	4	4	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.87	0.87	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.57	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.6**	**8.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.7	7.5	cfs

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Mar 29 2024

Outfall (18in RCP)

Circular

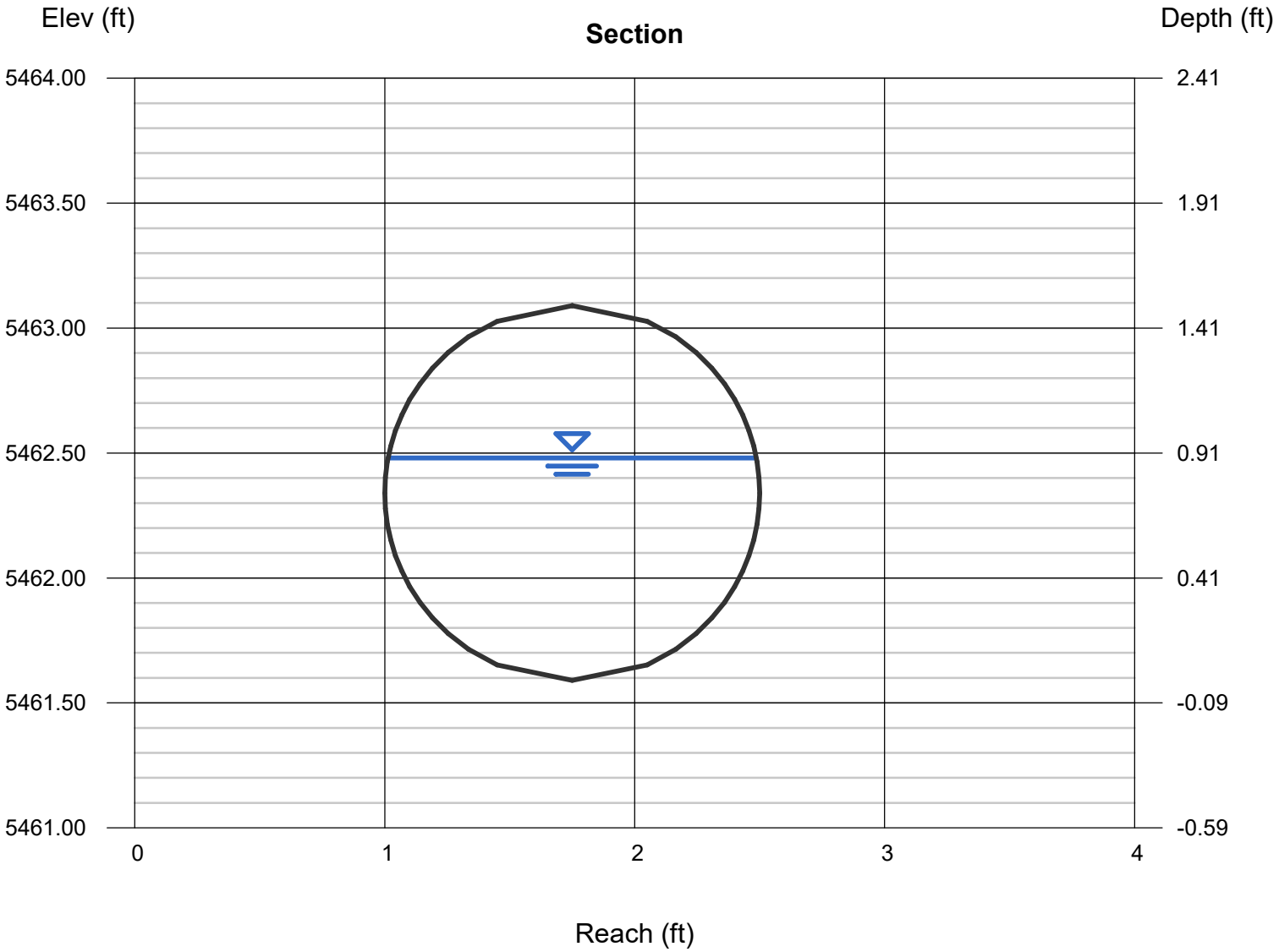
Diameter (ft)	= 1.50
Invert Elev (ft)	= 5461.59
Slope (%)	= 3.40
N-Value	= 0.013

Calculations

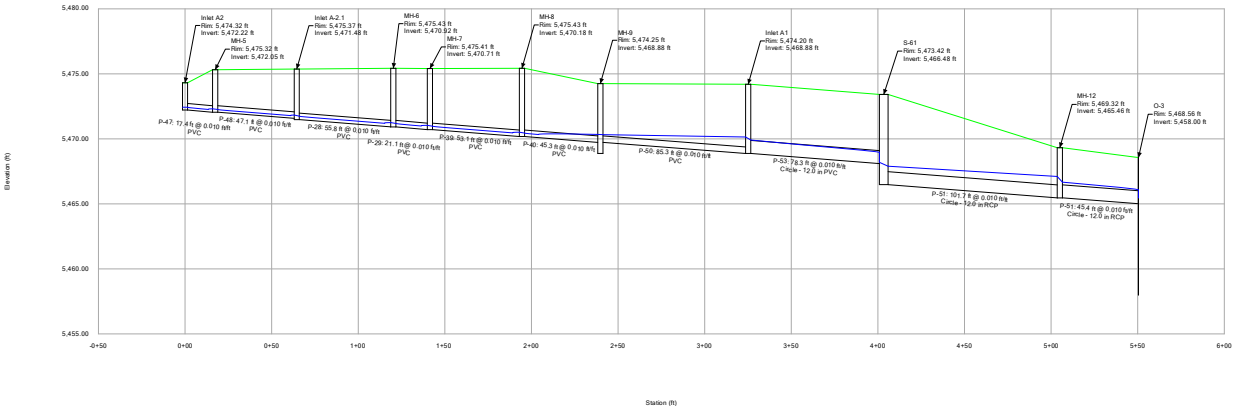
Compute by:	Known Q
Known Q (cfs)	= 12.80

