

**DRAINAGE REPORT  
FOR  
PENROSE RV & BOAT STORAGE**

**COUNTY OF FREMONT  
STATE OF COLORADO**

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ENGINEERS & PLANNERS

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ENGINEER'S CERTIFICATION OF DRAINAGE REPORT

"I hereby certify that this report for the preliminary drainage design of Penrose RV & Boat Storage was prepared by me (or under my direct supervision) in accordance with the provisions of the Urban Drainage Flood Control District Storm Drainage Criteria and supplemental Fremont County requirements for the owners thereof."

Jim Brzostowicz  
Registered Professional Engineer  
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Drainage Report

**1.0 BACKGROUND**

**1.1 Location**

The Penrose RV & Boat Storage project is located at 17225 Highway 115, situated in the northwest one-quarter of Section 28, Township 18 South, Range 68 West of the 6th Principal Meridian, County of Fremont, State of Colorado. The Property includes Lot 2 of the Coyle-Vanegmond lot line adjustment, and is surrounded by Colorado State Highway 115 (SH 115) to the southeast, the Brush Hollow Supply Ditch to the north, and undeveloped land to the west. The lot is currently zoned B – business, per the Fremont County Zoning Resolution. Refer to Figure 1 for a project vicinity map.



Figure 1: Project Vicinity Map

**1.2 Description of Property**

The Penrose RV & Boat Storage project proposes to develop the existing Lot 2 of the Coyle-Vanegmond lot line adjustment (the Property) into approximately 25 storage units for boats and recreational vehicles. The Property contains 1.36 acres of mostly undeveloped land, with an existing garage and shipping container unit. The total drainage area, analyzed for the purposes of this report, is 42.12 acres – 1.36 acres of on-property drainage basins, 1.42 acres of adjacent off-property areas which contribute runoff to the Property, and an additional 39.34 acres north of the Brush Hollow Supply Ditch, which may contribute runoff during large storm events.

The Property generally slopes to the southwest with an average grade of 6%. Soils in the study area can be classified as Hydrologic Soil Group B, per the Natural Resources Conservation Service (NRCS) web soil survey. The Property lies within Zone X, area of minimal hazard, per FEMA National Flood Hazard Layer. Refer to Appendix A for a soils map and FIRMette.

## 2.0 **DRAINAGE BASINS**

### 2.1 **Historic Drainage Basins**

The study area can historically be divided into three (3) on-property drainage basins, and five (5) off-property basins. Refer to Appendix B for historic runoff calculations.

- Basin H-1 is located along the west property line and contains 0.12 acres of undeveloped land. Runoff in this basin generally flows south from the undeveloped area to the existing roadside swale along SH 115, and continues southwest, off of the Property. The impervious coverage of Basin H-1 is 2.0% and the 100-year historic runoff coefficient is 0.44.
- Basin H-2 contains 1.03 acres of the central portion of the Property, including two existing buildings and landscaped area. Runoff generated in this basin sheet flows south from the central portion of the Property to Basin HOS-2, where it then flows southwest. The impervious coverage of this basin is 8.4% and the 100-year historic runoff coefficient is 0.46.
- Basin H-3 contains the east portion of the Property, and consists of 0.20 acres of undeveloped land. Runoff in this basin sheet flows south to the roadside swale. Runoff is conveyed southwest via an 18-inch corrugated metal pipe culvert, into Basin HOS-3. The impervious coverage of the basin is 2.0% and the 100-year historic runoff coefficient is 0.44.
- Basin HO-1 is located west of Basin H-1 on the west property line, and contains 0.06 acres of undeveloped land. Runoff in this basin sheet flows east into basin H-1. The impervious coverage of this basin is 2.0% and the 100-year historic runoff coefficient is 0.44.
- Basin HOS-1 is located southeast of Basin H-3 between the property line and SH 115 centerline. This basin contains 0.53 acres of landscaped right-of-way, an existing roadside swale, and the northeast half of SH 115. Runoff in the basin sheet flows to the roadside swale and flows southwest via an 18-inch corrugated metal pipe culvert. The impervious coverage of this basin is 34.5% and the 100-year historic runoff coefficient is 0.59.
- Basin HOS-2 is located south of Basin H-2, and contains landscaped right-of-way, an existing roadside swale, and a portion of SH 115. Runoff sheet flows to the swale, where it channelizes and flows southwest. The impervious coverage of this basin is 38.2% and the 100-year historic runoff coefficient is 0.60.
- Basin HOS-3 is located adjacent to the southwest corner of the Property, and contains 0.12 acres of landscaped right-of-way and a portion of SH 115. Runoff in this basin sheet flows west, away from the Property. The impervious coverage of this basin is 35.7%, and the 100-year historic runoff coefficient is 0.59.
- Basin HOS-4 is located north of the Brush Hollow Supply Ditch, and contains 39.34 acres of undeveloped land, primarily desert. Runoff in this basin sheet flows south towards the ditch. The impervious coverage of this basin is 2.0%, and the 100-year historic runoff coefficient is 0.44. During high flow events, it is likely that runoff from this basin flows across the ditch, assumed to be full, and enters the Property.

### 2.2 **Proposed Drainage Basins**

Under developed conditions, the study area can be divided into ten (10) on-property drainage basins and five (5) off-property basins. On-property basins tributary to the detention pond are denoted "S", while off-property basins tributary to the pond are denoted "O". On-property basins bypassing detention are denoted "SO", while off-property basins bypassing detention are denoted "OS". The overall impervious coverage of the developed Property is 41.8%. The Study

area is not analyzed in any Master Drainage Report.

- Basin S-1 is located along the north and west property lines. The 0.21-acre basin contains a conveyance swale and landscape area. Runoff in this basin sheet flows to the conveyance swale, where the runoff channelizes and flows west and south to the detention pond. The impervious coverage of this basin is 2.7% and the 100-year developed runoff coefficient is 0.44.
- Basin S-2 is 0.07 acres and contains the roof area of Building B. Runoff developed in this basin will be collected in roof leaders, and surface discharge via downspout to the swale in Basin S-1. The impervious coverage of the basin is 90% and the 100-year developed runoff coefficient is 0.84.
- Basin S-3 is 0.14 acres and contains the roof area of Building A. Runoff in this basin will be collected in roof leaders, and surface discharge via downspout to the swale in Basin S-1. The impervious coverage of this basin is 90% and the 100-year developed runoff coefficient is 0.84.
- Basin S-4 is located in the center of Lot 2, and contains 0.48 acres of the proposed drive aisles. Runoff in this basin sheet flows to a swale centered in the drive aisle, where the runoff channelizes and flows west and south. The swale terminates at the edge of the drive aisle, and runoff enters a second swale, adjacent to the property line, via a riprap rundown. From there, the runoff flows southwest to the detention pond in basin PND. The impervious coverage of the basin is 38.3% and the 100-year developed runoff coefficient is 0.60.
- Basin S-5 is 0.20 acres and contains the roof area of Building C. Runoff generated in this basin will be collected in roof leaders and conveyed to the property line swale in Basin S-4 via an 8" PVC header pipe. The impervious coverage of this basin is 90% and the 100-year developed runoff coefficient is 0.84.
- Basin PND is located in the southwest corner of the Property and contains the 0.08-acre detention pond. Runoff generated in this basin will be captured by the detention pond outlet structure and discharge to the existing roadside swale, via a 12" outfall pipe. The impervious coverage of this basin is 4.1% and the 100-year developed runoff coefficient is 0.45.
- Basin O-1 is an off-property basin, located along the west property line. This basin contains 0.06 acres of undeveloped landscape area, with an impervious coverage of 2.0% and a 100-year developed runoff coefficient of 0.44. Runoff in this basin sheet flows east, on to the Property, to the conveyance swale in Basin S-1, and is ultimately detained in the pond.
- Basin OS-1 is an off-property basin, located in the SH 115 right-of-way, between the southeast property line and the highway centerline. The basin contains 0.64 acres of landscaped right-of-way, a roadside swale, and a portion of the highway. Runoff in this basin sheet flows to the swale, where it channelizes and flows southwest to an 18-inch culvert under the proposed access drive. The impervious coverage of this basin is 32.1% and the 100-year developed runoff coefficient is 0.58.
- Basin OS-2 is an off-property basin located in the SH 115 right-of-way, between the detention pond and the highway centerline. This basin is 0.56 acres and contains the proposed access drive, the roadside swale, and landscaped right-of-way. Runoff generated in this basin sheet flows to the swale, where it channelizes and flows southwest to an existing 18-inch corrugated metal pipe culvert. This basin also receives the outflow from the detention pond. The impervious coverage of this basin is 47.9% and the 100-year developed runoff coefficient is 0.65.

- Basin OS-3 is an off-property basin, located adjacent to the southwest corner of the Property, which contains 0.15 acres of landscaped right-of-way and a portion of SH 115. Runoff in this basin generally sheet flows to the roadside swale. The impervious coverage of this basin is 38.9% and the 100-year developed runoff coefficient is 0.60.
- Basin OS-4 is located north of the Brush Hollow Supply Ditch, and contains 39.34 acres of undeveloped land, primarily desert. Runoff in this basin sheet flows south towards the ditch. The impervious coverage of this basin is 2%, and the 100-year historic runoff coefficient is 0.44.
- Basin SO-1 is an on-property basin, located at the eastern corner of the Property. The basin contains 0.12 acres of landscape area with a swale. Runoff in this basin will sheet flow to the swale, then flow southeast, off of the property, and discharge into basin OS-1 without being detained. The impervious coverage of this basin is 2.0% and the 100-year developed runoff coefficient is 0.44.
- Basin SO-2 is an on-property basin, located at the driveway entrance to the Property. The basin contains 0.01 acres of gravel driveway surface. Runoff in this basin sheet flows south into Basin OS-2, without being detained. The impervious coverage of this basin is 36.6% and the 100-year runoff coefficient is 0.60.
- Basin SO-3 is an on-property basin, located at the southwest corner of the Property, between the property line and detention pond. The basin contains 0.03 acres of landscape area and the detention pond emergency spillway. Runoff in this basin will sheet flow south/southeast and discharge into basin OS-2 without being detained. The impervious coverage of this basin is 8.1% and the 100-year developed runoff coefficient is 0.46.
- Basin SO-4 is an on-property basin, located along the western property line, west of the detention pond. The basin contains 0.02 acres of landscape area. Runoff in this basin will sheet flow south and discharge into basin OS-2 without being detained. The impervious coverage of this basin is 2.0% and the 100-year developed runoff coefficient is 0.44.

### **3.0 DRAINAGE DESIGN CRITERIA**

#### **3.1 Regulations**

The proposed drainage design complies with the regulations set forth in the *Subdivision Regulations of Fremont County*, last amended January 2020, as well as the Mile High Flood District's (MHFD) *Urban Storm Drainage Criteria Manual*, version prior to March 2024 updates (USDCM).

#### **3.2 Development Criteria Reference and Constraints**

The Subdivision Regulations state that the peak runoff for the developed Property must not exceed the historic peak runoff for the same storm event. Furthermore, stormwater detention facilities shall not release runoff at a rate higher than the historic runoff rate. The proposed development of the Property will increase the overall runoff as a result of increased impervious area. To adhere to the regulations set forth by the Fremont County, a detention pond will be used to temporarily store developed runoff and discharge at a rate less than or equal to the historic rate.

#### **3.3 Hydrological Criteria**

The hydrology of the study area was determined using the methods described in the *Subdivision Regulations of Fremont County*, last amended January 2020, as well as the Mile High Flood District's (MHFD) *Urban Storm Drainage Criteria Manual*, latest version (USDCM). The following methods were utilized:

## Drainage Report

- The Rational Method was utilized to estimate the 10- and 100-year peak flowrates as the minor and major storm events, respectively.
- Runoff coefficients were determined from land usage and hydrologic soil group data as outlined by Tables 6-3 through 6-5 of the USDCM.
- The design point rainfall values used in the Rational Method were obtained from NOAA Atlas 14 Precipitation Frequency Data Server, and are included in Appendix A.
- The Modified FAA Method and Colorado Urban Hydrograph Procedure were utilized to estimate the required 100-year detention volume for the Property.

### 3.4 Hydraulic Criteria

- The detention pond outlet structure was designed using the MHFD outlet structure workbook. The detention pond will utilize an outlet structure with water quality orifice plate, overflow weir, and outflow pipe with a restrictor plate for 100-year peak flow events or smaller, and an emergency spillway for events exceeding the 100-year storm.
- Hydraflow Express software was used to model the proposed culverts, roof drain, and conveyance of off-property flows through the subject Property. Please refer to Appendix C for Hydraflow Express output files.

## 4.0 DRAINAGE FACILITY DESIGN

### 4.1 General Concept

The proposed stormwater design will generally maintain the historic drainage patterns of the Property. The majority of developed runoff from the Property will be directed southwest toward the proposed detention pond, via sheet flow and conveyance swales. The pond will provide water quality treatment to the developed flow, and will temporarily store developed runoff and discharge at a rate equal to or below the historic runoff. Outflow from the detention pond will discharge to the existing roadside swale adjacent to SH 115.

Off-property basins OS-1, OS-2, and OS-3 will continue to flow off-property, under developed conditions, and on-property basins SO-1 through SO-4 will discharge off-property without being detained. To account for this developed runoff bypassing detention, runoff tributary to the detention pond will be "over-detained". The sum of all developed runoff from basins bypassing detention and the discharge from the detention pond will be equal to or less than the historic runoff for the Property.

### 4.2 Specific Details

Historically, the Property discharges to the roadside swale along SH 115, and flows southwest along the highway, eventually discharging to Bear Creek. Overall, the proposed drainage system is designed to maintain the historic drainage patterns and overall discharge point of the Property.

Developed runoff in Basin S-1 will sheet flow to a swale along the west property line. The swale is designed to convey the 100-year developed runoff to the detention pond, via a type VL riprap rundown at design point S-1. The swale in Basin S-1 will also collect runoff generated from the roof areas of Building A in Basin S-3, as well as runoff from off-property, undeveloped Basin O-1. The runoff from the building will be collected in roof leaders, and surface drain, via downspouts, to the swale.

