FINAL DRAINAGE REPORT
FOR
JICS - WAYNOKA

MAY 2023

Prepared for:

Elder Construction
4870 Centennial Boulevard, Suite 100
Colorado Springs, Colorado 80919
(719) 471-2708

Prepared by:

CIVIL CONSULTANTS,INC.

212 Wahsatch Ave., Ste. 305
Colorado Springs, CO 80903
(719) 955-5485

Project #PPR239

FINAL DRAINAGE REPORT
FOR
JICS – WAYNOKA

DRAINAGE PLAN STATEMENTS

ENGINEERS STATEMENT

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

COLORADO REGISTERED
VIRGIL A. SANCHEZ
37160
05-10-23
PROFESSIONAL ENGINEER

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

DEVELOPER'S STATEMENT

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

BY: _____ 5/4/23

TITLE: Jeremy Hammers
DATE: 05/11/23

ADDRESS: Elder Construction
4870 Centennial Boulevard, Suite 100
Colorado Springs, Colorado 80919

EL PASO COUNTY'S STATEMENT

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

BY: _____
Joshua Palmer, P.E.
County Engineer

Approved
By: Elizabeth Nijkamp, PE
Date:05/25/2023
El Paso County Department of Public Works

CONDITIONS:

FINAL DRAINAGE REPORT
FOR
JICS – WAYNOKA

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FINAL DRAINAGE REPORT
FOR
JICS – WAYNOKA

PURPOSE

This document is the Final Drainage Report for JICS - Waynoka. The purpose of this report is to identify the existing and proposed runoff patterns and recommend proposed drainage improvements for the proposed roadway improvements and to safely route runoff to downstream facilities.

GENERAL LOCATION AND DESCRIPTION

Improvements to existing Waynoka Road and Waynoka Place are required to support the surrounding developments. The roadway improvements will redevelop the roadway intersections and will extend approximately 80' east of Powers Boulevard and 750' south of Constitution Avenue. This will include the construction of an intersection and new striping on the southern half of Waynoka Place and the construction of a cul-de-sac, curb, and gutter at the west end of Waynoka Road. The striping will be installed on Waynoka Place to separate north and southbound traffic. The cul-de-sac and the proposed curb and gutter will block vehicle access from North Bound Powers Boulevard and Waynoka Road. This report will focus on the drainage solutions for the north-west quarter of Waynoka Road where the roadway improvements are to occur. Information regarding the flows along the south side of the roadway is provided, but will remain equal in the existing and proposed conditions.

Waynoka Place and Waynoka Road are located east of Powers Boulevard and south of Constitution Avenue within the El Paso County, Colorado. The segment of the roadway being improved is the western intersection of Waynoka Road and the southern half of Waynoka Place, which lie mostly in Lot 3 of the northwest half of the northwest quarter (NW ½, NW ¼) of Section 6, Township 14 South, Range 65 west of the Sixth Principal Meridian. A portion of the improvements on the southern half of Waynoka Place lie in Lot 4 of the southwest half of the southwest quarter (NW ½, NW ¼) of Section 31, Township 14 South, Range 65 west of the Sixth Principal Meridian. A Vicinity Map has been provided in the appendix of this report for reference.

WETLANDS

There are no apparent wetlands within the boundary of this project.

CHANNEL IMPROVEMENTS

The proposed project is not adjacent to Jimmy Camp Creek or any other significant drainageway. No channel improvements are necessary as a part of this project.

SOILS

Soils for this project, which are delineated on the map included within the appendix of this report, are classified as Blendon Sandy Loam (10) and Ellicott Loamy Coarse Sand (28) have been characterized as Hydrologic Soil Type "B" and "A", respectively. Soils in the study area are shown as mapped by S.C.S. in the "Soils Survey of El Paso County Area". The study area consists of a paved roadway, where exposed ground is present it is sparsely vegetated with native grasses. See Appendix for soils map.

HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual and where applicable the Urban Storm Drainage Criteria Manual. The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals. Basins were analyzed and delineated (see Existing Conditions Map & Proposed Conditions Map in the Appendix) in order to determine areas and C coefficients. Overland flow and channelized flow paths were analyzed for each sub-basin in order to determine times of concentration and in order to analyze the hydraulic drainage system. Table 6-6 Volume 1 of DCM was used for corresponding runoff coefficients.

HYDRAULIC CALCULATIONS

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

FLOODPLAIN STATEMENT

According to the Federal Emergency Management Agency (FEMA) LOMR 12-08-057P, effective date February 28, 2013, Flood Insurance Rate Map (FIRM) Panel No. 08041C0751 G, effective date December 7, 2018, and Flood Insurance Rate Map (FIRM) Panel No. 08041C0752 G, effective date December 7, 2018, the site DOES NOT lie within a flood zone. A FIRM Panel showing the general site location is included in the Appendix with an outline of the project site shown between both adjoining panels.

DRAINAGE CRITERIA

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

FOUR STEP PROCESS

As stated in the City of Colorado Springs DCM Volume 2, the Four Step Process is applicable to all new and re-developed projects with construction activities that disturb 1 acre or greater or that disturb less than 1 acre but are part of a larger common plan development. The roadway improvements associated with Waynoka Road and Waynoka Place disturb approximately 0.66 acres, less than an acre, and is considered a standalone project.

EXISTING DRAINAGE CONDITIONS

In the existing condition, runoff reaching the existing Waynoka Place corridor from developed grounds located to the east, west and north of the roadway are collected and conveyed to the south along Waynoka Place to the northwestern portion of the existing Waynoka Road. Runoff from undeveloped Lot 5 Block 2 Cimmaron-Northwest Industrial flows southwest onto the northwest portion of existing Waynoka Road. The combined flows along the west portion of Waynoka Road are conveyed west towards the existing north bound Powers Boulevard and are then conveyed south along the roadway. Runoff exiting the site, continues south on Powers Boulevard until entering the Sand Creek channel which is located about one thousand and two hundred feet (1200') to the south of the site. The existing pavement section located to the south of the site generally drains east to west and north to south at grades that vary from 0 to 5.5%. All analyzed lands lies within the Sand Creek Major Basin Watershed.

In accordance with the drainage criteria manual, an existing condition hydrologic analysis was prepared to determine peak runoff entering and exiting the subject site. The existing condition topography, basins boundaries, contributing design points, and peak flow summaries are depicted on the Waynoka Road at Powers Boulevard Existing Drainage Map in the appendix of this report. The following paragraphs detail the existing conditions analysis preformed on the site.

Design Point 1 (Q5 = 5.4 cfs, Q100 = 11.6 cfs) consists of runoff produced from existing Waynoka Place and portions of surrounding lots, Lot 4 Cimmaron-Northwest Industrial Filing No. 3A, Lot 1 Schlaufman Subdivision Filing No. 1, and Lot 2 Cimmaron-Northwest Industrial Filing No. 3A to the east of Powers Boulevard. The runoff from the 2.55 acre **Basin A (**Q5 = 5.4 cfs, Q100 = 11.6 cfs) enters the northern portion of an existing Waynoka Road located along the south end of Waynoka Place at **DP1.** The runoff is then conveyed west along the northern portion of existing Waynoka Road to **Design Point 2 (DP2)**.