Highlighted

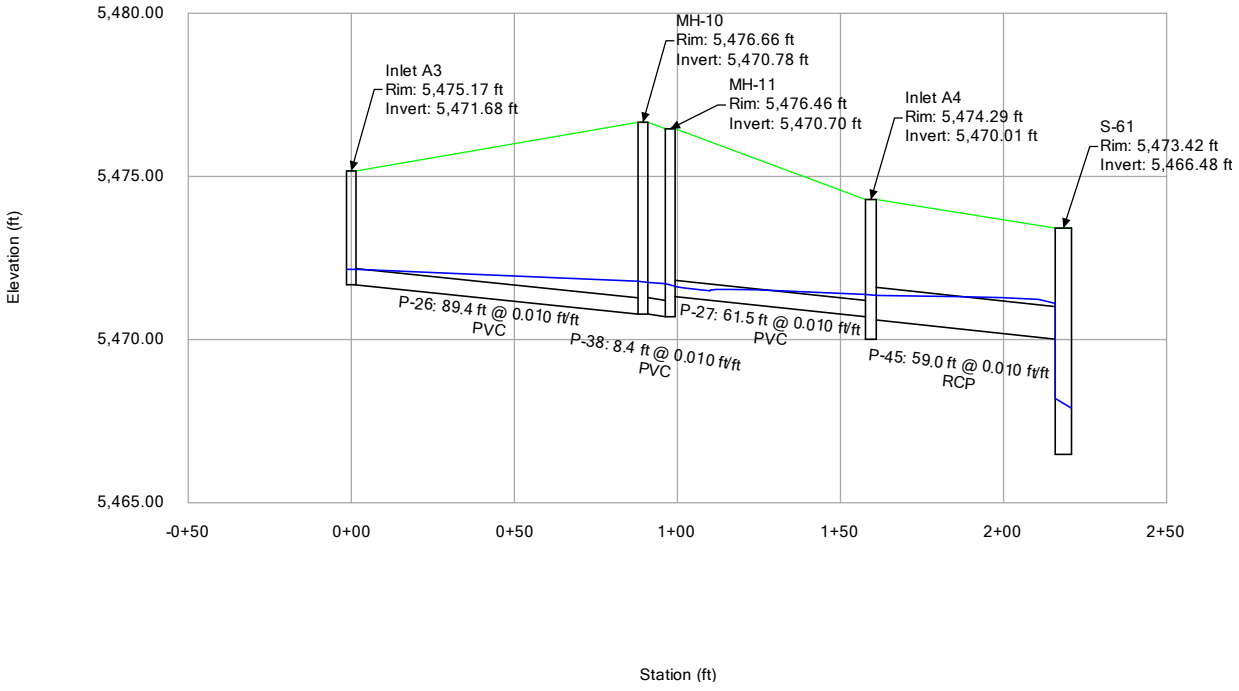
Depth (ft)	= 0.89
Q (cfs)	= 12.80
Area (sqft)	= 1.09
Velocity (ft/s)	= 11.70
Wetted Perim (ft)	= 2.64
Crit Depth, Yc (ft)	= 1.35
Top Width (ft)	= 1.47
EGL (ft)	= 3.02



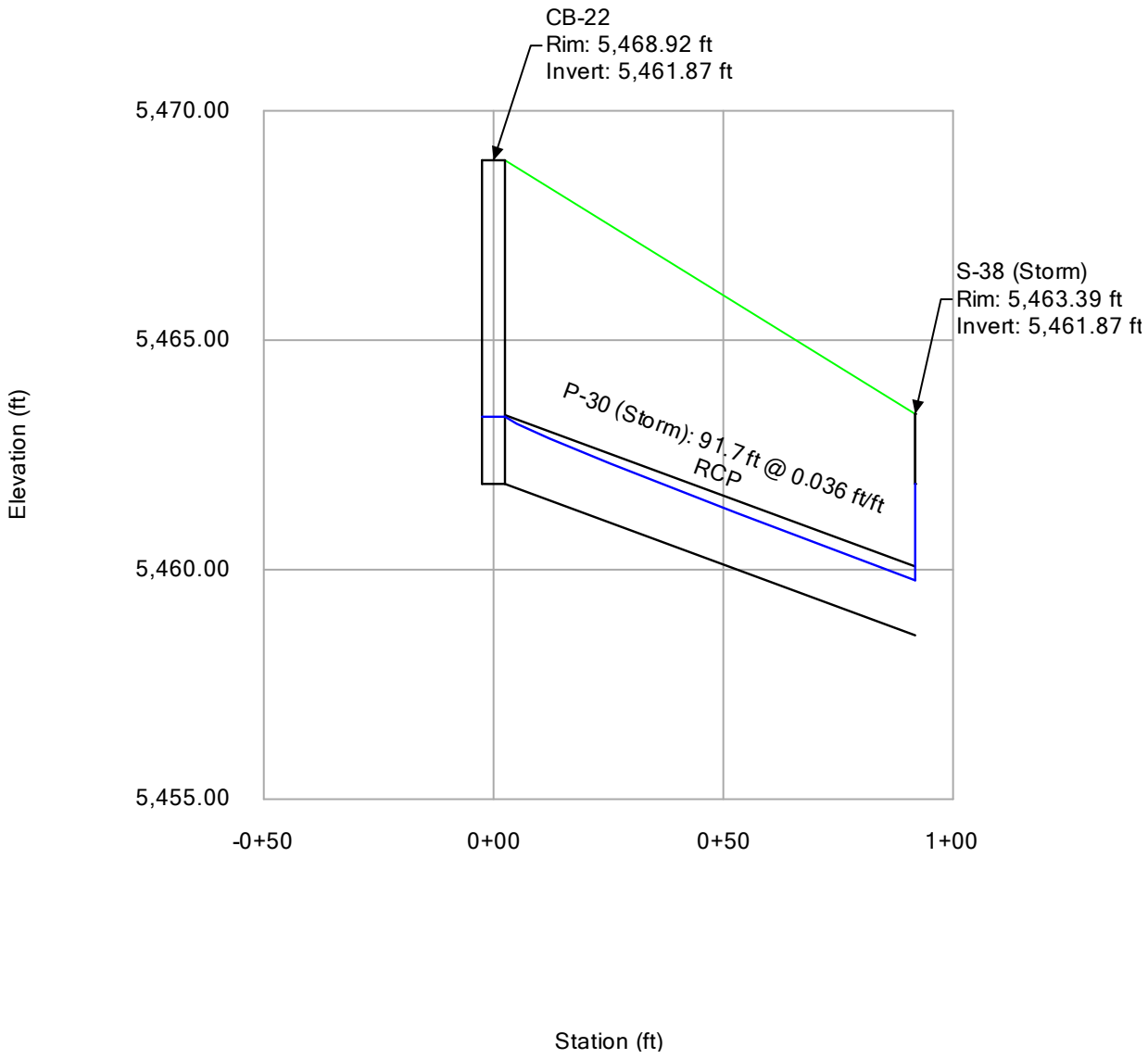
Profile Report
Engineering Profile - Inlet A2 to ADS (Storm Pipe Calcs REV.stsw)