The grading in Basin S-4 is designed to capture developed runoff in a swale, centered in the gravel drive aisle, and direct the runoff south and west, where the swale terminates at a type VL riprap rundown and enters a second swale located between the property line and edge of the gravel drive. The drive aisle swale will also capture developed runoff from the



roof of Building B in Basin S-2. Runoff from Basin S-5 is will be captured in roof leaders, and piped to the property line swale in Basin S-4 via an 8" PVC pipe, ultimately discharging to the detention pond

On-property Basins SO-1 through SO-4 will discharge directly off-property, bypassing the detention pond. Due to the existing grades along the property boundary easement, it is impracticable to capture runoff from these basins and direct it to the detention pond.

Off- property Basins OS-1 and OS-2 will be modified slightly from existing conditions to remove the existing access drive and 18" culvert, and relocate the drive and culvert to the southwest. The roadside swale will also be realigned and re-graded to accommodate the new location of the culvert. Basin OS-3 will remain unchanged from historic conditions.

The Property is bounded by the Brush Hollow Supply Ditch on the upstream side, which may intercept upstream runoff from basin OS-4 during the minor, 10-year storm event. Upstream runoff from the major, 100-year storm will enter and flow through the Property. Flows from OS-4 will overtop the ditch and enter the property. Because the grade along the ditch is very flat, the flow is likely to enter the Property in a sheet flow condition with a depth of approximately 0.1-foot, or 0.8 cfs/linear foot of property line along the ditch. Once inside the Property, the runoff will re-concentrate and flow between the buildings, in the main drive aisle, and in other swales to direct flow around the buildings. The buildings have been elevated above the estimated depth of flow at critical locations. Refer to the Drainage Plan provided in Appendix D. Flow rates have been apportioned based on the contributing property line frontage times 0.8 cfs/linear foot.

#### **4.3 Stormwater Storage Facilities**

The proposed detention pond is designed to treat the WQCV and to detain the 100-year storm event. The pond was sized using the Modified FAA method and the Colorado Urban Hydrograph Procedure (CUHP). The WQCV for the area tributary to the pond was calculated to be 0.020 acre-feet. The 100-year detention volume was calculated to be 0.083 acre-feet per the CUHP, and 0.078 acre-feet per the Modified FAA method; to be conservative, 0.083 acre-feet was used as the minimum 100-year detention volume. The total required detention pond volume is 0.102 acre-feet for the WQCV and 100-year detention volume.

The detention pond will accept a total of 5.60 cfs of developed runoff during the 100-year storm from basins S-1 through S-5, PND, and OS-1. The area tributary to the pond is 1.24 acres, with a composite impervious coverage of 45.0%.

The pond outlet structure will consist of a modified Type C inlet, with a water quality orifice plate, and outfall pipe with flow restrictor. The water quality orifice plate features two (2) 7/16-inch diameter orifices spaced 8-inches on-center, and was sized to drain 99% of the WQCV in 43 hours, which satisfies the USDCM minimum of 40 hours. The pond will also drain 97% of the 5-year volume in 63 hours, satisfying the State maximum allowable drain time of 72 hours. Outflow from the pond will discharge to the historic discharge point – the roadside swale along SH 115. The 100-year outflow from the pond will be discharged at a rate of 2.16 cfs.

The pond will have a 5-foot-wide concrete emergency spillway along the southeast side. The invert elevation of the spillway will be 5505.00-feet, 0.01 feet above the 100-year water surface elevation (WSEL) of 5504.99-feet; furthermore, the detention pond will have a top of berm elevation of 5506.00, providing more than 1.00-foot of freeboard above the 100-year WSEL. Table 1 summarizes the stage-storage of the proposed pond. The downstream side of the spillway will be armored with type VL riprap for a length of 5-feet. The spillway was sized to convey the undetained 100-year runoff to the pond, 5.60 cfs. Refer to Appendix C for spillway sizing calculations.

Table 1: Stage-Storage Summary

| Stage<br>(ft) | Elevation<br>(ft) | Δ Elevation<br>(ft) | Area<br>(SF) | Incremental Est. Volume<br>(CF) | Est. Available Volume |         | Note                    |
|---------------|-------------------|---------------------|--------------|---------------------------------|-----------------------|---------|-------------------------|
|               |                   |                     |              |                                 | (CF)                  | (ac-ft) |                         |
| 0             | 5503.00           | 0.00                | 0            | 0                               | 0                     | 0.000   | Outlet Structure Invert |
| 0.50          | 5503.50           | 0.50                | 353          | 88                              | 88                    | 0.002   | -                       |
| 1.00          | 5504.00           | 0.50                | 1,384        | 434                             | 522                   | 0.012   | -                       |
| 1.23          | 5504.23           | 0.23                |              |                                 |                       |         | WQCV WSEL               |
| 1.50          | 5504.50           | 0.50                | 2,026        | 852                             | 1,375                 | 0.032   | -                       |
| 1.99          | 5504.99           | 0.49                |              |                                 |                       |         | 100-yr WSEL             |
| 2.00          | 5505.00           | 0.50                | 2,454        | 1,120                           | 2,495                 | 0.057   | Spillway Invert         |
| 2.50          | 5505.50           | 0.50                | 3,013        | 1,367                           | 3,862                 | 0.089   | -                       |
| 3.00          | 5506.00           | 0.50                | 3,776        | 1,697                           | 5,559                 | 0.128   | Top of Berm             |

4.4 **Runoff Summary**

Table 2 illustrates the overall runoff from the developed study area, as compared to historic conditions.

Table 2: Runoff Summary

| Point of Discharge | Runoff Existing (CFS) |        |        |         |          | Runoff Proposed (CFS) |        |        |         |          | Total Site Discharge Proposed (CFS) |        |         |          | Δ in Discharge from Discharge Point Proposed LESS Existing (CFS) |        |         |          |
|--------------------|-----------------------|--------|--------|---------|----------|-----------------------|--------|--------|---------|----------|-------------------------------------|--------|---------|----------|--|--------|---------|----------|
|                    | Basin                 | 2-Year | 5-Year | 10-Year | 100-Year | Basin                 | 2-Year | 5-Year | 10-Year | 100-Year | 2-Year                              | 5-Year | 10-Year | 100-Year | 2-Year   | 5-Year | 10-Year | 100-Year |
|                    | Detention Pond        | H-1    | 0.00   | 0.00    | 0.04     | 0.44                  | S-1    | 0.01   | 0.01    | 0.05     | 0.53                                | 0.012  | 0.013   | 0.260    | 2.16   | -0.14  | -0.21   | -0.43    |
|                    |                       |        |        |         |          | S-2                   | 0.14   | 0.18   | 0.23    | 0.45     |                                     |        |         |          |  |        |         |          |
| H-2                |                       | 0.14   | 0.20   | 0.57    | 3.87     | S-3                   | 0.29   | 0.38   | 0.48    | 0.94     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         |          | S-4                   | 0.28   | 0.40   | 0.59    | 1.79     |                                     |        |         |          |  |        |         |          |
| H-2                |                       | 0.01   | 0.01   | 0.06    | 0.73     | S-5                   | 0.42   | 0.56   | 0.70    | 1.38     |                                     |        |         |          |  |        |         |          |
| HO-1               |                       | 0.00   | 0.00   | 0.02    | 0.23     | PND                   | 0.01   | 0.01   | 0.03    | 0.29     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         |          | O-1                   | 0.00   | 0.00   | 0.02    | 0.23     |                                     |        |         |          |  |        |         |          |
| Total              | 0.15                  | 0.22   | 0.69   | 5.28    | Total    | 1.13                  | 1.54   | 2.11   | 5.60    |          |                                     |        |         |          |  |        |         |          |
| Direct Off-Site    | HOS-1                 | 0.27   | 0.39   | 0.60    | 1.91     | OS-1                  | 0.29   | 0.43   | 0.67    | 2.23     | 1.44                                | 2.00   | 7.18    | 64.55    | 0.20   | 0.28   | 0.40    | 1.35     |
|                    |                       |        |        |         |          | OS-2                  | 0.56   | 0.78   | 1.11    | 2.98     |                                     |        |         |          |  |        |         |          |
|                    | HOS-2                 | 0.40   | 0.58   | 0.85    | 2.57     | OS-3                  | 0.12   | 0.17   | 0.25    | 0.74     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         |          | OS-4                  | 0.46   | 0.59   | 0.97    | 57.93    |                                     |        |         |          |  |        |         |          |
|                    | HOS-3                 | 0.11   | 0.17   | 0.25    | 0.79     | SO-1                  | 0.00   | 0.00   | 0.04    | 0.44     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         |          | SO-2                  | 0.01   | 0.02   | 0.02    | 0.08     |                                     |        |         |          |  |        |         |          |
|                    | HOS-4                 | 0.46   | 0.59   | 0.97    | 57.93    | SO-3                  | 0.00   | 0.01   | 0.01    | 0.10     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         | SO-4     | 0.00                  | 0.00   | 0.01   | 0.06    |          |                                     |        |         |          |  |        |         |          |
| Total              | 1.23                  | 1.72   | 6.78   | 63.20   | Total    | 1.44                  | 2.00   | 7.18   | 64.55   |          |                                     |        |         |          |  |        |         |          |
| Overall Site Total | -                     | 1.39   | 1.94   | 7.47    | 68.48    | -                     | 2.57   | 3.54   | 9.29    | 70.15    | 1.45                                | 2.01   | 7.44    | 66.71    | 0.06   | 0.07   | -0.03   | -1.77    |

Runoff from basins bypassing the detention pond will increase post-development. However, the total runoff discharging from the Property will be reduced by 0.03 cfs for the minor, 10-year storm, and 1.77 cfs for the major, 100-year storm. This satisfies the criteria outlined in the Subdivision Regulations, as the peak flow discharging from the developed Property

does not exceed the respective historic storm, for the 10 and 100-year events. Furthermore, the detention pond sufficiently over-detains the 10-year and 100-year runoff to account for undetained developed discharge. The total developed 10-year discharge is 7.44 cfs and 100-year discharge is 66.71 cfs. This is less than the historic 10- and 100-year discharges of 7.47 cfs and 68.48 cfs, respectively.

## **5.0 CONCLUSIONS**

### **5.1 Compliance with the Town and UDFCD Criteria**

This report is in compliance with the provisions outlined in the *Subdivision Regulations of Fremont County*, last amended January 2020, as well as the Mile High Flood District's (MHFD) *Urban Storm Drainage Criteria Manual*, version prior to March 2024 updates (USDCM).

### **5.2 Drainage Concept**

The Penrose RV & Boat Storage project will improve drainage conditions in the proximity of the Property, by utilizing a detention basin. The detention basin will be used to control the discharge of runoff from the Property by temporarily storing runoff and releasing it at a controlled rate. Runoff from the majority of the overall drainage area will be captured by the detention pond, and the developed runoff from the overall drainage area will be reduced from 68.48 cfs to 66.71 cfs, an approximate 2.5% reduction.

Based on these factors, the proposed project is not anticipated to have an adverse impact on the existing drainage conditions of the Property, nor its immediate vicinity.

**6.0 REFERENCES**

- *Urban Storm Drainage Criteria Manual, Volumes 1, 2 and 3.* Mile High Flood District. Version prior to March 2024 update.
- *Subdivision Regulations of Fremont County, Colorado.* Fremont County Department of Planning and Zoning. Last amended January 14, 2020.

**7.0 LIST OF APPENDICIES****Appendix A – Figures**

- Project Vicinity Map
- NRCS HSG Soils Map & Table
- FEMA FIRMette
- NOAA Atlas 14 Point Precipitation Frequency Estimates

**Appendix B – Hydrologic Computations**

- Developed Runoff Calculations
- Historic Runoff Calculations
- Runoff Summary

**Appendix C – Hydraulic Computations**

- MHFD Detention Basin Design Workbook
- MHFD Detention Volume by the Modified FAA Method
- Detention Pond Stage-Storage Table
- Hydraflow Storm Sewer Summary Report
- Emergency Spillway Analysis
- Internal site conveyance calculations for basin HOS-4 pass through

**Appendix D – Drawings**

- Historic Drainage Plan
- Drainage Plan
- Off-site Drainage Exhibit
- Outlet Structure Details

**Appendix E – Operations & Maintenance Manual**

- Stormwater Permanent Control Measure Standard Operating Procedures Agreement
- Permanent Stormwater Inspection Form/Maintenance Form
- Grass Swale Maintenance Checklist
- Extended Detention Basin Checklist
- Southeast Metro Stormwater Authority Standard Operating Procedures for Inspection and Maintenance, Grass Buffers and Grass Swales
- Southeast Metro Stormwater Authority Standard Operating Procedures for Inspection and Maintenance, Extended Detention Basins

