

**PRELIMINARY DRAINAGE REPORT**  
for  
**LDS CHURCH – PARKING ADDITION**

950 Hwy 150  
Monument, Colorado

**May 2024**

**PCD File No.:PPR24xx**

Prepared for:

**LDS Church – Real Estate Division**  
50 E North Temple #509-8866  
Salt Lake City, UT 84150  
Contact: Scott Hollister

Prepared by:

**Drexel, Barrell & Co.**  
101 S. Sahwatch St. #100  
Colorado Springs, CO 80903  
Contact: Tim McConnell, P.E.  
(719) 260-0887

21841-00CSCV

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**PRELIMINARY DRAINAGE REPORT**  
for  
**LDS CHURCH – PARKING ADDITION**  
Monument, Colorado

**1.0 CERTIFICATION STATEMENTS**

**ENGINEER'S STATEMENT**

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

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Tim D. McConnell, P.E.  
Colorado P.E. License No. 33797  
For and on Behalf of Drexel, Barrell & Co.

Date

**DEVELOPER'S STATEMENT**

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

Business Name: LDS Church – Real Estate Division

By:

---

Scott Hollister

Date

Title:

Address:

50 E. North Temple #509-8866  
Salt Lake City, UT 84150

**EL PASO COUNTY**

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

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For the County Engineer  
CONDITIONS

Date

## **2.0 PURPOSE**

This report is prepared by Drexel, Barrel & Co in support of the LDS Church – Parking Addition project. The purpose of this report is to identify onsite and offsite drainage patterns, storm sewer, inlet locations, and areas tributary to the site, and to safely route developed storm water runoff to adequate outfall facilities.

## **3.0 GENERAL SITE DESCRIPTION**

### Location

The LDS Church – Parking Addition project is located in Monument, El Paso County, Colorado, within the SW 1/4 of the NW 1/4 of Section 13, Township 11 S, Range 67 W of the 6th P.M. The site is bounded on the west by the existing LDS church site, to the north and east by undeveloped land owned by El Paso County and to the south by Hwy 105.

### Site Conditions

The site is approximately 1 acre in size and is currently undeveloped and is covered with native grass and vegetation. The site generally slopes from east to west. It is proposed to be developed as an additional parking lot for the LDS church to the west of this project site.

### Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the site is partially underlain by the Alamosa loam (Soil No. 1), and by the Tomah-Crowfoot loamy sands (Soil No. 92). The soils are type 'D' and type 'B' hydrologic soil groups, respectively. See appendix for map.

### Climate

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry, and summers relatively warm and dry. Precipitation ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

### Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panels 08041C0276G, 08041C0278G and 08041C0279G (December 7, 2018) no portion of the site lies within any flood zones.

#### 4.0 DRAINAGE CRITERIA

The drainage analysis has been prepared in accordance with the current El Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5 year and 100 year frequency storms for historic and developed conditions using the Rational Method as required for basins containing less than 100 acres.

#### 5.0 EXISTING CONDITION

The existing site is undeveloped and covered with native vegetation that consists mostly of grasses as well as some shrubs. The site generally follows a 1-42% grade from east to west. The flows that leave the site to the north and are carried to the Dirty Woman Creek. The flows that leave the site to the south are carried to Hwy 105 where they then continue to the west.

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm events. See below for a summary runoff table. See Appendix for Historic Condition Drainage Map.

**Rational Method Runoff Summary**

BASIN	DP	AREA (AC)	% IMPERV	Q5 (cfs)	Q100 (cfs)
A	1	0.62	0%	0.6	3.4
B	2	0.52	4%	0.2	1.2

#### 6.0 DEVELOPED CONDITION

The proposed site consists of an asphalt parking lot with 2 access points off of the existing parking lot. Flows from the parking lot are captured by a proposed sump 5' Type R inlet in the southwest corner of the parking lot, where they are then carried to the at-grade 5' Type R inlet along Hwy 105. The portion of the site north of the proposed parking lot remains mostly undisturbed and will continue to flow north to Dirty Woman Creek.

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm recurrence intervals. UD-Inlet and HydraFlow were also used to identify storm system sizing (see appendix for calculations), and below for a summary runoff table.

### Rational Method Runoff Summary

BASIN	DP	AREA (AC)	% IMPERV	Q5 (cfs)	Q100 (cfs)
A	1	0.52	85%	2.1	3.9
B	2	0.17	0%	0.1	0.5
C	3	0.45	0%	0.3	1.7

## 7.0 PROPOSED DETENTION/WATER QUALITY FACILITIES

The total disturbed area of the site is 0.58 acres, therefore no detention facility is required.