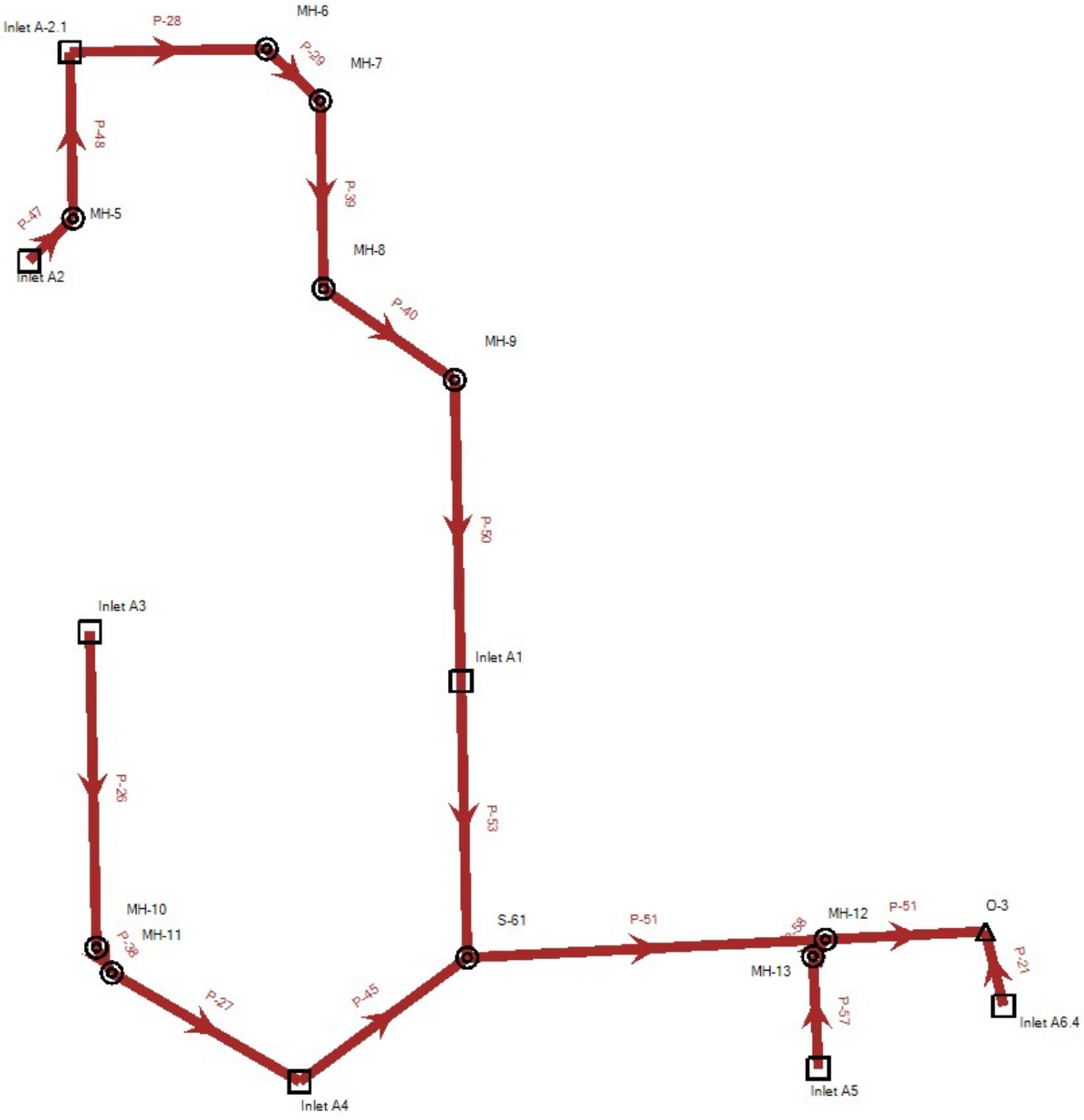


Profile Report
Engineering Profile - Inlet A3 to S-61 (Storm Pipe Calcs REV.stsw)



Profile Report
Engineering Profile - Outfall Pipe (Outfall Calcs.stsw)




Inlet A-2.1
P-28
MH-6
P-29
MH-7
P-48
P-39
P-47
MH-5
MH-8
Inlet A2
P-40
MH-9
P-50
Inlet A3
Inlet A1
P-26
P-53
MH-10
MH-11
S-61
P-51
MH-12
P-51
O-3
P-38
P-27
P-45
MH-13
P-57
P-21
Inlet A6.4
Inlet A4
Inlet A5

Label	-Node- Upstream Downstream	Diameter (in)	Slope (Calculated) (ft/ft)	Flow (cfs)	Length (User Defined) (ft)	Velocity (ft/s)	-EGL- Upstream Downstream (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Section Discharge Capacity (cfs)	Capacity (Design) (cfs)
P-28	Inlet A-2.1	6	0.01	0.28	55.8	3.03	5471.85	5475.37	5471.75	5471.48	0.28	0.61
	MH-6						5471.32	5475.43	5471.25	5470.92	0.61	
P-48	MH-5	6	0.01	0.18	47.1	2.7	5472.34	5475.32	5472.26	5472.05	0.18	0.61
	Inlet A-2.1						5471.88	5475.37	5471.83	5471.48	0.61	
P-26	Inlet A3	6	0.01	0.39	89.4	3.29	5472.22	5475.17	5472.15	5471.68	0.39	0.61
	MH-10						5471.85	5476.66	5471.79	5470.78	0.61	
P-47	Inlet A2	6	0.01	0.18	17.4	2.7	5472.51	5474.32	5472.43	5472.22	0.18	0.61
	MH-5						5472.36	5475.32	5472.31	5472.05	0.61	
P-45	S-61	12	0.01	1.43	59	1.82	5468.23	5473.42	5471.35	5466.48	1.43	3.86
	Inlet A4						5471.44	5474.29	5471.11	5470.01	3.86	
P-27	MH-11	6	0.01	0.39	61.5	3.29	5471.77	5476.46	5471.63	5470.7	0.39	0.61
	Inlet A4						5471.44	5474.29	5471.38	5470.01	0.61	
P-53	Inlet A1	12	0.01	4.26	78.3	5.42	5470.37	5474.2	5469.92	5468.88	4.26	3.86
	S-61						5468.73	5473.42	5468.97	5466.48	3.86	
P-51	S-61	12	0.01	5.69	101.7	4.64	5468.23	5473.42	5467.9	5466.48	5.69	3.56
	MH-12						5467.44	5469.32	5467.11	5465.46	3.56	
P-38	MH-10	6	0.01	0.39	8.4	1.99	5471.81	5476.66	5471.75	5470.78	0.39	0.61
	MH-11						5471.78	5476.46	5471.72	5470.7	0.61	
P-29	MH-6	6	0.01	0.28	21.1	3.03	5471.29	5475.43	5471.19	5470.92	0.28	0.61
	MH-7						5471.11	5475.41	5471.04	5470.71	0.61	
P-39	MH-7	6	0.01	0.28	53.1	3.03	5471.08	5475.41	5470.98	5470.71	0.28	0.61
	MH-8						5470.58	5475.43	5470.51	5470.18	0.61	
P-40	MH-8	6	0.01	0.28	45.3	3.03	5470.56	5475.43	5470.45	5470.18	0.28	0.61
	MH-9						5470.38	5474.25	5470.34	5468.88	0.61	
P-50	MH-9	6	0.01	0.28	85.3	1.43	5470.36	5474.25	5470.32	5468.88	0.28	0.61
	Inlet A1						5470.18	5474.2	5470.14	5468.88	0.61	
P-57	Inlet A5	8	0.01	1.51	31.8	4.33	5468.08	5469.12	5467.78	5465.84	1.51	1.31
	MH-13						5467.65	5469.51	5467.36	5465.52	1.31	
P-21	Inlet A6.4	12	0.012	11.12	21.7	14.16	5470.68	5467.9	5467.57	5464.71	11.12	3.89
	O-3						(N/A)	5468.56	5465.45	5458	3.89	
P-51	MH-12	12	0.01	7.2	45.4	5.87	5467.22	5469.32	5466.67	5465.46	7.2	3.56
	O-3						(N/A)	5468.56	5466.08	5458	3.56	
P-58	MH-13	8	0.01	1.51	5.9	4.33	5467.48	5469.51	5467.19	5465.52	1.51	1.31
	MH-12						5467.44	5469.32	5467.11	5465.46	1.31	

Label	-Node- Upstream Downstream	Diameter (in)	Slope (Calculated) (ft/ft)	Flow (cfs)	Length (User Defined) (ft)	Velocity (ft/s)	-EGL- Upstream Downstream (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Section Discharge Capacity (cfs)	Capacity (Design) (cfs)
P-30 (Storm)	CB-22	18	0.036	19.06	91.7	12.83	5465.16	5468.92	5463.33	5461.87	19.06	19.92
	S-38 (Storm)						(N/A)	5463.39	5459.77	5461.87	19.92	

Low Tail Water Basin and Riprap Design OF-1

Project Name KT Superior

5-Mar-24

Instructions: Refer to Section 3.4.3.2 of Chap 8 Vol 2 in UD Manual. Enter values in blue cells. Green cells are calculated.