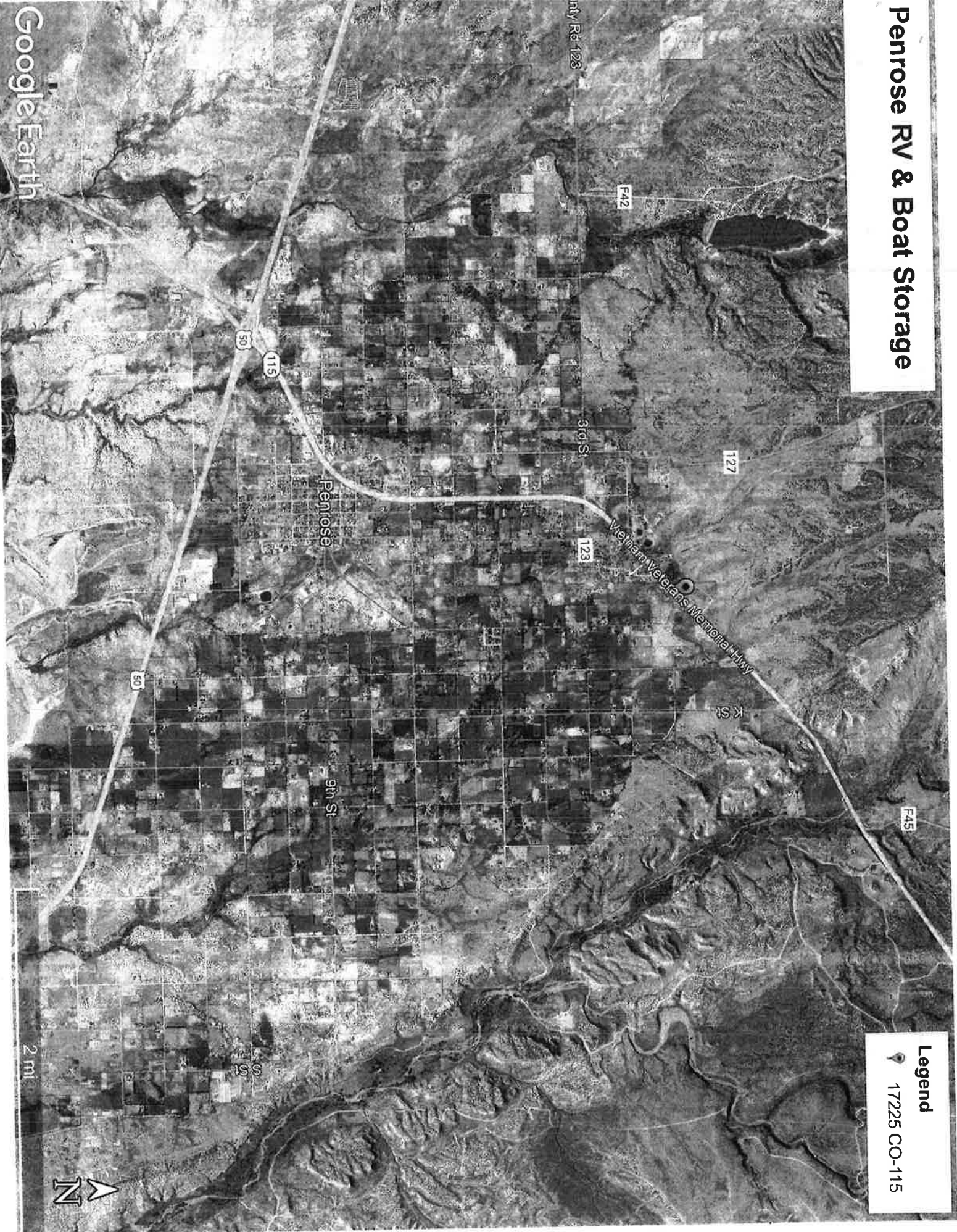
# **APPENDIX A**

## **Figures**

# Penrose RV & Boat Storage

## Legend

📍 17225 CO-115












































Hydrologic Soil Group—Fremont County Area, Colorado  
(177225 SH 115, Penrose, CO)



Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey

## MAP LEGEND

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

## 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: Fremont County Area, Colorado  
 Survey Area Date: Version 20, Sep 7, 2022

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

Date(s) aerial images were photographed: May 18, 2020—May 21, 2020

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



## Hydrologic Soil Group

| Map unit symbol             | Map unit name                           | Rating | Acres in AOI | Percent of AOI |
|-----------------------------|---|--------|--------------|----------------|
| 65                          | Manvel silt loam, 0 to 2 percent slopes | B      | 1.5          | 100.0%         |
| Totals for Area of Interest |   |        | 1.5          | 100.0%         |

### 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*



## Legend

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

**SPECIAL FLOOD HAZARD AREAS**

Without Base Flood Elevation (BFE)  
2022 A, B, C, D, E  
 With BFE or Depth from AE, AH, or VE AE  
 Regulatory Floodway

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. 2022 A, B, C, D, E

Future Conditions 1% Annual Chance Flood Hazard. 2022 A, B, C, D, E

Area with Reduced Flood Risk due to Levees. See Notes. 2022 A, B, C, D, E

Area with Flood Risk due to Levees 2022 A, B, C, D, E

**OTHER AREAS OF FLOOD HAZARD**

NO SCREEN

Area of Minimal Flood Hazard 2022 A, B, C, D, E

Effective LOMRs

**OTHER AREAS GENERAL STRUCTURES**

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

**2022**

Water Surface Elevation

Coastal Transact

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

**OTHER FEATURES**

Digital Data Available

No Digital Data Available

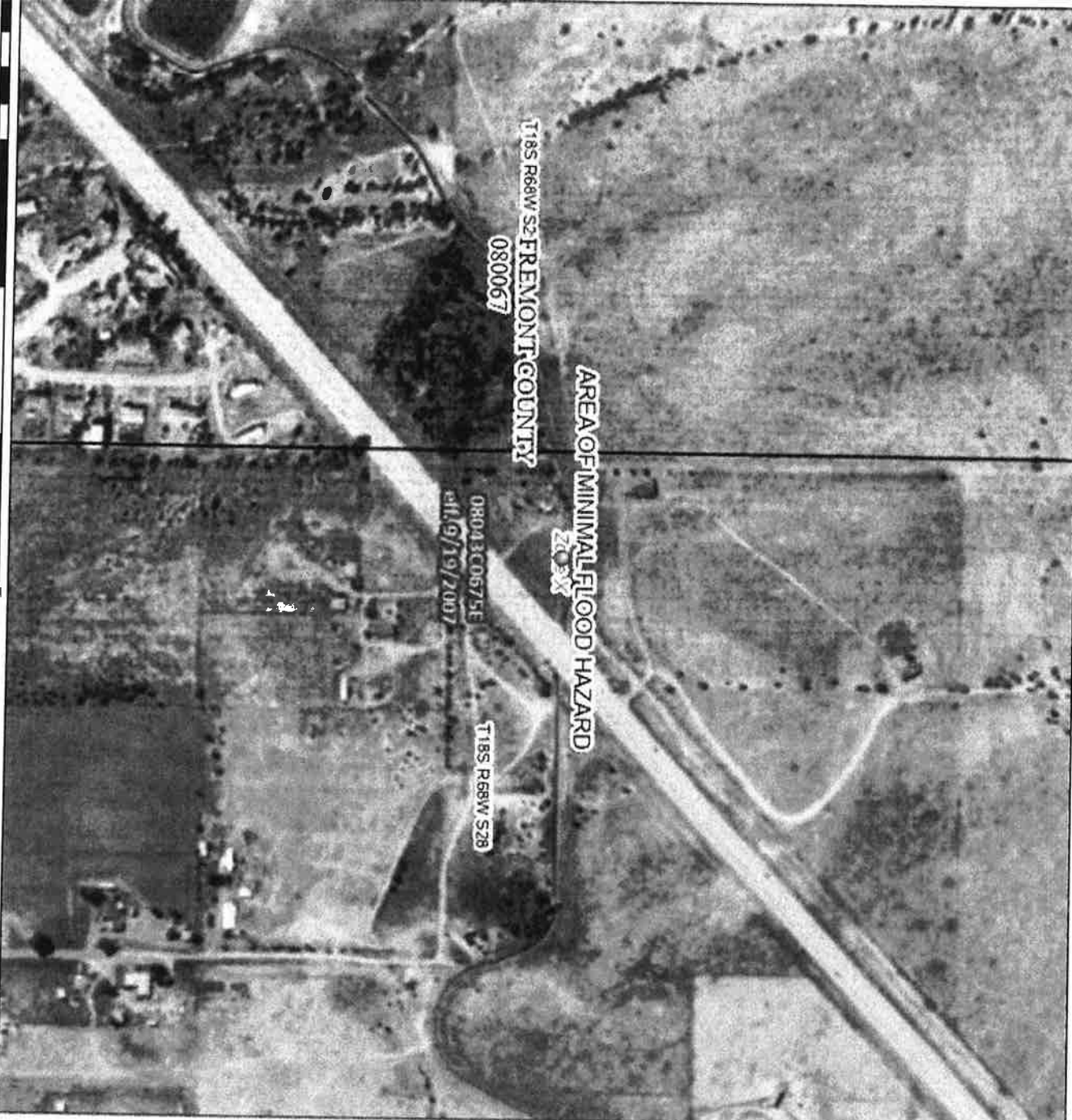
Unmapped

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. It is not used 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 2/12/2024 at 4:05 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.





**NOAA Atlas 14, Volume 8, Version 2**  
**Location name: Penrose, Colorado, USA\***  
**Latitude: 38.4543°, Longitude: -105.014°**  
**Elevation: 5514 ft\*\***  
 \* source: ESRI Maps  
 \*\* source: USGS



**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps & aeriels](#)

**PF tabular**

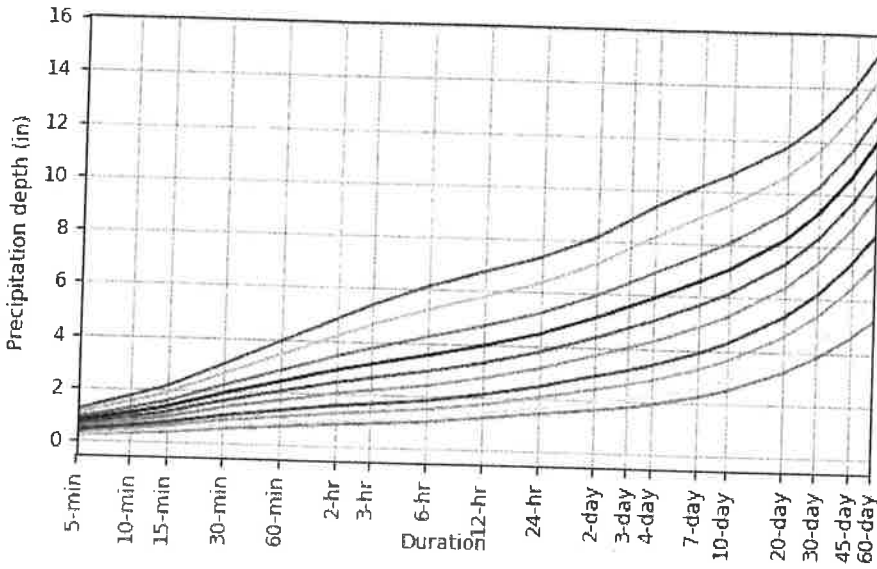
| <b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b> |                                     |                        |                        |                        |                        |                        |                       |                       |                      |                      |
|--|-------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------|-----------------------|----------------------|----------------------|
| Duration   | Average recurrence interval (years) |                        |                        |                        |                        |                        |                       |                       |                      |                      |
|  | 1                                   | 2                      | 5                      | 10                     | 25                     | 50                     | 100                   | 200                   | 500                  | 1000                 |
| 5-min  | 0.223<br>(0.172-0.288)              | 0.267<br>(0.206-0.346) | 0.349<br>(0.268-0.453) | 0.425<br>(0.325-0.555) | 0.543<br>(0.408-0.756) | 0.644<br>(0.471-0.908) | 0.754<br>(0.533-1.10) | 0.874<br>(0.593-1.31) | 1.05<br>(0.684-1.62) | 1.19<br>(0.753-1.86) |
| 10-min   | 0.326<br>(0.253-0.422)              | 0.391<br>(0.302-0.507) | 0.510<br>(0.393-0.663) | 0.622<br>(0.477-0.813) | 0.795<br>(0.598-1.11)  | 0.943<br>(0.689-1.33)  | 1.10<br>(0.780-1.60)  | 1.28<br>(0.869-1.92)  | 1.53<br>(1.00-2.38)  | 1.74<br>(1.10-2.72)  |
| 15-min   | 0.398<br>(0.308-0.515)              | 0.477<br>(0.369-0.618) | 0.623<br>(0.479-0.809) | 0.759<br>(0.581-0.992) | 0.969<br>(0.729-1.35)  | 1.15<br>(0.841-1.62)   | 1.35<br>(0.951-1.96)  | 1.56<br>(1.06-2.34)   | 1.87<br>(1.22-2.90)  | 2.12<br>(1.34-3.32)  |
| 30-min   | 0.565<br>(0.437-0.731)              | 0.676<br>(0.522-0.875) | 0.880<br>(0.678-1.14)  | 1.07<br>(0.821-1.40)   | 1.37<br>(1.03-1.91)    | 1.62<br>(1.19-2.29)    | 1.90<br>(1.34-2.76)   | 2.21<br>(1.50-3.32)   | 2.65<br>(1.73-4.10)  | 3.01<br>(1.90-4.70)  |
| 60-min   | 0.704<br>(0.545-0.911)              | 0.831<br>(0.642-1.08)  | 1.08<br>(0.829-1.40)   | 1.32<br>(1.01-1.72)    | 1.70<br>(1.28-2.38)    | 2.03<br>(1.49-2.88)    | 2.40<br>(1.70-3.51)   | 2.82<br>(1.92-4.25)   | 3.43<br>(2.24-5.33)  | 3.93<br>(2.49-6.14)  |
| 2-hr   | 0.844<br>(0.658-1.08)               | 0.986<br>(0.769-1.27)  | 1.27<br>(0.988-1.64)   | 1.56<br>(1.20-2.02)    | 2.02<br>(1.55-2.83)    | 2.44<br>(1.81-3.44)    | 2.91<br>(2.08-4.21)   | 3.43<br>(2.36-5.13)   | 4.20<br>(2.78-6.48)  | 4.85<br>(3.10-7.50)  |
| 3-hr   | 0.909<br>(0.713-1.16)               | 1.05<br>(0.822-1.34)   | 1.34<br>(1.05-1.72)    | 1.65<br>(1.28-2.12)    | 2.16<br>(1.67-3.01)    | 2.62<br>(1.96-3.69)    | 3.15<br>(2.27-4.55)   | 3.75<br>(2.60-5.58)   | 4.63<br>(3.09-7.10)  | 5.38<br>(3.46-8.26)  |
| 6-hr   | 1.04<br>(0.825-1.32)                | 1.19<br>(0.937-1.50)   | 1.50<br>(1.18-1.90)    | 1.83<br>(1.44-2.34)    | 2.41<br>(1.88-3.34)    | 2.94<br>(2.22-4.10)    | 3.54<br>(2.59-5.08)   | 4.24<br>(2.97-6.26)   | 5.28<br>(3.56-8.02)  | 6.15<br>(4.00-9.35)  |
| 12-hr  | 1.22<br>(0.975-1.53)                | 1.38<br>(1.10-1.73)    | 1.73<br>(1.38-2.17)    | 2.10<br>(1.66-2.65)    | 2.72<br>(2.14-3.73)    | 3.29<br>(2.51-4.54)    | 3.95<br>(2.91-5.59)   | 4.69<br>(3.32-6.85)   | 5.81<br>(3.95-8.72)  | 6.75<br>(4.43-10.1)  |
| 24-hr  | 1.42<br>(1.14-1.76)                 | 1.63<br>(1.31-2.02)    | 2.04<br>(1.64-2.54)    | 2.46<br>(1.96-3.08)    | 3.15<br>(2.49-4.23)    | 3.76<br>(2.88-5.10)    | 4.45<br>(3.30-6.20)   | 5.23<br>(3.73-7.51)   | 6.37<br>(4.38-9.43)  | 7.33<br>(4.86-10.9)  |
| 2-day  | 1.63<br>(1.32-2.00)                 | 1.90<br>(1.54-2.33)    | 2.41<br>(1.95-2.97)    | 2.91<br>(2.34-3.60)    | 3.69<br>(2.93-4.87)    | 4.37<br>(3.37-5.83)    | 5.12<br>(3.82-7.03)   | 5.95<br>(4.28-8.42)   | 7.16<br>(4.96-10.4)  | 8.16<br>(5.47-12.0)  |
| 3-day  | 1.77<br>(1.45-2.16)                 | 2.07<br>(1.69-2.52)    | 2.63<br>(2.14-3.22)    | 3.17<br>(2.56-3.90)    | 4.02<br>(3.21-5.27)    | 4.76<br>(3.70-6.31)    | 5.57<br>(4.19-7.60)   | 6.47<br>(4.68-9.10)   | 7.78<br>(5.42-11.3)  | 8.86<br>(5.98-12.9)  |
| 4-day  | 1.90<br>(1.55-2.30)                 | 2.21<br>(1.81-2.69)    | 2.81<br>(2.29-3.42)    | 3.38<br>(2.74-4.14)    | 4.28<br>(3.42-5.58)    | 5.05<br>(3.94-6.67)    | 5.91<br>(4.46-8.02)   | 6.86<br>(4.98-9.59)   | 8.23<br>(5.76-11.9)  | 9.36<br>(6.35-13.6)  |
| 7-day  | 2.22<br>(1.84-2.68)                 | 2.59<br>(2.13-3.12)    | 3.26<br>(2.68-3.94)    | 3.88<br>(3.17-4.72)    | 4.85<br>(3.90-6.25)    | 5.68<br>(4.45-7.41)    | 6.58<br>(5.00-8.83)   | 7.58<br>(5.54-10.5)   | 9.00<br>(6.35-12.8)  | 10.2<br>(6.96-14.6)  |
| 10-day   | 2.50<br>(2.07-2.99)                 | 2.90<br>(2.40-3.47)    | 3.62<br>(2.99-4.35)    | 4.28<br>(3.52-5.18)    | 5.29<br>(4.27-6.75)    | 6.14<br>(4.83-7.94)    | 7.06<br>(5.38-9.39)   | 8.06<br>(5.92-11.0)   | 9.48<br>(6.72-13.4)  | 10.6<br>(7.32-15.2)  |
| 20-day   | 3.22<br>(2.70-3.82)                 | 3.72<br>(3.11-4.41)    | 4.57<br>(3.81-5.44)    | 5.32<br>(4.41-6.37)    | 6.42<br>(5.20-8.03)    | 7.32<br>(5.79-9.29)    | 8.26<br>(6.34-10.8)   | 9.25<br>(6.85-12.5)   | 10.6<br>(7.60-14.8)  | 11.7<br>(8.17-16.6)  |
| 30-day   | 3.81<br>(3.21-4.49)                 | 4.39<br>(3.69-5.18)    | 5.37<br>(4.50-6.35)    | 6.20<br>(5.17-7.38)    | 7.38<br>(5.99-9.13)    | 8.32<br>(6.61-10.5)    | 9.28<br>(7.16-12.0)   | 10.3<br>(7.64-13.7)   | 11.6<br>(8.36-16.0)  | 12.7<br>(8.90-17.8)  |
| 45-day   | 4.57<br>(3.86-5.35)                 | 5.27<br>(4.46-6.18)    | 6.42<br>(5.41-7.55)    | 7.37<br>(6.18-8.71)    | 8.68<br>(7.08-10.6)    | 9.68<br>(7.72-12.0)    | 10.7<br>(8.27-13.7)   | 11.7<br>(8.73-15.4)   | 13.0<br>(9.40-17.8)  | 14.1<br>(9.91-19.5)  |
| 60-day   | 5.22<br>(4.43-6.09)                 | 6.04<br>(5.12-7.05)    | 7.36<br>(6.22-8.61)    | 8.42<br>(7.09-9.91)    | 9.85<br>(8.02-11.9)    | 10.9<br>(8.73-13.5)    | 12.0<br>(9.29-15.2)   | 13.0<br>(9.73-17.0)   | 14.3<br>(10.4-19.4)  | 15.3<br>(10.9-21.2)  |