## 8.0 FOUR-STEP PROCESS

This project conforms to the El Paso County Four Step Process. The process for this site focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

1. **Employ Runoff Reduction Practices:** Proposed impervious areas on this site (roofs, asphalt/sidewalk) will sheet flow across landscaped area, gravel and natural grasses in an effort to slow runoff and increase time of concentration prior to entering Dirty Woman Creek. This will minimize directly connected impervious areas within the project site.
2. **Implement BMP's that provide a Water Quality Capture Volume with slow release:** Runoff from this project will be treated through capture and slow release of the WQCV in the proposed water quality pond designed per current City of Colorado Springs/El Paso County drainage criteria. Per Resolution No. 16-426, all lots within Claremont Business Park require a permanent water quality pond.
3. **Stabilize Drainage Ways:** Dirty Woman Creek will not require any stabilization to occur due to the runoff from this site. The area of the project site that was previously running into the creek in the existing condition, but are now proposed to be developed are being captured in the proposed storm system and connecting to the storm system in Hwy 105 and carried west. The proposed flows into Dirty Woman Creek are now less than in the existing condition. The creek is in acceptable condition and is able to convey the flows without impact to downstream facilities.
4. **Implement Site Specific and Other Source Control BMP's:** Standard commercial source control will be utilized in order to minimize potential pollutants entering the creek. Example source control measures consist of: indoor storage of chemicals; and trash receptacles in common areas.

## **9.0 DRAINAGE/BRIDGE FEES**

The project lies within the Dirty Woman Drainage Basin, and has been previously platted, therefore no drainage and bridge fees are due.

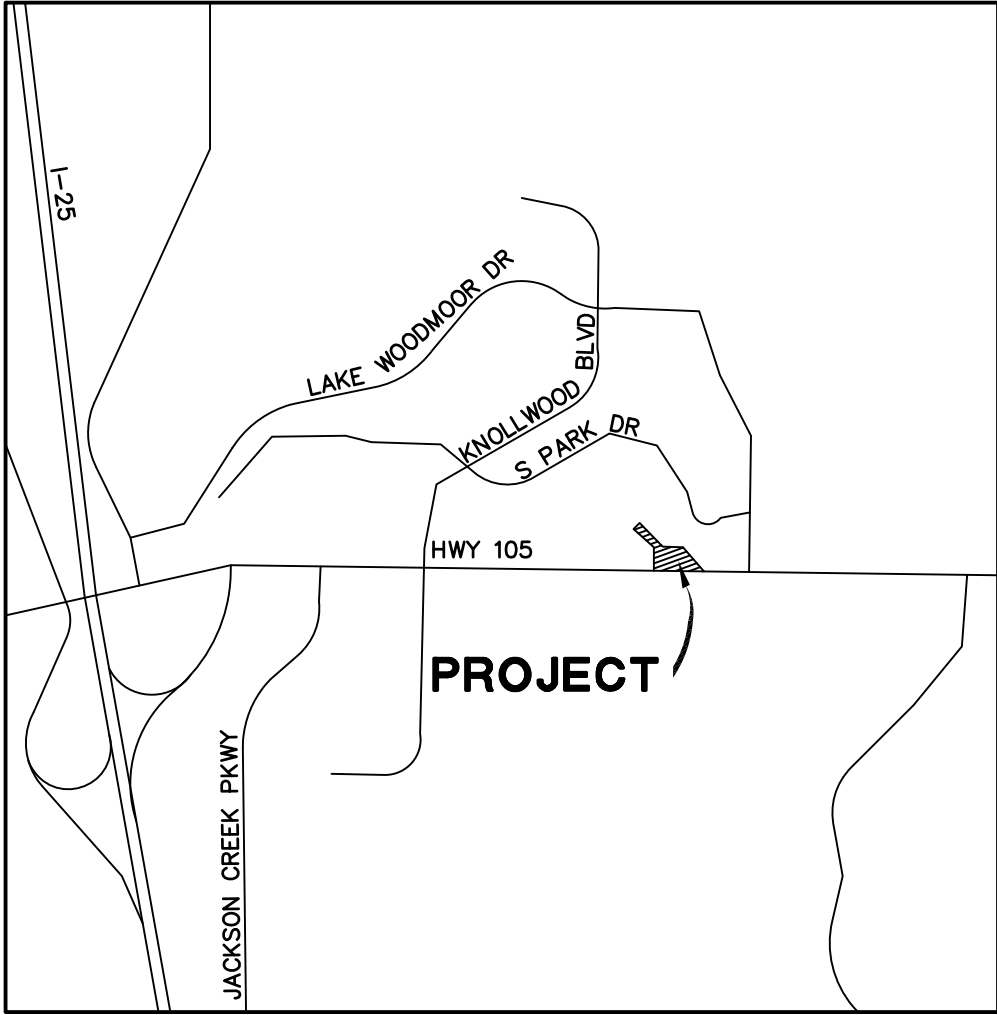
## **10.0 CONCLUSIONS**

The LDS Church – Parking Addition project has been designed in accordance with El Paso County criteria. The flows leaving this site to the north and into Dirty Woman Creek decrease by 0.3 cfs in the 5-yr storm event and by 1.7 cfs in the 100-yr storm event. The flows leaving the site to the south towards Hwy 105 increase by 2.0 cfs in the 5-yr storm event and by 1.0 cfs in the 100-yr storm event. This development will not negatively impact the downstream facilities.