100-year design flows

Outlet Pipe Information:

Type of Pipe:	Circular	
Storm Sewer Dia, D =	1.5	ft

Riprap Size:

Velocity =	3.4	ft/s (1)	100 Year
Design Depth, d =	0.34	ft (2)	
Gravity, g =	32.2	ft/s^2	

Eqn: HS-16e

P_d = 4.74 ft/s

Use Figure HS-20c to find the size and type of riprap to use in the outlet protection basin.

Riprap Selection:	**Type L**	
Riprap Diameter, D_{50} =	9	inches

Riprap Minimum Thickness:

Eqn: HS-17

Thickness, T = 1.31 ft

Basin Dimensions:

Storm Sewer Dia, D = 1.5 ft

Length is defined as being the greater of the following:

L = 4D =	6	ft	Eqn: HS-18
L = (D)^0.5(V/2) =	2.082066281	ft	Eqn: HS-19
L =	**6**	ft	

Width:

w = width of box culvert	1.5	ft	
W = 4D =	6	ft	Eqn: HS-20 or HS-21

Cutoff Wall:

B = 2.06 ft Eqn: HS-22

(1) Obtain Velocity from Section 3.4.3.1 of Vol 2 in the UD Manual or program such as FlowMaster or StormCad

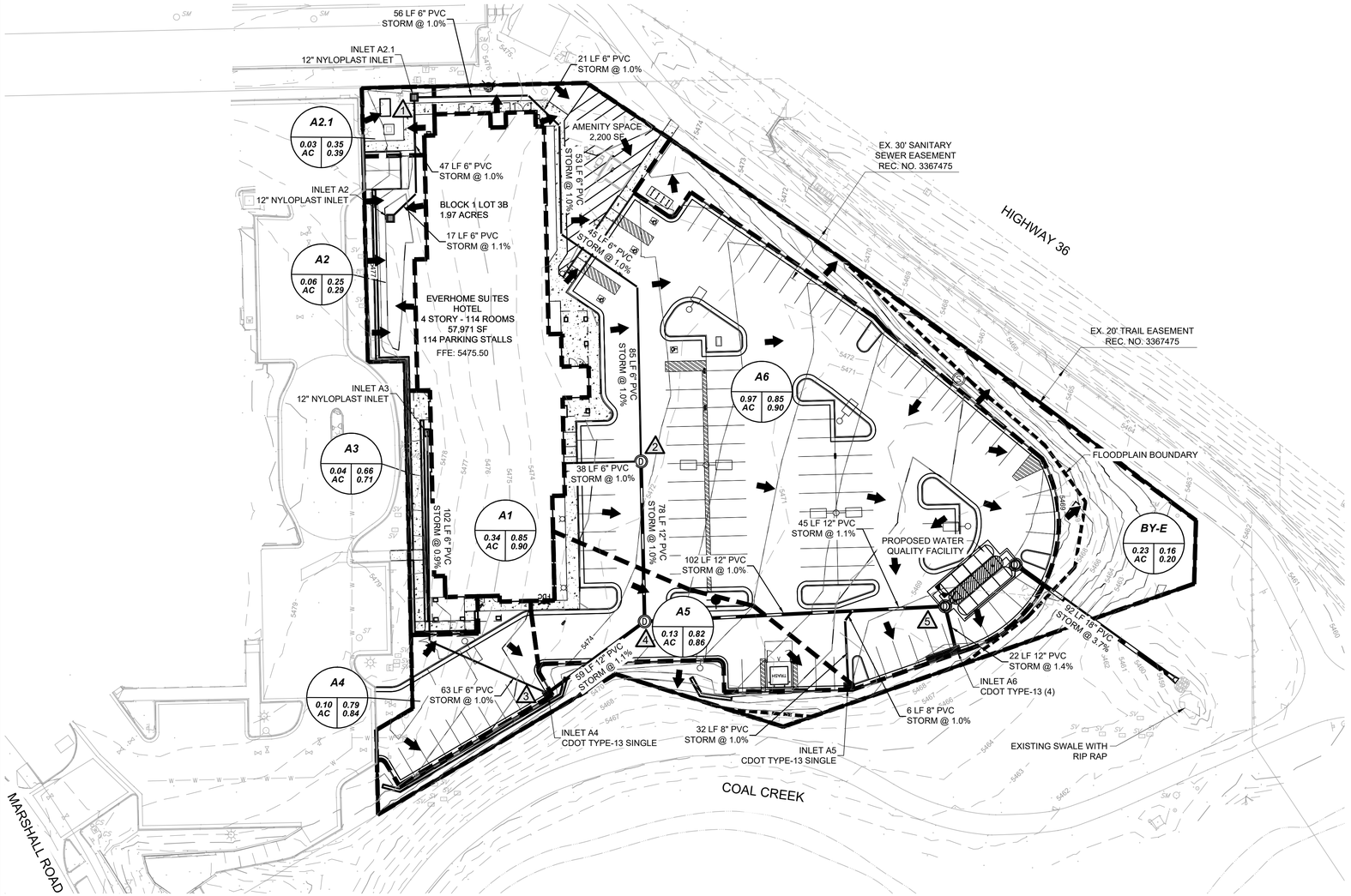
(2) Obtain flow depth from Section 3.4.3.1 of Vol 2 in the UD Manual or program such as FlowMaster or StormCad

Appendix D – Drainage Plans

SUPERIOR TOWN CENTER FINAL DEVELOPMENT PLAN FOR
EVERHOME SUITES - SUPERIOR
AT McCASLIN & MARSHALL ROAD

LEGAL DESCRIPTION:

LOT 3B, BLOCK 1, SUPERIOR TOWN CENTER FILING NO. 1B REPLAT NO. 3, ACCORDING TO THE PLAT THEREOF RECORDED DECEMBER 1, 2016 UNDER RECEPTION NO. 03560623, COUNTY OF BOULDER, STATE OF COLORADO