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

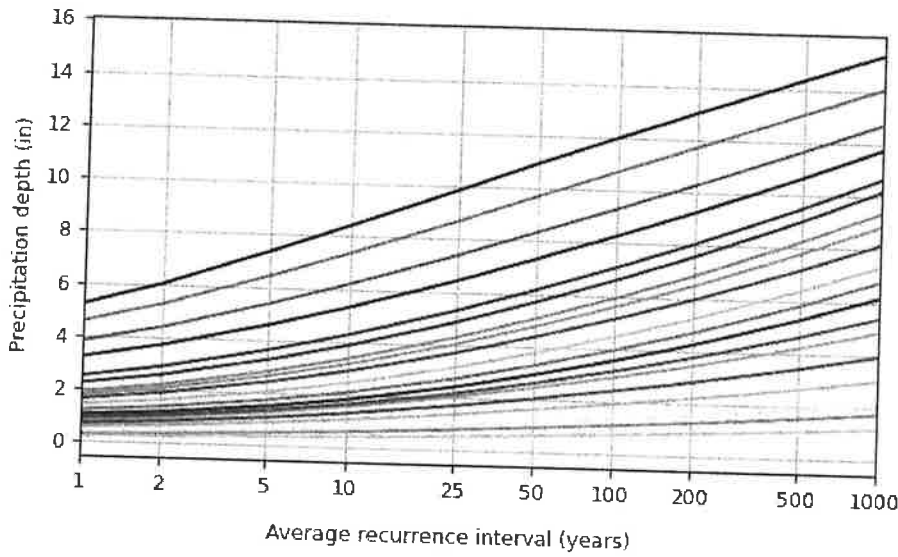
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**PF graphical**

PDS-based depth-duration-frequency (DDF) curves  
 Latitude: 38.4543°, Longitude: -105.0140°



| Average recurrence interval (years) |
|-------------------------------------|
| 1                                   |
| 2                                   |
| 5                                   |
| 10                                  |
| 25                                  |
| 50                                  |
| 100                                 |
| 200                                 |
| 500                                 |
| 1000                                |

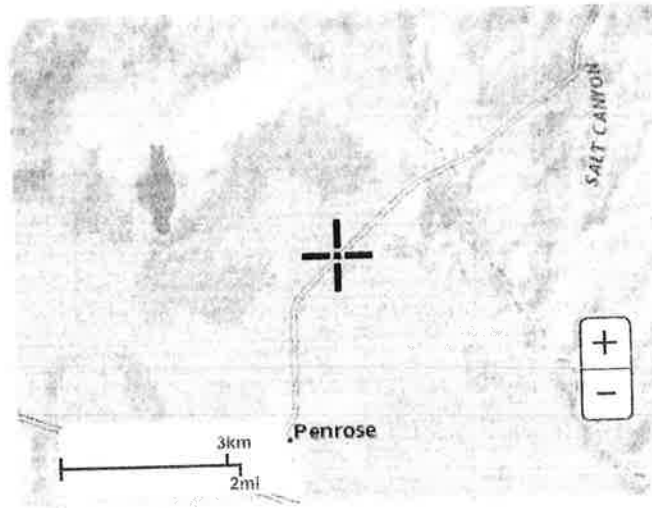


| Duration |
|----------|
| 5-min    |
| 10-min   |
| 15-min   |
| 30-min   |
| 60-min   |
| 2-hr     |
| 3-hr     |
| 6-hr     |
| 12-hr    |
| 24-hr    |
| 2-day    |
| 3-day    |
| 4-day    |
| 7-day    |
| 10-day   |
| 20-day   |
| 30-day   |
| 45-day   |
| 60-day   |

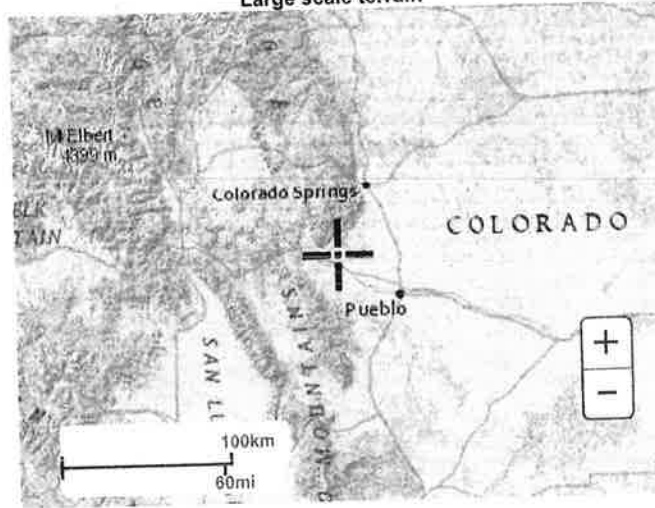
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**Maps & aerials**

**Small scale terrain**



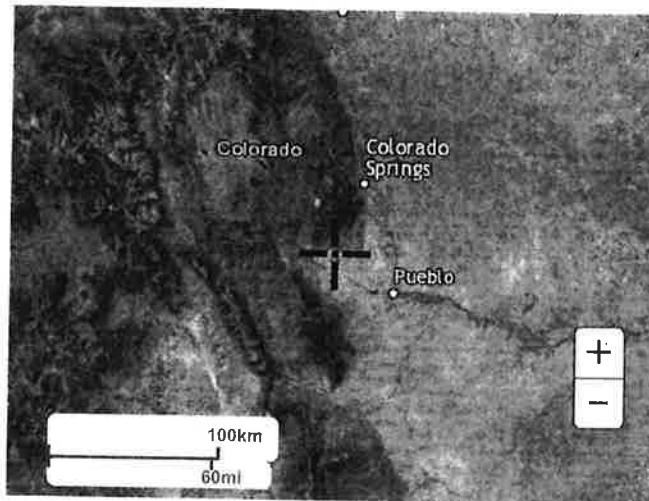
Large scale terrain



Large scale map



Large scale aerial



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[US Department of Commerce](#)  
[National Oceanic and Atmospheric Administration](#)  
[National Weather Service](#)  
[National Water Center](#)  
1325 East West Highway  
Silver Spring, MD 20910  
Questions?: [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

[Disclaimer](#)

# **APPENDIX B**

## **Hydrologic Computations**



Table 1  
**PENROSE RV & BOAT STORAGE**  
**DEVELOPED DRAINAGE**  
**WEIGHTED PERCENT IMPERVIOUSNESS AND RUNOFF COEFFICIENT "C"**

| Land Use       | ImperVIOUSNESS (%) |
|----------------|--------------------|
| Roof           | 90                 |
| Pavement       | 100                |
| Gravel         | 40                 |
| Landscape/Open | 2                  |
| Historic       | 2                  |

NRCS Hydrologic Soil Group **B**

| Sub-Basin I.D.        | TOTAL            |              | Area          |               |               |              |               |                    |                  |              |             |             | Weighted ImperVIOUSNESS (%) | Runoff Coefficient "C" |             |  |  |
|-----------------------|------------------|--------------|---------------|---------------|---------------|--------------|---------------|--------------------|------------------|--------------|-------------|-------------|-----------------------------|------------------------|-------------|--|--|
|                       | (sf)             | (ac)         | Roof          | Pavement      | Gravel        | LC/Open      | Historic      | ImperVIOUSNESS (%) | 2-Year           | 5-Year       | 10-Year     | 100-Year    |                             |                        |             |  |  |
| OS-1                  | 28,062           | 0.64         | 0.00          | 8,613         | 0.20          | 0            | 19,449        | 0.45               | 0                | 0.00         | 32.1        | 0.22        | 0.25                        | 0.32                   | 0.58        |  |  |
| OS-2                  | 24,563           | 0.56         | 0             | 11,205        | 0.26          | 759          | 12,598        | 0.29               | 0                | 0.00         | 47.9        | 0.35        | 0.38                        | 0.44                   | 0.65        |  |  |
| OS-3                  | 6,548            | 0.15         | 0             | 2,388         | 0.05          | 209          | 3,951         | 0.09               | 0                | 0.00         | 38.9        | 0.28        | 0.31                        | 0.37                   | 0.60        |  |  |
| OS-4                  | 1,713,691        | 39.34        | 0             | 0             | 0.00          | 0            | 0             | 0.00               | 1,713,691        | 39.34        | 2.0         | 0.01        | 0.01                        | 0.07                   | 0.44        |  |  |
| SO-1                  | 5,323            | 0.12         | 0             | 0             | 0.00          | 0            | 5,323         | 0.12               | 0                | 0.00         | 2.0         | 0.01        | 0.01                        | 0.07                   | 0.44        |  |  |
| SO-2                  | 679              | 0.02         | 0             | 0             | 0.00          | 618          | 0.01          | 61                 | 0.00             | 0            | 36.6        | 0.26        | 0.29                        | 0.35                   | 0.60        |  |  |
| SO-3                  | 3,117            | 0.03         | 0             | 0.00          | 0.00          | 45           | 0.00          | 1,020              | 0.02             | 0            | 8.1         | 0.05        | 0.05                        | 0.12                   | 0.46        |  |  |
| SO-4                  | 730              | 0.02         | 0             | 0             | 0.00          | 0            | 730           | 0.02               | 0                | 0.00         | 2.0         | 0.01        | 0.01                        | 0.07                   | 0.44        |  |  |
| <b>OFF-SITE TOTAL</b> | <b>1,780,713</b> | <b>40.88</b> | <b>0</b>      | <b>22,258</b> | <b>0.51</b>   | <b>1,632</b> | <b>43,133</b> | <b>0.99</b>        | <b>1,713,691</b> | <b>39.34</b> | <b>3.3</b>  | <b>0.02</b> | <b>0.02</b>                 | <b>0.08</b>            | <b>0.44</b> |  |  |
| S-1                   | 9,328            | 0.21         | 0             | 0             | 0.00          | 161          | 9,167         | 0.21               | 0                | 0.00         | 2.7         | 0.01        | 0.01                        | 0.08                   | 0.44        |  |  |
| S-2                   | 2,850            | 0.07         | 2,850         | 0.07          | 0             | 0            | 0             | 0.00               | 0                | 0.00         | 90.0        | 0.74        | 0.76                        | 0.78                   | 0.84        |  |  |
| S-3                   | 6,000            | 0.14         | 6,000         | 0.14          | 0             | 0            | 0             | 0.00               | 0                | 0.00         | 90.0        | 0.74        | 0.76                        | 0.78                   | 0.84        |  |  |
| S-4                   | 20,866           | 0.48         | 0             | 19,200        | 0.04          | 14,993       | 3,962         | 0.09               | 0                | 0.00         | 38.3        | 0.27        | 0.30                        | 0.36                   | 0.60        |  |  |
| S-5                   | 8,800            | 0.20         | 8,800         | 0.20          | 0             | 0            | 0             | 0.00               | 0                | 0.00         | 90.0        | 0.74        | 0.76                        | 0.78                   | 0.84        |  |  |
| PND                   | 3,491            | 0.08         | 0             | 0             | 0.00          | 196          | 3,294         | 0.08               | 0                | 0.00         | 4.1         | 0.02        | 0.02                        | 0.09                   | 0.45        |  |  |
| O-1                   | 2,754            | 0.06         | 0             | 0             | 0.00          | 0            | 2,754         | 0.06               | 0                | 0.00         | 2.0         | 0.01        | 0.01                        | 0.07                   | 0.44        |  |  |
| <b>POUD TOTAL</b>     | <b>54,089</b>    | <b>1.24</b>  | <b>17,659</b> | <b>0.41</b>   | <b>19,920</b> | <b>0.04</b>  | <b>15,350</b> | <b>0.35</b>        | <b>19,168</b>    | <b>0.44</b>  | <b>45.0</b> | <b>0.33</b> | <b>0.36</b>                 | <b>0.42</b>            | <b>0.64</b> |  |  |
| <b>Total</b>          | <b>1,834,802</b> | <b>42.12</b> | <b>17,659</b> | <b>0.41</b>   | <b>24,178</b> | <b>0.56</b>  | <b>16,982</b> | <b>0.39</b>        | <b>62,301</b>    | <b>1.43</b>  | <b>4.9</b>  | <b>0.02</b> | <b>0.02</b>                 | <b>0.09</b>            | <b>0.45</b> |  |  |

Runoff Coefficient "C" Values are from Table 6-5 in the USDCM.