Design Point 2 (Q5 = 8.9 cfs, Q100 = 20.1 cfs) consists of the runoff from **DP1,** undeveloped Lot 5, Block 2 Cimmaron-Northwest Industrial (**Basin B)**, and the northern portion of existing Waynoka Road (**Basin C)**. The runoff from **DP1** combines with runoff from the 0.68 acre **Basin C** (Q5 = 2.1 cfs, Q100 = 4.1 cfs) in the northern portion of existing Waynoka Road and the combined flows are conveyed west. The flows along Waynoka Road, combine with flows from 2.12 acre **Basin B** (Q5 = 2.6 cfs, Q100 = 7.2 cfs) on the southwest corner of Lot 5 Block 2 Cimmaron-Northwest Industrial at to **DP2**. The flows at **DP2** are then discharged to a swale along the east border of North Bound Powers Boulevard and the north border of Waynoka Road. These flows are then conveyed south under Waynoka Road.

Design Point 3 (Q5 = 2.4 cfs, Q100 = 4.6 cfs) consists of runoff generated from the southern portion of existing Waynoka Road. Runoff produced within the 0.71 acre **Basin D** (Q5 = 2.4 cfs, Q100 = 4.6 cfs) generally sheet flows to west towards Powers Boulevard and collects at **DP3,** where it exists the basin and is conveyed south to a swale along the east border of North Bound Powers Boulevard and the south border of Waynoka Road. These flows continue south until they enter the Sand Creek Basin.

PROPOSED DRAINAGE CONDITIONS

Since this project will only improve the west portion of Waynoka Road and a portion of the southern half of Waynoka Place, the storm sewer collection points will be similar to those in the existing conditions. In the northern portion of the southern half of Waynoka Place, a new striping plan and a newly constructed intersection to the adjacent Lot 4 Cimmaron-Northwest Industrial Filing No. 3A is proposed. A paved cul-de-sac with a north-to-south running curb and gutter is proposed to be added on the west end of Waynoka Road. Curb openings on the north and south ends of the proposed curb and gutter will send flows along Waynoka Road to their original design points per the existing conditions. The existing roadway to the west will remain, but will be re-developed to stabilize the proposed curb. An existing channel keeps flows on the northern half of Waynoka Road until they reach an existing culvert which discharges to the south of the roadway. The increased flows from the existing to the proposed condition are added from off-site flows in the existing condition which are routed using a different path to the same existing channel. Thus, this does not increase peak flows to the channel, but re-routes the flows from the existing to the proposed conditions. Flows on the southern half of the roadway will flow west and south to an existing swale along the eastern edge of North Bound Powers Boulevard. The following paragraphs detail the proposed conditions analysis preformed on the site. All the proposed storm improvements for this project are to be publicly owned and maintained.

Design Point 1 (Q5 = 5.7 cfs, Q100 = 12.1 cfs) runoff is generated from the southern half of Waynoka Place, an area of the eastern portion of developed Lot 4 Cimmaron-Northwest Industrial Filing No. 3A, and portions of the western halves of Lot 2 Cimmaron-Northwest Industrial Filing No. 3A and Lot 1 Schlaufman Subdivision Filing No. 1. In the developed condition, runoff produced from within 2.62-acre **Basin A** (Q5 = 5.7 cfs, Q100 = 12.1 cfs) shall be conveyed south to existing Waynoka Road at **DP1.** Runoff at **DP1** (Q5 = 5.7 cfs, Q100 = 12.1 cfs) will continue west within the northern half of Waynoka Road to **Design Point 2 (DP2).** The addition of a proposed intersection between Lot 4 Cimmaron-Northwest Industrial Filing No. 3A and Waynoka Place, has increased the imperviousness, area and runoff produced from **Basin A** compared to the existing conditions. However, this proposed basin area and runoff increase also results in a basin area and runoff decrease from the existing adjacent property and re-routes the flows for the added portion to the proposed conditions in a different path, to the same existing channel to the south.

Design Point 2 (Q5 = 9.1 cfs, Q100 = 20.4 cfs) runoff is generated from the southern half of Waynoka Place (**DP1**), the northwestern section of Waynoka Road (**Basin C**), and Lot 5, Block 2 Cimmaron-Northwest Industrial (**Basin B**). In the undeveloped condition, runoff produced from within 2.09-acre **Basin B** (Q5 =2.8 cfs, Q100 = 7.4 cfs) shall be conveyed southwest to **DP2.** Runoff produced from **DP1** flow-by will combine with runoff within 0.71-acre **Basin C** (Q5 =2.3 cfs, Q100 = 4.4 cfs) and the combined runoff shall be conveyed west via the northwestern section of Waynoka Road to **DP2.** A cul-de-sac and new curb and gutter are proposed at the northwest end of Waynoka Road. The proposed curbs will tie into the existing curbs of the north and south ends, but will have openings on the north and south of the new curb on Waynoka Road. All combined runoff reaching opening will combine with flows from **Basin B** (Q5 =2.8 cfs, Q100 = 7.4 cfs) and will be conveyed west and north by the existing swale at the northwest end of Waynoka Road to **DP2** (Q5 = 9.1 cfs, Q100 = 20.4 cfs). Flows at **DP2** will enter an existing channel at the northwest corner of Waynoka Road and will be conveyed south under the roadway. The increase in peak flow rates from **DP1**, results in an increase of peak flow rates to **DP2** from the existing to the proposed conditions. However, this proposed runoff increase does not affect the downstream drainage system, since the runoff was re-routed from an existing site, to the proposed site and both sites will lead to the same existing channel at the northwest end of Waynoka Road next to **DP2**.

Design Point 3 (Q5 = 2.4 cfs, Q100 = 4.6 cfs) runoff is generated from the southwestern quarter of the existing Waynoka Road. Runoff produced within the 0.71-acre **Basin D** (Q5 =2.4 cfs, Q100 = 4.6 cfs) generally sheet flows west and south to DP3, Lot A Replat of Lots 2, 3, Block 3 Cimmaron-Northwest Industrial, as in the existing condition. Flows discharged as sheet flow to the adjacent site will remain consistent with the existing condition (Q5 = 2.4 cfs, Q100 = 4.6 cfs).

EROSION CONTROL

It is the policy of El Paso County that a grading and erosion control plan be submitted with the drainage report. At this time, we respectfully request that the erosion control plan be submitted in conjunction with the final grading plan. Proposed rock socks, silt fence, vehicle traffic control, and reseeding are proposed as erosion control measures.

DRAINAGE, BRIDGE, AND POND FEES

Waynoka Place has previously been platted with additional rights-of-way dedicated for the proposed improvements as a portion of the Claremont Business Park Filing No.3 subdivision. As such, no fees for drainage, bridge and or pond are due.

CONSTRUCTION COST ESTIMATE

Storm Sewer System (Public, **Non-Reimbursable**)

All proposed drainage facilities will be publicly owned and maintained after the system is constructed by the developer and the improvements accepted by El Paso County.

Description	Quantity	Unit	Unit Cost	Total Cost
Curb Opening	2	EA	$2,500.00	$5,000.00
Subtotal:				$5,000.00
Contingency (15%)				$750.00
TOTAL:				**$5,750.00**

M & S Civil Consultants, Inc. (M & S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above is only an estimate of the facility costs in the year 2023 and is subject to change.

SUMMARY

Proper implementation of the concepts presented in this Final Drainage report will provide for the development of the proposed site without negative impacts to the receiving water course and surrounding developments. All drainage facilities proposed are to be publicly owned and maintained. Curb and gutter are proposed to be added north to south along the west end of existing Waynoka Road. The proposed curb openings at the north and south ends of the new cul-de-sac will allow runoff to flow through the curb lines to existing channels as per the existing conditions.

REFERENCES

1.) "El Paso County and City of Colorado Springs Drainage Criteria Manual".