LEGEND

- PROPOSED CONTOURS (5001)
- EXISTING CONTOURS (5001)
- PROPOSED EASEMENT
- PROPOSED BASIN DELINEATION
- PROPOSED BUILDING SETBACK
- PROPOSED BUILDING
- EXISTING CURB AND GUTTER
- PROPOSED 6" CURB AND GUTTER
- EXISTING STORM SEWER LINE
- PROPOSED STORM SEWER LINE
- PROPOSED STORM MANHOLES
- EXISTING STORM MANHOLES
- PROPOSED STORM INLET/GRATE
- EXISTING STORM INLET
- FLOW ARROW AND GRADE (3.1%)
- FLOODPLAIN LIMIT
- DRAINAGE FLOW ARROW
- DESIGN POINT
- BASIN DESIGNATION (B)
- 5-YEAR RUNOFF COEFFICIENT (0.38 AC)
- 100-YEAR RUNOFF COEFFICIENT (0.71 / 0.73)
- BASIN AREA IN ACRES

BASIN SUMMARY

DESIGN POINT	TRIBUTARY BASIN	AREA (AC)	PERCENT IMPERVIOUS	COEFFICIENT C5	COEFFICIENT C100	TOTAL RUNOFF* Q5 (CFS)	TOTAL RUNOFF* Q100 (CFS)
1	A2	0.06	14.6	0.25	0.29	0.06	0.12
	A2.1	0.03	28.0	0.35	0.39	0.03	0.07
2	A1	0.34	90.0	0.85	0.90	1.31	2.67
3	A3	0.04	70.2	0.66	0.71	0.13	0.26
	A4	0.10	87.6	0.79	0.84	0.34	0.70
4	A5	0.13	91.2	0.82	0.86	0.50	1.01
5	A6	0.97	96.3	0.85	0.90	3.67	7.45
	BY-E	0.30	2.0	0.16	0.20	0.22	0.52
Total Proposed Site		1.97	76.1	0.71	0.76	6.26	12.80

PROJECT BENCHMARK

ELEVATIONS ARE BASED UPON A POST-PROCESSED STATIC GNSS CONNECTION MADE TO NGS BENCH MARK W 413 (PID KK1549) UTILIZING GEOID12B TO MODEL THE ELLIPSOID SEPARATION. ELEVATION 5459.62 (NAVD 88).

811 Know what's below. Call before you dig.

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987 or 811
CALL 3-BUSINESS DAYS (NOT INCLUDING INITIAL DAY OF CONTACT) IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

N

SCALE IN FEET
0 30 60

IF BAR DOES NOT MEASURE 1 INCH THEN DRAWING IS NOT TO SCALE

No.	REVISION	BY	DATE

PRELIMINARY NOT FOR CONSTRUCTION

EES ENTITLEMENT AND ENGINEERING SOLUTIONS, INC.
3801 E. Florida Avenue, Suite 425
Denver, CO 80210
303-572-7997
www.ees.us.com

FINAL DEVELOPMENT PLAN
EVERHOME SUITES - SUPERIOR
MCCASLIN & MARSHALL RD, SUPERIOR, CO
DRAINAGE PLAN

PROJECT NO:	KTD005.01
DESIGNED BY:	AMG
DRAWN BY:	AMG
DATE:	4/19/24

P2.0

4

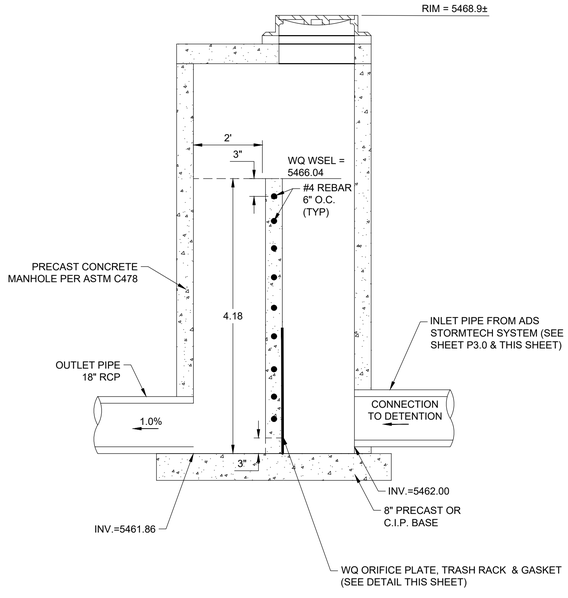
P:\KT DEVELOPMENT\CO, SUPERIOR - MCCASLIN & MARSHALL RD\08 CAD\FDP\P2.0 DRAINAGE PLAN.DWG

SUPERIOR TOWN CENTER FINAL DEVELOPMENT PLAN FOR

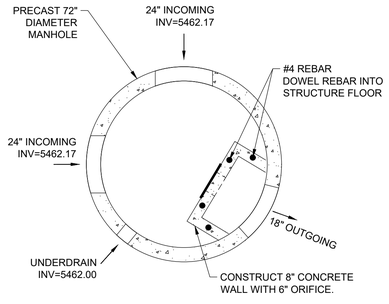
EVERHOME SUITES - SUPERIOR
AT McCASLIN & MARSHALL ROAD

LEGAL DESCRIPTION:

LOT 3B, BLOCK 1, SUPERIOR TOWN CENTER FILING NO. 1B REPLAT NO. 3, ACCORDING TO THE PLAT THEREOF RECORDED DECEMBER 1, 2016 UNDER RECEPTION NO. 03560623, COUNTY OF BOULDER, STATE OF COLORADO

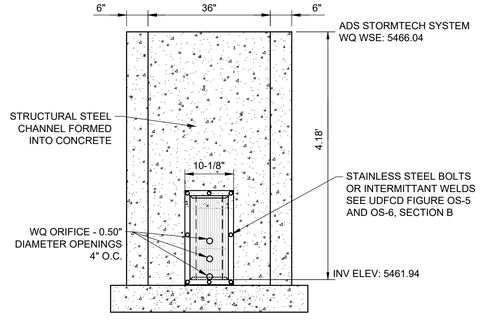


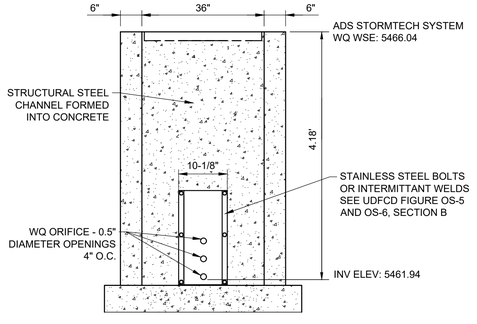
SECTION VIEW



PLAN VIEW

ADS STORMTECH SYSTEM OUTLET STRUCTURE DETAIL





ADS STORMTECH SYSTEM WQ ORIFICE PLATE DETAIL

P:\KT DEVELOPMENT\CO, SUPERIOR - MCCASLIN & MARSHALL RD\08 CAD\CDS\D1.3 DRAINAGE DETAILS.DWG

No.	REVISION	BY	DATE

PRELIMINARY NOT FOR CONSTRUCTION

EES ENTITLEMENT AND ENGINEERING SOLUTIONS, INC.
3801 E. Florida Avenue, Suite 425
Denver, CO 80210
303-572-7997 www.ees.us.com