Table 2  
**PENROSE RV & BOAT STORAGE**  
**DEVELOPED DRAINAGE**  
**DEVELOPED T<sub>c</sub>**

| Type of Land Surface                 | NRCS Conveyance Factor, K |
|--------------------------------------|---------------------------|
| Heavy meadow                         | 2.5                       |
| Tillage/Field                        | 5                         |
| Short pasture and lawns              | 7                         |
| Nearly bare ground                   | 10                        |
| Grassed waterway                     | 15                        |
| Paved areas and shallow paved swales | 20                        |

NRCS Hydrologic Soil Group B

| Sub-Basin I.D. | Total Area (ac) | Overland Sheet Flow |           |    | Shallow Concentrated Flow |           |    | Egn 6-3 T <sup>1</sup> (min) | Egn 6-4 T <sup>2</sup> (min) | Egn 6-2 T <sup>3</sup> (min) | Egn 6-5 T <sup>4</sup> (min) | Final T <sub>c</sub> (min) |
|----------------|-----------------|---------------------|-----------|----|---------------------------|-----------|----|------------------------------|------------------------------|------------------------------|------------------------------|----------------------------|
|                |                 | Length (ft)         | Slope (%) | K  | Length (ft)               | Slope (%) | K  |                              |                              |                              |                              |                            |
| OS-1           | 0.64            | 119                 | 5.9%      | 7  | 199                       | 3.0%      | 7  | 9.4                          | 2.7                          | 12.1                         | 22.0                         | 12.1                       |
| OS-2           | 0.56            | 137                 | 4.4%      | 7  | 162                       | 0.0%      | 7  | 9.3                          | 0.0                          | 9.3                          | 0.0                          | 5.0                        |
| OS-3           | 0.15            | 95                  | 4.2%      | 7  | 0                         | 0.0%      | 7  | 8.7                          | 0.0                          | 8.7                          | 0.0                          | 5.0                        |
| OS-4           | 39.34           | 150                 | 3.9%      | 10 | 2,500                     | 3.9%      | 10 | 15.4                         | 21.1                         | 36.5                         | 48.4                         | 36.5                       |
| SO-1           | 0.12            | 44                  | 2.7%      | 15 | 32                        | 0.0%      | 15 | 9.4                          | 0.0                          | 9.4                          | 0.0                          | 5.0                        |
| SO-2           | 0.02            | 46                  | 5.1%      | 20 | 0                         | 0.0%      | 20 | 5.8                          | 0.0                          | 5.8                          | 0.0                          | 5.0                        |
| SO-3           | 0.03            | 21                  | 11.1%     | 7  | 0                         | 0.0%      | 7  | 3.9                          | 0.0                          | 3.9                          | 0.0                          | 5.0                        |
| SO-4           | 0.02            | 20                  | 35.8%     | 7  | 0                         | 0.0%      | 7  | 2.7                          | 0.0                          | 2.7                          | 0.0                          | 5.0                        |
| S-1            | 0.21            | 37                  | 1.0%      | 15 | 318                       | 2.8%      | 15 | 11.8                         | 2.1                          | 13.9                         | 28.9                         | 13.9                       |
| S-2            | 0.07            | 40                  | 0.0%      | 20 | 0                         | 0.0%      | 20 | 14.1                         | 0.0                          | 14.1                         | 0.0                          | 5.0                        |
| S-3            | 0.14            | 50                  | 0.0%      | 20 | 0                         | 0.0%      | 20 | 15.8                         | 0.0                          | 15.8                         | 0.0                          | 5.0                        |
| S-4            | 0.48            | 64                  | 1.9%      | 20 | 343                       | 2.2%      | 20 | 9.3                          | 1.9                          | 11.2                         | 22.2                         | 11.2                       |
| S-5            | 0.20            | 50                  | 0.0%      | 20 | 0                         | 0.0%      | 20 | 16.0                         | 0.0                          | 16.0                         | 0.0                          | 5.0                        |
| PND            | 0.08            | 34                  | 12.3%     | 15 | 48                        | 1.8%      | 15 | 5.0                          | 0.4                          | 5.4                          | 25.9                         | 5.4                        |
| O-1            | 0.06            | 86                  | 5.0%      | 7  | 0                         | 0.0%      | 7  | 10.7                         | 0.0                          | 10.7                         | 0.0                          | 5.0                        |

<sup>1</sup>T<sub>c</sub> = 0.395\*(1-C<sub>s</sub>)<sup>1/5</sup>S<sub>c</sub><sup>0.33</sup> (Eq. 6-3)

<sup>2</sup>T<sub>c</sub> = L/(60\*K\*(S<sub>o</sub><sup>0.50</sup>)) (Eq. 6-4)

<sup>3</sup>T<sub>c</sub> = T<sub>1</sub> + T<sub>2</sub> (Eq. 6-2)

<sup>4</sup>T<sub>c</sub> = (26-7i)+(L/(60\*(1.4i+9)(S<sub>o</sub><sup>0.50</sup>))) (Eq. 6-5)



**Table 3**  
**PENROSE RV & BOAT STORAGE**  
**DEVELOPED DRAINAGE**  
**DEVELOPED PEAK FLOWS**

|                             |        |        |         |          |
|-----------------------------|--------|--------|---------|----------|
| <sup>1</sup> P <sub>1</sub> | 2-year | 5-year | 10-year | 100-year |
|                             | 0.83   | 1.08   | 1.32    | 2.40     |

NRCS Hydrologic Soil Group      B

| Sub-Basin ID          | Total Area (ac) | Final T <sub>c</sub> (min) | Weighted Imper. (%) | Runoff Coefficient "C" |             |             | Rainfall Intensity "I" |                  |                  |                   |                    | Runoff       |              |               |                |  |
|-----------------------|-----------------|----------------------------|---------------------|------------------------|-------------|-------------|------------------------|------------------|------------------|-------------------|--------------------|--------------|--------------|---------------|----------------|--|
|                       |                 |                            |                     | 2-Year                 | 5-Year      | 10-Year     | 100-Year               | 2-Year (in/hour) | 5-Year (in/hour) | 10-Year (in/hour) | 100-Year (in/hour) | 2-Year (cfs) | 5-Year (cfs) | 10-Year (cfs) | 100-Year (cfs) |  |
| OS-1                  | 0.64            | 12.1                       | 32.1                | 0.22                   | 0.25        | 0.32        | 0.58                   | 2.08             | 2.70             | 3.30              | 6.00               | 0.29         | 0.43         | 0.67          | 2.23           |  |
| OS-2                  | 0.56            | 5.0                        | 47.9                | 0.35                   | 0.38        | 0.44        | 0.65                   | 2.82             | 3.66             | 4.48              | 8.14               | 0.56         | 0.78         | 1.11          | 2.98           |  |
| OS-3                  | 0.15            | 5.0                        | 38.9                | 0.28                   | 0.31        | 0.37        | 0.60                   | 2.82             | 3.66             | 4.48              | 8.14               | 0.12         | 0.17         | 0.25          | 0.74           |  |
| OS-4                  | 39.34           | 36.5                       | 2.0                 | 0.01                   | 0.01        | 0.07        | 0.44                   | 1.16             | 1.51             | 1.94              | 3.35               | 0.46         | 0.59         | 5.07          | 57.93          |  |
| SO-1                  | 0.12            | 5.0                        | 2.0                 | 0.01                   | 0.01        | 0.07        | 0.44                   | 2.82             | 3.66             | 4.48              | 8.14               | 0.00         | 0.00         | 0.04          | 0.44           |  |
| SO-2                  | 0.02            | 5.0                        | 36.6                | 0.26                   | 0.29        | 0.35        | 0.60                   | 2.82             | 3.66             | 4.48              | 8.14               | 0.01         | 0.02         | 0.02          | 0.08           |  |
| SO-3                  | 0.03            | 5.0                        | 8.1                 | 0.05                   | 0.05        | 0.12        | 0.46                   | 2.82             | 3.66             | 4.48              | 8.14               | 0.00         | 0.01         | 0.01          | 0.10           |  |
| SO-4                  | 0.02            | 5.0                        | 2.0                 | 0.01                   | 0.01        | 0.07        | 0.44                   | 2.82             | 3.66             | 4.48              | 8.14               | 0.00         | 0.00         | 0.01          | 0.06           |  |
| <b>OFF-SITE TOTAL</b> | <b>40.86</b>    | -                          | <b>3.3</b>          | <b>0.02</b>            | <b>0.02</b> | <b>0.08</b> | <b>0.44</b>            | -                | -                | -                 | -                  | <b>1.44</b>  | <b>2.00</b>  | <b>7.18</b>   | <b>64.55</b>   |  |
| S-1                   | 0.21            | 13.9                       | 2.7                 | 0.01                   | 0.01        | 0.08        | 0.44                   | 1.95             | 2.54             | 3.10              | 5.64               | 0.01         | 0.01         | 0.05          | 0.53           |  |
| S-2                   | 0.07            | 5.0                        | 90.0                | 0.74                   | 0.76        | 0.78        | 0.84                   | 2.82             | 3.66             | 4.48              | 8.14               | 0.14         | 0.18         | 0.23          | 0.45           |  |
| S-3                   | 0.14            | 5.0                        | 90.0                | 0.74                   | 0.76        | 0.78        | 0.84                   | 2.82             | 3.66             | 4.48              | 8.14               | 0.29         | 0.38         | 0.48          | 0.94           |  |
| S-4                   | 0.48            | 11.2                       | 38.3                | 0.27                   | 0.30        | 0.36        | 0.60                   | 2.15             | 2.79             | 3.41              | 6.20               | 0.28         | 0.40         | 0.59          | 1.79           |  |
| S-5                   | 0.20            | 5.0                        | 90.0                | 0.74                   | 0.76        | 0.78        | 0.84                   | 2.82             | 3.66             | 4.48              | 8.14               | 0.42         | 0.56         | 0.70          | 1.38           |  |
| PND                   | 0.08            | 5.4                        | 4.1                 | 0.02                   | 0.02        | 0.09        | 0.45                   | 2.76             | 3.59             | 4.39              | 7.98               | 0.01         | 0.01         | 0.03          | 0.29           |  |
| O-1                   | 0.06            | 5.0                        | 2.0                 | 0.01                   | 0.01        | 0.07        | 0.44                   | 2.82             | 3.66             | 4.48              | 8.14               | 0.00         | 0.00         | 0.02          | 0.23           |  |
| <b>POND TOTAL</b>     | <b>1.24</b>     | -                          | <b>45.0</b>         | <b>0.33</b>            | <b>0.36</b> | <b>0.42</b> | <b>0.64</b>            | -                | -                | -                 | -                  | <b>1.13</b>  | <b>1.54</b>  | <b>2.11</b>   | <b>5.60</b>    |  |
| <b>Total</b>          | <b>42.12</b>    | -                          | <b>4.5</b>          | <b>0.02</b>            | <b>0.02</b> | <b>0.09</b> | <b>0.45</b>            | -                | -                | -                 | -                  | <b>2.57</b>  | <b>3.54</b>  | <b>9.29</b>   | <b>70.15</b>   |  |

<sup>1</sup>P<sub>1</sub> for the 2-year, 5-year, 10-year and 100-year storms were taken from NOAA Atlas 14 (Vol. 8, Ver. 2) Point Precipitation Frequency Estimates Table 6-5 (USDCA) along with the weighted imperviousness for each basin was used to find the composite "C" runoff coefficient.  
<sup>2</sup> Taken from Final Report OR 1 = (28.5<sup>1</sup>P<sub>1</sub>)/(10<sup>1</sup>J)<sup>0.785</sup> (Eq. 5-3)  
<sup>3</sup> Q<sub>c</sub> = CIA

Table 4  
 PENROSE RV & BOAT STORAGE  
 EXISTING DRAINAGE  
 WEIGHTED PERCENT IMPERVIOUSNESS AND RUNOFF COEFFICIENT "C"

| Land Use       | ImperVIOUSNESS (%) |
|----------------|--------------------|
| Roof           | 90                 |
| Pavement       | 100                |
| Gravel         | 40                 |
| Landscape/Open | 2                  |
| Historic       | 2                  |