2.) "Urban Storm Drainage Criteria Manual"

3.) Web Soil Survey, USDA NRCS Soils Map

https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

4.) FEMA flood Map Service Center, Federal Emergency Management Agency

https://msc.fema.gov/portal/home

Flood Insurance Rate Map (FIRM) Panel No. 08041C0751 G, effective date December 7, 2018,

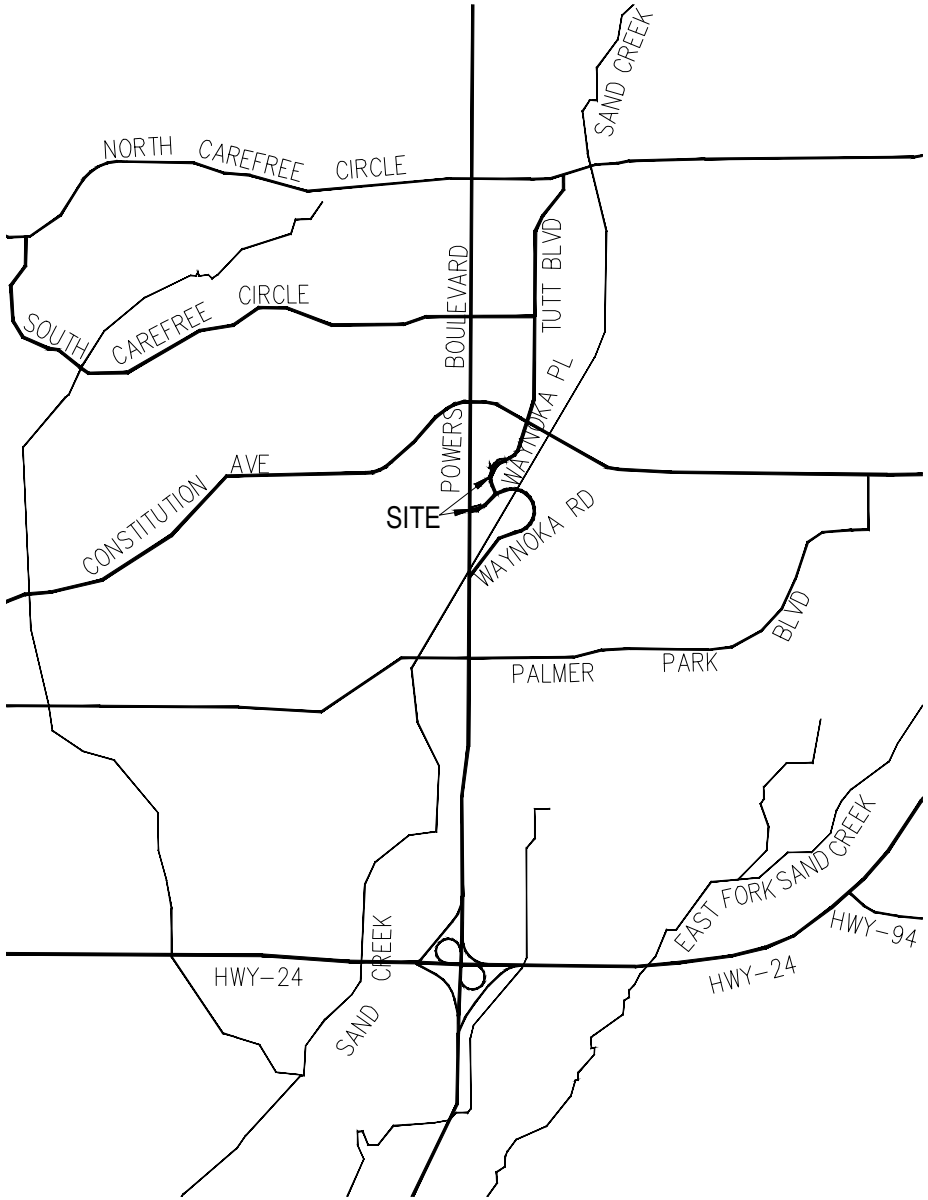
Flood Insurance Rate Map (FIRM) Panel No. 08041C0752 G, effective date December 7, 2018

5.) "Sand Creek Drainage Basin Planning Study Preliminary Design Report" (DBPS), prepared by Kiowa Engineering, revised December 1998.

APPENDIX

VICINITY MAP

VICINITY MAP



1" = 500'

0 250 500 1000

Scale in Feet

CIVIL CONSULTANTS, INC.

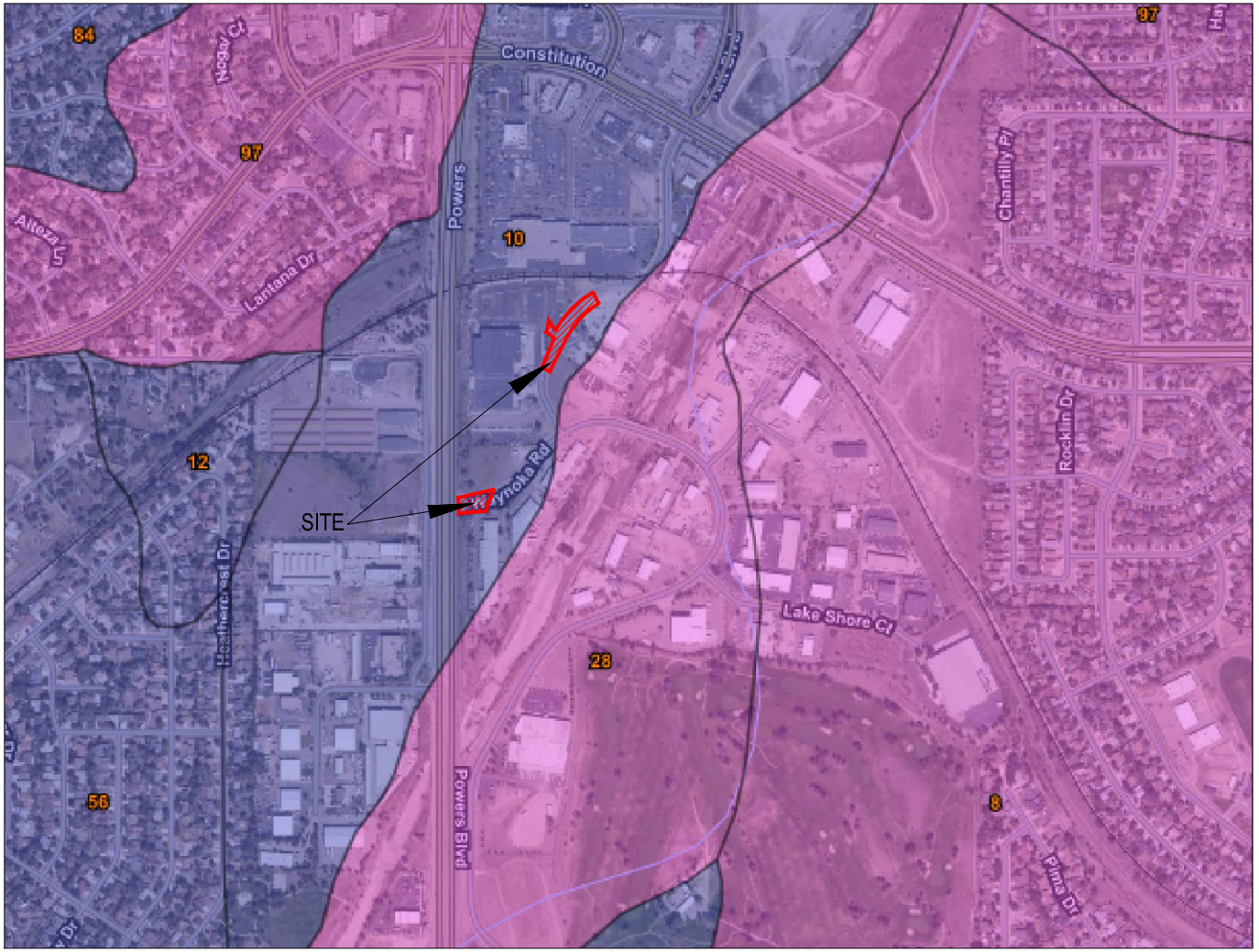
212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