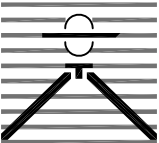
## **11.0 REFERENCES**

The sources of information used in the development of this study are listed below:

1. El Paso County Drainage Criteria Manual, October 2018.
2. Urban Storm Drainage Criteria Manuals, Urban Drainage and Flood Control District. June 2001, Revised April 2008.
3. Natural Resources Conservation Service (NRCS) Web Soil Survey
4. Federal Emergency Management Agency, Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Map Number 8041CO575F, Effective Date March 17, 1997.
5. Final Drainage Report Highway 105 Project A, by HDR, April 7, 2023



*Vicinity Map*  
Not to scale



**MONUMENT LDS CHURCH  
VICINITY MAP**

**Drexel, Barrell & Co.**  
Engineers • Surveyors

DATE:  
5-9-2024  
JOB NO:  
20841-00CSCV

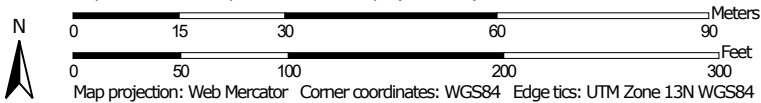
DWG. NO.  
**VMAP**  
SHEET 1 OF 1



































Hydrologic Soil Group—El Paso County Area, Colorado



Map Scale: 1:1,070 if printed on A landscape (11" x 8.5") sheet.



### MAP LEGEND

- Area of Interest (AOI)**
  -  Area of Interest (AOI)
- Soils**
  - Soil Rating Polygons**
    -  A
    -  A/D
    -  B
    -  B/D
    -  C
    -  C/D
    -  D
    -  Not rated or not available
  - Soil Rating Lines**
    -  A
    -  A/D
    -  B
    -  B/D
    -  C
    -  C/D
    -  D
    -  Not rated or not available
  - Soil Rating Points**
    -  A
    -  A/D
    -  B
    -  B/D
- Water Features**
  -  Streams and Canals
- Transportation**
  -  Rails
  -  Interstate Highways
  -  US Routes
  -  Major Roads
  -  Local Roads
- Background**
  -  Aerial Photography
- Other**
  -  C
  -  C/D
  -  D
  -  Not rated or not available

### MAP INFORMATION

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

**Warning:** Soil Map may not be valid at this scale.  
 Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

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

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

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

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

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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.

## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Alamosa loam, 1 to 3 percent slopes	D	1.1	73.3%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	0.4	26.7%
<b>Totals for Area of Interest</b>			<b>1.5</b>	<b>100.0%</b>

### Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

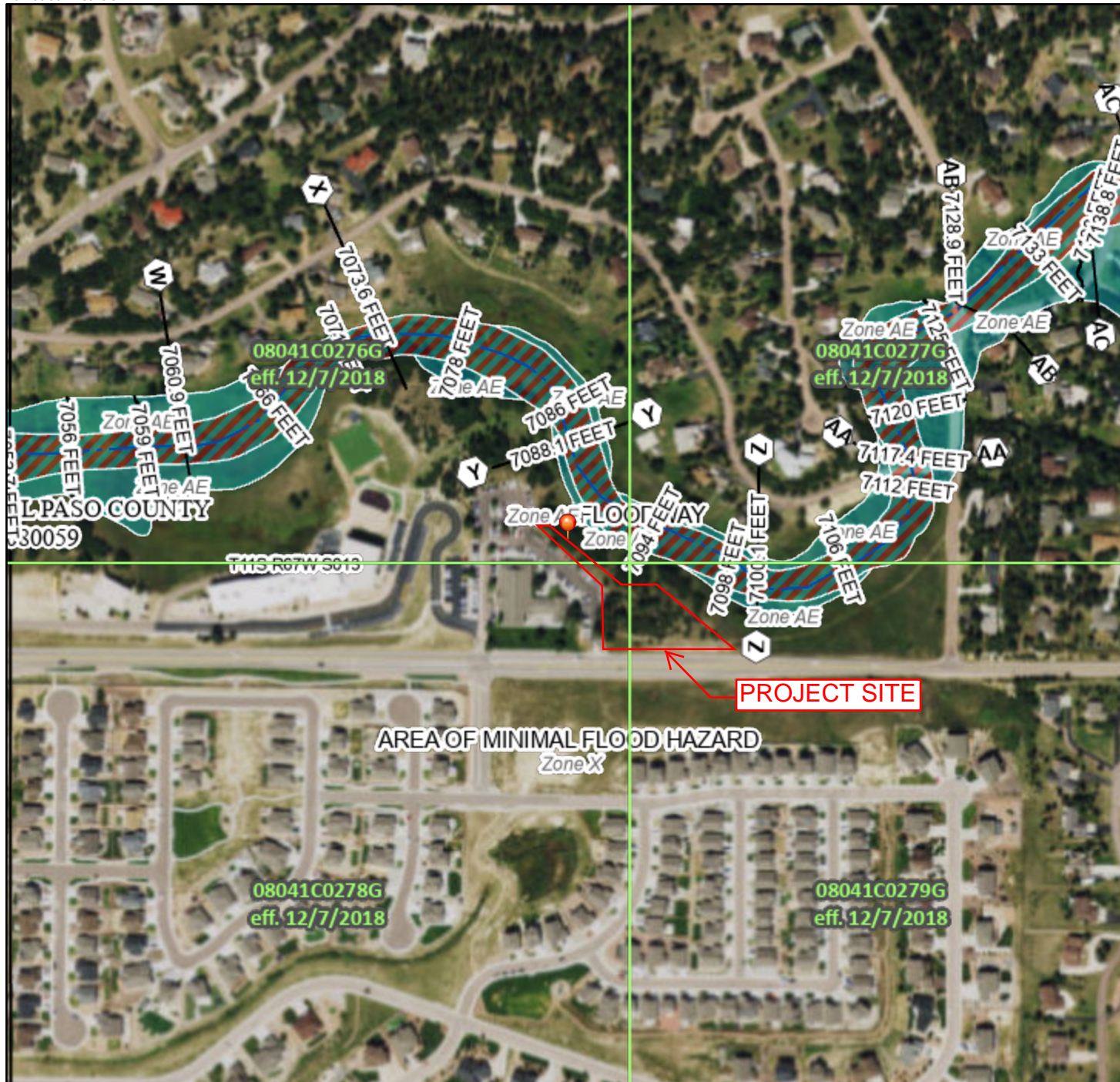
*Tie-break Rule:* Higher



# National Flood Hazard Layer FIRMMette



104°50'58"W 39°5'52"N



## Legend

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

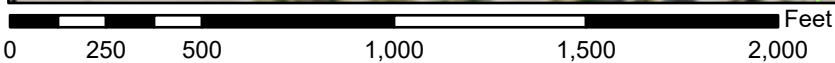
<p><b>SPECIAL FLOOD HAZARD AREAS</b></p>	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: cyan; border: 1px solid black;"></span> Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, red 2px, red 4px); border: 1px solid black;"></span> Regulatory Floodway</li> </ul>
<p><b>OTHER AREAS OF FLOOD HAZARD</b></p>	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: orange; border: 1px solid black;"></span> 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 <i>Zone X</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, gray 2px, gray 4px); border: 1px solid black;"></span> Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, orange 2px, orange 4px); border: 1px solid black;"></span> Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, yellow 2px, yellow 4px); border: 1px solid black;"></span> Area with Flood Risk due to Levee <i>Zone D</i></li> </ul>
<p><b>OTHER AREAS</b></p>	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: white; border: 1px solid gray;"></span> NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; border: 2px solid blue;"></span> Effective LOMRs</li> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: lightorange; border: 1px solid gray;"></span> Area of Undetermined Flood Hazard <i>Zone D</i></li> </ul>
<p><b>GENERAL STRUCTURES</b></p>	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 20px; border-bottom: 2px dashed black;"></span> Channel, Culvert, or Storm Sewer</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px dashed gray;"></span> Levee, Dike, or Floodwall</li> </ul>
<p><b>OTHER FEATURES</b></p>	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 20px; border-bottom: 2px solid black;"></span> <b>B</b> 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px dashed black;"></span> 17.5 Coastal Transect</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px dashed gray;"></span> Base Flood Elevation Line (BFE)</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px solid red;"></span> Limit of Study</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px solid yellow;"></span> Jurisdiction Boundary</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px dashed gray;"></span> Coastal Transect Baseline</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px solid blue;"></span> Profile Baseline</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px solid blue;"></span> Hydrographic Feature</li> </ul>
<p><b>MAP PANELS</b></p>	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 10px; height: 10px; background-color: white; border: 1px solid gray; border-style: dashed;"></span> Digital Data Available</li> <li><span style="display: inline-block; width: 10px; height: 10px; background-color: white; border: 1px solid gray;"></span> No Digital Data Available</li> <li><span style="display: inline-block; width: 10px; height: 10px; background-color: white; border: 1px solid gray; border-style: dotted;"></span> Unmapped</li> </ul>

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 **1/18/2024 at 1:06 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.



1:6,000

104°50'21"W 39°5'24"N

**PROJECT INFORMATION**

PROJECT: LDS parking lot  
 PROJECT NO: 21841-00  
 DESIGN BY: SBN  
 REV. BY: TDM  
 AGENCY: El Paso County  
 REPORT TYPE: Final  
 DATE: 5/9/2024



Drexel, Barrell & Co.

