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June 13, 2022

Town of Keenseburg Public Works
91 W. Broadway Avenue
Keenesburg, CO 80643

RE: JUDIE ANNE SUBDIVISION - DRAINAGE NARRATIVE LETTER

Dear Town of Keenesburg Public Works:

Western Engineering Consultants inc. LLC (WEC) appreciates the opportunity to submit this Drainage Narrative Letter on behalf of Ryberg Construction Co., Inc.

The Judie Anne Subdivision currently consists of a single 2.57 acre parcel. This letter summarizes the drainage impact from the proposed improvements of the Judie Anne Subdivision.

Attached to this letter are the following:

- Vicinity Map
- Key map (Google Exhibit)
- FEMA Firmette
- NRCS Soils Report
- Rational Method Runoff Calculations
- WEC Drainage Plans

FLOODPLAIN

Pursuant to the attached exhibit (the current FEMA) – the entire property is **not** within a current or expected amended floodplain. It is located within an Area of Minimal Flood Hazard (Zone X) as seen in FIRM panel 08123C2157E dated January 20, 2016.

PARCEL DESCRIPTION

The Judie Anne Subdivision lies directly north of the Woodward Avenue, east of Johnson Street, and south of Kipp Avenue in the Town of Keenseburg. The entire parcel is noted as in the Northeast 1/4 of Section 26, Township 2 North, Range 64 West of the 6th P.M. The existing site consists of a residence, a detached garage, two existing silos, and a gravel driveway. The remainder of the existing site is undeveloped land.

PROPOSED IMPROVEMENTS

The 2.57-acre site is to be subdivided into 13 residential lots with the existing residence to remain in Lot 1. A paved access road (Johnson Court) is proposed off Johnson Street to the west with a 100’ diameter cul-de-sac to provide access to eleven (11) of the proposed lots. Lots 1 and 3 will share an access point off Johnson Street to the west.

The proposed subdivision has been designed to adequately convey storm runoff to the existing low points in the southeast and northeast corners of the site through the use of curb & gutter, concrete pans, and drainage swales. Each lot has been designed with an assumed 1,600 sf building pad as the high point of the lot. The lots will drain away from the building pad (at 10% for the first ten feet) and runoff will be captured by the proposed drainage conveyance elements.

Discussion regarding historic and existing runoff/release rates versus proposed build-out developed runoff/release rates can be found in the conclusion.

WEC has prepared and analyzed preliminary grading concepts for each basin and enclosed drainage calculations based on the proposed improvements of the overall property.

HISTORIC / EXISTING RATIONAL DRAINAGE DESCRIPTION
The 2.57-acre site has been mapped as a single Historic Basin.

Historically, the site drained from northwest to southeast at roughly 1.7% (per the USGS Keenesburg Quad Map).

Basin H (2.57 ac.) consists of the entire 2.57-ac site. The calculated runoff is 0.04 cfs and 4.61 cfs for the minor (5yr) and major (100yr) storm events, respectively.

The existing site has been mapped as a single Existing Basin and two Off-Site Basins (OFF-JA and OFF-KA).

Basin E (2.57 ac.) contains the entirety of the existing property that drains from the northwest corner of the site to the low existing low point in the southeast corner at roughly 1.9%. The existing effective imperviousness of the basin is 5.59%, as the basin consists of two existing buildings and a gravel driveway. The calculated runoff is 0.20 cfs and 5.30 cfs for the minor (5yr) and major (100yr) storm events, respectively.

Basin OFF-JA (0.16 ac.) consists of the east half of the Johnson Street ROW that drains onto the site. The basin drains from the centerline of the existing road to the site (northwest to southeast) at roughly 1.5%. The existing effective imperviousness for the basin is 69.15% as the basin consists primarily of an asphalt road with a gravel/undeveloped shoulder. The runoff calculated is 0.31 cfs and 0.91 cfs for the minor (5yr) and major (100yr) storm events, respectively.

Basin OFF-KA (0.25 ac.) consists of the south half of the Kipp Avenue ROW that drains toward the site. The basin drains from the centerline of the existing road to the existing curb and gutter (north to south) at roughly 2.0% and ultimately east along the existing curb and gutter towards WCR 59 east of this site at Design Point O2. The existing effective imperviousness for the basin is 79.31% as the basin consists primarily of an existing asphalt road with existing concrete curb, gutter and sidewalk. The runoff calculated is 0.65 cfs and 1.77 cfs for the minor (5yr) and major (100yr) storm events, respectively. The existing curb & gutter along Kipp Avenue will convey most of the stormwater runoff along the road to the east and not onto the site, but it has been included here as it has the potential to overtop onto this property.

DEVELOPED RATIONAL DRAINAGE ANALYSIS
The attachments below include all Rational Method runoff calculations summarizing the 5, 10, and 100 year event runoff the proposed Developed Basins.

Currently, the grading and drainage design is intended to convey stormwater runoff to either the existing low point in the southeast corner or offsite to the north along Kipp Avenue to be ultimately captured by the existing Town stormwater infrastructure around the site.

The site was broken into four (4) developed basins (P-1, P-2, P-3, and P-4) and two Off-Site Basins (OFF-JA and OFF-KA).

Basin P-1 (0.76 ac.) contains the south half of proposed Lots 9-13 as well as the proposed Johnson Court. The basin drains from the high point of the assumed building pad south towards the proposed Johnson Court at roughly 6.0% and ultimately east along the proposed curb and gutter to a proposed chase drain at Design Point 1. The developed effective imperviousness for the basin was calculated at 85.53% based on the full build-out lot development and the paved road. The runoff calculated is 2.11 cfs and 5.52 cfs for the minor (5yr) and major (100yr) storm events, respectively.

Basin P-2 (0.67 ac.) contains proposed Lots 6-8 and the portion of Lot 9 that drains towards the proposed drainage swale along the east property line. The basin drains from the high point at the front of the lot east towards the proposed drainage swale along the east property line at roughly 6.0% and ultimately south through the drainage swale to a proposed chase drain at Design Point 2. The developed effective imperviousness for the basin was calculated at 76.50% based on the full build-out lot development and the proposed drainage swale. The runoff calculated is 1.44 cfs and 4.00 cfs for the minor (5yr) and major (100yr) storm events, respectively.

Basin P-3 (0.81 ac.) contains proposed Lots 1-5 and Outlot A that drain towards the proposed drainage swale along the south property line. The basin drains from the high point at the lot south towards the proposed swale along the south property line at roughly 4.9% and ultimately east through the drainage swale to a proposed chase drain at Design Point 3. The developed effective imperviousness for the basin was calculated at 80.53% based on the full build-out lot development, the existing Lot 1, and the proposed drainage swale. The runoff calculated is 1.34 cfs and 3.55 cfs for the minor (5yr) and major (100yr) storm events, respectively.

Basin P-4 (0.33 ac.) contains the north half of proposed Lots 10-13 and the portion of Lot 9 that drains north towards Kipp Avenue. The basin drains from the high point of the assumed building pad north towards the Kipp Avenue right-of-way at roughly 5.8% and will sheet flow off-site to be conveyed east by the existing Kipp Ave curb and gutter. The developed effective imperviousness for the basin was calculated at 80.00% based on the full build-out lot development. The runoff calculated is 0.82 cfs and 2.22 cfs for the minor (5yr) and major (100yr) storm events, respectively.

Basin OFF-JA (0.16 ac.) consists of the east half of the Johnson Street ROW that drains toward the site. The basin drains from the centerline of the existing road to the proposed curb and gutter (northwest to southeast) at roughly 1.5% and ultimately south along the proposed curb and gutter towards Woodward Ave at Design Point O1. This development will construct curb, gutter and sidewalk along the east edge of the existing asphalt road. The developed effective imperviousness for the basin is 98.99% as the basin consists primarily of an asphalt road with proposed concrete curb, gutter, and sidewalk. The runoff calculated is 0.53 cfs and 1.28 cfs for the minor (5yr) and major (100yr) storm events, respectively.

Basin OFF-KA (0.25 ac.) consists of the south half of the Kipp Avenue ROW that drains toward the site. The basin drains from the centerline of the existing road to the existing curb and gutter (north to south) at roughly 2.0% and ultimately east along the existing curb and gutter towards WCR 59 east of this site at Design Point O2. No improvements are proposed in this basin as part of this development. The existing effective imperviousness for the basin is 79.31% as the basin consists primarily of an existing asphalt road with existing concrete curb, gutter and sidewalk. The runoff calculated is 0.65 cfs and 1.77 cfs for the minor (5yr) and major (100yr) storm events, respectively. The existing curb & gutter along Kipp Avenue will convey most of the stormwater runoff along the road to the east and not onto the site, but it has been included here as it has the potential to overtop onto this property.

The grading of the site will adequately convey on-site storm runoff to the proposed chase drains in the southeast corner of the site or to the north onto Kipp Ave to be captured by the existing Town storm infrastructure.

DRAINAGE CONVEYANCE DESIGN & ANALYSIS

Three drainage swales have been designed to adequately convey the developed runoff to the proposed chase drains in the southeast corner of the site.

Swale S is located along the south property line of the site. Based on existing and design grading of the site, Swale S will only convey runoff from Basin P-3 (5.11 cfs) but has the capacity to handle approximately 10.4 cfs. Swale S will be sent into a proposed chase drain onto Woodward Ave where the swale meets Outlot A. The grading of Swale S has been designed so that any runoff the bypasses the proposed chase drain will continue east where the swale meets Swale E at the southeast corner of the site.

Swale E is located along the east property line of the site. Based on existing and design grading of the site, Swale E will only convey runoff from Basin P-2 (4.00 cfs) but has the capacity to handle approximately 10.4 cfs. Swale E will be sent into a proposed chase drain onto Woodward Ave where the swale meets the east end of Swale S at the southeast corner of the site.

Swale Outlot A is located withing Outlot A and will convey developed runoff from the proposed Johnson Court to the proposed chase drain onto Woodward Ave. Based on existing and design grading of the site, Swale Outlot A will only convey runoff from Basin P-1 (5.52 cfs) but has the capacity to handle approximately 10.4 cfs. Swale Outlot A will be sent into a proposed chase drain onto Woodward Ave where the swale meets Swale S.

Swale cross sections and chase drain details are in the Final Construction Drawings for the Judie Anne Subdivision.

CONCLUSION
The proposed swales will capture runoff from the entire site and any off-site runoff from Basin OFF-JA and OFF-KA that enters the site and will convey it towards a design low point of the site. Under existing conditions, the 2.57 acre property (5.59% impervious) released approximately 5.30 cfs of stormwater runoff onto Woodward Ave to be captured by the existing Town storm infrastructure. This development split the developed runoff to release onto both Woodward Ave as well as Kipp Ave. Approximately 2.24 acres of the site (Basins P-1, P-2, and P-3) will release onto Woodward Ave with a routed total runoff of 13.8 cfs. The remaining 0.33 acres of the site (Basin P-4) will release approximately 2.22 cfs onto Kipp Ave. The overall 2.57 acre property has been modeled at a build-out imperviousness of 80.88%.

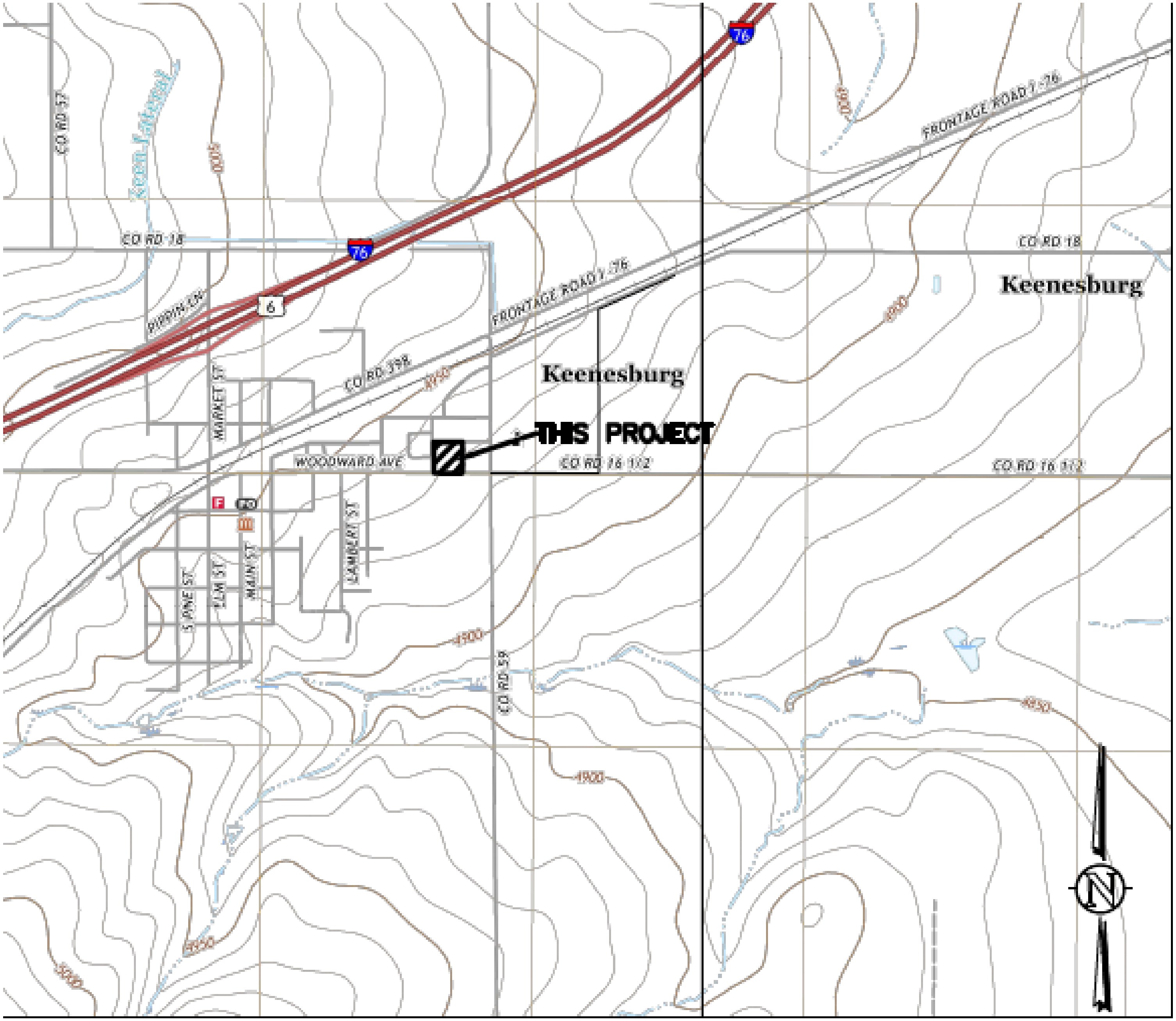
The proposed improvements for the Judie Anne Subdivision will create additional imperviousness, however the attached drainage plan and supporting calculations enhance the current existing runoff conditions. The attached designs are intended to meet or exceed the minimum requirements of Town of Keenesburg Storm Drainage and UDFCD criteria.

Please contact me with any questions or comments you may have on this Judie Anne Subdivision development!