SHEET 1 OF 1

File: O:\10022A-Waynoka Rd\Elder Const\Dwg\Eng Exhibits\10022-Vicinity Map.dwg Plotstamp: 1/17/2023 2:07 PM

SOILS MAP

SOILS MAP



1" = 1000'

0 500 1000 2000

Scale in Feet

Tables — Hydrologic Soil Group — Summary By Map Unit

Summary by Map Unit — El Paso County Area, Colorado (CO625)

Summary by Map Unit — El Paso County Area, Colorado (CO625)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10	Blendon sandy loam, 0 to 3 percent slopes	B	29.5	45.8%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	A	34.8	54.2%
Totals for Area of Interest			**64.3**	**100.0%**

JICS – WAYNOKA

SOILS MAP

CIVIL CONSULTANTS, INC.

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

FIRM PANELS

FLOODPLAIN MAP

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT 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*

NO SCREEN
- Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs

OTHER AREAS
- 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
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

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

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on 1/9/2023 11:46 AM 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. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

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. 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.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88

For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

1 inch = 500 feet 1:6,000

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

N

0 50 100 200 300 400 Meters

FEMA National Flood Insurance Program

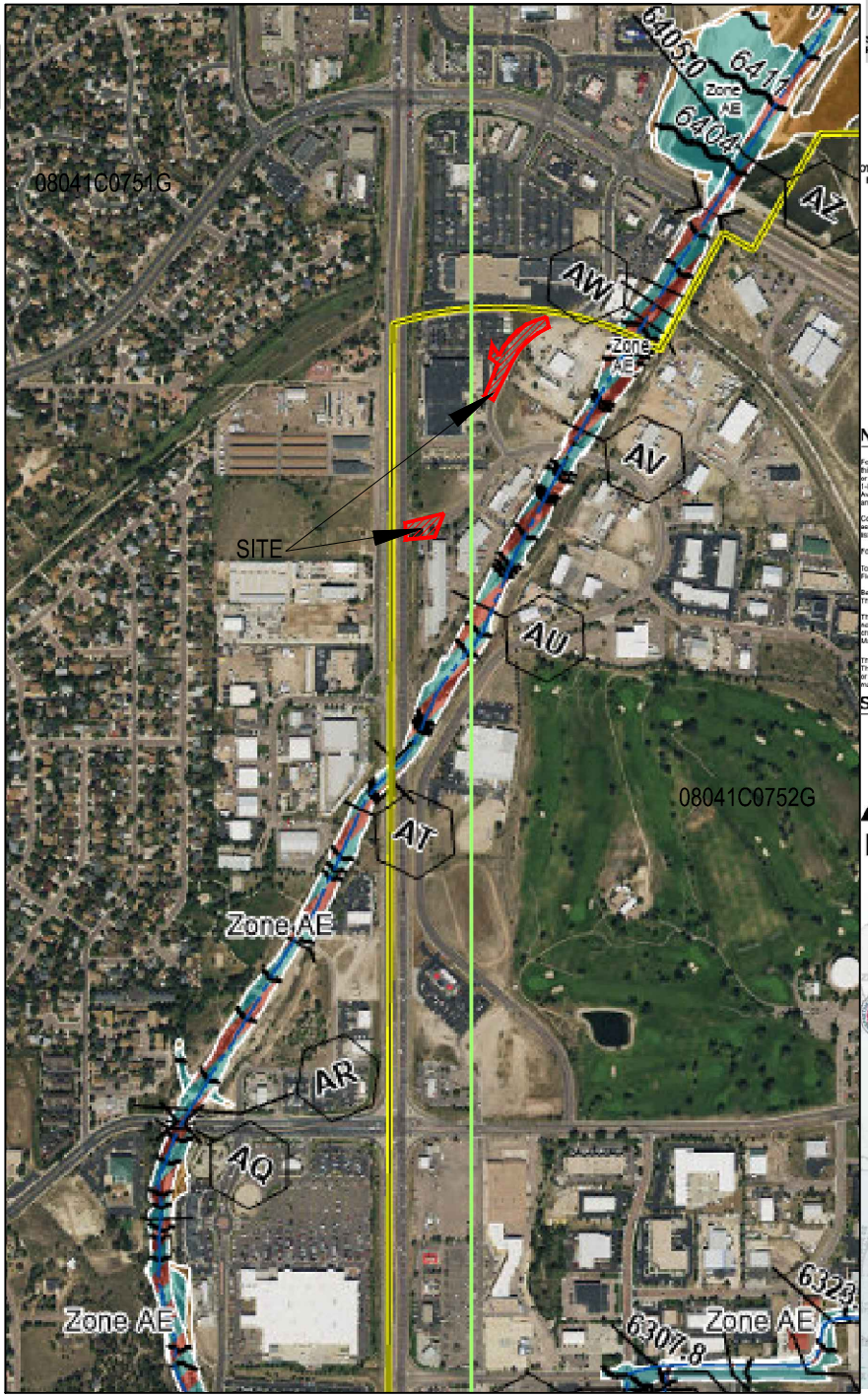
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

PANEL 752 OF 1275

Panel Contains:

COMMUNITY	NUMBER	PANEL
EL PASO COUNTY	080059	0752
CITY OF COLORADO SPRINGS	080060	0752

MAP NUMBER
08041C0752G
EFFECTIVE DATE
December 07, 2018



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- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

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This map was exported from FEMA's National Flood Hazard Layer (NFHL) on 1/9/2023 11:03 AM 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. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

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SCALE

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

N

0 50 100 200 300 400 Meters

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

PANEL 751 OF 1275

Panel Contains:

COMMUNITY	NUMBER	PANEL
EL PASO COUNTY	080059	0751
CITY OF COLORADO SPRINGS	080060	0751

MAP NUMBER
08041C0751G
EFFECTIVE DATE
December 07, 2018

JICS – WAYNOKA
FIRM MAP

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

1/17/2023 4:21 PM

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HYDROLOGIC CALCULATIONS

FINAL DRAINAGE REPORT
JICS - WAYNOKA
(Existing Conditions - Area Runoff Coefficient Summary)

			STREETS/DEVELOPED			*INDUSTRIAL DEV*			*GRAVEL/IMP LANDSCAPE*			*LANDSCAPED/UNDEVELOPED*			*WEIGHTED*	
BASIN	**TOTAL AREA** *(SF)*	**TOTAL AREA** *(Acres)*	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**C_5**	**C_{100}**
A	***111283.2***	2.55	1.10	0.90	0.96	0.36	0.59	0.70	0.13	0.59	0.70	0.97	0.09	0.36	***0.53***	***0.68***
B	***92447.9***	2.12	0.57	0.90	0.96	0.00	0.59	0.70	0.08	0.59	0.70	1.47	0.09	0.36	***0.33***	***0.54***
C	***29506.6***	0.68	0.52	0.90	0.96	0.00	0.59	0.70	0.00	0.59	0.70	0.16	0.09	0.36	***0.71***	***0.82***
D	***31033.8***	0.71	0.53	0.90	0.96	0.00	0.59	0.70	0.09	0.59	0.70	0.09	0.09	0.36	***0.76***	***0.85***