Soil Type: B & D							
			<b>C5* (Type B)</b>	<b>C5* (Type D)</b>	<b>C100* (Type B)</b>	<b>C100* (Type D)</b>	<b>% IMPERV</b>
Pasture/Meadow			0.08	0.15	0.35	0.50	0
Asphalt/Sidewalk			0.90	0.90	0.96	0.96	100

\*C-Values and Basin Imperviousness based on Table 6-6, City of Colorado Springs "Drainage Criteria Manual"

**EXISTING**

SUB-BASIN	SURFACE DESIGNATION	AREA ACRE	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV
			C5 (Type B)	C5 (Type D)	C100* (Type B)	C100* (Type D)	
<b>A</b>	Pasture/Meadow	0.00	0.08		0.35		0
	Pasture/Meadow	0.62		0.15		0.50	0
	Asphalt/Sidewalk	0.00	0.90		0.96		100
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.15		0.50	0%
<b>TOTAL A</b>		0.62					
<b>B</b>	Pasture/Meadow	0.28	0.08		0.35		0
	Pasture/Meadow	0.22		0.15		0.50	0
	Asphalt/Sidewalk	0.02	0.90		0.96		100
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.11		0.40	4%
<b>TOTAL B</b>		0.52					
<b>TOTAL SITE</b>		<b>1.14</b>		<b>0.13</b>		<b>0.45</b>	<b>1.8%</b>

**PROJECT INFORMATION**

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**RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF**

EXISTING TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t <sub>i</sub> )				TRAVEL TIME (t <sub>t</sub> )					TIME OF CONC. t <sub>c</sub>		FINAL t <sub>c</sub>
BASIN	DESIGN PT.	C <sub>s</sub>	C <sub>100</sub>	AREA	LENGTH	HT	SLOPE	t <sub>i</sub>	LENGTH	HT	SLOPE	VEL.	t <sub>t</sub>	COMP. t <sub>c</sub>	MINIMUM t <sub>c</sub>	
				Ac	Ft	FT	%	Min	Ft	FT	%	FPS	Min	t <sub>c</sub>	t <sub>c</sub>	Min
A	1	0.15	0.50	0.62	145	13	9.0	10.3						10.3	5	10.3
B	2	0.11	0.40	0.52	155	6	3.9	14.7						14.7	5	14.7



Drexel, Barrell & Co.

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 DATE: 5/9/2024

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING	RUNOFF		5 YR STORM		P1=		1.50
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t <sub>c</sub> (MIN)	C * A	I (IN/HR)	Q (CFS)
A	1	0.62	0.15	10.3	0.09	4.09	0.6
B	2	0.52	0.11	14.7	0.06	3.55	0.2





Drexel, Barrell & Co.

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## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING	RUNOFF	100 YR STORM			P1=	2.52	
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t <sub>c</sub> (MIN)	C * A	I (IN/HR)	Q (CFS)
A	1	0.62	0.50	10.3	0.31	6.86	3.4
B	2	0.52	0.40	14.7	0.21	5.96	1.2

**PROJECT INFORMATION**

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 REPORT TYPE: Final  
 DATE: 5/9/2024  
 Soil Type: B & D



Drexel, Barrell & Co.

	C5* (Type B)	C5* (Type D)	C100* (Type B)	C100* (Type D)	% IMPERV
Pasture/Meadow	0.08	0.15	0.35	0.50	0
Asphalt/Sidewalk	0.90	0.90	0.96	0.96	100

\*C-Values and Basin Imperviousness based on Table 6-6, City of Colorado Springs "Drainage Criteria Manual"

**PROPOSED**

SUB-BASIN	SURFACE DESIGNATION	AREA ACRE	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV
			C5 (Type B)	C5 (Type D)	C100* (Type B)	C100* (Type D)	
<b>A</b>	Pasture/Meadow	0.06	0.08		0.35		0
	Pasture/Meadow	0.02		0.15		0.50	0
	Asphalt/Sidewalk	0.14	0.90		0.96		100
	Asphalt/Sidewalk	0.30		0.90		0.96	100
	WEIGHTED AVERAGE			0.78		0.87	85%
<b>TOTAL A</b>		0.52					
<b>B</b>	Pasture/Meadow	0.09	0.08		0.35		0
	Pasture/Meadow	0.08		0.15		0.50	0
	Asphalt/Sidewalk	0.00	0.90		0.96		100
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.11		0.42	0%
<b>TOTAL B</b>		0.17					
<b>C</b>	Pasture/Meadow	0.01	0.08		0.35		0
	Pasture/Meadow	0.44		0.15		0.50	0
	Asphalt/Sidewalk	0.00	0.90		0.96		100
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.15		0.50	0%
<b>TOTAL C</b>		0.45					
<b>TOTAL</b>		<b>1.14</b>		<b>0.43</b>		<b>0.66</b>	<b>38.6%</b>

**PROJECT INFORMATION**

PROJECT: LDS parking lot  
 PROJECT NO: 21841-00  
 DESIGN BY: SBN  
 REV. BY: TDM  
 AGENCY: El Paso County  
 REPORT TYPE: Final  
 DATE: 5/9/2024



**RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF**  
 PROPOSED TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t <sub>i</sub> )				TRAVEL TIME (t <sub>t</sub> )					PIPE TRAVEL TIME (t <sub>p</sub> )				TIME OF CONC. t <sub>c</sub>		FINAL t <sub>c</sub>
BASIN	DESIGN PT.	C <sub>s</sub>	C <sub>100</sub>	AREA	LENGTH	HT	SLOPE	t <sub>i</sub>	LENGTH	HT	SLOPE	VEL.	t <sub>t</sub>	LENGTH	SLOPE	VEL.	t <sub>p</sub>	COMP.	MINIMUM	
				Ac	Ft	FT	%	Min	Ft	FT	%	FPS	Min	Ft	%	FPS	Min	t <sub>c</sub>	t <sub>c</sub>	Min
A	1	0.78	0.87	0.52	100	3	3.0	4.2	175	5	2.9	10.0	0.3					4.5	5	5.0
B	2	0.11	0.42	0.17	40	1	2.5	8.6										8.6	5	8.6
C	3	0.15	0.50	0.45	85	8	9.4	7.8										7.8	5	7.8

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Drexel, Barrell & Co.

**RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF**

PROPOSED RUNOFF 5 YR STORM P1= 1.50

BASIN (S)	DESIGN POINT	AREA (AC)	DIRECT RUNOFF		C * A	I (IN/HR)	Q (CFS)
			RUNOFF COEFF	t <sub>c</sub> (MIN)			
A	1	0.52	0.78	5.0	0.40	5.17	2.1
B	2	0.17	0.11	8.6	0.02	4.36	0.1
C	3	0.45	0.15	7.8	0.07	4.51	0.3

**PROJECT INFORMATION**

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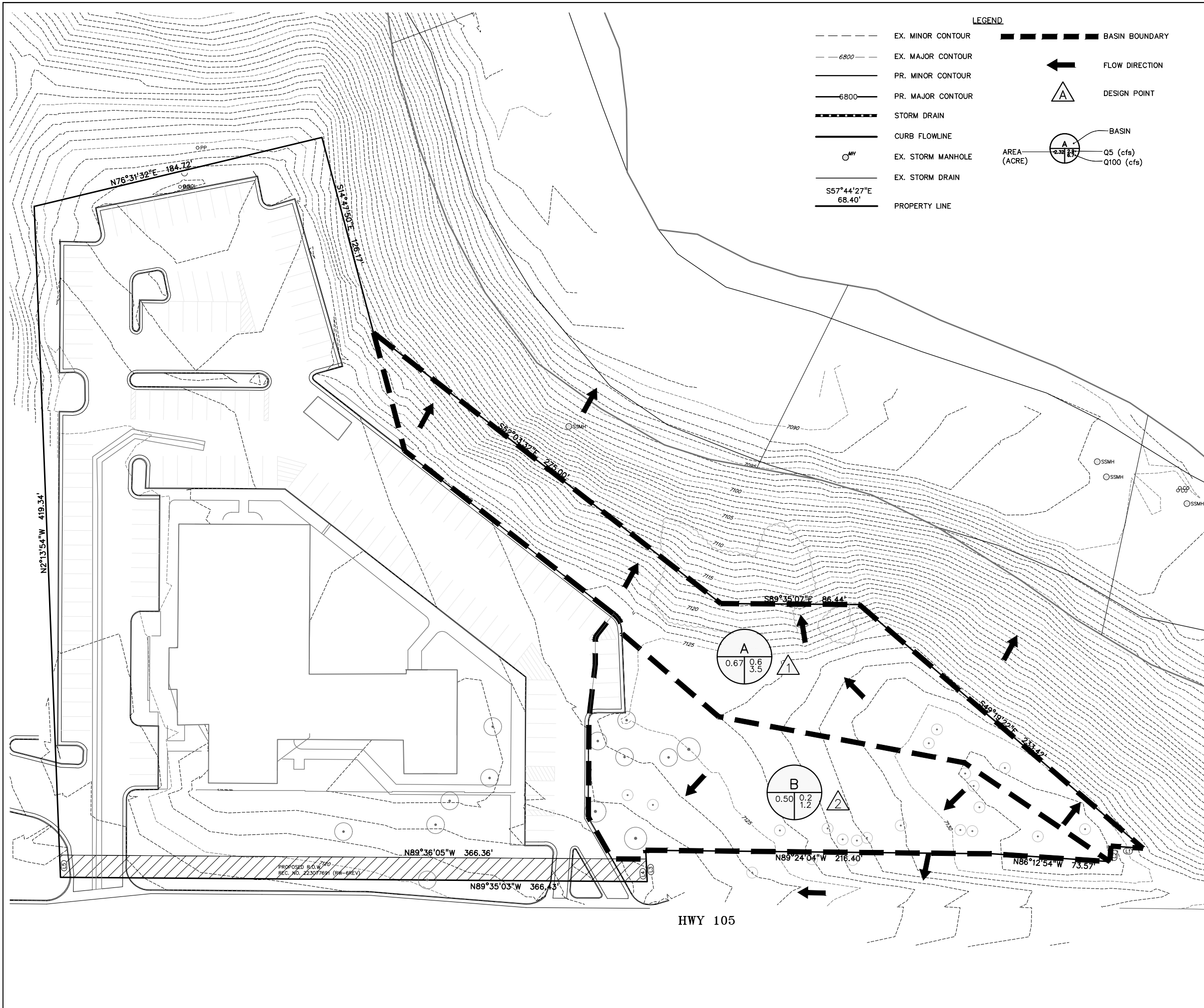


Drexel, Barrell & Co.