Sincerely,

Western Engineering Consultants inc., LLC
Chadwin F. Cox, P.E.
Senior Project Manager

Encl. Google Site Plan Exhibit, USGS Vicinity Map, NRCS Soils Report, WEC Drainage Plans, WEC Historic, and Existing, & Developed Rational Drainage Calcs,



VICINITY MAP

SCALE 1" = 2,000'

NE 1/4, S26, T2N, R64W, 6th P.M.

SHOWN VICINITY MAP TAKEN FROM USGS QUAD MAPS - KEENESBURG 40104-A5, PROSPECT VALLEY 40104-A5, KLUG RANCH 40104-B5 & TAMPA 40104-B4

Untitled Map
Write a description for your map.
Legend
Ryberg-Keensburg
Johnson St
E Kiser Ave
Kipp Ave
Johnson Cir
Johnson Ave
Ryberg-Keensburg
59
Woodward Ave
Co Rd 16 1/2
N
400 ft
Google Earth
© 2021 Google

National Flood Hazard Layer FIRMette

FEMA

104°30'58"W 40°6'49"N

104°30'20"W 40°6'21"N

Feet

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/24/2021 at 4:42 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.

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

Weld County, Colorado, Southern Part

Ryberg

June 24, 2021

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: 1:911 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 10, 20, 40, 60

Feet: 0, 40, 80, 160, 240

N

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Weld County, Colorado, Southern Part
Survey Area Data: Version 19, Jun 5, 2020

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

Date(s) aerial images were photographed: Jul 19, 2018—Aug 10, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
15	Colby loam, 1 to 3 percent slopes	2.9	100.0%
Totals for Area of Interest		**2.9**	**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.

Weld County, Colorado, Southern Part

15—Colby loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 361q
Elevation: 4,850 to 5,050 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Colby

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous eolian deposits

Typical profile

H1 - 0 to 7 inches: loam
H2 - 7 to 60 inches: silt loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains
Hydric soil rating: No

Minor Components

Wiley

Percent of map unit: 9 percent
Hydric soil rating: No

Keith

Percent of map unit: 6 percent

Hydric soil rating: No

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Historic Runoff Table - JUDIE ANNE SUBDIVISION							
BASIN	Impervious	C-YR	I	A	CIA(YR-historic)	Flow	DESIGN POINT
H							
C_2 (MHFD 2018)	2.00	0.01	1.32	2.57	0.03	cfs	H
C_5	2.00	0.01	1.75	2.57	0.04	cfs	
C_{10}	2.00	0.07	2.16	2.57	0.39	cfs	
C_{100}	2.00	0.44	4.08	2.57	4.61	cfs	

JUDIE ANNE SUBDIVISION - Historic Runoff Calcs

6/10/2022

for soils - C_2 C_5 C_{10} C_{100} --> from Table RO-5

**for Ti calculations - only C_5 is used

Ti= (.395*(1.1-C_{yr})*(L^.5)) / (S)^.333

From MHFD (UDFCD) 2018, Equation 6-3

	2	5	10	100
1-Hour Point Rainf	**0.86**	**1.14**	**1.41**	**2.66**

H — **Historic - 2, 5, 10, 100 yr** — **2.569** acres

NRCS Types 100% B

		C_{yr} - see frequency left	Ti**	Velocity	Tt	Tc	Use Tc	I	A		
2yr		0.01	28.96	1.30	2.25	31.21	31.21	1.32	2.57	**CIA5 existing**	0.03 **cfs**
5yr		0.01	28.96	1.30	2.25	31.21	31.21	1.75	2.57	**CIA10 existing**	0.04 **cfs**
10yr	Overland flow	0.07	28.96	1.30	2.25	31.21	31.21	2.16	2.57	**CIA10 existing**	0.39 **cfs**
100yr	Cv= 10	0.44	28.96	1.30	2.25	31.21	31.21	4.08	2.57	**CIA100 existing**	4.61 **cfs**

	Length	Slope
initial	300	0.017
travel	176	0.017
	476	

300 ft max for urban, 500 ft max for rural

Remainder carried as travel

2.569 acres

H	**Undeveloped**	**Gravel**	**Building**	**Concrete**	**Water/Aphalt**	
NRCS Types 100% B						**EFFECTIVE**
Imperviousness %	2	40.00	90.00	100.00	100.00	**2.00**
C2	0.01	0.29	0.74	0.84	0.84	**0.01**
C5	0.01	0.32	0.76	0.86	0.86	**0.01**
C10	0.07	0.38	0.78	0.86	0.86	**0.07**
C100	0.44	0.61	0.84	0.89	0.89	**0.44**
AREA	2.569	0.00	0.00	0.00	0.00	2.57

0.000 acres

H2	**Undeveloped**	**Gravel**	**Building**	**Concrete**	**Water/Aphalt**	
NRCS Types 100% B						**EFFECTIVE**
Imperviousness %	2	40.00	90.00	100.00	100.00	**#DIV/0!**
C2	0.01	0.29	0.74	0.84	0.84	**#DIV/0!**
C5	0.01	0.32	0.76	0.86	0.86	**#DIV/0!**
C10	0.07	0.38	0.78	0.86	0.86	**#DIV/0!**
C100	0.44	0.61	0.84	0.89	0.89	**#DIV/0!**
AREA	0.000	0.00	0.00	0.00	0.00	0.00

TABLE RO-2 (taken from MHFD (UDFCD Manual - Vol. I)	
Type of Land Surface	Conveyance coefficient,
Heavy Meadow	2.5
Tillage/field	5
Short pasture/Lawns	7
Nearly Bare Ground	10.00
Grassed Waterway	15.00
Paved areas and shallow paved swales	20.00

Existing Runoff Table - JUDIE ANNE SUBDIVISION							
BASIN	Impervious	C-YR	I	A	CIA(YR-existing)	Flow	DESIGN POINT
E							
C_2 (MHFD 2018)	5.59	0.04	1.46	2.57	0.15	cfs	E
C_5	5.59	0.04	1.94	2.57	0.20	cfs	
C_{10}	5.59	0.10	2.39	2.57	0.61	cfs	
C_{100}	5.59	0.46	4.52	2.57	5.30	cfs	
OFF-JA							
C_2 (MHFD 2018)	69.15	0.58	2.43	0.16	0.23	cfs	O1
C_5	69.15	0.59	3.22	0.16	0.31	cfs	
C_{10}	69.15	0.61	3.98	0.16	0.39	cfs	
C_{100}	69.15	0.75	7.51	0.16	0.91	cfs	
OFF-KA							
C_2 (MHFD 2018)	79.31	0.66	2.83	0.25	0.48	cfs	O2
C_5	79.31	0.68	3.75	0.25	0.65	cfs	
C_{10}	79.31	0.69	4.64	0.25	0.82	cfs	
C_{100}	79.31	0.79	8.75	0.25	1.77	cfs	

JUDIE ANNE SUBDIVISION - Existing Runoff Calcs

6/10/2022

for soils - C2 C_5 C_{10} C_{100} = from Table RO-5

**for Ti calculations - only C_5 is used

Ti= (.395*(1.1-C_{yr})*(L^.5)) / (S)^.333
From MHFD (UDFCD) 2018, Equation 6-3

	2	5	10	100
1-Hour Point Rainfall	**0.86**	**1.14**	**1.41**	2.66

2018 MHFD >>> Tc Check = (26-17i) + [Ltravel / (60*(14i + 9)(So)^.5)]

E	**Existing - 2, 5, 10, 100 yr**					**2.569** acres									
	NRCS Types 100% B				C_{yr} - see frequency left	Ti**	Velocity	Tt	Tc	check	Use Tc	I	A	**CIA_5 existing**	
2yr					0.04	27.13	1.38	1.09	28.22	26.16	26.16	1.46	2.57		0.15 **cfs**
			Length	Slope											
		initial	300	0.019										**CIA_5 existing**	
5yr		travel	90	0.019	0.04	27.13	1.38	1.09	28.22	26.16	26.16	1.94	2.57		0.20 **cfs**
			390											**CIA_{10} existing**	
10yr	Overland flow				0.10	27.13	1.38	1.09	28.22	26.16	26.16	2.39	2.57		0.61 **cfs**
	300 ft max for urban, 500 ft max for rural														
	Remainder carried as travel													**CIA_{100} existing**	
100yr		Cv=		10	0.46	27.13	1.38	1.09	28.22	26.16	26.16	4.52	2.57		5.30 **cfs**

OFF-JA	**Existing - 2, 5, 10, 100 yr**					**0.162** acres									
	NRCS Types 100% B				C_{yr} - see frequency left	Ti**	Velocity	Tt	Tc	check	Use Tc	I	A	**CIA_5 existing**	
2yr					0.58	4.63	1.19	4.30	8.93	17.12	8.93	2.43	0.16		0.23 **cfs**
			Length	Slope											
		initial	28	0.015										**CIA_5 existing**	
5yr		travel	306	0.009	0.59	4.63	1.19	4.30	8.93	17.12	8.93	3.22	0.16		0.31 **cfs**
			334											**CIA_{10} existing**	
10yr	Overland flow				0.61	4.63	1.19	4.30	8.93	17.12	8.93	3.98	0.16		0.39 **cfs**
	300 ft max for urban, 500 ft max for rural														
	Remainder carried as travel													**CIA_{100} existing**	
100yr		Cv=		12.5	0.75	4.63	1.19	4.30	8.93	17.12	8.93	7.51	0.16		0.91 **cfs**

OFF-KA	**Existing - 2, 5, 10, 100 yr**					**0.254** acres									
	NRCS Types 100% B				C_{yr} - see frequency left	Ti**	Velocity	Tt	Tc	check	Use Tc	I	A	**CIA_5 existing**	
2yr					0.66	3.10	1.96	2.49	5.59	14.37	5.59	2.83	0.25		0.48 **cfs**
			Length	Slope											
		initial	25	0.021										**CIA_5 existing**	
5yr		travel	292	0.017	0.68	3.10	1.96	2.49	5.59	14.37	5.59	3.75	0.25		0.65 **cfs**
			317											**CIA_{10} existing**	
10yr	Overland flow				0.69	3.10	1.96	2.49	5.59	14.37	5.59	4.64	0.25		0.82 **cfs**
	300 ft max for urban, 500 ft max for rural														
	Remainder carried as travel													**CIA_{100} existing**	
100yr		Cv=		15	0.79	3.10	1.96	2.49	5.59	14.37	5.59	8.75	0.25		1.77 **cfs**

E	Undeveloped	Gravel	Building	Concrete	Water/Asphalt	
	2.569 acres					
NRCS Types 100% B						EFFECTIVE
Imperviousness %	2	40.00	90.00	100.00	100.00	**5.59**
C2	0.01	0.29	0.74	0.84	0.84	**0.04**
C5	0.01	0.32	0.76	0.86	0.86	**0.04**
C10	0.07	0.38	0.78	0.86	0.86	**0.10**
C100	0.44	0.61	0.84	0.89	0.89	**0.46**
AREA	2.438	0.05	0.06	0.02	0.00	2.57

E2	Undeveloped	Gravel	Building	Concrete	Water/Asphalt	
	0.000 acres					
NRCS Types 100% B						EFFECTIVE
Imperviousness %	2	40.00	90.00	100.00	100.00	**#DIV/0!**
C2	0.01	0.29	0.74	0.84	0.84	**#DIV/0!**
C5	0.01	0.32	0.76	0.86	0.86	**#DIV/0!**
C10	0.07	0.38	0.78	0.86	0.86	**#DIV/0!**
C100	0.44	0.61	0.84	0.89	0.89	**#DIV/0!**
AREA	0.000	0.00	0.00	0.00	0.00	0.00

OFF-JA	Undeveloped	Gravel	Building	Concrete	Water/Asphalt	
	0.162 acres					
NRCS Types 100% B						EFFECTIVE
Imperviousness %	2	40.00	90.00	100.00	100.00	**69.15**
C2	0.01	0.29	0.74	0.84	0.84	**0.58**
C5	0.01	0.32	0.76	0.86	0.86	**0.59**
C10	0.07	0.38	0.78	0.86	0.86	**0.61**
C100	0.44	0.61	0.84	0.89	0.89	**0.75**
AREA	0.049	0.00	0.00	0.00	0.11	0.16

OFF-KA	Undeveloped	Gravel	Building	Concrete	Water/Asphalt	
	0.254 acres					
NRCS Types 100% B						EFFECTIVE
Imperviousness %	2	40.00	90.00	100.00	100.00	**79.31**
C2	0.01	0.29	0.74	0.84	0.84	**0.66**
C5	0.01	0.32	0.76	0.86	0.86	**0.68**
C10	0.07	0.38	0.78	0.86	0.86	**0.69**
C100	0.44	0.61	0.84	0.89	0.89	**0.79**
AREA	0.054	0.00	0.00	0.06	0.15	0.25

TABLE RO-2 (taken from MHFD (UDFCD) Manual - Vol. I)

Type of Land Surface	Conveyance coefficient, Cv
Heavy Meadow	2.5
Tillage/field	5
Short pasture/Lawns	7
Nearly Bare Ground	10.00
Grassed Waterway	15.00
Paved areas and shallow paved swales	20.00

Developed Runoff Table - JUDIE ANNE SUBDIVISION							
BASIN	Impervious	C-YR	I	A	CIA(YR-DEVELOPED)	cfs	DESIGN POINT
P-1							
C_2 (MHFD 2018)	85.53	0.72	2.85	0.76	1.55	cfs	1
C_5	85.53	0.73	3.78	0.76	2.11	cfs	
C_{10}	85.53	0.74	4.67	0.76	2.64	cfs	
C_{100}	85.53	0.82	8.82	0.76	5.52	cfs	
P-2							
C_2 (MHFD 2018)	76.50	0.64	2.47	0.67	1.06	cfs	2
C_5	76.50	0.65	3.28	0.67	1.44	cfs	
C_{10}	76.50	0.67	4.06	0.67	1.82	cfs	
C_{100}	76.50	0.78	7.65	0.67	4.00	cfs	
P-3							
C_2 (MHFD 2018)	80.53	0.67	2.54	0.81	1.39	cfs	3
C_5	80.53	0.69	3.37	0.81	1.89	cfs	
C_{10}	80.53	0.70	4.17	0.81	2.38	cfs	
C_{100}	80.53	0.80	7.86	0.81	5.11	cfs	
P-4							
C_2 (MHFD 2018)	80.00	0.67	2.77	0.33	0.60	cfs	4
C_5	80.00	0.68	3.67	0.33	0.82	cfs	
C_{10}	80.00	0.70	4.54	0.33	1.03	cfs	
C_{100}	80.00	0.80	8.57	0.33	2.22	cfs	
OFF-JA							
C_2 (MHFD 2018)	98.99	0.83	2.88	0.16	0.39	cfs	O1
C_5	98.99	0.85	3.82	0.16	0.53	cfs	
C_{10}	98.99	0.85	4.72	0.16	0.65	cfs	
C_{100}	98.99	0.89	8.90	0.16	1.28	cfs	
OFF-KA							
C_2 (MHFD 2018)	79.31	0.66	2.83	0.25	0.48	cfs	O2
C_5	79.31	0.68	3.75	0.25	0.65	cfs	
C_{10}	79.31	0.69	4.64	0.25	0.82	cfs	
C_{100}	79.31	0.79	8.75	0.25	1.77	cfs	