FINAL DRAINAGE REPORT
JICS - WAYNOKA
(Existing Conditions - Area Drainage Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*STREET / CHANNEL FLOW*				*Time of Travel (T_t)*		*INTENSITY **		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	**C_5**	**C_{100}** *From DCM Table 5-1*	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**CHECK** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*
A	2.55	0.53	0.68	0.53	40	0.8	5.1	820	1.3%	2.3	6.0	11.2	14.8	4.0	6.7	***5.4***	***11.6***
B	2.12	0.33	0.54	0.33	80	2.0	9.2	225	2.2%	1.0	3.6	12.8	11.7	3.8	6.3	***2.6***	***7.2***
C	0.68	0.71	0.82	0.71	40	0.8	3.6	625	1.4%	2.3	4.5	8.0	13.7	4.5	7.5	***2.1***	***4.1***
D	0.71	0.76	0.85	0.76	40	0.8	3.1	650	1.3%	2.3	4.7	7.8	13.8	4.5	7.5	***2.4***	***4.6***

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

Calculated by: TAU
Date: 1/26/2023
Checked by: VAS

FINAL DRAINAGE REPORT
JICS - WAYNOKA
(Existing Conditions - Basin Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	**CONTRIBUTING BASINS**	**CA_5**	**CA_{100}**	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*	COMMENTS
1	**A**	1.36	1.74	Assumes Basin A Tt =								11.2	4.0	6.7	***5.4***	***11.6***	North Curbline of Waynoka Road
2	**DP1, B, C**	2.54	3.43	Assumes DP1 Tt =			11.2	625	1.6%	2.5	4.1	15.3	3.5	5.9	***8.9***	***20.1***	Existing 30" culvert
3	**D**	0.54	0.61	Assumes Basin D Tt =								7.8	4.5	7.5	***2.4***	***4.6***	Sheet Flow to Offsite Area West of Marksheffel

Calculated by: TAU
Date: 12/21/2022
Checked by: VAS

FINAL DRAINAGE REPORT
JICS - WAYNOKA
(Proposed Conditions - Area Runoff Coefficient Summary)

			STREETS/DEVELOPED			*INDUSTRIAL DEV*			*GRAVEL/IMP LANDSCAPE*			*LANDSCAPED/UNDEVELOPED*			*WEIGHTED*	
BASIN	**TOTAL AREA** *(SF)*	**TOTAL AREA** *(Acres)*	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**C_5**	**C_{100}**
A	***114324.9***	2.62	1.17	0.90	0.96	0.36	0.59	0.70	0.13	0.59	0.70	0.97	0.09	0.36	***0.54***	***0.69***
B	***91023.1***	2.09	0.59	0.90	0.96	0.00	0.59	0.70	0.08	0.59	0.70	1.41	0.09	0.36	***0.34***	***0.54***
C	***30931.4***	0.71	0.55	0.90	0.96	0.00	0.59	0.70	0.00	0.59	0.70	0.16	0.09	0.36	***0.72***	***0.82***
D	***31033.8***	0.71	0.53	0.90	0.96	0.00	0.59	0.70	0.09	0.59	0.70	0.09	0.09	0.36	***0.76***	***0.85***

FINAL DRAINAGE REPORT
JICS - WAYNOKA
(Proposed Conditions - Area Drainage Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*STREET / CHANNEL FLOW*				*Time of Travel (T_t)*		*INTENSITY **		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	**C_5**	**C_{100}** *From DCM Table 5-1*	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**CHECK** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*
A	2.62	0.54	0.69	0.54	40	0.8	5.1	820	1.3%	2.3	6.0	11.1	14.8	4.0	6.7	***5.7***	***12.1***
B	2.09	0.34	0.54	0.34	80	2.0	9.1	225	2.2%	1.0	3.6	12.7	11.7	3.9	6.5	***2.8***	***7.4***
C	0.71	0.72	0.82	0.72	40	0.8	3.5	625	1.4%	2.3	4.5	7.9	13.7	4.5	7.5	***2.3***	***4.4***
D	0.71	0.76	0.85	0.76	40	0.8	3.1	650	1.3%	2.3	4.7	7.8	13.8	4.5	7.5	***2.4***	***4.6***

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

Calculated by: TAU
Date: 1/10/2023
Checked by: VAS

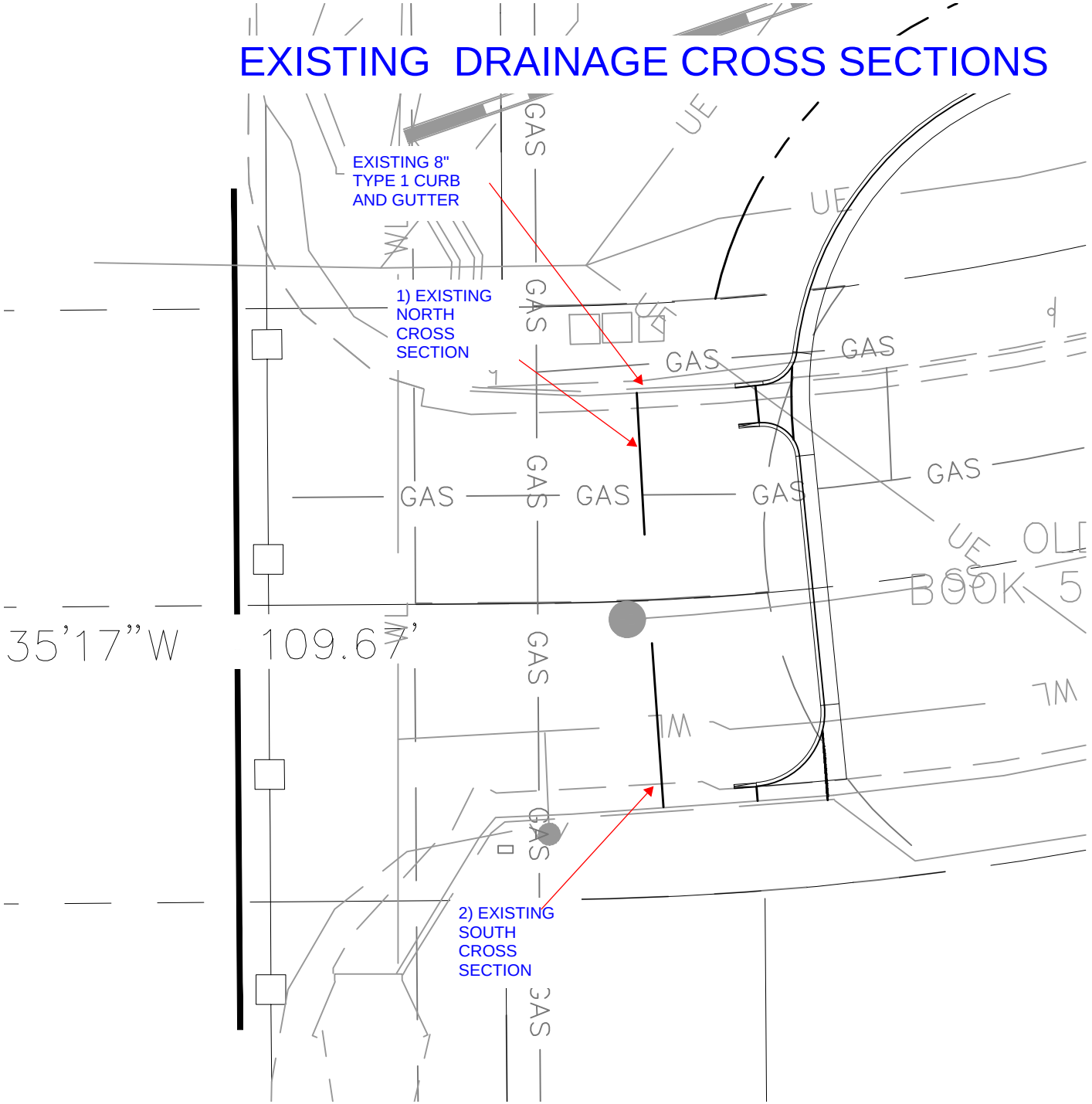
FINAL DRAINAGE REPORT
JICS - WAYNOKA
(Proposed Conditions - Basin Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	**CONTRIBUTING BASINS**	**CA_5**	**CA_{100}**	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*	COMMENTS
1	**A**	1.43	1.81	Assumes Basin A Tt =								11.1	4.0	6.7	***5.7***	***12.1***	North Curbline of Waynoka Road
2	**DP1, B, C**	2.65	3.53	Assumes B Tt =			11.7	625	1.6%	2.5	4.1	15.8	3.4	5.8	***9.1***	***20.4***	Existing 30" culvert
3	**D**	0.54	0.61	Assumes Basin D Tt =								7.8	4.5	7.5	***2.4***	***4.6***	Sheet Flow to Offsite Area West of Marksheffel