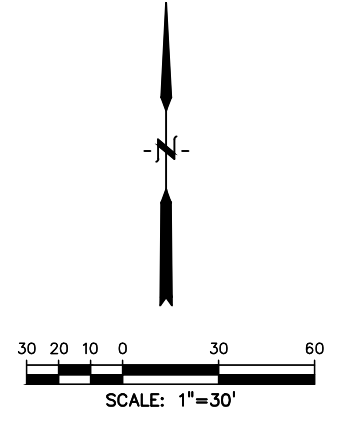
**RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF**

PROPOSED RUNOFF 100 YR STORM P1= 2.52

BASIN (S)	DESIGN POINT	AREA (AC)	DIRECT RUNOFF				PIPE SIZING			
			RUNOFF COEFF	t <sub>c</sub> (MIN)	C * A	I (IN/HR)	Q (CFS)	n	Slope (ft/ft)	Calculated Pipe Dia (in)
A	1	0.52	0.87	5.0	0.45	8.68	3.9	0.013		
B	2	0.17	0.42	8.6	0.07	7.31	0.5			
C	3	0.45	0.50	7.8	0.22	7.57	1.7			



- LEGEND**
- EX. MINOR CONTOUR
  - - - - 6800 EX. MAJOR CONTOUR
  - PR. MINOR CONTOUR
  - - - - 6800 PR. MAJOR CONTOUR
  - STORM DRAIN
  - CURB FLOWLINE
  - SMH EX. STORM MANHOLE
  - S57°44'27"E 68.40' EX. STORM DRAIN
  - PROPERTY LINE
  - BASIN BOUNDARY
  - ← FLOW DIRECTION
  - △ DESIGN POINT
  - BASIN
  - Q5 (cfs)
  - Q100 (cfs)



BASIN	DP	AREA (AC)	% IMPERV	Q5 (cfs)	Q100 (cfs)
A	1	0.62	0%	0.6	3.4
B	2	0.52	4%	0.2	1.2

PREPARED BY:

**DREXEL, BARRELL & CO.**  
 Engineers • Surveyors  
 101 SAHWATCH ST., #100  
 COLORADO SPRGS, COLORADO 80903  
 CONTACT: TIM D. MCCONNELL, P.E.  
 (719)260-0887  
 COLORADO SPRINGS • LAFAYETTE

CLIENT:

LDS CHURCH—REAL ESTATE DIVISION  
 50 E NORTH TEMPLE  
 #509-8866  
 SALT LAKE CITY, UT 84150

DRAINAGE PLANS FOR:  
**LDS CHURCH  
 PARKING ADDITION**  
 MONUMENT, COLORADO

ISSUE	DATE
INITIAL ISSUE	1-11-2024
DESIGNED BY:	SBN
DRAWN BY:	SBN
CHECKED BY:	TDM
FILE NAME:	21841-00 EXDR

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.  
 DRAWING SCALE:  
 HORIZONTAL: 1"=30'  
 VERTICAL: N/A