JUDIE ANNE SUBDIVISION - Developed Runoff Calcs (% Max Bldg-Pavement)

6/10/2022

See below for effective C values as calculated from Table RO-5

**for Ti calculations - only C_5 is used

$Ti = (.395*(1.1-C_{yr})*(L^{.5})) / (S)^{.333}$
From MHFD (UDFCD) 2018, Equation 6-3

	2	5	10	100
Point Rainfall	**0.86**	**1.14**	**1.41**	**2.66**

2018 MHFD >>> Tc Check = (26-17i) + [Ltravel / (60*(14i + 9)(So)^.5)]

P-1	**Developed -2, 5, 10, 100 yr**				**0.76** acres										
	NRCS Types 100% B			C_5	Ti	Velocity	Tt	Tc	check	Use Tc	C_{yr} - see above	I	A	**CIA_5 developed**	
2yr				0.73	2.75	1.64	2.69	5.44	13.38	5.44	0.72	2.85	0.76	1.55	**cfs**
		Length	Slope												
	initial	50	0.091											**CIA_5 developed**	
5yr	travel	265	0.012	0.73	2.75	1.64	2.69	5.44	13.38	5.44	0.73	3.78	0.76	2.11	**cfs**
		315	0.025												
														CIA_{10} developed	
10yr	Overland flow			0.73	2.75	1.64	2.69	5.44	13.38	5.44	0.74	4.67	0.76	2.64	**cfs**
	300 ft max for urban, 500 ft max for rural														
	Remainder carried as travel													**CIA_{100} developed**	
100yr		Cv=	15.00	0.73	2.75	1.64	2.69	5.44	13.38	5.44	0.82	8.82	0.76	5.52	**cfs**
P-2	**Developed -2, 5, 10, 100 yr**				**0.67** acres										
	NRCS Types 100% B			C_5	Ti	Velocity	Tt	Tc	check	Use Tc	C_{yr} - see above	I	A	**CIA_5 developed**	
2yr				0.65	4.25	1.06	4.24	8.49	16.22	8.49	0.64	2.47	0.67	1.06	**cfs**
		Length	Slope												
	initial	60	0.061											**CIA_5 developed**	
5yr	travel	270	0.005	0.65	4.25	1.06	4.24	8.49	16.22	8.49	0.65	3.28	0.67	1.44	**cfs**
		330	0.015												
														CIA_{10} developed	
10yr	Overland flow			0.65	4.25	1.06	4.24	8.49	16.22	8.49	0.67	4.06	0.67	1.82	**cfs**
	300 ft max for urban, 500 ft max for rural														
	Remainder carried as travel													**CIA_{100} developed**	
100yr		Cv=	15.00	0.65	4.25	1.06	4.24	8.49	16.22	8.49	0.78	7.65	0.67	4.00	**cfs**
P-3	**Developed -2, 5, 10, 100 yr**				**0.81** acres										
	NRCS Types 100% B			C_5	Ti	Velocity	Tt	Tc	check	Use Tc	C_{yr} - see above	I	A	**CIA_5 developed**	
2yr				0.69	2.88	1.28	5.01	7.88	16.01	7.88	0.67	2.54	0.81	1.39	**cfs**
		Length	Slope												
	initial	29	0.049											**CIA_5 developed**	
5yr	travel	385	0.007	0.69	2.88	1.28	5.01	7.88	16.01	7.88	0.69	3.37	0.81	1.89	**cfs**
		414	0.010												
														CIA_{10} developed	
10yr	Overland flow			0.69	2.88	1.28	5.01	7.88	16.01	7.88	0.70	4.17	0.81	2.38	**cfs**
	300 ft max for urban, 500 ft max for rural														
	Remainder carried as travel													**CIA_{100} developed**	
100yr		Cv=	15.00	0.69	2.88	1.28	5.01	7.88	16.01	7.88	0.80	7.86	0.81	5.11	**cfs**

P-4	**Developed -2, 5, 10, 100 yr**				**0.33** acres										
	NRCS Types 100% B			C_5	Ti	Velocity	Tt	Tc	check	Use Tc	C_{yr} - see above	I	A	**CIA_5 developed**	
2yr				0.68	3.52	1.77	2.49	6.01	14.25	6.01	0.67	2.77	0.33	0.60	**cfs**
		Length	Slope												
	initial	50	0.058											**CIA_5 developed**	
5yr	travel	265	0.014	0.68	3.52	1.77	2.49	6.01	14.25	6.01	0.68	3.67	0.33	0.82	**cfs**
		315	0.021												
														CIA_{10} developed	
10yr	Overland flow			0.68	3.52	1.77	2.49	6.01	14.25	6.01	0.70	4.54	0.33	1.03	**cfs**
	300 ft max for urban, 500 ft max for rural														
	Remainder carried as travel													**CIA_{100} developed**	
100yr		Cv=	15.00	0.68	3.52	1.77	2.49	6.01	14.25	6.01	0.80	8.57	0.33	2.22	**cfs**

OFF-JA	**Developed -2, 5, 10, 100 yr**				**0.16** acres										
	NRCS Types 100% B			C_5	Ti	Velocity	Tt	Tc	check	Use Tc	C_{yr} - see above	I	A	**CIA_5 developed**	
2yr				0.85	2.27	1.71	2.99	5.25	11.52	5.25	0.83	2.88	0.16	0.39	**cfs**
		Length	Slope												
	initial	28	0.015											**CIA_5 developed**	
5yr	travel	306	0.009	0.85	2.27	1.71	2.99	5.25	11.52	5.25	0.85	3.82	0.16	0.53	**cfs**
		334	0.010												
														CIA_{10} developed	
10yr	Overland flow			0.85	2.27	1.71	2.99	5.25	11.52	5.25	0.85	4.72	0.16	0.65	**cfs**
	300 ft max for urban, 500 ft max for rural														
	Remainder carried as travel													**CIA_{100} developed**	
100yr		Cv=	18.00	0.85	2.27	1.71	2.99	5.25	11.52	5.25	0.89	8.90	0.16	1.28	**cfs**

OFF-KA	**Developed -2, 5, 10, 100 yr**				**0.25** acres										
	NRCS Types 100% B			C_5	Ti	Velocity	Tt	Tc	check	Use Tc	C_{yr} - see above	I	A	**CIA_5 developed**	
2yr				0.68	3.10	1.96	2.49	5.59	14.37	5.59	0.66	2.83	0.25	0.48	**cfs**
		Length	Slope												
	initial	25	0.021											**CIA_5 developed**	
5yr	travel	292	0.017	0.68	3.10	1.96	2.49	5.59	14.37	5.59	0.68	3.75	0.25	0.65	**cfs**
		317	0.017												
														CIA_{10} developed	
10yr	Overland flow			0.68	3.10	1.96	2.49	5.59	14.37	5.59	0.69	4.64	0.25	0.82	**cfs**
	300 ft max for urban, 500 ft max for rural														
	Remainder carried as travel													**CIA_{100} developed**	
100yr		Cv=	15.00	0.68	3.10	1.96	2.49	5.59	14.37	5.59	0.79	8.75	0.25	1.77	**cfs**

P-1	TOTAL AREA Landscaping	0.761 acres Gravel	Building	Concrete	Water/ Asphalt	EFFECTIVE
NRCS Types 100% B						
I	2	40.00	90.00	100.00	100.00	**85.53**
C2	0.01	0.29	0.74	0.84	0.84	**0.72**
C5	0.01	0.32	0.76	0.86	0.86	**0.73**
C10	0.07	0.38	0.78	0.86	0.86	**0.74**
C100	0.44	0.61	0.84	0.89	0.89	**0.82**
AREA	0.10	0.01	0.09	0.27	0.29	0.761

P-2	TOTAL AREA Landscaping	0.669 acres Gravel	Building	Concrete	Water/ Asphalt	EFFECTIVE
NRCS Types 100% B						
I	2	40.00	90.00	100.00	100.00	**76.50**
C2	0.01	0.29	0.74	0.84	0.84	**0.64**
C5	0.01	0.32	0.76	0.86	0.86	**0.65**
C10	0.07	0.38	0.78	0.86	0.86	**0.67**
C100	0.44	0.61	0.84	0.89	0.89	**0.78**
AREA	0.15	0.00	0.12	0.40	0.00	0.669

P-3	TOTAL AREA Landscaping	0.814 acres Gravel	Building	Concrete	Water/ Asphalt	EFFECTIVE
NRCS Types 100% B						
I	2	40.00	90.00	100.00	100.00	**80.53**
C2	0.01	0.29	0.74	0.84	0.84	**0.67**
C5	0.01	0.32	0.76	0.86	0.86	**0.69**
C10	0.07	0.38	0.78	0.86	0.86	**0.70**
C100	0.44	0.61	0.84	0.89	0.89	**0.80**
AREA	0.14	0.00	0.19	0.48	0.00	0.814

P-4	TOTAL AREA Landscaping	0.325 acres Gravel	Building	Concrete	Water/ Asphalt	EFFECTIVE
NRCS Types 100% B						
I	2	40.00	90.00	100.00	100.00	**80.00**
C2	0.01	0.29	0.74	0.84	0.84	**0.67**
C5	0.01	0.32	0.76	0.86	0.86	**0.68**
C10	0.07	0.38	0.78	0.86	0.86	**0.70**
C100	0.44	0.61	0.84	0.89	0.89	**0.80**
AREA	0.06	0.00	0.08	0.18	0.00	0.325

OFF-JA	TOTAL AREA Landscaping	0.162 acres Gravel	Building	Concrete	Water/ Asphalt	EFFECTIVE
NRCS Types 100% B						
I	2	40.00	90.00	100.00	100.00	**98.99**
C2	0.01	0.29	0.74	0.84	0.84	**0.83**
C5	0.01	0.32	0.76	0.86	0.86	**0.85**
C10	0.07	0.38	0.78	0.86	0.86	**0.85**
C100	0.44	0.61	0.84	0.89	0.89	**0.89**
AREA	0.00	0.00	0.00	0.05	0.11	0.162

OFF-KA	TOTAL AREA Landscaping	0.254 acres Gravel	Building	Concrete	Water/ Asphalt	EFFECTIVE
NRCS Types 100% B						
I	2	40.00	90.00	100.00	100.00	**79.31**
C2	0.01	0.29	0.74	0.84	0.84	**0.66**
C5	0.01	0.32	0.76	0.86	0.86	**0.68**
C10	0.07	0.38	0.78	0.86	0.86	**0.69**
C100	0.44	0.61	0.84	0.89	0.89	**0.79**
AREA	0.05	0.00	0.00	0.06	0.15	0.254

TABLE RO-2 (taken from MHFD (UDFCD) Manual - Vol. I)

Type of Land Surface	Conveyance coefficient, Cv
Heavy Meadow	2.5
Tillage/field	5
Short pasture/Lawns	7
Nearly Bare Ground	10.00
Grassed Waterway	15.00
Paved areas and shallow paved swales	20.00

STANDARD FORM SF-2
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)
100 Year Storm Event

Subdivision: JUDIE ANNE SUBDIVISION

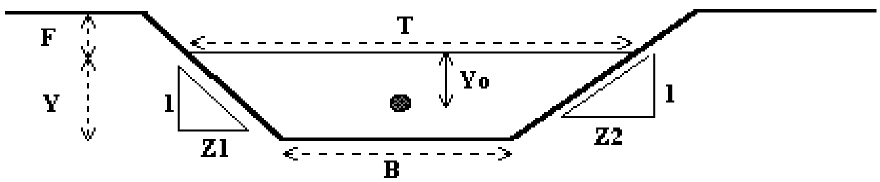
Calculated by: ____________________ **WECI Job No.:** 0377.001.00

Checked by: ____________________ **Date:** June 10, 2022

		Direct Runoff							Total Runoff				Street Carry Over		Pipe			Travel Time		
Structure Type (Page)	Design Pt.	Area Design Point	Area (ac)	Runoff Coeff. (C)	T_C (min)	C*A (ac)	I (in/hr)	Q (cfs)	T_C (min)	C*A (ac)	I (in/hr)	Q (cfs)	S (%)	Q (cfs)	Q (cfs)	S (%)	Pipe Size (in)	L (ft)	V (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)
	1	P-1	0.76	0.82	5.4	0.63	8.8	5.5												
	3	P-3	0.81	0.80	7.9	0.65	7.9	5.1												
									7.9	1.28	7.9	10.0	<<Flow where Basin P-1 joins Basin P-2							
	2	P-2	0.67	0.78	8.5	0.52	7.7	4.0												
									8.5	1.80	7.7	13.8	<<Flow at Outfall							

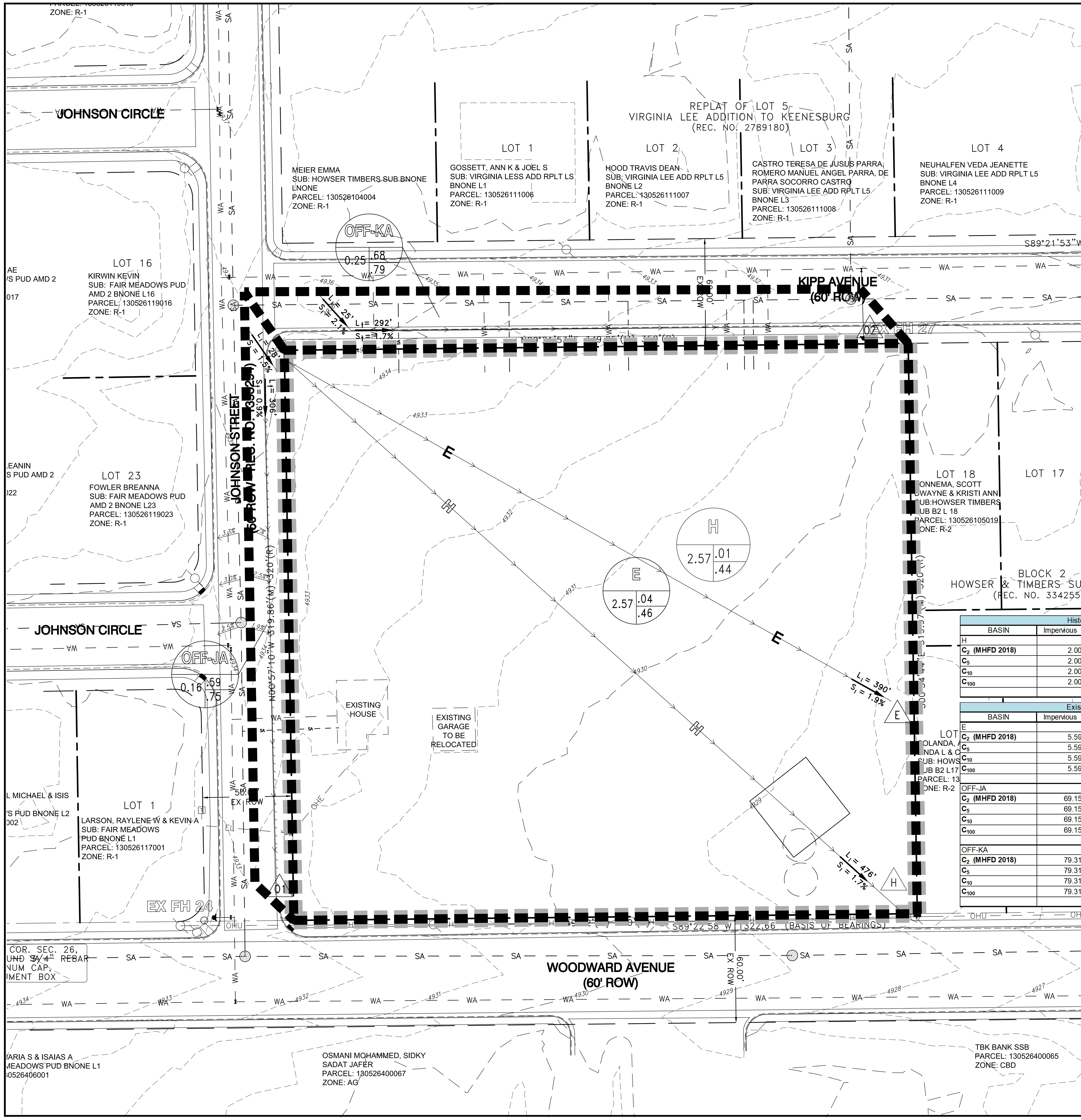
Normal Flow Analysis - Trapezoidal Channel