Calculated by: TAU
Date: 12/21/2022
Checked by: VAS

HYDRAULIC CALCULATIONS

EXISTING DRAINAGE CROSS SECTIONS



1) Worksheet for Existing North Street Section - 20.1cfs

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Discharge	20.10 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	72.15
0+18	71.62
0+20	71.36
0+20	72.03
0+25	72.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 72.15)	(0+20, 72.03)	0.015
(0+20, 72.03)	(0+25, 72.50)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	8.0 in
Roughness Coefficient	0.015
Elevation	72.03 ft
Elevation Range	71.4 to 72.5 ft
Flow Area	4.0 ft²
Wetted Perimeter	16.6 ft
Hydraulic Radius	2.9 in
Top Width	15.90 ft
Normal Depth	8.0 in
Critical Depth	9.6 in
Critical Slope	0.005 ft/ft
Velocity	5.08 ft/s
Velocity Head	0.40 ft
Specific Energy	1.07 ft
Froude Number	1.794

1)Worksheet for Existing North Street Section - 20.1cfs

Results	
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.0 in
Critical Depth	9.6 in
Channel Slope	0.018 ft/ft
Critical Slope	0.005 ft/ft

2)Worksheet for Existing South Street Section - 4.6cfs

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.011 ft/ft
Discharge	4.60 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	72.23
0+18	71.79
0+21	71.53
0+21	72.20

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 72.23)	(0+21, 72.20)	0.015

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

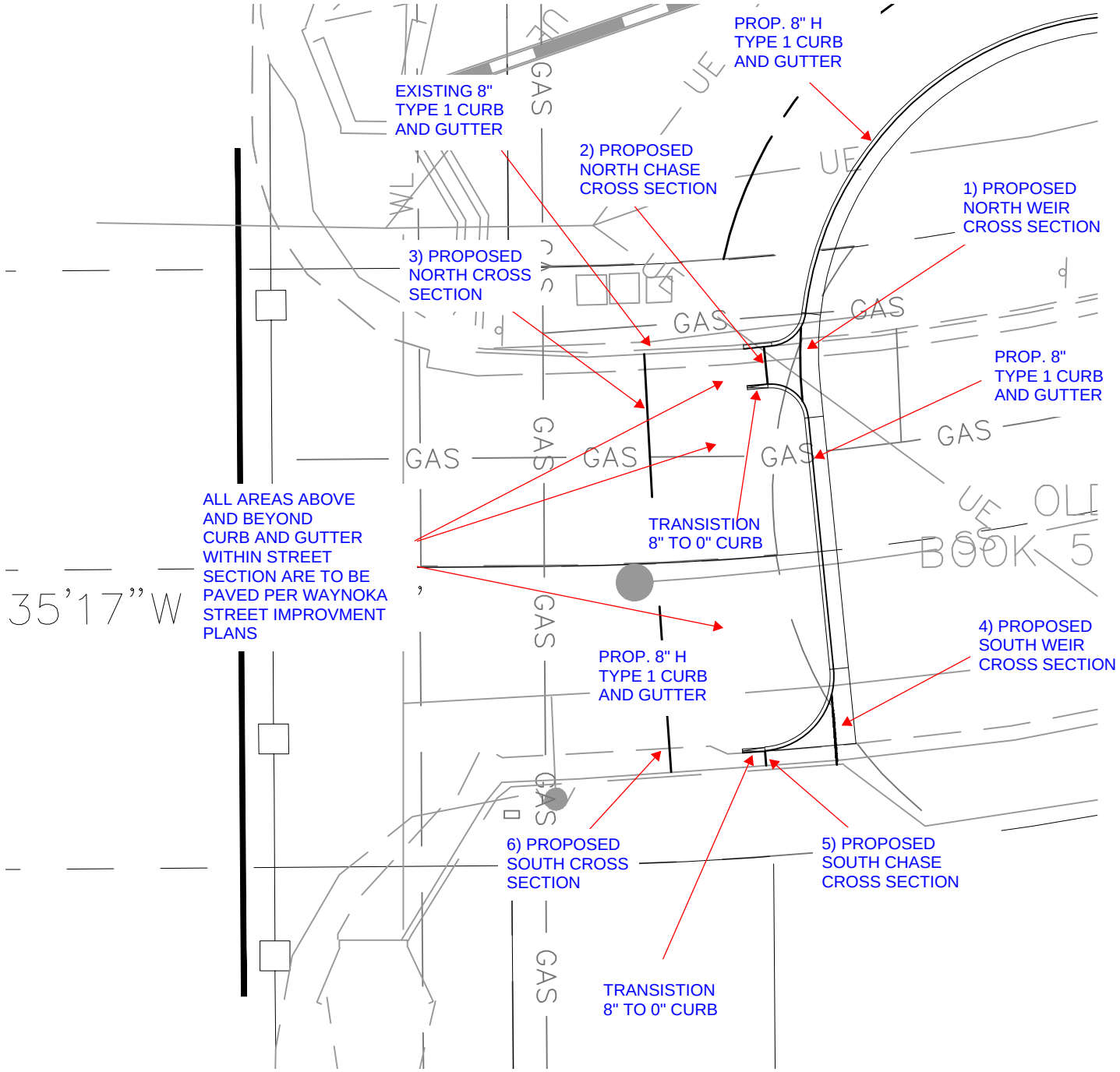
Results	
Normal Depth	5.3 in
Roughness Coefficient	0.015
Elevation	71.97 ft
Elevation Range	71.5 to 72.2 ft
Flow Area	1.6 ft²
Wetted Perimeter	10.8 ft
Hydraulic Radius	1.8 in
Top Width	10.38 ft
Normal Depth	5.3 in
Critical Depth	5.7 in
Critical Slope	0.006 ft/ft
Velocity	2.87 ft/s
Velocity Head	0.13 ft
Specific Energy	0.57 ft
Froude Number	1.285
Flow Type	Supercritical

2)Worksheet for Existing South Street Section - 4.6cfs

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.3 in
Critical Depth	5.7 in
Channel Slope	0.011 ft/ft
Critical Slope	0.006 ft/ft

PROPOSED DRAINAGE CROSS SECTIONS



1) Worksheet for North Weir-20.4cfs

Project Description	
Solve For	Headwater Elevation

Input Data	
Discharge	20.40 cfs
Crest Elevation	0.00 ft
Tailwater Elevation	0.00 ft
Weir Coefficient	3.10 ft^(1/2)/s
Crest Length	13.9 ft
Number Of Contractions	0