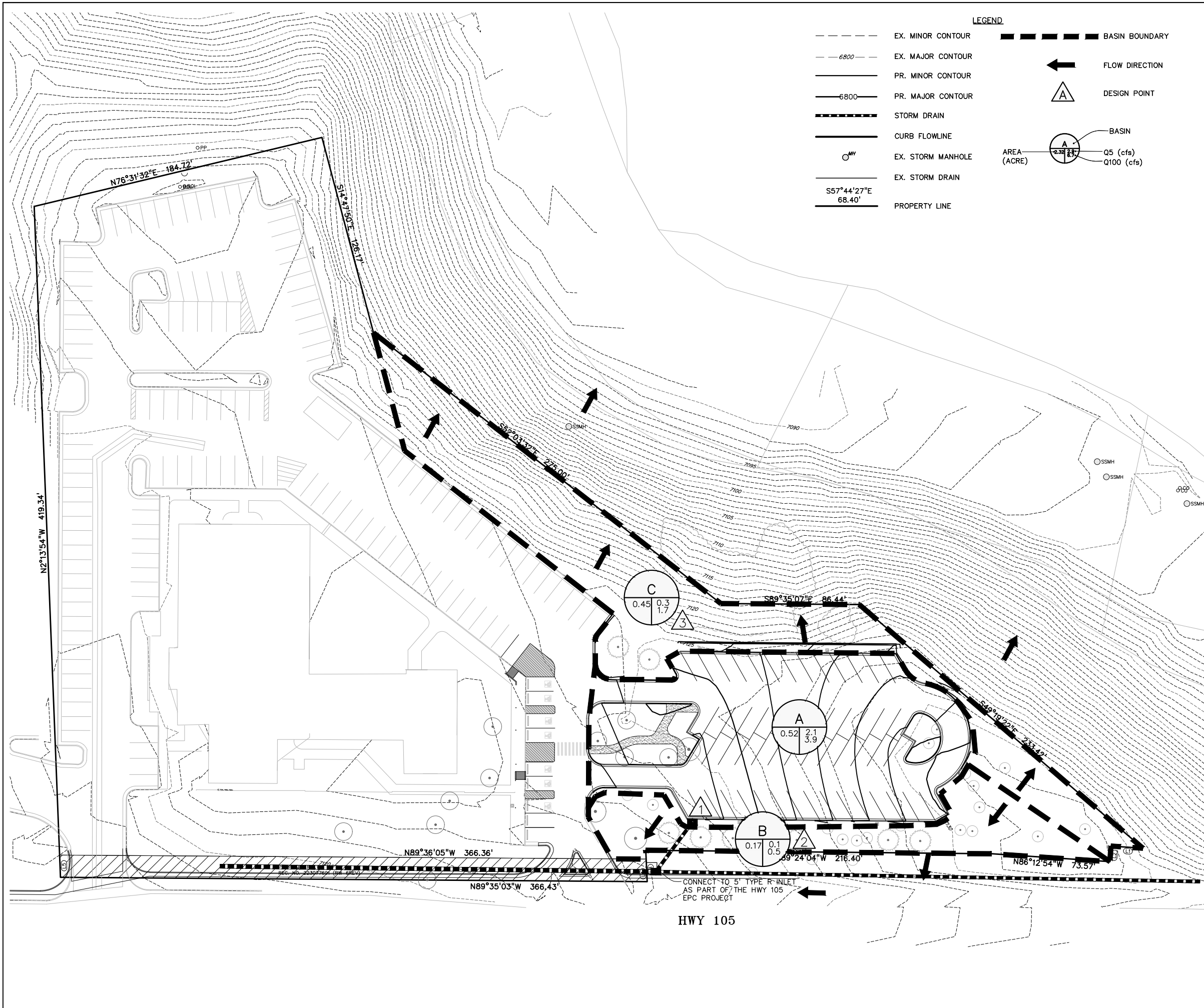
EXISTING CONDITIONS  
 DRAINAGE MAP

PROJECT NO. 21841-00CSCV  
 DRAWING NO.

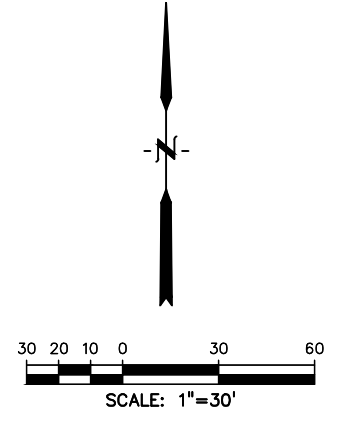
**EX**

SHEET: 1 OF 2

**811** Know what's below.  
 Call before you dig.  
 CALL 3-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.



- LEGEND**
- EX. MINOR CONTOUR
  - - - - 6800 EX. MAJOR CONTOUR
  - PR. MINOR CONTOUR
  - - - - 6800 PR. MAJOR CONTOUR
  - STORM DRAIN
  - CURB FLOWLINE
  - SMH EX. STORM MANHOLE
  - S57°44'27"E 68.40' EX. STORM DRAIN
  - PROPERTY LINE
  - BASIN BOUNDARY
  - ← FLOW DIRECTION
  - △ DESIGN POINT
  - BASIN
  - Q5 (cfs)
  - Q100 (cfs)



BASIN	DP	AREA (AC)	% IMPERV	Q5 (cfs)	Q100 (cfs)
A	1	0.52	85%	2.1	3.9
B	2	0.17	0%	0.1	0.5
C	3	0.45	0%	0.3	1.7

PREPARED BY:  
  
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DRAINAGE PLANS FOR:  
**LDS CHURCH  
 PARKING ADDITION**  
 MONUMENT, COLORADO

ISSUE	DATE
INITIAL ISSUE	1-11-2024
DESIGNED BY:	SBN
DRAWN BY:	SBN
CHECKED BY:	TDM
FILE NAME:	21841-00 PRDR

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 DRAWING SCALE:  
 HORIZONTAL: 1"=30'  
 VERTICAL: N/A

PROPOSED CONDITIONS  
 DRAINAGE MAP  
 PROJECT NO. 21841-00CSCV  
 DRAWING NO.

**PR**  
 SHEET: 2 OF 2