Project: JUDIE ANNE SUBDIVISION
Channel ID: SWALES E&S



Design Information (Input)			
Channel Invert Slope	So =	0.0050	ft/ft
Manning's n	n =	0.025	
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Slope	Z2 =	4.00	ft/ft
Freeboard Height	F =	0.00	ft
Design Water Depth	Y =	**1.00**	ft

Normal Flow Condtion (Calculated)			
Discharge	**Q =**	**10.41**	cfs
Froude Number	**Fr =**	**0.65**	
Flow Velocity	**V =**	**2.60**	fps
Flow Area	A =	4.00	sq ft
Top Width	T =	8.00	ft
Wetted Perimeter	P =	8.25	ft
Hydraulic Radius	R =	0.49	ft
Hydraulic Depth	D =	0.50	ft
Specific Energy	Es =	1.11	ft
Centroid of Flow Area	Yo =	0.33	ft
Specific Force	Fs =	0.13	kip



EXISTING DRAINAGE LEGEND

- E — EXISTING SUB-BASIN DESIGNATION
- 1.12 — AREA IN ACRES
- .73 — C10
- .83 — C100
- 8 — DESIGN POINT
- EXISTING BASIN
- EXISTING DRAINAGE PATTERN

HISTORIC DRAINAGE LEGEND

- H — HISTORIC SUB-BASIN DESIGNATION
- 1.12 — AREA IN ACRES
- .73 — C10
- .83 — C100
- HISTORIC BASIN
- HISTORIC DRAINAGE PATTERN

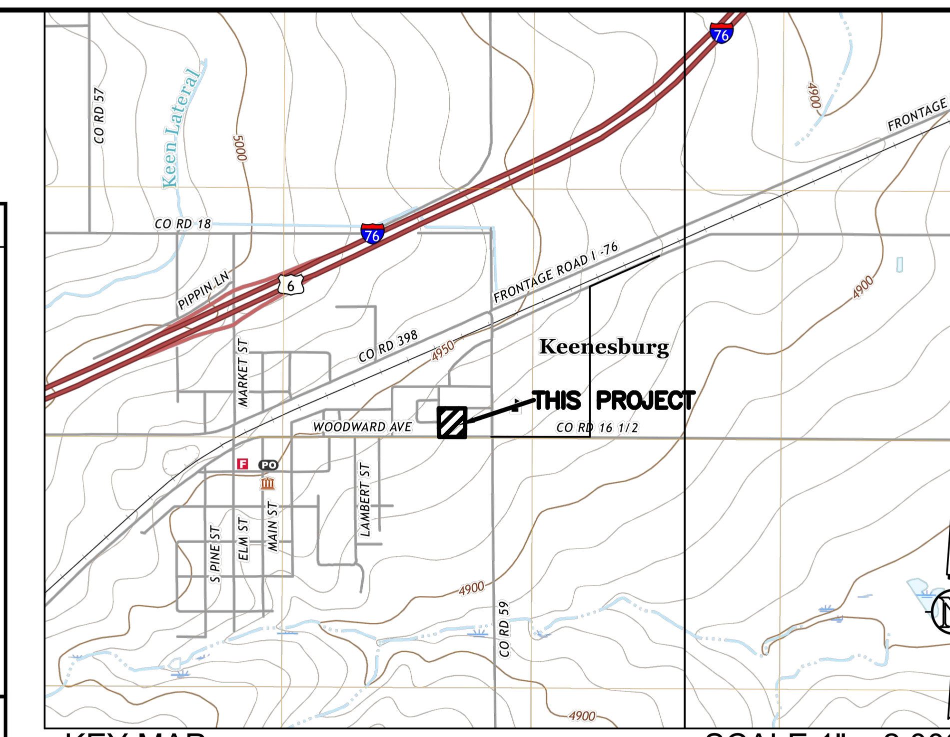
- L_I - INITIAL LENGTH (L_I = LI)
- S_I - INITIAL SLOPE (S_I = SI)
- L_T - TRAVEL LENGTH (L_T = LT)
- S_T - TRAVEL SLOPE (S_T = ST)

Historic Runoff Table - JUDIE ANNE SUBDIVISION

BASIN	Impervious	C-YR	I	A	CIA(YR-historic)	Flow	DESIGN POINT
H							
C_2 **(MHFD 2018)**	2.00	0.01	1.32	2.57	0.03	cfs	H
C_5	2.00	0.01	1.75	2.57	0.04	cfs	
C_{10}	2.00	0.07	2.16	2.57	0.39	cfs	
C_{100}	2.00	0.44	4.08	2.57	4.61	cfs	

Existing Runoff Table - JUDIE ANNE SUBDIVISION

BASIN	Impervious	C-YR	I	A	CIA(YR-existing)	Flow	DESIGN POINT
E							
C_2 **(MHFD 2018)**	5.59	0.04	1.46	2.57	0.15	cfs	E
C_5	5.59	0.04	1.94	2.57	0.20	cfs	
C_{10}	5.59	0.10	2.39	2.57	0.61	cfs	
C_{100}	5.59	0.46	4.52	2.57	5.30	cfs	
OFF-JA							
C_2 **(MHFD 2018)**	69.15	0.58	2.43	0.16	0.23	cfs	O1
C_5	69.15	0.59	3.22	0.16	0.31	cfs	
C_{10}	69.15	0.61	3.98	0.16	0.39	cfs	
C_{100}	69.15	0.75	7.51	0.16	0.91	cfs	
OFF-KA							
C_2 **(MHFD 2018)**	79.31	0.66	2.83	0.25	0.48	cfs	O2
C_5	79.31	0.68	3.75	0.25	0.65	cfs	
C_{10}	79.31	0.69	4.64	0.25	0.82	cfs	
C_{100}	79.31	0.79	8.75	0.25	1.77	cfs	



KEY MAP SCALE 1" = 2,000'
NE 1/4, S26, T2N, R64W, 6th P.M.
SHOWN KEY MAP TAKEN FROM USGS QUAD MAPS - KEENESBURG, CO

NOTES

THIS PLAN IS INTENDED AS THE HISTORIC & EXISTING DRAINAGE PLAN FOR JUDIE ANNE SUBDIVISION.

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SEE SURVEY COMPLETED BY AMERICAN WEST LAND SURVEYING CO. – DATED MAY 11, 2021.

SEE COVER SHEET FOR BASIS OF BEARING.

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SYMBOL LEGEND

- 45 DEG BEND
- 22.5 DEG BEND
- RESTRAINED PLUG
- RESTRAINED TEE
- WATER METER
- RESTRAINED CROSS
- FIRE HYDRANT
- RESTRAINED WATER VALVE
- PIPE CROSSOVER
- MANHOLE
- EXISTING ASPHALT PAVING
- PROPOSED ASPHALT PAVING
- PROPOSED CONCRETE PAVING
- PROPOSED GRAVEL

LINETYPE LEGEND

- LOT / PROPERTY LINE
- RIGHT OF WAY LINE
- EASEMENT
- SETBACK
- TO BE ABANDONED LOT LINE
- EXISTING BUILDING, CURB
- EDGE of ASPHALT or GRAVEL RD
- CHAINLINK FENCE
- X — WIRE FENCE
- POND WQ W/S
- SWALE
- OHE — EXISTING OVERHEAD ELEC
- E — EXISTING ELECTRICAL LINE
- EXISTING STORM LINE
- S — EXISTING SANITARY LINE
- W — EXISTING WATER LINE
- G — EXISTING GAS LINE
- FIBER — EXISTING FIBER OPTIC LINE
- T — EXISTING TELEPHONE LINE
- SA — PROPOSED SANITARY LINE
- SS — PROPOSED SANITARY SERVICE
- STM — PROPOSED STORM LINE
- WA — PROPOSED WATER LINE
- WAS — PROPOSED WATER SERVICE
- GA — PROPOSED GAS LINE
- EL — PROPOSED ELECTRIC LINE
- PH — PROPOSED TELEPHONE LINE

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(720) 685-9951
FAX (720) 294-1330

No.	REVISION	DATE	BY
0	INITIAL RELEASE	07/09/21	CFC
1	PRELIM/FINAL SUB	12/31/21	CFC
2	REV PER TOWN REVIEW	01/20/22	CFC
3	REV PER TOWN REVIEW	03/09/22	CFC
5	REV FOR FINAL APPROVAL	06/13/22	CFC

RYBERG CONST. CO., INC
CONTACT: ERNIE RYBERG
17843 COUNTY ROAD 6
BRIGHTON, CO 80603
(303) 597-2127

HIST & EXISTING DRAINAGE PLAN
JUDIE ANNE SUBDIVISION
FINAL CONSTRUCTION PLANS
TOWN of KEENESBURG, WELD COUNTY, COLORADO

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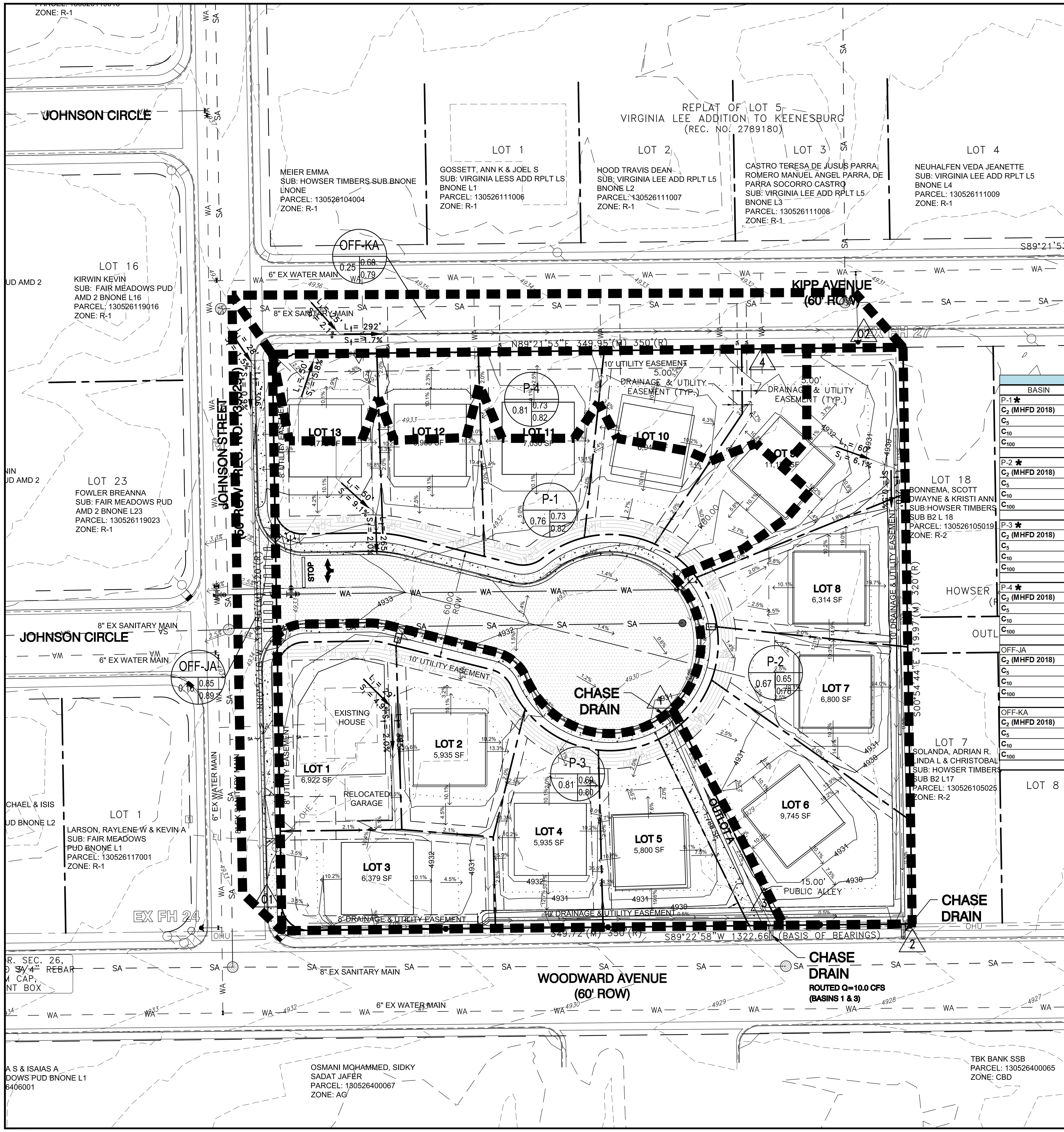
FOR CONSTRUCTION
COLORADO REGISTERED PROFESSIONAL ENGINEER
CHADWIN F. COX
33802
06/13/22
ONLY VALID FOR CONSTRUCTION IF SEAL & ORIGINAL SIGNATURE ARE ON EACH SHEET