NRCS Hydrologic Soil Group B

| Sub-Basin I.D. | TOTAL            |              | Roof         |             | Pavement      |             | Gravel       |             | LCOpen   |             | Historic         |              | Weighted ImperVIOUSNESS (%) | Runoff Coefficient "C" |             |             |             |
|----------------|------------------|--------------|--------------|-------------|---------------|-------------|--------------|-------------|----------|-------------|------------------|--------------|-----------------------------|------------------------|-------------|-------------|-------------|
|                | (af)             | (ac)         | (af)         | (ac)        | (sf)          | (ac)        | (sf)         | (ac)        | (af)     | (ac)        | (sf)             | (ac)         |                             | 2-Year                 | 5-Year      | 10-Year     | 100-Year    |
| H-1            | 5,406            | 0.12         | 0            | 0.00        | 0             | 0.00        | 0            | 0.00        | 0        | 0.00        | 5,406            | 0.12         | 2.0                         | 0.01                   | 0.01        | 0.07        | 0.44        |
| H-2            | 44,867           | 1.03         | 1,233        | 0.03        | 0             | 0.00        | 4,666        | 0.11        | 0        | 0.00        | 38,988           | 0.89         | 8.4                         | 0.05                   | 0.05        | 0.12        | 0.46        |
| H-3            | 8,910            | 0.20         | 0            | 0.00        | 0             | 0.00        | 0            | 0.00        | 0        | 0.00        | 8,910            | 0.20         | 2.0                         | 0.01                   | 0.01        | 0.07        | 0.44        |
| HOS-1          | 22,929           | 0.53         | 0            | 0.00        | 7,550         | 0.17        | 159          | 0.00        | 0        | 0.00        | 15,220           | 0.35         | 34.5                        | 0.24                   | 0.27        | 0.34        | 0.59        |
| HOS-2          | 29,069           | 0.67         | 0            | 0.00        | 104,697       | 2.24        | 660,57       | 0.02        | 0        | 0.00        | 17,918           | 0.41         | 38.2                        | 0.27                   | 0.30        | 0.36        | 0.60        |
| HOS-3          | 7,163            | 0.16         | 0            | 0.00        | 2,388         | 0.05        | 209          | 0.00        | 0        | 0.00        | 4,565            | 0.11         | 35.7                        | 0.25                   | 0.28        | 0.34        | 0.59        |
| HOS-4          | 1,713,691        | 39.34        | 0            | 0.00        | 0             | 0.00        | 0            | 0.00        | 0        | 0.00        | 1,713,691        | 39.34        | 2.0                         | 0.01                   | 0.01        | 0.07        | 0.44        |
| HO-1           | 2,748            | 0.06         | 0            | 0.00        | 0             | 0.00        | 0            | 0.00        | 0        | 0.00        | 2,748            | 0.06         | 2.0                         | 0.01                   | 0.01        | 0.07        | 0.44        |
| <b>Total</b>   | <b>1,834,801</b> | <b>42.12</b> | <b>1,233</b> | <b>0.03</b> | <b>20,418</b> | <b>0.47</b> | <b>5,715</b> | <b>0.13</b> | <b>0</b> | <b>0.00</b> | <b>1,897,446</b> | <b>41.49</b> | <b>3.3</b>                  | <b>0.02</b>            | <b>0.02</b> | <b>0.08</b> | <b>0.44</b> |

Runoff Coefficient "C" Values are from Table 6-5 in the USDCM.



Table 5  
**PENROSE RV & BOAT STORAGE**  
**EXISTING DRAINAGE**  
**EXISTING T<sub>c</sub>**

| Type of Land Surface                 | NRCS Conveyance Factor K |
|--------------------------------------|--------------------------|
| Heavy meadow                         | 2.5                      |
| Tillage/Field                        | 5                        |
| Short pasture and lawns              | 7                        |
| Nearly bare ground                   | 10                       |
| Grassed waterway                     | 15                       |
| Paved areas and shallow paved swales | 20                       |

NRCS Hydrologic Soil Group B

| Sub-Basin I.D. | Total Area (ac) | Overland Sheet Flow |           |    | Shallow Concentrated Flow |           |    | Imp (%) | C <sub>s</sub> | Eqn 6-3 T <sub>1</sub> <sup>1</sup> (min) | Eqn 6-4 T <sub>1</sub> <sup>2</sup> (min) | Eqn 6-2 T <sub>c</sub> <sup>3</sup> (min) | Eqn 6-5 T <sub>c</sub> <sup>4</sup> (min) | Final T <sub>c</sub> (min) |
|----------------|-----------------|---------------------|-----------|----|---------------------------|-----------|----|---------|----------------|---|---|---|---|----------------------------|
|                |                 | Length (ft)         | Slope (%) | K  | Length (ft)               | Slope (%) | K  |         |                |   |   |   |   |                            |
| H-1            | 0.12            | 258                 | 3.5%      | 7  | 0                         | 0.0%      | 7  | 2.0     | 0.01           | 20.9                                      | 0.0                                       | 20.9                                      | 0.0                                       | 5.0                        |
| H-2            | 1.03            | 221                 | 2.9%      | 7  | 0                         | 0.0%      | 7  | 8.4     | 0.05           | 19.7                                      | 0.0                                       | 19.7                                      | 0.0                                       | 5.0                        |
| H-3            | 0.20            | 89                  | 4.1%      | 7  | 0                         | 0.0%      | 7  | 2.0     | 0.01           | 11.6                                      | 0.0                                       | 11.6                                      | 0.0                                       | 5.0                        |
| HOS-1          | 0.53            | 121                 | 5.8%      | 7  | 145.42                    | 0.03      | 7  | 34.53   | 0.27           | 9.3                                       | 2.0                                       | 11.3                                      | 21.1                                      | 11.3                       |
| HOS-2          | 0.67            | 81                  | 7.0%      | 7  | 230                       | 2.4%      | 7  | 38.2    | 0.30           | 6.9                                       | 3.5                                       | 10.4                                      | 21.2                                      | 10.4                       |
| HOS-3          | 0.16            | 108                 | 4.3%      | 7  | 0                         | 0.0%      | 7  | 35.7    | 0.28           | 9.5                                       | 0.0                                       | 9.5                                       | 0.0                                       | 5.0                        |
| HOS-4          | 39.34           | 150                 | 3.9%      | 10 | 2,500                     | 3.9%      | 10 | 2.0     | 0.01           | 15.4                                      | 21.1                                      | 36.5                                      | 48.4                                      | 36.5                       |
| HO-1           | 0.06            | 76                  | 4.8%      | 7  | 0                         | 0.0%      | 7  | 2.0     | 0.01           | 10.2                                      | 0.0                                       | 10.2                                      | 0.0                                       | 5.0                        |

<sup>1</sup>T<sub>1</sub> = 0.395\*(1.1-C<sub>s</sub>)\*L<sup>0.5</sup>/S<sup>0.33</sup> (Eq. 6-3)

<sup>2</sup>T<sub>1</sub> = L/(60\*K\*(S<sub>0</sub><sup>0.50</sup>)) (Eq. 6-4)

<sup>3</sup>T<sub>c</sub> = T<sub>1</sub> + T<sub>1</sub> (Eq. 6-2)

<sup>4</sup>T<sub>c</sub> = (26-17)\*(L/(60\*(14+9)\*(S<sub>0</sub><sup>0.5</sup>))) (Eq. 6-5)



**Table 6**  
**PENROSE RV & BOAT STORAGE**  
**EXISTING DRAINAGE**  
**EXISTING PEAK FLOWS**

|                             | 2-year | 5-year | 10-year | 100-year |
|-----------------------------|--------|--------|---------|----------|
| <sup>1</sup> P <sub>1</sub> | 0.83   | 1.08   | 1.32    | 2.40     |

NRCS Hydrologic Soil Group B

| Sub-Basin LD. | Total Area (ac) | Final T <sub>c</sub> (min) | Weighted Imper. (%) | Runoff Coefficient "C" |             |             |             | Rainfall Intensity "I" |                  |                   |                    | Runoff       |              |               |                |
|---------------|-----------------|----------------------------|---------------------|------------------------|-------------|-------------|-------------|------------------------|------------------|-------------------|--------------------|--------------|--------------|---------------|----------------|
|               |                 |                            |                     | 2-Year                 | 5-Year      | 10-Year     | 100-Year    | 2-Year (in/hour)       | 5-Year (in/hour) | 10-Year (in/hour) | 100-Year (in/hour) | 2-Year (cfs) | 5-Year (cfs) | 10-Year (cfs) | 100-Year (cfs) |
| H-1           | 0.12            | 5.0                        | 2.0                 | 0.01                   | 0.01        | 0.07        | 0.44        | 2.82                   | 3.66             | 4.48              | 8.14               | 0.00         | 0.00         | 0.04          | 0.44           |
| H-2           | 1.03            | 5.0                        | 8.4                 | 0.05                   | 0.05        | 0.12        | 0.46        | 2.82                   | 3.66             | 4.48              | 8.14               | 0.14         | 0.20         | 0.57          | 3.87           |
| H-3           | 0.20            | 5.0                        | 2.0                 | 0.01                   | 0.01        | 0.07        | 0.44        | 2.82                   | 3.66             | 4.48              | 8.14               | 0.01         | 0.01         | 0.06          | 0.73           |
| HOS-1         | 0.53            | 11.3                       | 34.5                | 0.24                   | 0.27        | 0.34        | 0.59        | 2.14                   | 2.78             | 3.40              | 6.19               | 0.27         | 0.39         | 0.60          | 1.91           |
| HOS-2         | 0.67            | 10.4                       | 38.2                | 0.27                   | 0.30        | 0.36        | 0.60        | 2.21                   | 2.88             | 3.52              | 6.39               | 0.40         | 0.58         | 0.85          | 2.57           |
| HOS-3         | 0.16            | 5.0                        | 35.7                | 0.25                   | 0.28        | 0.34        | 0.59        | 2.82                   | 3.66             | 4.48              | 8.14               | 0.11         | 0.17         | 0.25          | 0.79           |
| HOS-4         | 39.34           | 36.5                       | 2.0                 | 0.01                   | 0.01        | 0.07        | 0.44        | 1.16                   | 1.51             | 1.84              | 3.35               | 0.46         | 0.59         | 5.07          | 57.93          |
| HO-1          | 0.06            | 5.0                        | 2.0                 | 0.01                   | 0.01        | 0.07        | 0.44        | 2.82                   | 3.66             | 4.48              | 8.14               | 0.00         | 0.00         | 0.02          | 0.23           |
| <b>Total</b>  | <b>42.12</b>    |                            | <b>3.3</b>          | <b>0.02</b>            | <b>0.02</b> | <b>0.08</b> | <b>0.44</b> |                        |                  |                   |                    | <b>1.39</b>  | <b>1.94</b>  | <b>7.47</b>   | <b>68.48</b>   |

<sup>1</sup>P<sub>1</sub> for the 2-year, 5-year, 10-year and 100-year storms were taken from NOAA Atlas 14 (Vol. 8, Ver. 2) Point Precipitation Frequency Estimates  
<sup>2</sup>Table 6-5 (USDCM) along with the weighted imperviousness for each basin was used to find the composite "C" runoff coefficient.  
<sup>3</sup> Taken from Final Report OR 1 = (28.5<sup>T<sub>c</sub></sup>)/(10+T<sub>c</sub>)<sup>0.786</sup> (Eq. 5-3)  
<sup>4</sup> Q = CIA



**Table 7  
PENROSE RV & BOAT STORAGE  
SITE  
RUNOFF COMPARISON**

| Point of Discharge | Runoff Existing (CFS) |        |        |         |          | Runoff Proposed (CFS) |        |        |         |          | Total Site Discharge Proposed (CFS) |        |         |          | Δ In Discharge from Discharge Point Proposed LESS Existing (CFS) |        |         |          |
|--------------------|-----------------------|--------|--------|---------|----------|-----------------------|--------|--------|---------|----------|-------------------------------------|--------|---------|----------|--|--------|---------|----------|
|                    | Basin                 | 2-Year | 5-Year | 10-Year | 100-Year | Basin                 | 2-Year | 5-Year | 10-Year | 100-Year | 2-Year                              | 5-Year | 10-Year | 100-Year | 2-Year   | 5-Year | 10-Year | 100-Year |
| Detention Pond     | H-1                   | 0.00   | 0.00   | 0.04    | 0.44     | S-1                   | 0.01   | 0.01   | 0.05    | 0.53     | 0.012                               | 0.013  | 0.260   | 2.16     | -0.14  | -0.21  | -0.43   | -3.12    |
|                    | H-2                   | 0.14   | 0.20   | 0.57    | 3.87     | S-2                   | 0.14   | 0.18   | 0.23    | 0.45     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         |          | S-3                   | 0.29   | 0.38   | 0.48    | 0.94     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         |          | S-4                   | 0.28   | 0.40   | 0.59    | 1.79     |                                     |        |         |          |  |        |         |          |
|                    | H-2                   | 0.01   | 0.01   | 0.06    | 0.73     | S-5                   | 0.42   | 0.56   | 0.70    | 1.38     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         |          | PND                   | 0.01   | 0.01   | 0.03    | 0.29     |                                     |        |         |          |  |        |         |          |
|                    | H-1                   | 0.00   | 0.00   | 0.02    | 0.23     | O-1                   | 0.00   | 0.00   | 0.02    | 0.23     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         |          | Total                 | 1.43   | 1.54   | 2.11    | 5.60     |                                     |        |         |          |  |        |         |          |
|                    | Total                 | 0.15   | 0.22   | 0.69    | 5.28     | OS-1                  | 0.29   | 0.43   | 0.67    | 2.23     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         |          | OS-2                  | 0.56   | 0.78   | 1.11    | 2.98     |                                     |        |         |          |  |        |         |          |
| Direct Off-Site    | HOS-1                 | 0.27   | 0.39   | 0.60    | 1.91     | OS-3                  | 0.12   | 0.17   | 0.25    | 0.74     | 1.44                                | 2.00   | 7.18    | 64.55    | 0.20   | 0.28   | 0.40    | 1.35     |
|                    | HOS-2                 | 0.40   | 0.58   | 0.85    | 2.57     | OS-4                  | 0.46   | 0.59   | 0.74    | 2.98     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         |          | SO-1                  | 0.00   | 0.00   | 0.04    | 0.44     |                                     |        |         |          |  |        |         |          |
|                    | HOS-3                 | 0.11   | 0.17   | 0.25    | 0.79     | SO-2                  | 0.01   | 0.02   | 0.02    | 0.08     |                                     |        |         |          |  |        |         |          |
|                    |                       |        |        |         |          | SO-3                  | 0.00   | 0.01   | 0.01    | 0.10     |                                     |        |         |          |  |        |         |          |
|                    | HOS-4                 | 0.46   | 0.59   | 5.07    | 57.93    | SO-4                  | 0.00   | 0.00   | 0.01    | 0.06     |                                     |        |         |          |  |        |         |          |
|                    | Total                 | 1.23   | 1.72   | 6.78    | 63.20    | Total                 | 1.44   | 2.00   | 7.18    | 64.55    |                                     |        |         |          |  |        |         |          |
|                    | Overall Site Total    | 1.39   | 1.94   | 7.47    | 68.48    | Total                 | 2.57   | 3.54   | 9.29    | 70.15    |                                     |        |         |          |  |        |         |          |