Results	
Headwater Elevation	0.61 ft
Headwater Height Above Crest	0.61 ft
Tailwater Height Above Crest	0.00 ft
Flow Area	8.4 ft²
Velocity	2.42 ft/s
Wetted Perimeter	15.1 ft
Top Width	13.90 ft

2)Worksheet for North Retangular Curb Chase-20.4cfs

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.012 ft/ft
Bottom Width	5.00 ft
Discharge	20.40 cfs

Results	
Normal Depth	6.6 in
Flow Area	2.8 ft²
Wetted Perimeter	6.1 ft
Hydraulic Radius	5.4 in
Top Width	5.00 ft
Critical Depth	9.6 in
Critical Slope	0.004 ft/ft
Velocity	7.38 ft/s
Velocity Head	0.85 ft
Specific Energy	1.40 ft
Froude Number	1.751
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.6 in
Critical Depth	9.6 in
Channel Slope	0.012 ft/ft
Critical Slope	0.004 ft/ft

3)Worksheet for North Street Section - 20.4cfs

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Discharge	20.40 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	72.15
0+18	71.62
0+20	71.36
0+20	72.03
0+25	72.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 72.15)	(0+20, 72.03)	0.015
(0+20, 72.03)	(0+25, 72.50)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	8.1 in
Roughness Coefficient	0.015
Elevation	72.03 ft
Elevation Range	71.4 to 72.5 ft
Flow Area	4.0 ft²
Wetted Perimeter	16.7 ft
Hydraulic Radius	2.9 in
Top Width	16.01 ft
Normal Depth	8.1 in
Critical Depth	9.7 in
Critical Slope	0.005 ft/ft
Velocity	5.09 ft/s
Velocity Head	0.40 ft
Specific Energy	1.08 ft
Froude Number	1.796

3)Worksheet for North Street Section - 20.4cfs

Results	
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.1 in
Critical Depth	9.7 in
Channel Slope	0.018 ft/ft
Critical Slope	0.005 ft/ft

4)Worksheet for South Weir-4.6cfs

Project Description	
Solve For	Headwater Elevation

Input Data	
Discharge	4.60 cfs
Crest Elevation	0.00 ft
Tailwater Elevation	0.00 ft
Weir Coefficient	3.10 ft^(1/2)/s
Crest Length	12.7 ft
Number Of Contractions	0

Results	
Headwater Elevation	0.24 ft
Headwater Height Above Crest	0.24 ft
Tailwater Height Above Crest	0.00 ft
Flow Area	3.0 ft²
Velocity	1.52 ft/s
Wetted Perimeter	13.2 ft
Top Width	12.70 ft

5)Worksheet for South Rectangular Curb Chase 4.6cfs

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.012 ft/ft
Bottom Width	2.00 ft
Discharge	4.60 cfs

Results	
Normal Depth	5.0 in
Flow Area	0.8 ft²
Wetted Perimeter	2.8 ft
Hydraulic Radius	3.5 in
Top Width	2.00 ft
Critical Depth	6.6 in
Critical Slope	0.005 ft/ft
Velocity	5.54 ft/s
Velocity Head	0.48 ft
Specific Energy	0.89 ft
Froude Number	1.514
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.0 in
Critical Depth	6.6 in
Channel Slope	0.012 ft/ft
Critical Slope	0.005 ft/ft

6) Worksheet for South Rectangular Curb Chase 4.6cfs

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

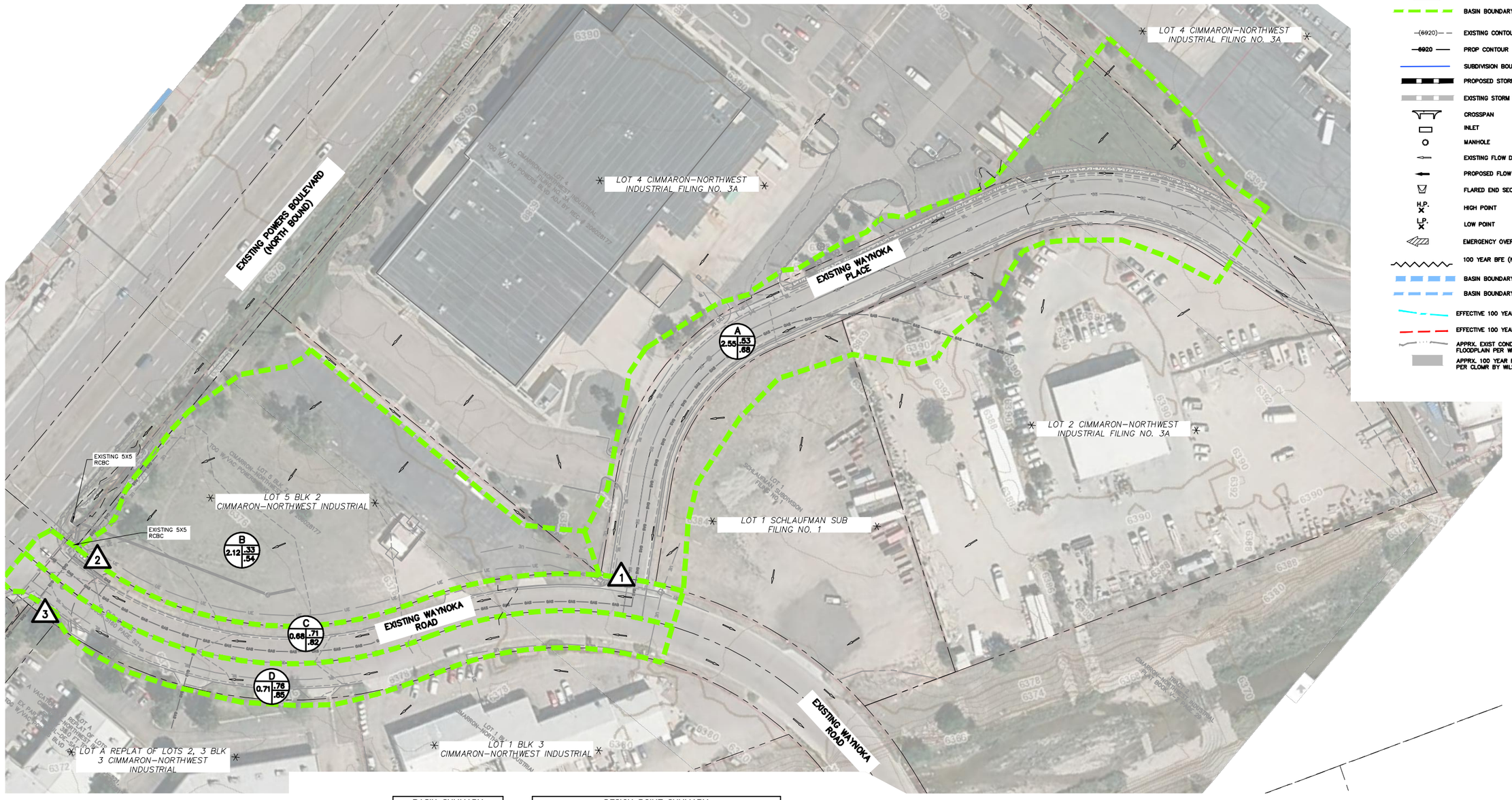
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.012 ft/ft
Bottom Width	2.00 ft
Discharge	4.60 cfs