INITIAL PLAN RELEASE: 07/09/21
DESIGNED BY: CFC
DRAWN BY: CFC
CHECKED BY: CFC

PROJECT NO. 01-0377.001.00
DOC CON # 0015-H/E DRNG
SHEET 15 OF 28



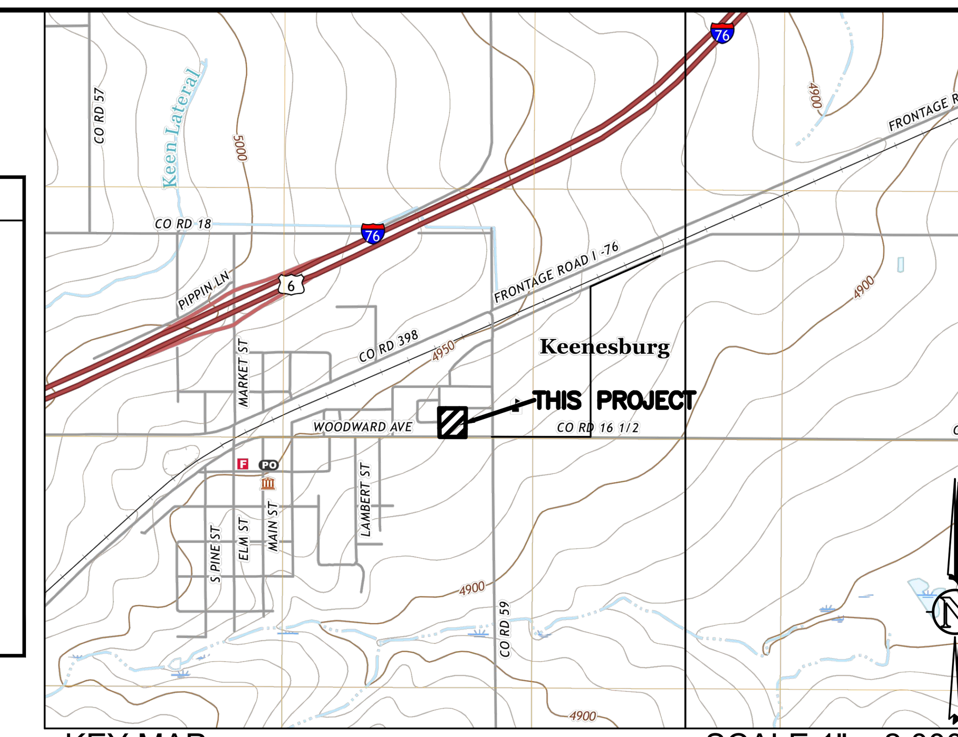
DEVELOPED DRAINAGE LEGEND

- B1 — SUB-BASIN DESIGNATION
- 3.20 — AREA IN ACRES
- .58 — C5
- .88 — C100
- DEVELOPED BASIN
- PROPOSED DRAINAGE PATTERN
- DESIGN POINT

- L_i - INITIAL LENGTH (L_i = LI)
- S_i - INITIAL SLOPE (S_i = SI)
- L_t - TRAVEL LENGTH (L_t = LT)
- S_t - TRAVEL SLOPE (S_t = ST)

Developed Runoff Table - JUDIE ANNE SUBDIVISION							
BASIN	Impervious	C-YR	I	A	CIA(YR-DEVELOPED)	cfs	DESIGN POINT
P-1 *							
C_2 (MHFD 2018)	*85.53	0.72	2.85	0.76	1.55	cfs	1
C_5	85.53	0.73	3.78	0.76	2.11	cfs	
C_{10}	85.53	0.74	4.67	0.76	2.64	cfs	
C_{100}	85.53	0.82	8.82	0.76	5.52	cfs	
P-2 *							
C_2 (MHFD 2018)	*76.50	0.64	2.47	0.67	1.06	cfs	2
C_5	76.50	0.65	3.28	0.67	1.44	cfs	
C_{10}	76.50	0.67	4.06	0.67	1.82	cfs	
C_{100}	76.50	0.78	7.65	0.67	4.00	cfs	
P-3 *							
C_2 (MHFD 2018)	*80.53	0.67	2.54	0.81	1.39	cfs	3
C_5	80.53	0.69	3.37	0.81	1.89	cfs	
C_{10}	80.53	0.70	4.17	0.81	2.38	cfs	
C_{100}	80.53	0.80	7.86	0.81	5.11	cfs	
P-4 *							
C_2 (MHFD 2018)	*80.00	0.67	2.77	0.33	0.60	cfs	4
C_5	80.00	0.68	3.67	0.33	0.82	cfs	
C_{10}	80.00	0.70	4.54	0.33	1.03	cfs	
C_{100}	80.00	0.80	8.57	0.33	2.22	cfs	
OFF-JA							
C_2 (MHFD 2018)	98.99	0.83	2.88	0.16	0.39	cfs	O1
C_5	98.99	0.85	3.82	0.16	0.53	cfs	
C_{10}	98.99	0.85	4.72	0.16	0.65	cfs	
C_{100}	98.99	0.89	8.90	0.16	1.28	cfs	
OFF-KA							
C_2 (MHFD 2018)	79.31	0.66	2.89	0.25	0.49	cfs	O2
C_5	79.31	0.68	3.83	0.25	0.66	cfs	
C_{10}	79.31	0.69	4.74	0.25	0.83	cfs	
C_{100}	79.31	0.79	8.94	0.25	1.81	cfs	

* BASIN IMPERVIOUSNESS THIS TABLE REPRESENTS THE FULL BUILDOUT OF EACH LOT AT 80% IMPERVIOUSNESS.



KEY MAP SCALE 1" = 2,000'

SE 1/4, S24, T2N, R64W, 6th P.M.

SHOWN KEY MAP TAKEN FROM USGS QUAD MAPS - KEENESBURG 40104-A5, PROSPECT VALLEY 40104-A5, KLUG RANCH 40104-B5 & TAMPA 40104-B4

NOTES

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- RESTRAINED TEE
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- PIPE CROSSOVER
- MANHOLE
- EXISTING ASPHALT PAVING
- PROPOSED ASPHALT PAVING
- PROPOSED CONCRETE PAVING
- PROPOSED GRAVEL
- PROPOSED LIGHT POLE (OPTION 1)
- PROPOSED LIGHT POLE (OPTION 2)

LINETYPE LEGEND

- LOT / PROPERTY LINE
- RIGHT OF WAY LINE
- EASEMENT
- SETBACK
- TO BE ABANDONED LOT LINE
- EXISTING BUILDING, CURB
- EDGE of ASPHALT or GRAVEL RD
- CHAINLINK FENCE
- X — WIRE FENCE
- POND WQ W/S
- SWALE
- OHE — EXISTING OVERHEAD ELEC
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No.	REVISION	DATE	BY
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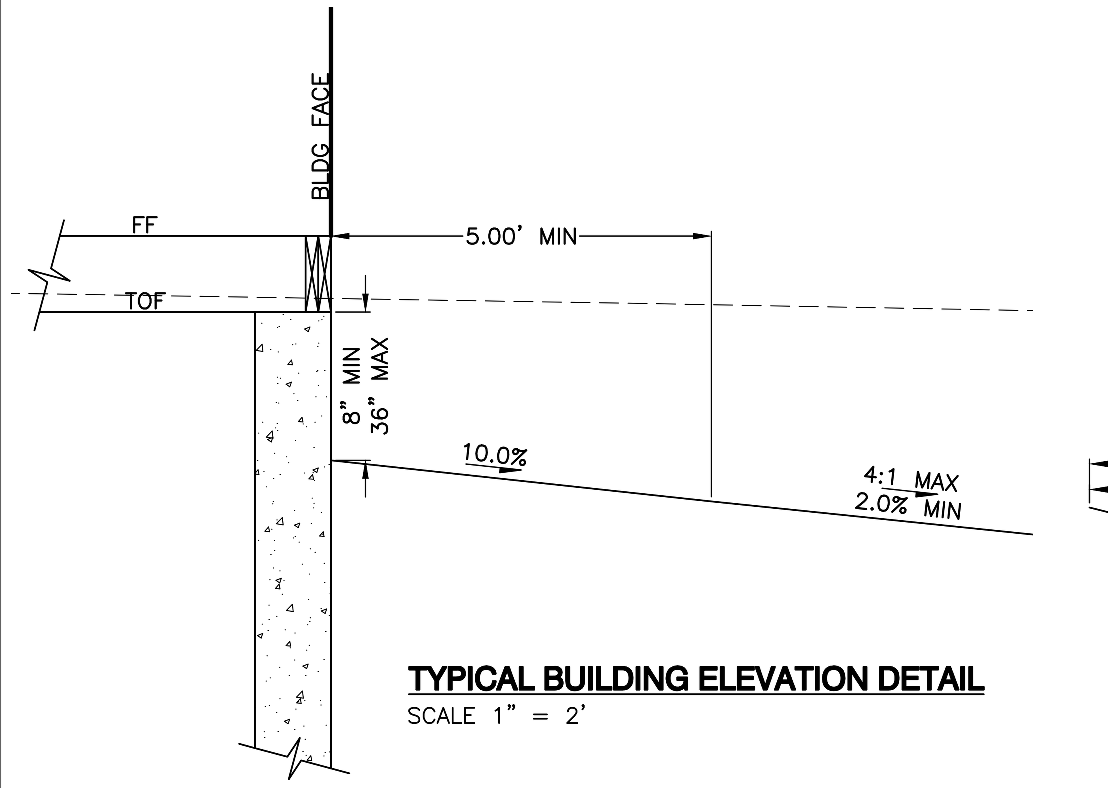
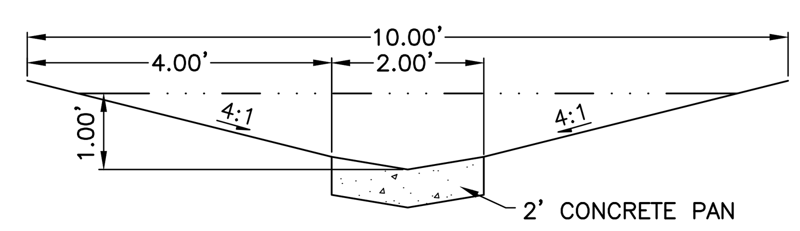
DEVELOPED DRAINAGE PLAN
JUDIE ANNE SUBDIVISION FINAL CONSTRUCTION PLANS
TOWN of KEENESBURG, WELD COUNTY, COLORADO

FOR CONSTRUCTION
COLORADO REGISTERED PROFESSIONAL ENGINEER 33802 06/13/22
ONLY VALID FOR CONSTRUCTION IF SEAL & ORIGINAL SIGNATURE ARE ON EACH SHEET

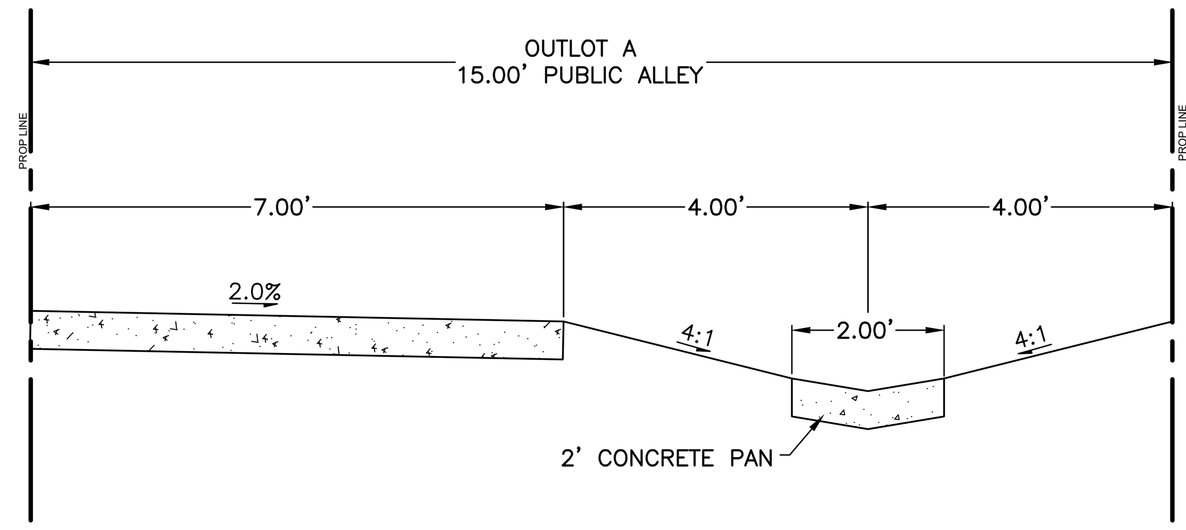
INITIAL PLAN RELEASE: 07/09/21
DESIGNED BY: CFC
DRAWN BY: CFC
CHECKED BY: CFC
PROJECT NO. 01-0377.001.00
DOC CON # 0016-DEV DRNG



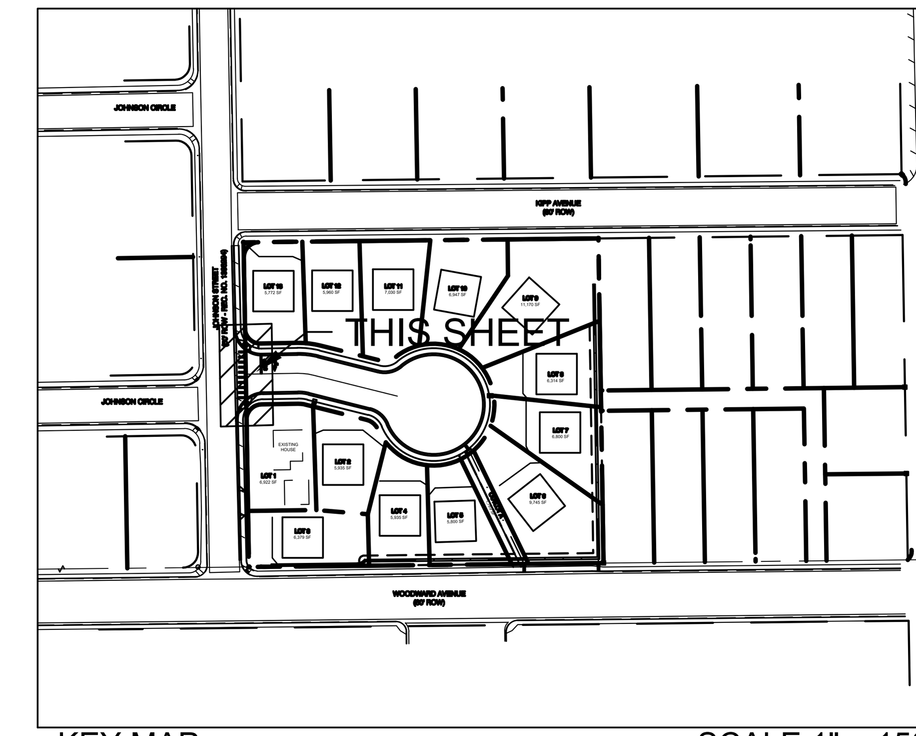
TYPICAL BUILDING ELEVATION DETAIL
SCALE 1" = 2'