# **APPENDIX C**

## **Hydraulic Computations**



# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Remrose RV & Boat Storage**  
 Basin ID: **PND**



**Watershed Information**

|   |                |
|---|----------------|
| Selected BMP Type =                     | <b>EDB</b>     |
| Watershed Area =                        | 1.24 acres     |
| Watershed Length =                      | 450 ft         |
| Watershed Length to Centroid =          | 240 ft         |
| Watershed Slope =                       | 0.020 ft/ft    |
| Watershed Imperviousness =              | 45.00% percent |
| Percentage Hydrologic Soil Group A =    | 0.0% percent   |
| Percentage Hydrologic Soil Group B =    | 100.0% percent |
| Percentage Hydrologic Soil Groups C/D = | 0.0% percent   |
| Target WQCV Drain Time =                | 40.0 hours     |

Location for 1-hr Rainfall Depths = User Input  
 After providing required inputs above including 1-hour rainfall depths, click Run CLHP to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

|  |                 |
|--|-----------------|
| Water Quality Capture Volume (WQCV) =  | 0.020 acre-feet |
| Excess Urban Runoff Volume (EURV) =    | 0.059 acre-feet |
| 2-yr Runoff Volume (P1 = 0.83 in.) =   | 0.033 acre-feet |
| 5-yr Runoff Volume (P1 = 1.08 in.) =   | 0.046 acre-feet |
| 10-yr Runoff Volume (P1 = 1.32 in.) =  | 0.064 acre-feet |
| 25-yr Runoff Volume (P1 = 1.7 in.) =   | 0.106 acre-feet |
| 50-yr Runoff Volume (P1 = 2.03 in.) =  | 0.138 acre-feet |
| 100-yr Runoff Volume (P1 = 2.4 in.) =  | 0.180 acre-feet |
| 500-yr Runoff Volume (P1 = 3.43 in.) = | 0.287 acre-feet |
| Approximate 2-yr Detention Volume =    | 0.031 acre-feet |
| Approximate 5-yr Detention Volume =    | 0.044 acre-feet |
| Approximate 10-yr Detention Volume =   | 0.062 acre-feet |
| Approximate 25-yr Detention Volume =   | 0.077 acre-feet |
| Approximate 50-yr Detention Volume =   | 0.096 acre-feet |
| Approximate 100-yr Detention Volume =  | 0.102 acre-feet |

| Optional User Overrides |      |
|-------------------------|------|
| acre-feet               |      |
| acre-feet               |      |
| inches                  | 0.83 |
| inches                  | 1.08 |
| inches                  | 1.32 |
| inches                  | 1.70 |
| inches                  | 2.03 |
| inches                  | 2.40 |
| inches                  | 3.43 |

**Define Zones and Basin Geometry**

|   |                 |
|---|-----------------|
| Zone 1 Volume (WQCV) =                    | 0.020 acre-feet |
| Zone 2 Volume (100-year - Zone 1) =       | 0.083 acre-feet |
| Select Zone 3 Storage Volume (Optional) = | acre-feet       |
| Total Detention Basin Volume =            | 0.102 acre-feet |

| Depth Increment = | ft   | Stage (ft) | Optional Override Stage (ft) | Length (ft) | Width (ft) | Area (ft <sup>2</sup> ) | Optional Override Area (ft <sup>2</sup> ) | Area (acre) | Volume (ft <sup>3</sup> ) | Volume (ac-ft) |
|-------------------|------|------------|------------------------------|-------------|------------|-------------------------|---|-------------|---------------------------|----------------|
| Top of Micropond  |      |            | 0.00                         |             |            |                         | 0   | 0.000       |                           |                |
| 5503.5            | 0.50 |            |                              |             |            |                         | 353                                       | 0.008       | 88                        | 0.002          |
| 5504              | 1.00 |            | 1.00                         |             |            |                         | 1,384                                     | 0.032       | 522                       | 0.012          |
| 5504.5            | 1.50 |            | 1.50                         |             |            |                         | 2,026                                     | 0.047       | 1,375                     | 0.032          |
| 5505              | 2.00 |            | 2.00                         |             |            |                         | 2,454                                     | 0.056       | 2,495                     | 0.057          |
| 5505.5            | 2.50 |            | 2.50                         |             |            |                         | 3,013                                     | 0.069       | 3,862                     | 0.089          |
| 5506              | 3.00 |            | 3.00                         |             |            |                         | 3,776                                     | 0.087       | 5,559                     | 0.128          |



# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.06 (July 2022)*

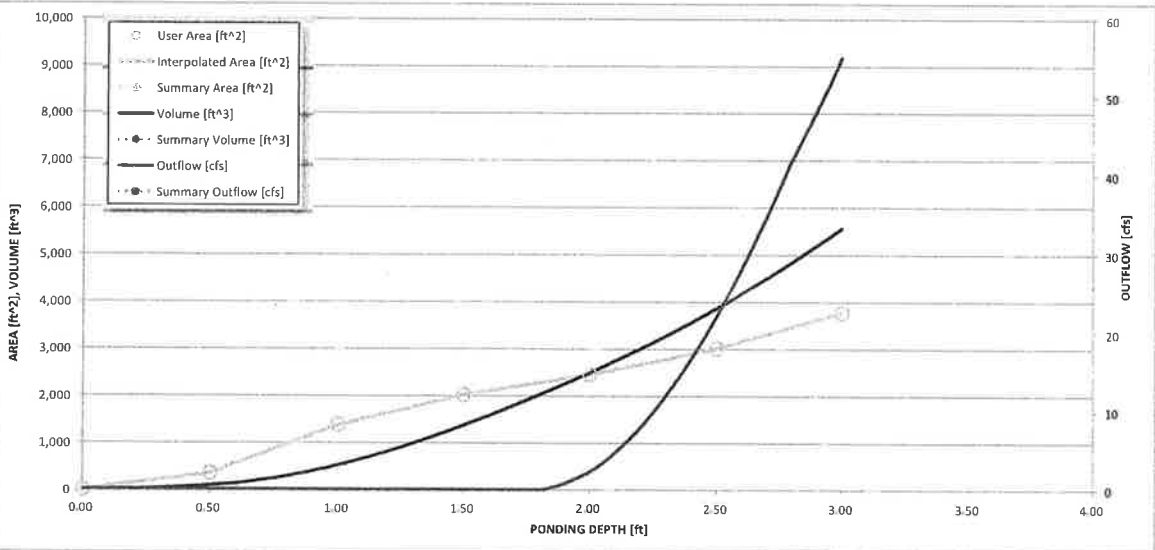
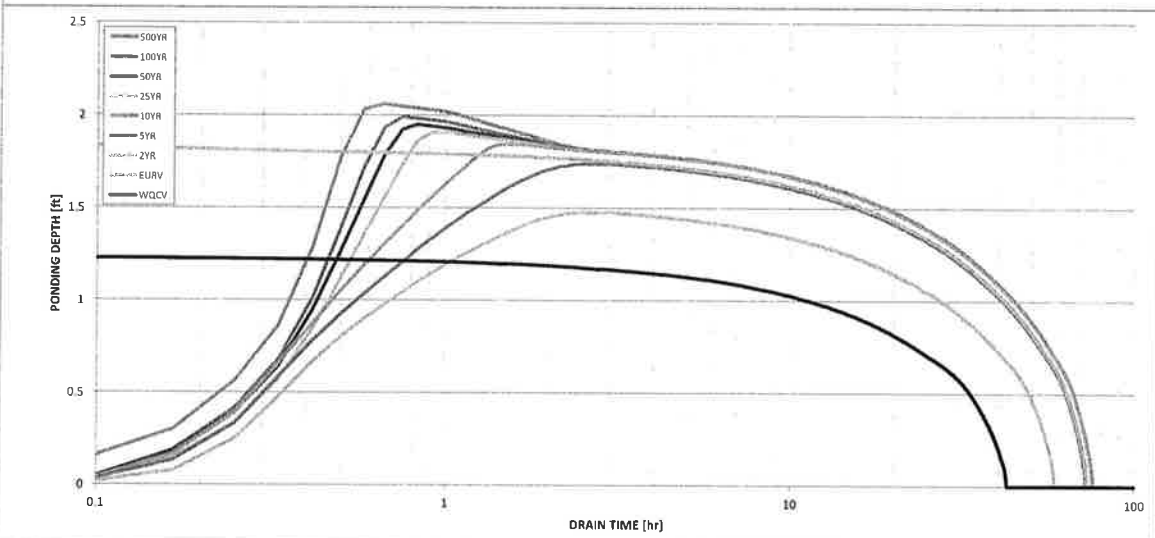
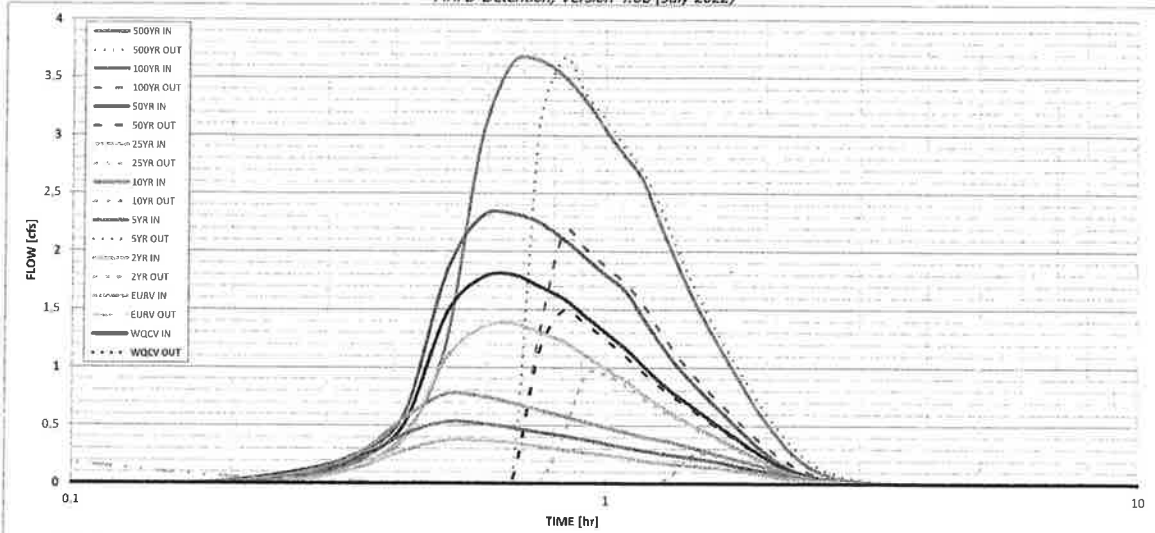
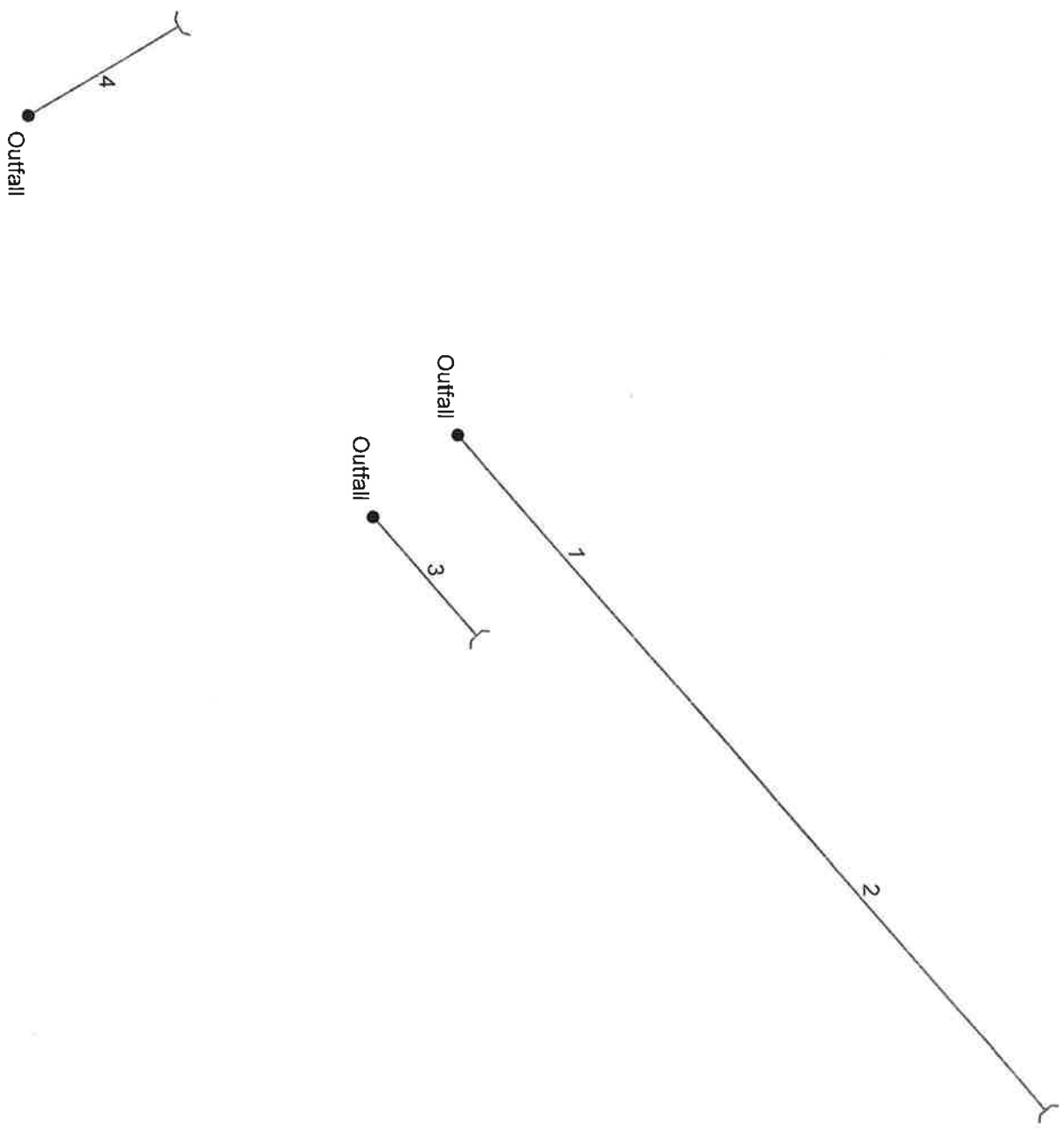