Results	
Normal Depth	5.0 in
Flow Area	0.8 ft²
Wetted Perimeter	2.8 ft
Hydraulic Radius	3.5 in
Top Width	2.00 ft
Critical Depth	6.6 in
Critical Slope	0.005 ft/ft
Velocity	5.54 ft/s
Velocity Head	0.48 ft
Specific Energy	0.89 ft
Froude Number	1.514
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.0 in
Critical Depth	6.6 in
Channel Slope	0.012 ft/ft
Critical Slope	0.005 ft/ft

DRAINAGE MAPS



LEGEND

- BASIN DESIGNATION (G1; 2.35 | .53 | .68; C5; C100; ACRES)
- PIPE RUN REFERENCE LABEL (4)
- SURFACE DESIGN POINT (6)
- BASIN BOUNDARY
- EXISTING CONTOUR (6920)
- PROP CONTOUR 6920
- SUBDIVISION BOUNDARY
- PROPOSED STORM SEWER PIPE
- EXISTING STORM SEWER PIPE
- CROSSPAN
- INLET
- MANHOLE
- EXISTING FLOW DIRECTION ARROW
- PROPOSED FLOW DIRECTION ARROW
- FLARED END SECTION
- H.P. HIGH POINT
- L.P. LOW POINT
- EMERGENCY OVERFLOW DIRECTION
- 100 YEAR BFE (NAVD88/NGVD29)
- BASIN BOUNDARY (POND 401)
- BASIN BOUNDARY EMVR7
- EFFECTIVE 100 YEAR FLOODPLAIN
- EFFECTIVE 100 YEAR FLOODWAY
- APPRX. EXIST COND. 100 YEAR FLOODPLAIN PER WILSON&CO.
- APPRX. 100 YEAR FLOODPLAIN PER CLOMR BY WILSON&CO

BASIN SUMMARY

BASIN	AREA (ACRES)	Q_5	Q_{100}
A	2.55	5.4	11.6
B	2.12	2.6	7.2
C	0.68	2.1	4.1
D	0.71	2.4	4.6

DESIGN POINT SUMMARY

DESIGN POINT	Q_5	Q_{100}	BASIN	STRUCTURE
1	5.4	11.6	A	CURB AND GUTTER NORTH SIDE OF INTERSECTION
2	8.9	20.1	DP1, B, C	FLOWS TO DITCH
3	2.4	4.6	D	FLOWS TO DITCH

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1" = 100'
0 25 50 100 200
Scale in Feet

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

JICS – WAYNOKA

EXISTING CONDITIONS DRAINAGE MAP

PROJECT NO. 10-022
DESIGNED BY: DLM
DRAWN BY: DLM
CHECKED BY: VAS
SCALE: HORIZONTAL: 1"=50' VERTICAL: N/A
DATE: 1-17-2023
SHEET 1 OF 1
DM

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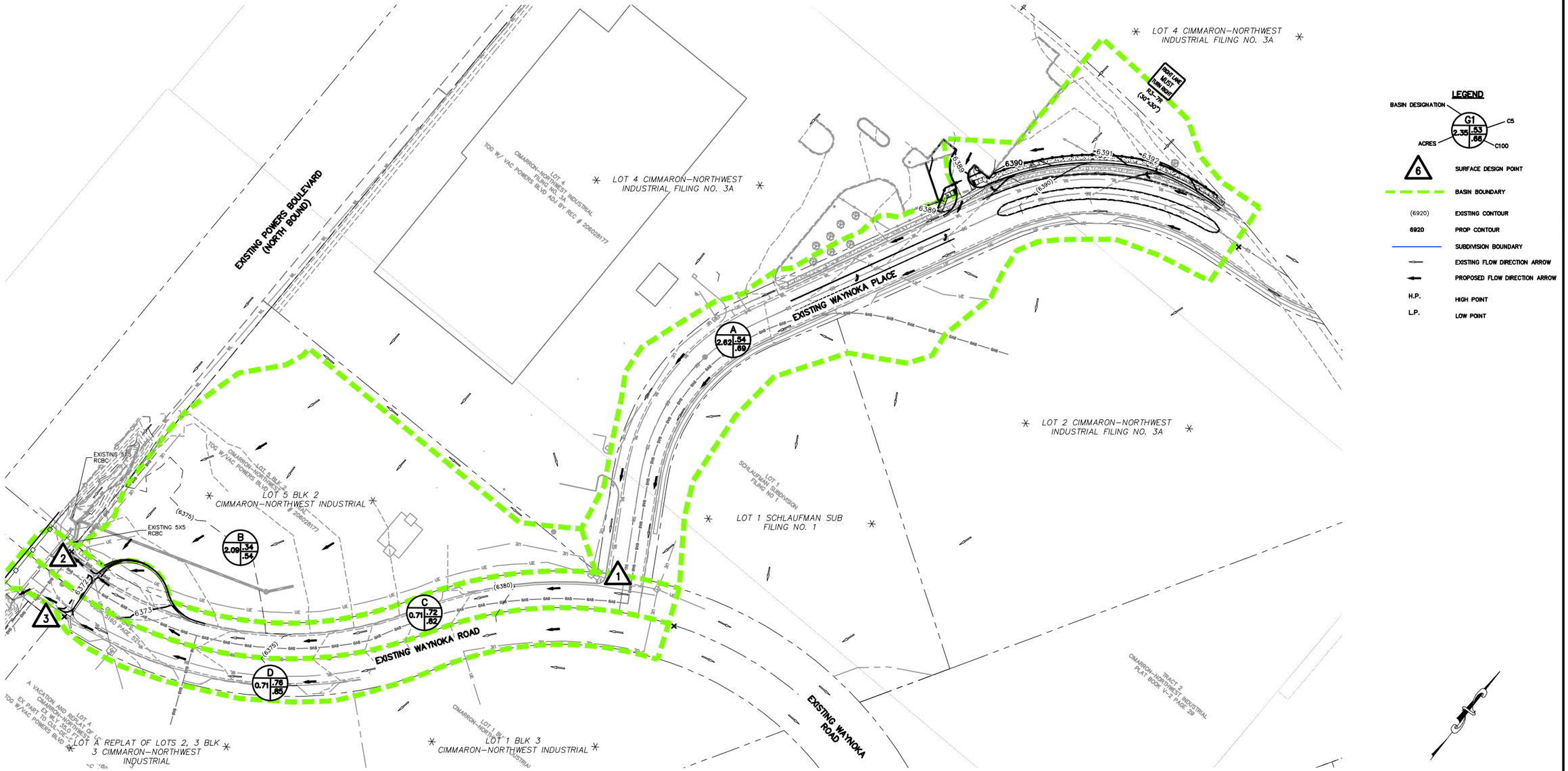

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5	Q_{100}
A	2.62	5.7	12.1
B	2.09	2.8	7.4
C	0.71	2.3	4.4
D	0.71	2.4	4.6

DESIGN POINT SUMMARY				
DESIGN POINT	Q_5	Q_{100}	BASIN	STRUCTURE
1	5.7	12.1	A	CURB AND GUTTER NORTH SIDE OF INTERSECTION
2	9.1	20.4	DP1, B, C	FLOWS TO DITCH
3	2.4	4.6	D	FLOWS TO DITCH

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

JICS – WAYNOKA

PROPOSED CONDITIONS DRAINAGE MAP

PROJECT NO. 10-022
DESIGNED BY: TAU
DRAWN BY: TAU
CHECKED BY: VAS
SCALE: HORIZONTAL: 1"=50' VERTICAL: N/A
DATE: 1-17-2023
SHEET 1 OF 1
DM

File: G:\10022A-Waynoka Rd\Elder Const\Drainage\Drainage Map\10-022 PDM.dwg Plotstamp: 1/17/2023 4:29 PM