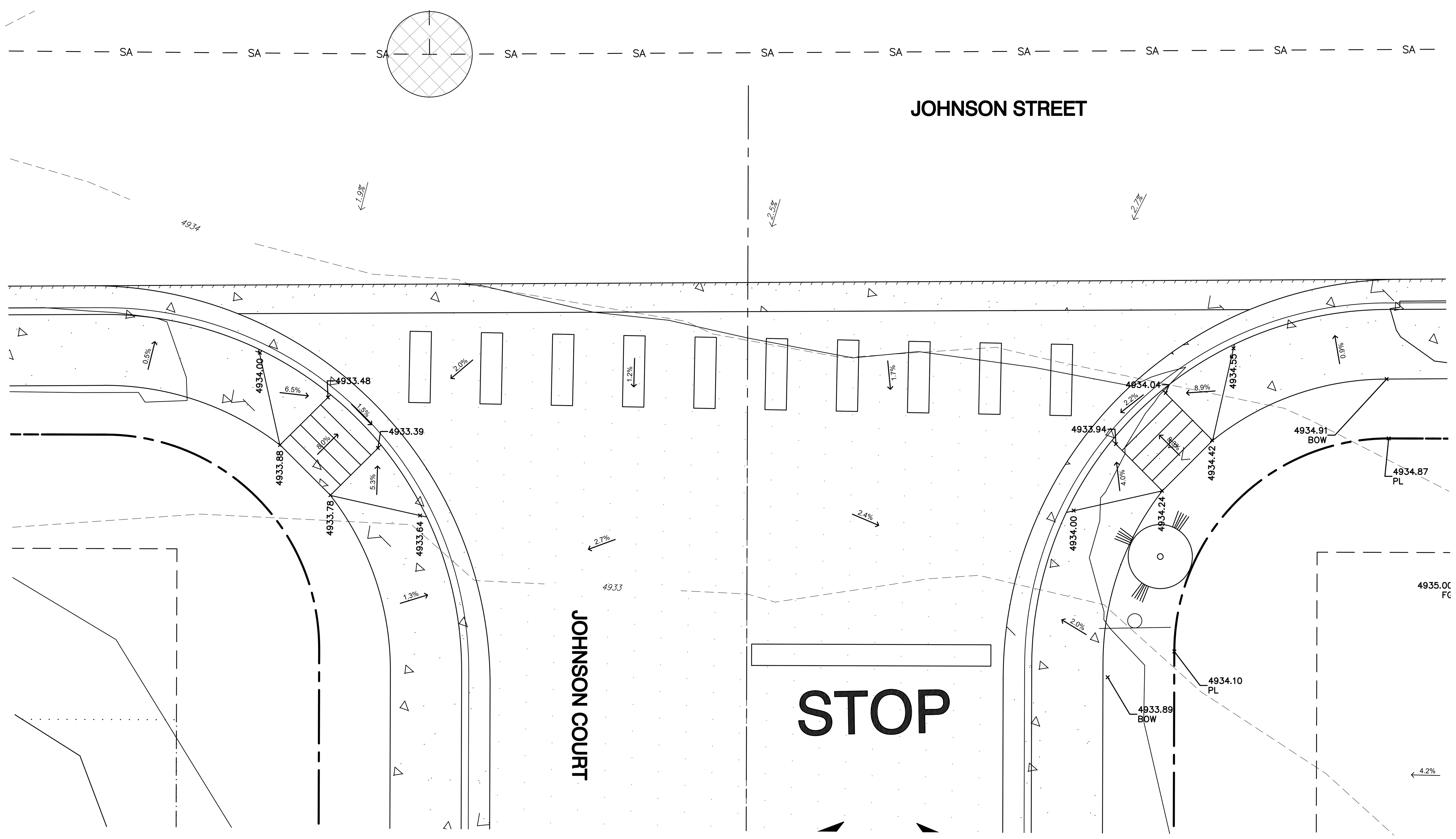
PERIMETER SWALE DETAIL
SCALE 1" = 2'

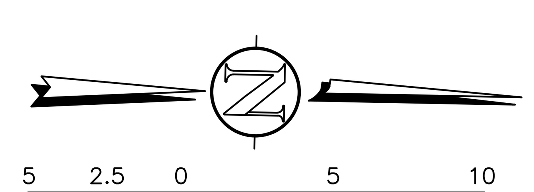


OUTLOT A CROSS SECTION DETAIL
SCALE 1" = 2'



KEY MAP SCALE 1" = 150'





FULL SCALE: 1" = 5'
HALF SCALE: 1" = 10'

NOTES

THIS PLAN IS INTENDED AS THE GRADING DETAILS FOR JUDIE ANNE SUBDIVISION.

ALL IMPROVEMENTS ARE PROPOSED UNLESS NOTED OTHERWISE.

IT IS THE OWNER AND/OR THE CONTRACTOR'S RESPONSIBILITY TO ATTAIN ALL APPROPRIATE PERMITS AND REVIEW APPROVALS FROM THE STATE OF COLORADO AND TOWN OF KEENESBURG RESPECTIVELY.

SEE SURVEY COMPLETED BY AMERICAN WEST LAND SURVEYING CO. – DATED MAY 11, 2021.

SEE COVER SHEET FOR BASIS OF BEARING.

ANY REFERENCE TO EASEMENTS, SURVEY POINTS, OR EXISTING UTILITIES AND FEATURES ARE BASED SOLELY FROM SURVEY INFORMATION PROVIDED BY AMERICAN WEST LAND SURVEYING CO.

SHOWN PROPOSED LAYOUT PROVIDED BY AMERICAN WEST SURVEYING CO. DATED MAY 11, 2021. ANY SUBSEQUENT REVISIONS MADE BY AMERICAN WEST ARE NOT REFLECTED IN THIS PLAN SET. REVISIONS DESCRIBED AND DATED ON INDIVIDUAL SHEETS IN THIS PLAN SET ARE WESTERN ENGINEERING REVISIONS ONLY.

NOT ALL UNCC UTILITY LOCATES HAVE BEEN PERFORMED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITIES ARE LOCATED AND SURVEY PROVIDED TO THE OWNER AND ENGINEER PRIOR TO CONSTRUCTION DRAWING RELEASE.

SYMBOL LEGEND

45 DEG BEND
22.5 DEG BEND
RESTRAINED PLUG
RESTRAINED TEE
WATER METER
RESTRAINED CROSS
FIRE HYDRANT
RESTRAINED WATER VALVE
PIPE CROSSOVER
MANHOLE
EXISTING ASPHALT PAVING
PROPOSED ASPHALT PAVING
PROPOSED CONCRETE PAVING
PROPOSED GRAVEL
PROPOSED LIGHT POLE (OPTION 1)
PROPOSED LIGHT POLE (OPTION 2)

LINETYPE LEGEND

LOT / PROPERTY LINE
RIGHT OF WAY LINE
EASEMENT
SETBACK
TO BE ABANDONED LOT LINE
EXISTING BUILDING, CURB
EDGE of ASPHALT or GRAVEL RD
CHAINLINK FENCE
WIRE FENCE
POND WQ W/S
SWALE
OHE — EXISTING OVERHEAD ELEC
E — EXISTING ELECTRICAL LINE
ST — EXISTING STORM LINE
S — EXISTING SANITARY LINE
W — EXISTING WATER LINE
G — EXISTING GAS LINE
FIBER — EXISTING FIBER OPTIC LINE
T — EXISTING TELEPHONE LINE

SA — PROPOSED SANITARY LINE
SS — PROPOSED SANITARY SERVICE
STM — PROPOSED STORM LINE
WA — PROPOSED WATER LINE
WAS — PROPOSED WATER SERVICE
GA — PROPOSED GAS LINE
EL — PROPOSED ELECTRIC LINE
PH — PROPOSED TELEPHONE LINE

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No.	REVISION	DATE	BY
1	PRELIM/FINAL SUB	12/21/21	CFC
2	REV PER TOWN REVIEW	01/20/22	CFC
3	REV PER TOWN REVIEW	03/09/22	CFC
4	REV PER LOT AREA GRADING	04/27/22	CFC
5	REV FOR FINAL APPROVAL	06/13/22	CFC

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GRADING DETAILS
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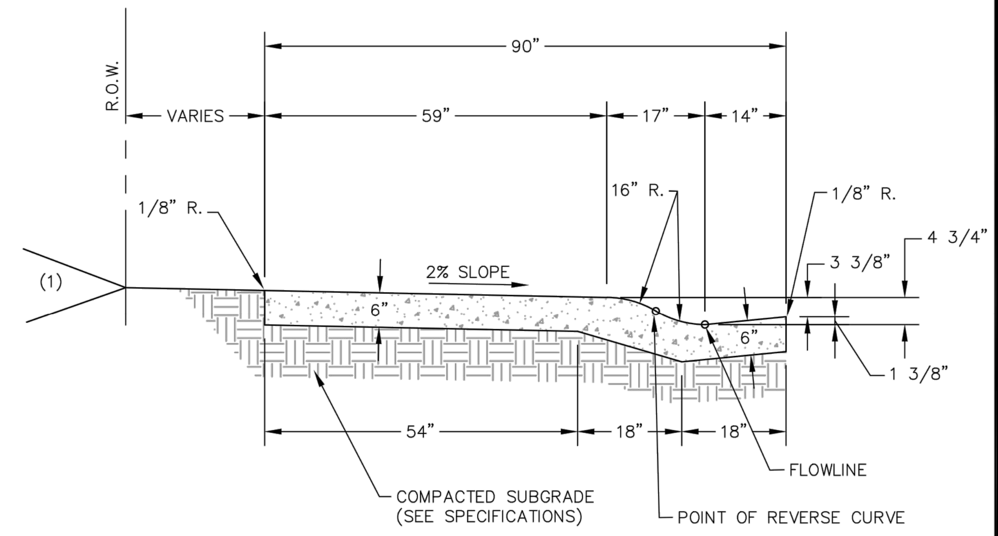


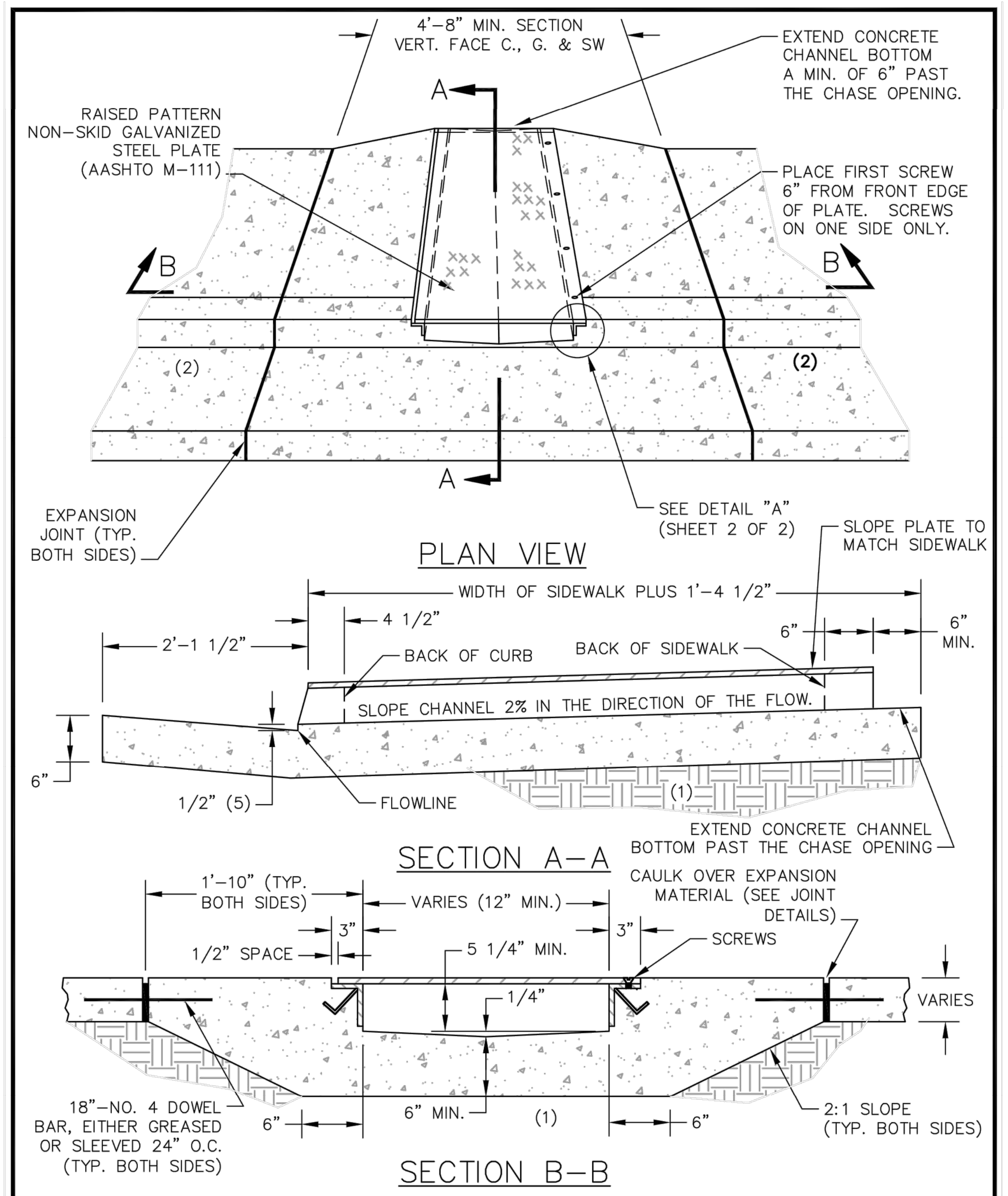
NOTES:

1. CUT AND FILL SLOPES SHALL BE A MAXIMUM OF 4:1.
2. THIS DETAIL SHALL BE USED ONLY IN THOSE SITUATIONS APPROVED BY THE CITY OR IN RETROFIT LOCATIONS. DETACHED SIDEWALKS AND VERTICAL FACE CURB AND GUTTER IS REQUIRED ON ALL NEW STREETS IN NEW RESIDENTIAL SUBDIVISIONS.
3. MAXIMUM SPACING OF CONTRACTION JOINTS – TEN (10) FEET.
4. EXPANSION JOINTS ARE REQUIRED, SEE JOINT DETAILS.
5. CONCRETE SURFACES TO RECEIVE A LIGHT BROOM FINISH.

DRIVE OVER CURB, GUTTER & SIDEWALK

DETAIL NO. S-15

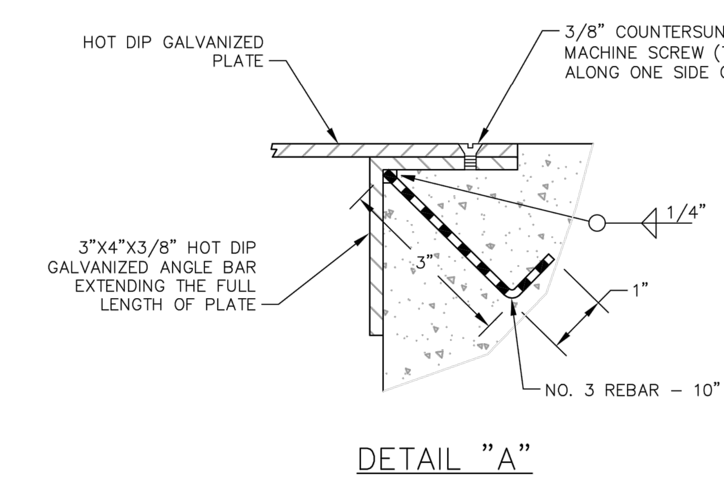
DATE: JULY, 2015 SCALE: N.T.S.



SIDEWALK CHASE FOR ATTACHED SIDEWALK
SHEET 1 OF 2

DETAIL NO. S-23-A

DATE: JULY, 2015 SCALE: N.T.S.