FINAL DEVELOPMENT PLAN

EVERHOME SUITES - SUPERIOR

MCCASLIN & MARSHALL RD, SUPERIOR, CO

DRAINAGE PLAN

PROJECT NO:	KTD005.01
DESIGNED BY:	AMG
DRAWN BY:	AMG
DATE:	4/19/24

P2.0

Appendix E – ADS Stormtech Details

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	JEROME MAGSINO 303-349-7555 JEROME.MAGSINO@ADSPIPE.COM
ADS SALES REP	MARK KAELBERER 720-256-8225 MARK.KAELBERER@ADS-PIPE.COM
PROJECT NO.	S401166

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

EVERHOME SUITES

SUPERIOR, CO, USA

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

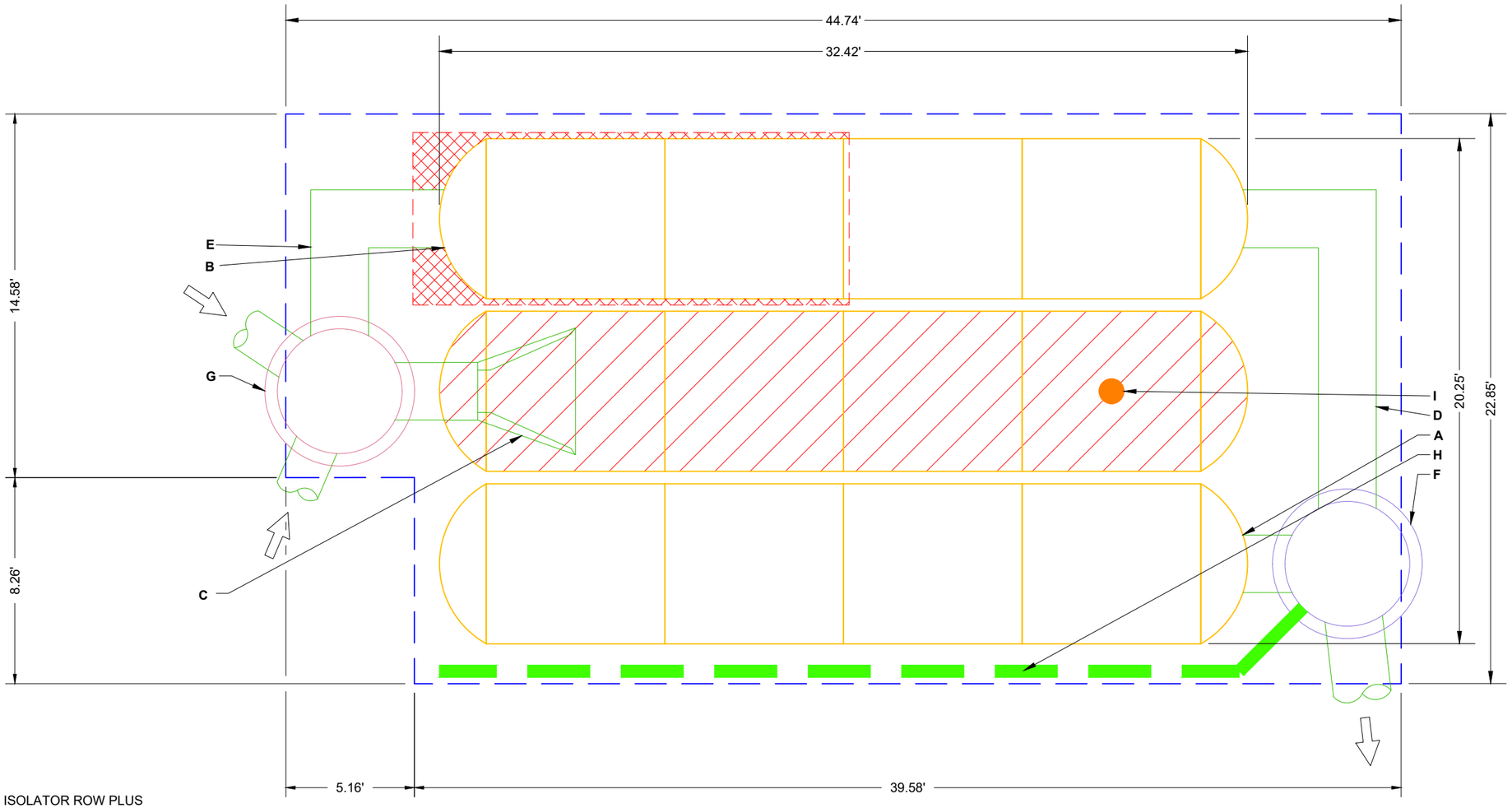
CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT	
12	STORMTECH MC-3500 CHAMBERS
6	STORMTECH MC-3500 END CAPS
12	STONE ABOVE (in)
9	STONE BELOW (in)
40	STONE VOID
979	SYSTEM AREA (SF)
135	SYSTEM PERIMETER (ft)

PROPOSED ELEVATIONS:	
MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	5474.50
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	5468.50
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	5468.00
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	5468.00
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	5468.00
TOP OF STONE:	5467.50
TOP OF MC-3500 CHAMBER:	5466.50
24" x 24" TOP MANIFOLD INVERT:	5463.96
24" x 24" BOTTOM MANIFOLD INVERT:	5462.92
24" ISOLATOR ROW PLUS INVERT:	5462.92
24" BOTTOM CONNECTION INVERT:	5462.92
BOTTOM OF MC-3500 CHAMBER:	5462.75
UNDERDRAIN INVERT:	5462.00
BOTTOM OF STONE:	5462.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	24" BOTTOM CORED END CAP, PART#: MC3500IEPP24BC / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.06"	
PREFABRICATED END CAP	B	24" TOP CORED END CAP, PART#: MC3500IEPP24TC / TYP OF ALL 24" TOP CONNECTIONS	14.48"	
FLAMP	C	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP		
MANIFOLD	D	24" x 24" BOTTOM MANIFOLD, ADS N-12	2.06"	
MANIFOLD	E	24" x 24" TOP MANIFOLD, ADS N-12	14.48"	
CONCRETE STRUCTURE	F	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		14.0 CFS OUT
CONCRETE STRUCTURE	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		8.5 CFS IN
UNDERDRAIN	H	6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		
INSPECTION PORT	I	4" SEE DETAIL		



ISOLATOR ROW PLUS
(SEE DETAIL)

PLACE MINIMUM 17.50' OF ADSPLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING
THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.