DETAIL "A"

WIDTH OF OPENING	THREADPLATE THICKNESS
12"–18" >18"–24" >24"	9/16" 5/8" SPECIAL DESIGN

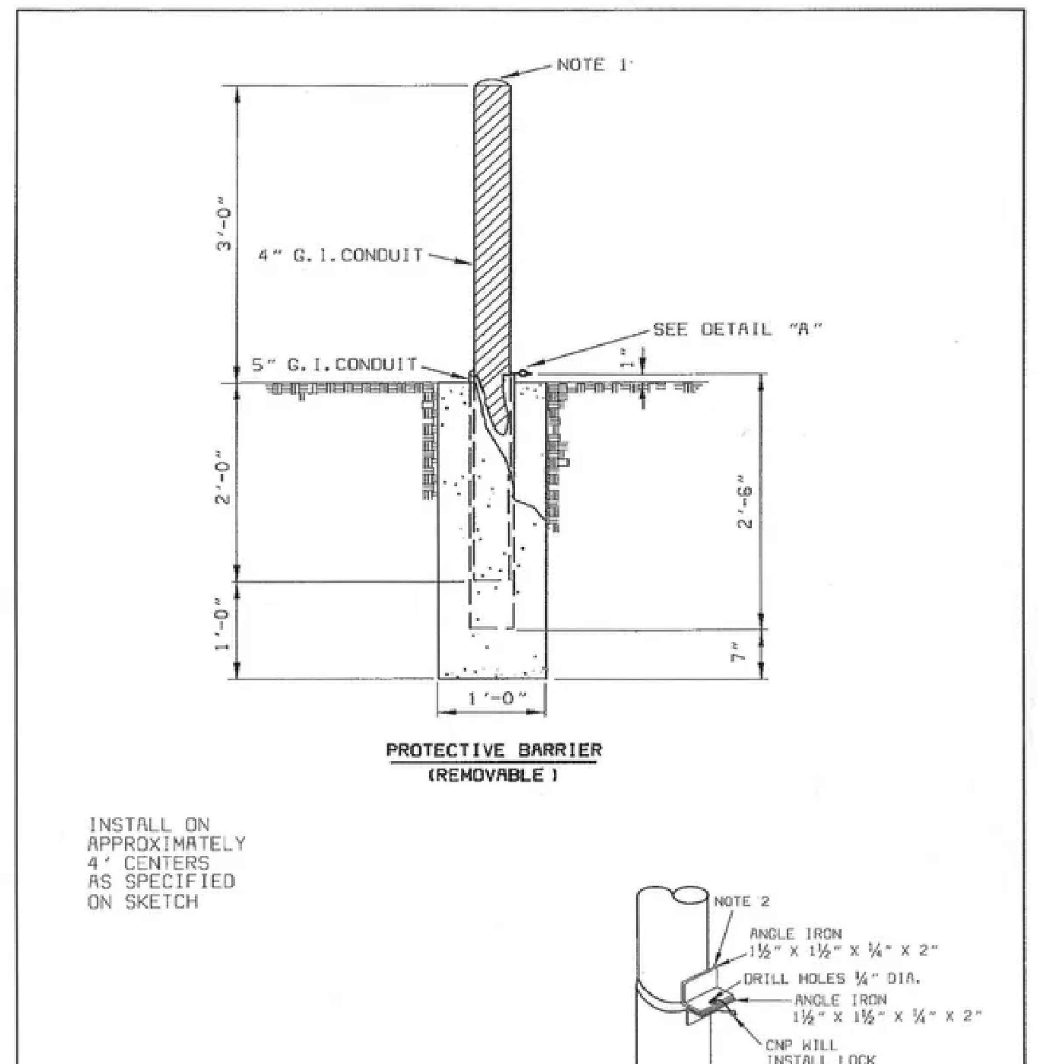
NOTES:

1. COMPACTED SUBGRADE (SEE SPECIFICATIONS).
2. FOR DRIVE OVER CURB, GUTTER AND SIDEWALK, TRANSITION (3' MIN.) TO A VERTICAL FACE CURB AND GUTTER FOR CHASE CONSTRUCTION. KEEP GUTTER WIDTH FOR DRIVE OVER.
3. NEENAH R-4999 SERIES BOLTED TRANSVERSE DRAINAGE STRUCTURE, SOLID CHECKERED TYPE D GRATE MAY BE SUBSTITUTED.
4. CONCRETE SURFACES TO RECEIVE A LIGHT BROOM FINISH.
5. ELIMINATE 1/2" FLOWLINE LIP WHEN STORMWATER DRAINS AWAY FROM THE GUTTER.

SIDEWALK CHASE FOR ATTACHED SIDEWALK
SHEET 2 OF 2

DETAIL NO. 2-23-A

DATE: JULY, 2015 SCALE: N.T.S.



NOTES:

1. 4" G.I. CONDUIT TO BE FILLED WITH CONCRETE.
2. ANGLE TO BE WELDED TO G.I. CONDUIT. ALL EXPOSED METAL TO BE PAINTED WITH GALVANOX PAINT.
3. SEAL GAP BETWEEN CONDUITS WITH DUCT SEAL FOR WATER TIGHT FIT.
4. USE 5" PLUG TO PREVENT CONCRETE FROM COMING UP 5" G.I. CONDUIT.

PROTECTIVE BARRIER
(REMOVABLE)

CURB RAMP GENERAL NOTES:

(1) IN NEW CONSTRUCTION OR FULL-DEPTH RECONSTRUCTION, PROVIDE A SEPARATE CURB RAMP FOR EACH MARKED OR UNMARKED PEDESTRIAN STREET CROSSING. CURB RAMPS SHALL BE CONTAINED WHOLLY WITHIN THE WIDTH OF THE PEDESTRIAN STREET CROSSING OR CROSSWALK THEY SERVE, OR AS SHOWN ON THE CONTRACT PLANS.

(2) ALTERATIONS ARE DEFINED AS CHANGES TO AN EXISTING HIGHWAY THAT AFFECT PEDESTRIAN ACCESS, CIRCULATION, OR USE. ALTERATIONS INCLUDE, BUT ARE NOT LIMITED TO, RESURFACING, REHABILITATION, RECONSTRUCTION, CURB RAMP RETROFITS, HISTORIC RESTORATION, OR CHANGES OR REARRANGEMENT TO STRUCTURAL PARTS OR ELEMENTS OF A PEDESTRIAN FACILITY.

(3) A WALKABLE SURFACE IS DEFINED AS A PAVED SURFACE ADJACENT TO A CURB RAMP OR TURNING SPACE, WITHOUT RAISED OBSTACLES, THAT COULD BE MISTAKENLY TRAVERSED BY A USER WHO IS VISUALLY IMPAIRED.

(4) IN ALTERATIONS, WHERE AN EXISTING PHYSICAL CONSTRAINT PREVENTS PROVIDING A SEPARATE CURB RAMP FOR EACH PEDESTRIAN STREET CROSSING, A SINGLE DIAGONAL RAMP (ON THE APEX) SHALL BE PERMITTED TO SERVE BOTH PEDESTRIAN STREET CROSSINGS. THE USE OF A SINGLE DIAGONAL RAMP SHALL BE APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION. DIAGONAL RAMPS ARE NOT ACCEPTABLE IN NEW CONSTRUCTION OR FULL-DEPTH RECONSTRUCTION.

(5) DETECTABLE WARNINGS SURFACES (DWS) ARE INTENDED TO INDICATE THE BOUNDARY BETWEEN A PEDESTRIAN ROUTE AND VEHICULAR ROUTE WHERE THERE IS A FLUSH RATHER THAN CURBED CONNECTION. DWS ARE NOT INTENDED TO PROVIDE WAYFINDING. DWS SHALL BE PROVIDED AT THE FOLLOWING LOCATIONS;
1. CURB RAMPS, BLENDED TRANSITIONS, AND DEPRESSED CORNERS AT PEDESTRIAN STREET CROSSINGS;
2. PEDESTRIAN REFUGE ISLANDS (6 FEET IN WIDTH OR GREATER);
3. BOARDING PLATFORMS AT TRANSIT STOPS WHERE THE EDGE OF THE PLATFORM IS NOT PROTECTED TO PEDESTRIAN CROSS TRAFFIC; AND
4. BOARDING AREAS AT SIDEWALK OR STREET LEVEL TRANSIT STOPS WHERE THE AREA IS NOT PROTECTED TO PEDESTRIAN CROSS TRAFFIC.

(6) DETECTABLE WARNING SURFACES SHALL CONTRAST VISUALLY WITH THE ADJACENT GUTTER, HIGHWAY, OR PEDESTRIAN ACCESS ROUTE SURFACE, EITHER LIGHT-ON-DARK OR DARK-ON-LIGHT. FEDERAL YELLOW COLOR IS PREFERRED, HOWEVER, OTHER COLORS MAY BE USED IF APPROVED BY THE ENGINEER.

(7) IN ALTERATIONS, TO AVOID CHASING GRADE INDEFINITELY ON STEEP ROADWAYS, A CURB RAMPS LENGTH IS NOT REQUIRED TO EXCEED 15 FEET REGARDLESS OF THE RESULTING RAMP RUNNING SLOPE.

(8) ALL SLOPES ARE MEASURED WITH RESPECT TO A LEVEL PLANE.

(9) DRAINAGE STRUCTURES, TRAFFIC SIGNAL EQUIPMENT, OR OTHER OBSTRUCTIONS SHALL NOT BE INSTALLED ON THE CURB RAMP, OR TURNING SPACE AREAS.

(10) IN NEW CONSTRUCTION, PULL BOXES, METER BOXES, MAINTENANCE HOLE COVERS, VAULT LIDS, OR SIMILAR, SHALL NOT BE CONSTRUCTED WITHIN ANY PART OF CURB RAMP OR TURNING SPACE. IN ALTERATIONS, WHERE THESE ITEMS CANNOT BE RELOCATED OUTSIDE OF THE CURB RAMP OR TURNING SPACE, THEY MUST NOT CREATE A VERTICAL DISCONTINUITY GRATER THAN 1/2 INCH. ANY VERTICAL DISCONTINUITY BETWEEN 1/4 INCH AND 1/2 INCH SHALL BE BEVELED WITH A SLOPE NOT STEEPER THAN 1V:2H. THE BEVEL SHALL BE APPLIED ACROSS THE ENTIRE SURFACE DISCONTINUITY.

(11) CONSTRUCTION OF ANY REQUIRED PEDESTRIAN CURB SHALL BE INCLUDED IN THE BID PRICE OF THE CONCRETE CURB RAMP AND WILL NOT BE PAID FOR SEPARATELY.

(12) ALL CURB RAMP JOINTS AND GRADE BREAKS SHALL BE FLUSH (0'-1/8"). THE JOINT BETWEEN THE ROADWAY SURFACE AND THE GUTTER PAN SHALL BE FLUSH.

(13) THE CONTRACTOR SHALL VERIFY REMOVAL LIMITS ARE SUFFICIENT TO PROVIDE POSITIVE DRAINAGE, MAINTAIN EXISTING DRAINAGE PATTERNS, AND AVOID PONDING IN THE FINAL CONFIGURATION.

(14) FLARED SIDE SLOPES MAY EXCEED 10.0% ONLY WHERE THEY ABUT A NON-WALKABLE SURFACE, OR WHERE THE ADJACENT RAMP SURFACE IS BLOCKED TO PEDESTRIAN TRAFFIC.

(15) THE CHANGE IN GRADE AT THE BOTTOM OF THE CURB RAMP SHALL NOT EXCEED AN ALGEBRAIC DIFFERENCE OF 13.33%. THE COUNTER SLOPE OF THE GUTTER AT THE FOOT OF A RAMP, TURNING SPACE, OR BLENDED TRANSITION SHALL NOT EXCEED 5.0%.

(16) GRADE BREAKS AT THE TOP AND BOTTOM OF RAMP RUNS SHALL BE PERPENDICULAR TO THE DIRECTION OF THE RAMP RUN. GRADE BREAKS SHALL NOT BE PERMITTED ON THE SURFACE OF THE RAMP RUN OR TURNING SPACE. SURFACE SLOPES THAT MEET AT GRADE BREAKS SHALL BE FLUSH.

(17) A BROOM FINISH, WITH SWEEPS PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAFFIC, SHALL BE APPLIED TO ALL RAMP AND TURNING SPACE SURFACES.

(18) IN ALTERATIONS, WHERE A RAMP OR TURNING SPACE MUST TIE INTO AN EXISTING GRADE THAT CANNOT BE ALTERED, THE RAMP OR TURNING SPACE MAY BE WARPED TO TRANSITION TO THE REQUIRED CROSS SLOPE. THE TRANSITION TO THE REQUIRED CROSS SLOPE SHALL BE SPREAD EVENLY OVER THE LENGTH OF THE RAMP OR TURNING SPACE TO MINIMIZE THE DEGREE OF WARPING. THE RATE OF CHANGE ON A RAMP OR TURNING SPACE SHALL NOT EXCEED 3% PER LINEAR FOOT.

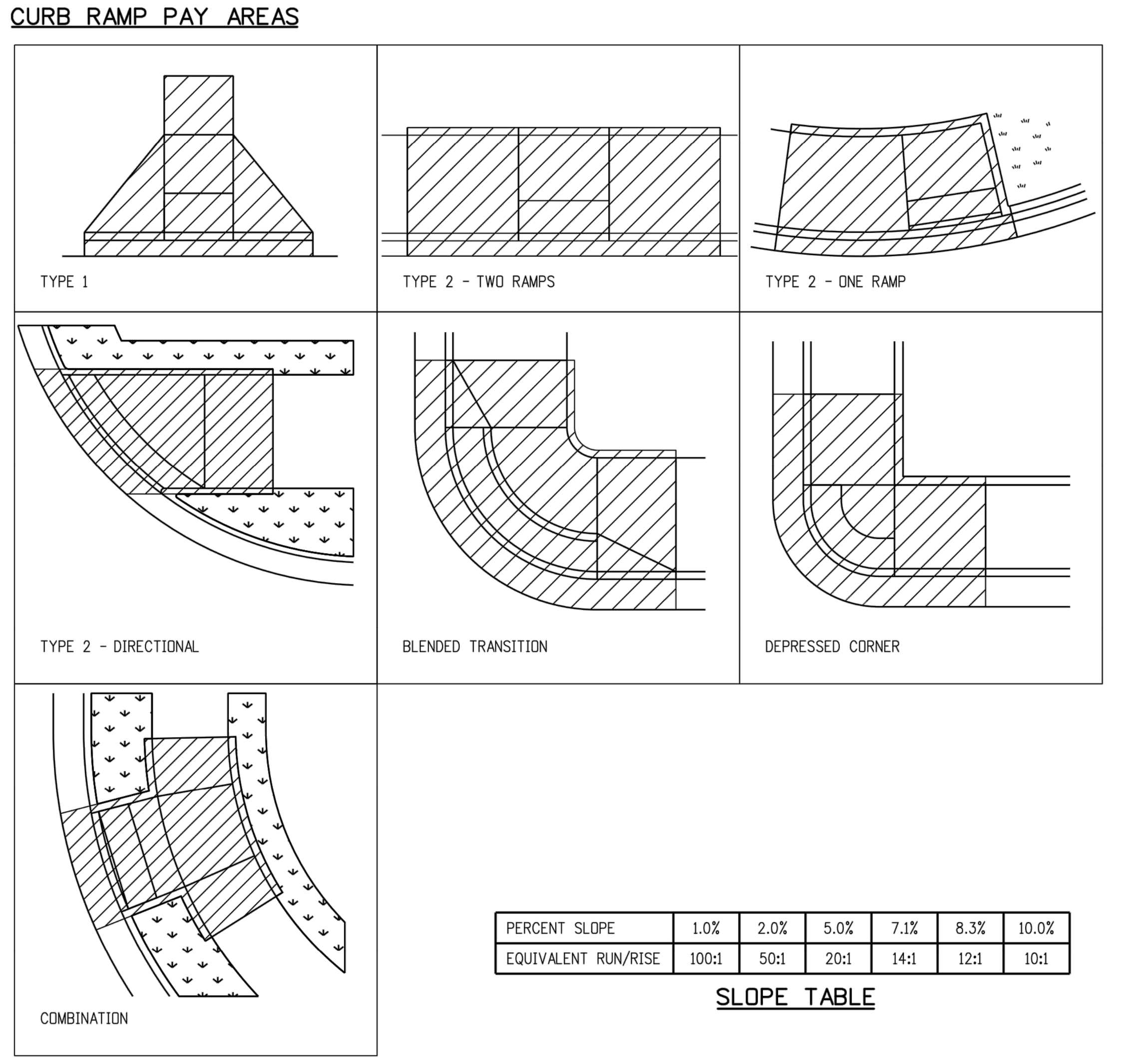
(19) DESIGN AND CONSTRUCT CURB RAMPS, TURNING SPACES, AND FLARE SLOPES WITH THE FLATTEST SLOPES POSSIBLE. THE SLOPES INDICATED IN THESE DETAILS SHOW THE MAXIMUM SLOPES ALLOWABLE. PREFERRED VALUES TO BE USED DURING DESIGN, LAYOUT, AND CONSTRUCTION ARE:
- RAMP RUNNING SLOPE 7.5%
- RAMP CROSS SLOPE 1.5%
- TURNING SPACE RUNNING SLOPE 1.5%
- TURNING SPACE CROSS SLOPE 1.5%
- FLARE SLOPE 8.0-9.0%