EVERHOME SUITES
SUPERIOR, CO, USA
DATE: 4-15-2024
DRAWN: MAH
CHECKED: XXX
PROJECT #: S401166

DATE	DRW	CHK	DESCRIPTION

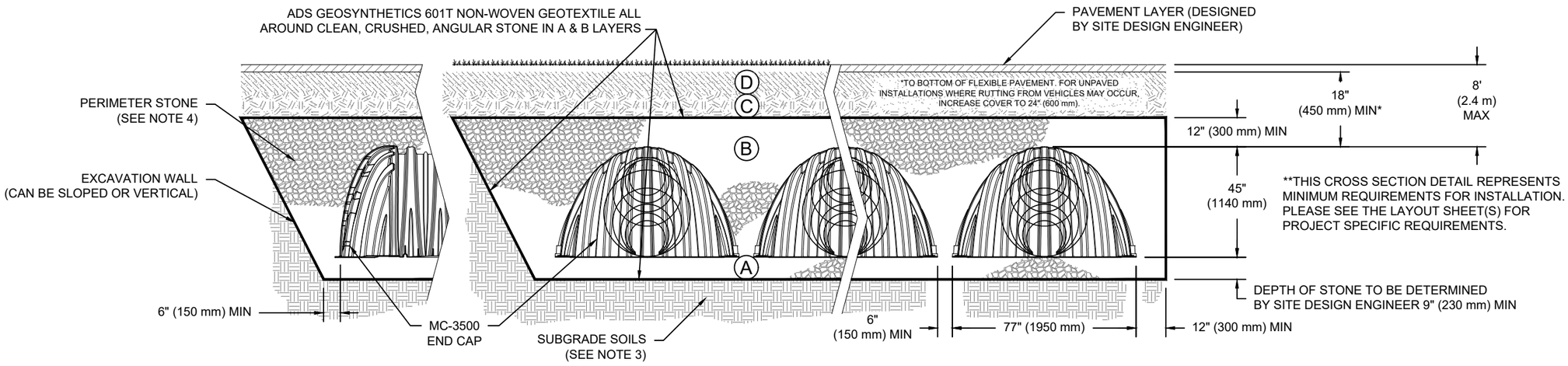
StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

0 5 10

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

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

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



NOTES:

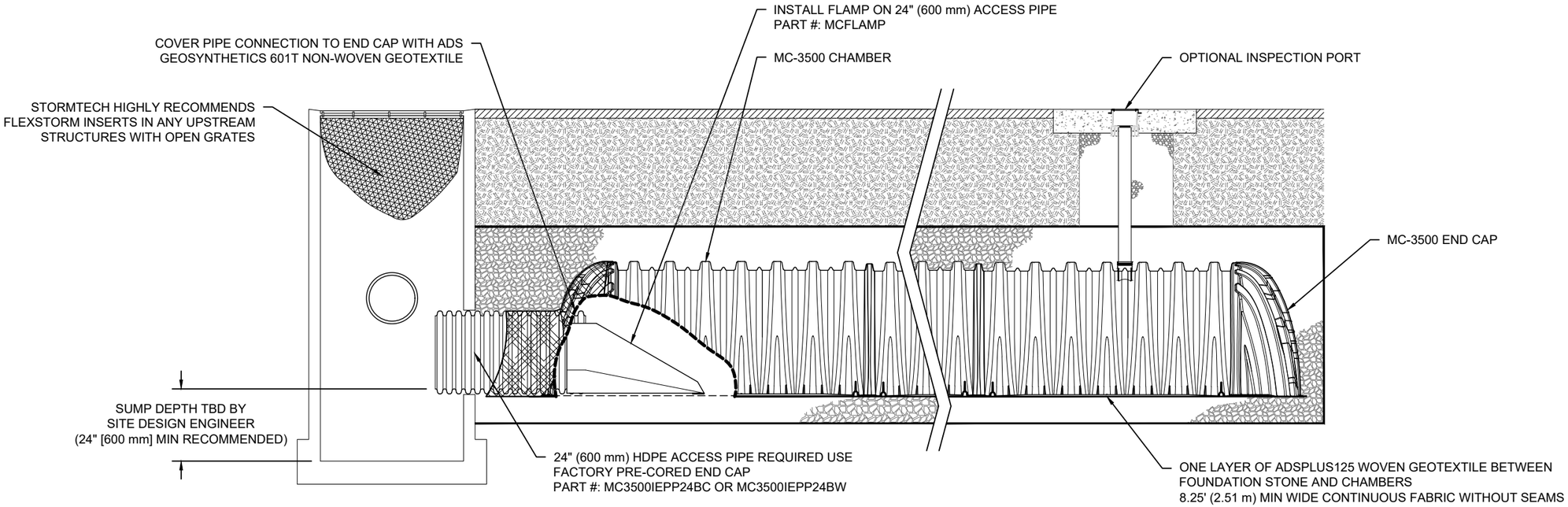
1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

EVERHOME SUITES
SUPERIOR, CO, USA
DATE: 4-15-2024 | DRAWN: MAH | CHECKED: XXX
PROJECT #: S401166

DATE	DRW	CHK	DESCRIPTION

StormTech® Chamber System
888-892-2694 | WWW.STORMTECH.COM

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



MC-3500 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

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

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

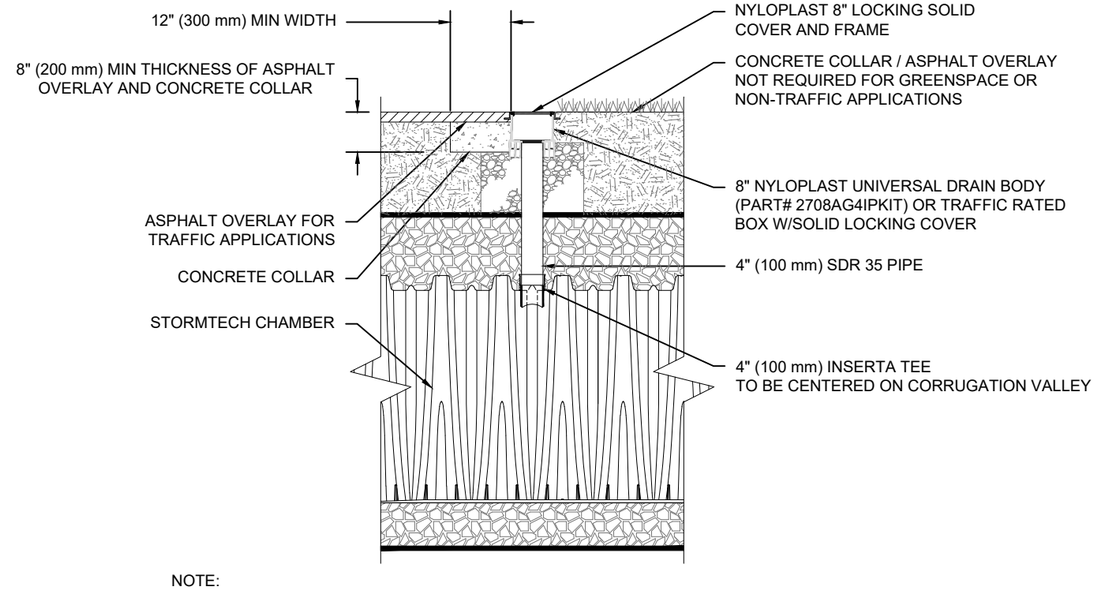
STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

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

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION VALLEY.