(20) WHERE SNOW REMOVAL EQUIPMENT WILL BE USED TO CLEAR THE PEDESTRIAN ACCESS ROUTE, CONSULT THE ENGINEER PRIOR TO CONSTRUCTION TO ENSURE THE WIDTH AND THICKNESS OF CURB RAMPS IS SUFFICIENT TO ACCOMODATE SUCH EQUIPMENT.

(21) PROVIDE EXPANSION JOINT MATERIAL 1/2" THICK WHERE CURB RAMPS ADJOIN ANY RIGID PAVEMENT, OR STRUCTURE. THE TOP OF THE JOINT FILLER MATERIAL SHALL BE FLUSH WITH ADJOINING CONCRETE SURFACES. THE EXPANSION JOINT MATERIAL SHALL EXTEND FOR THE FULL DEPTH OF THE CONCRETE SURFACE.

(22) PROVIDE TIE BAR REINFORCING BETWEEN INDEPEDENTLY POURED CONCRETE CURB RAMPS OR TURNING SPACES AND CURB AND GUTTER. DRILL AND GROUT NO. 4 12 INCH LONG REINFORCEMENT BARS (EPOXY COATED) AT 18 INCHES CENTER TO CENTER MINIMUM.

CURB RAMP PAY AREAS



PERCENT SLOPE	1.0%	2.0%	5.0%	7.1%	8.3%	10.0%
EQUIVALENT RUN/RISE	100:1	50:1	20:1	14:1	12:1	10:1

SLOPE TABLE

GENERAL NOTES & PAY AREAS

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12	Initials: JBK	Date:	Comments
Last Modification Date: 05/03/19	Initials: LTA	05/03/19	Completely revised every sheet.
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Drawing File Name: 6080101010.dgn			
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English			

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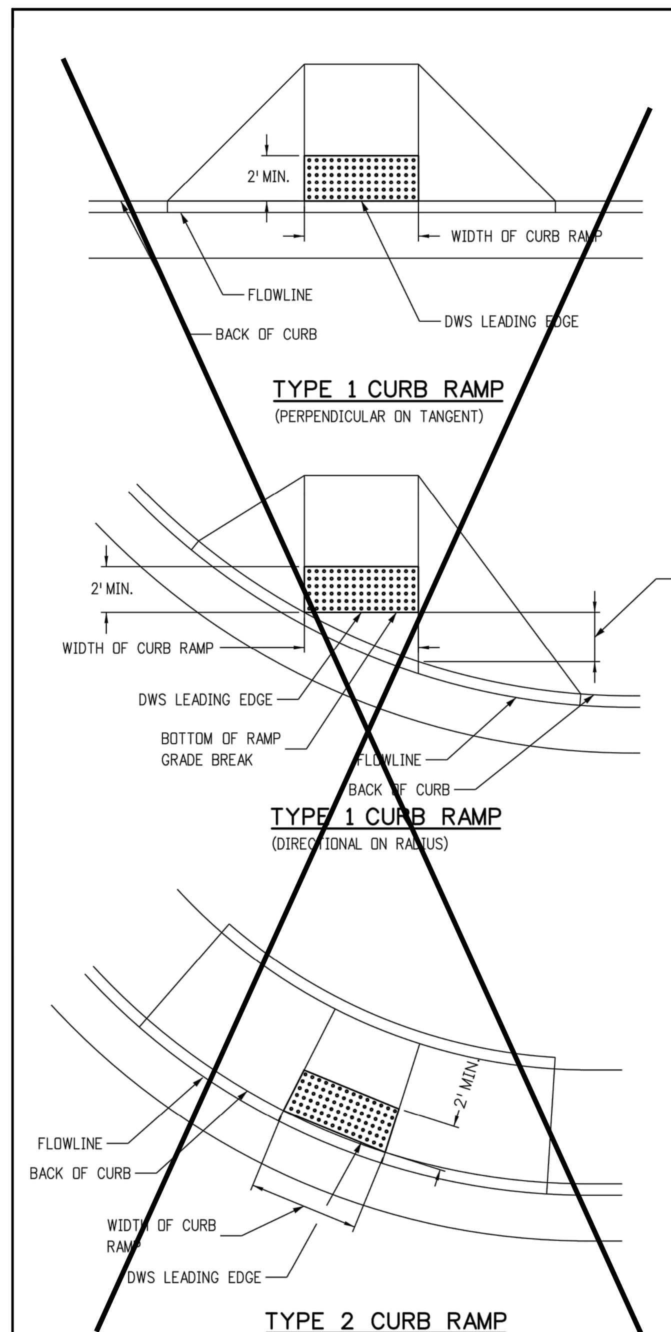
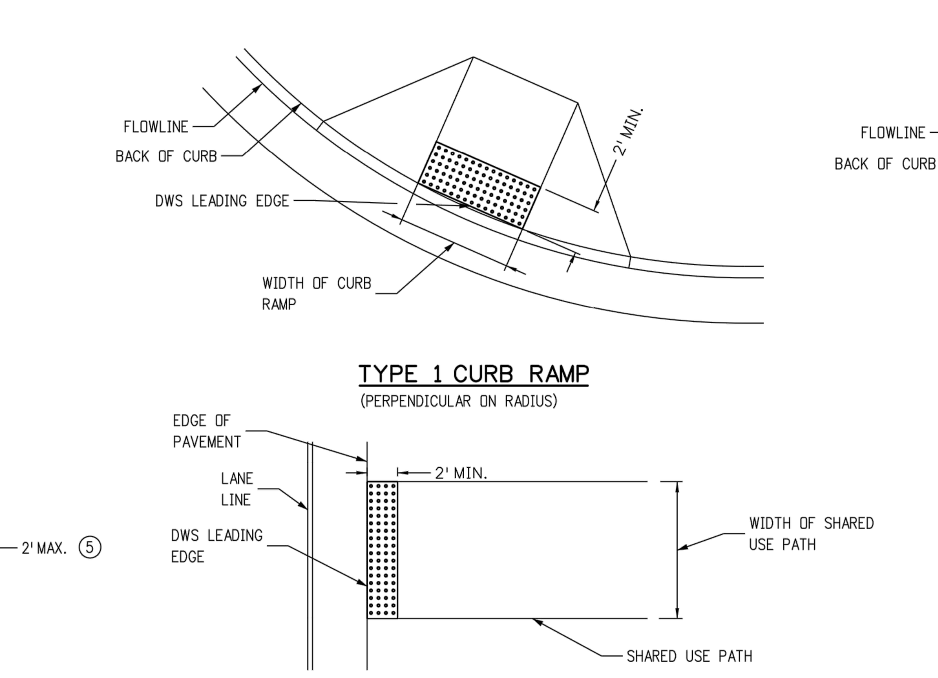
CURB RAMPS

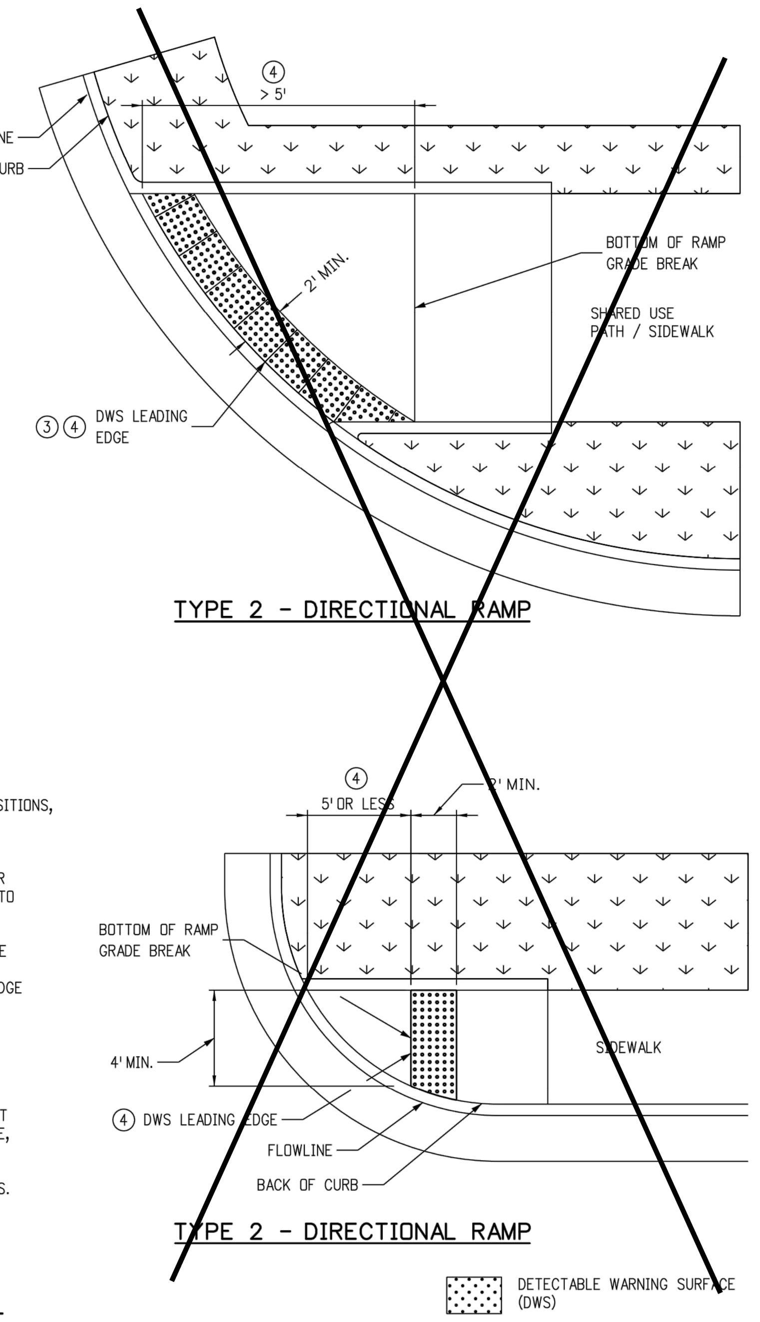
Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
M-608-1
Sheet No. 1 of 10





SHARED USE PATH CROSSING



DETECTABLE WARNING SURFACE NOTES:

(1) DETECTABLE WARNING SURFACES (DWS) SHALL BE INSTALLED AT SIDEWALK, OR SHARED USE PATH, TO STREET TRANSITIONS, AND SHALL CONSIST OF TRUNCATED DOME SURFACES. ANY TRUNCATED DOME PANELS OR PAVERS WHICH ARE USED MUST BE ON THE CDOT APPROVED PRODUCTS LIST (APL).

(2) THE DETECTABLE WARNING SURFACE SHALL SPAN THE FULL WIDTH OF THE CURB RAMP, SHARED USE PATH, OR OTHER ROADWAY ENTRANCE AS APPLICABLE. A GAP OF 2 INCHES FROM THE EDGE OF THE DETECTABLE WARNING SURFACE TO THE EDGE OF THE CURB RAMP OR SHARED USE PATH IS PERMITTED.

(3) WHEN DETECTABLE WARNING SURFACES ARE PLACED ON A SLOPE GREATER THAN 5.0%, TRUNCATED DOMES SHOULD BE ALIGNED IN THE DIRECTION OF THE RAMP RUN; OTHERWISE DOMES ARE NOT REQUIRED TO BE ALIGNED. TRUNCATED DOMES SHALL BE IN A SQUARE GRID OR RADIAL PATTERN. WHEN PLACED RADIALLY, PLACE ADJACENT DWS PLATES EDGE TO EDGE. EDGES OF CUT PLATES SHALL BE STRAIGHT.

(4) LOCATE ONE CORNER OF THE DWS LEADING EDGE AT THE BACK OF CURB. NO POINT ON THE LEADING EDGE OF THE DWS MAY BE MORE THAN 5 FT. FROM THE BACK OF CURB. WHEN ANY POINT OF THE LEADING EDGE OF THE DWS WILL BE GREATER THAN 5 FT. FROM THE BACK OF CURB, PLACE THE DWS RADIALLY AT THE BACK OF CURB.

(5) WHERE PERPENDICULAR DIRECTIONAL RAMPS ABUT A WALKABLE SURFACE, THE LEADING EDGE OF THE DWS SHALL NOT BE PLACED FURTHER THAN 2 FEET FROM THE BACK OF CURB. IF THE RADIUS OF A CORNER MAKES THIS IMPOSSIBLE, ORIENT THE CURB RAMP PERPENDICULAR TO THE CURB AND GUTTER.

(6) IF THE DETECTABLE WARNING SURFACE IS CUT, GRIND OFF THE REMAINING PORTION OF ANY CUT TRUNCATED DOMES. SEAL ALL CUT PANEL EDGES WITH AN APL SEALANT TO PREVENT WATER DAMAGE.

(7) TRUNCATED DOME PLATES SHALL BE EMBEDED IN THE CONCRETE CURB RAMP WHILE THE CONCRETE IS PLASTIC.

(8) DWS SHALL NOT BE PLACED OVER GRADE BREAKS.

DETECTABLE WARNING SURFACE PLACEMENT

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