4" PVC INSPECTION PORT DETAIL
(MC SERIES CHAMBER)
NTS

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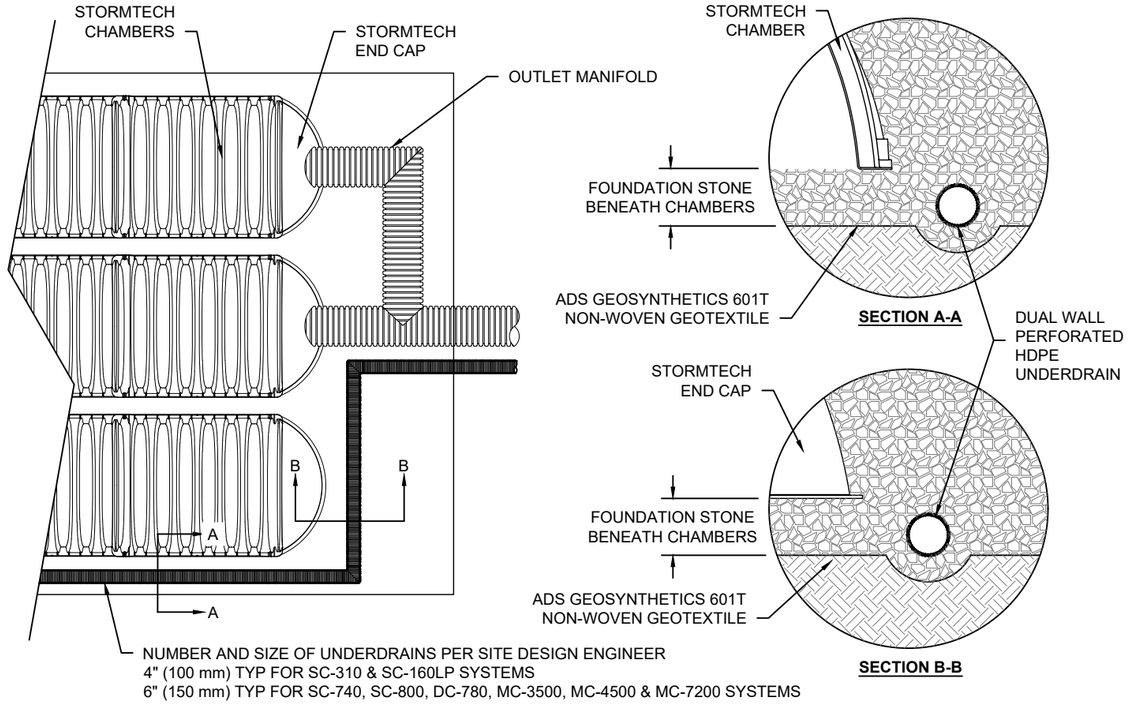
UNDERDRAIN DETAIL

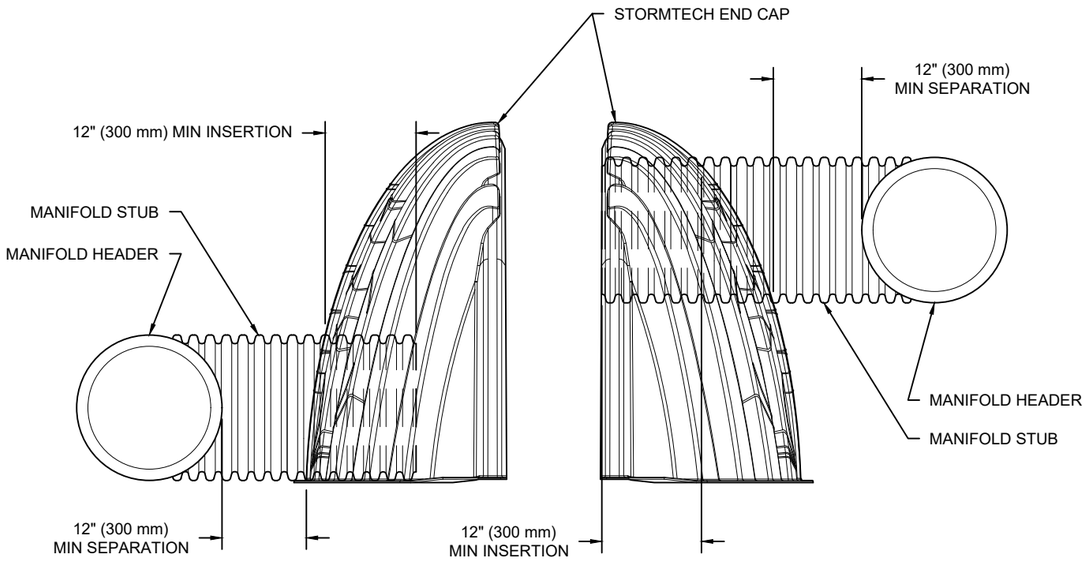
NTS



NUMBER AND SIZE OF UNDERDRAINS PER SITE DESIGN ENGINEER
4" (100 mm) TYP FOR SC-310 & SC-160LP SYSTEMS
6" (150 mm) TYP FOR SC-740, SC-800, DC-780, MC-3500, MC-4500 & MC-7200 SYSTEMS

MC-SERIES END CAP INSERTION DETAIL

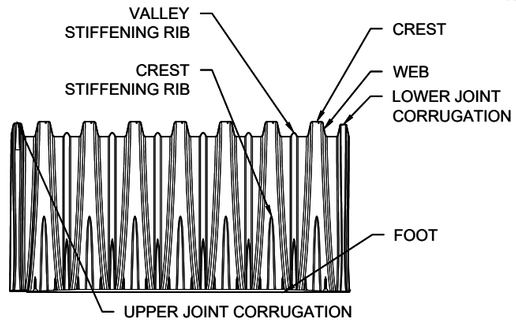
NTS

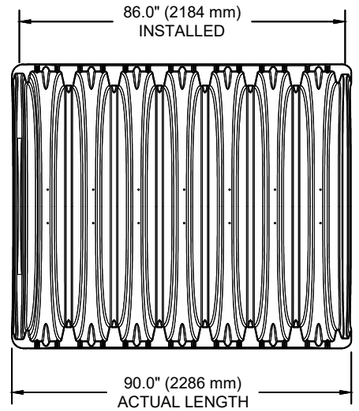


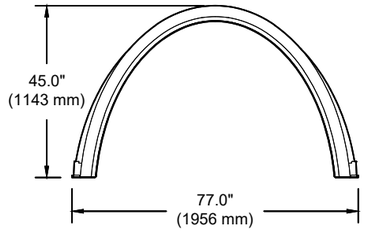
NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

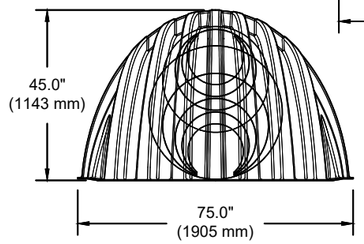
MC-3500 TECHNICAL SPECIFICATION

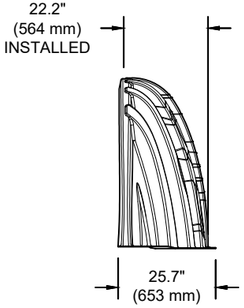
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

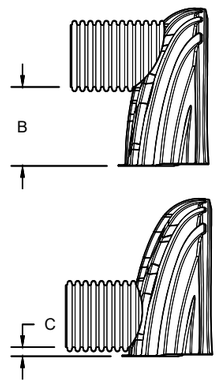
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" SPACING BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

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