Table 8  
**PENROSE RV & BOAT STORAGE**  
**DETENTION POND**  
**STAGE - STORAGE TABLE**

| Stage<br>(ft) | Elevation<br>(ft) | D Elevation<br>(ft) | Area<br>(SF) | Incremental Est. Volume<br>(CF) | Est. Available Volume |         | Note                    |
|---------------|-------------------|---------------------|--------------|---------------------------------|-----------------------|---------|-------------------------|
|               |                   |                     |              |                                 | (CF)                  | (ac-ft) |                         |
| 0             | 5503.00           | 0.00                | 0            | 0                               | 0                     | 0.000   | Outlet Structure Invert |
| 0.50          | 5503.50           | 0.50                | 353          | 88                              | 88                    | 0.002   | -                       |
| 1.00          | 5504.00           | 0.50                | 1,384        | 434                             | 522                   | 0.012   | -                       |
| 1.23          | 5504.23           | 0.23                |              |                                 |                       |         | WQCV WSEL               |
| 1.50          | 5504.50           | 0.50                | 2,026        | 852                             | 1,375                 | 0.032   | -                       |
| 1.99          | 5504.99           | 0.49                |              |                                 |                       |         | 100-yr WSEL             |
| 2.00          | 5505.00           | 0.50                | 2,454        | 1,120                           | 2,495                 | 0.057   | Spillway Invert         |
| 2.50          | 5505.50           | 0.50                | 3,013        | 1,367                           | 3,862                 | 0.089   | -                       |
| 3.00          | 5506.00           | 0.50                | 3,776        | 1,697                           | 5,559                 | 0.128   | Top of Berm             |

# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 355.001.02\_Penrose\_100-year.sim

Number of lines: 4

Date: 5/15/2024

# Storm Sewer Summary Report

| Line No. | Line ID     | Flow rate (cfs) | Line Size (in) | Line shape | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line Slope (%) | HGL Down (ft) | HGL Up (ft) | Minor loss (ft) | HGL Junct (ft) | Dns Line No. | Junction Type |
|----------|-------------|-----------------|----------------|------------|------------------|-------------------|-------------------|----------------|---------------|-------------|-----------------|----------------|--------------|---------------|
| 1        | Pipe - (33) | 1.38            | 8              | Cir        | 89.603           | 5505.50           | 5506.13           | 0.703          | 5506.05*      | 5507.11*    | 0.04            | 5507.14        | End          | Manhole       |
| 2        | Pipe - (32) | 1.38            | 8              | Cir        | 153.000          | 5506.13           | 5509.15           | 1.974          | 5507.14       | 5509.70     | n/a             | 5509.70        | 1            | OpenHeadwall  |
| 3        | Pipe - (39) | 2.67            | 18             | Cir        | 36.000           | 5503.31           | 5504.10           | 2.195          | 5503.93       | 5504.72     | n/a             | 5504.72        | End          | OpenHeadwall  |
| 4        | Pipe - (38) | 2.16            | 12             | Cir        | 47.452           | 5502.76           | 5503.00           | 0.506          | 5503.39       | 5503.75     | 0.18            | 5503.93        | End          | OpenHeadwall  |

Project File: 355.001.02\_Pemrose\_100-year.stm

Number of lines: 4

Run Date: 10/2/2024

NOTES: Return period = 100 Yrs. ; \*Surcharged (HGL above crown) ; j - Line contains hyd. jump.

# Storm Sewer Tabulation

| Station | Len | Drng Area |       | Rnoff<br>coeff | Area x C |       | Tc             |               | Rain<br>(l) | Total<br>flow | Cap<br>full | Vel  | Pipe         |              | Invert Elev |            | HGL Elev   |            | Grnd / Rim Elev |            | Line ID     |
|---------|-----|-----------|-------|----------------|----------|-------|----------------|---------------|-------------|---------------|-------------|------|--------------|--------------|-------------|------------|------------|------------|-----------------|------------|-------------|
|         |     | Incr      | Total |                | Incr     | Total | Inlet<br>(min) | Syst<br>(min) |             |               |             |      | Size<br>(in) | Slope<br>(%) | Dn<br>(ft)  | Up<br>(ft) | Dn<br>(ft) | Up<br>(ft) | Dn<br>(ft)      | Up<br>(ft) |             |
| 1       | End | 89.603    | 0.00  | 0.00           | 0.00     | 0.00  | 0.0            | 0.6           | 0.0         | 1.38          | 1.10        | 4.21 | 8            | 0.70         | 5505.50     | 5506.13    | 5506.05    | 5507.11    | 0.00            | 5508.62    | Pipe - (33) |
| 2       | 1   | 153.000   | 0.00  | 0.00           | 0.00     | 0.00  | 0.0            | 0.0           | 0.0         | 1.38          | 1.84        | 4.21 | 8            | 1.97         | 5506.13     | 5509.15    | 5507.14    | 5509.70    | 5508.62         | 5511.63    | Pipe - (32) |
| 3       | End | 36.000    | 0.00  | 0.00           | 0.00     | 0.00  | 0.0            | 0.0           | 0.0         | 2.67          | 15.56       | 3.88 | 18           | 2.19         | 5503.31     | 5504.10    | 5503.93    | 5504.72    | 5505.14         | 5506.33    | Pipe - (39) |
| 4       | End | 47.452    | 0.00  | 0.00           | 0.00     | 0.00  | 0.0            | 0.0           | 0.0         | 2.16          | 2.53        | 3.80 | 12           | 0.51         | 5502.76     | 5503.00    | 5503.39    | 5503.75    | 0.00            | 5504.88    | Pipe - (38) |

Project File: 355.001\_02\_Pemrose\_100-year.stm

Number of lines: 4

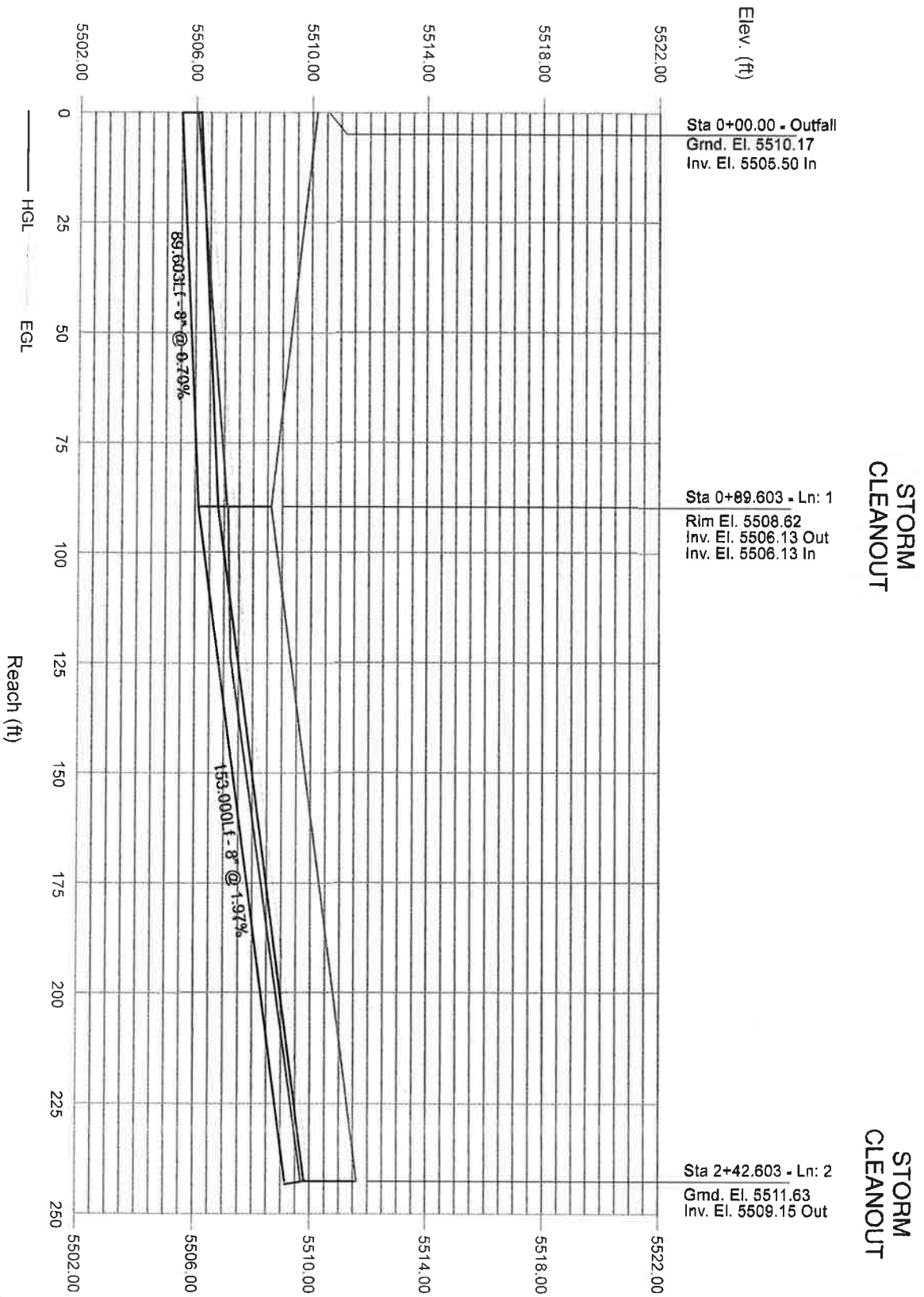
Run Date: 10/2/2024

NOTES: intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = Yrs. 100 ; c = cir e = ellip b = box



# Storm Sewer Profile

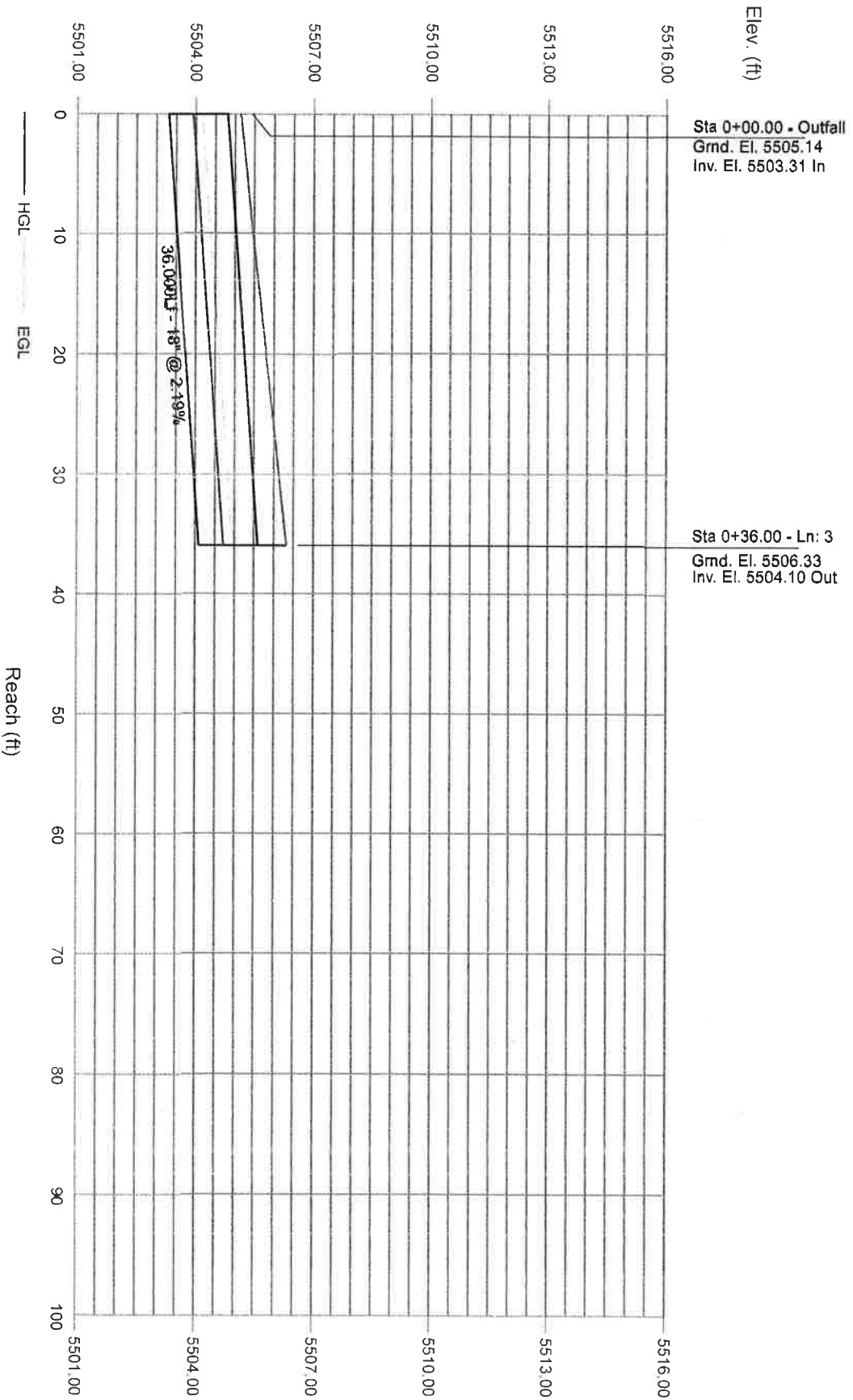
Proj. file: 355.001.02\_Penrose\_100-year.stm



# Storm Sewer Profile

Proj. file: 355.001.02\_Pemrose\_100-year.stm

## 18" FLARED END SECTION



# Storm Sewer Profile

Proj. file: 355.001.02\_Penrose\_100-year.stm

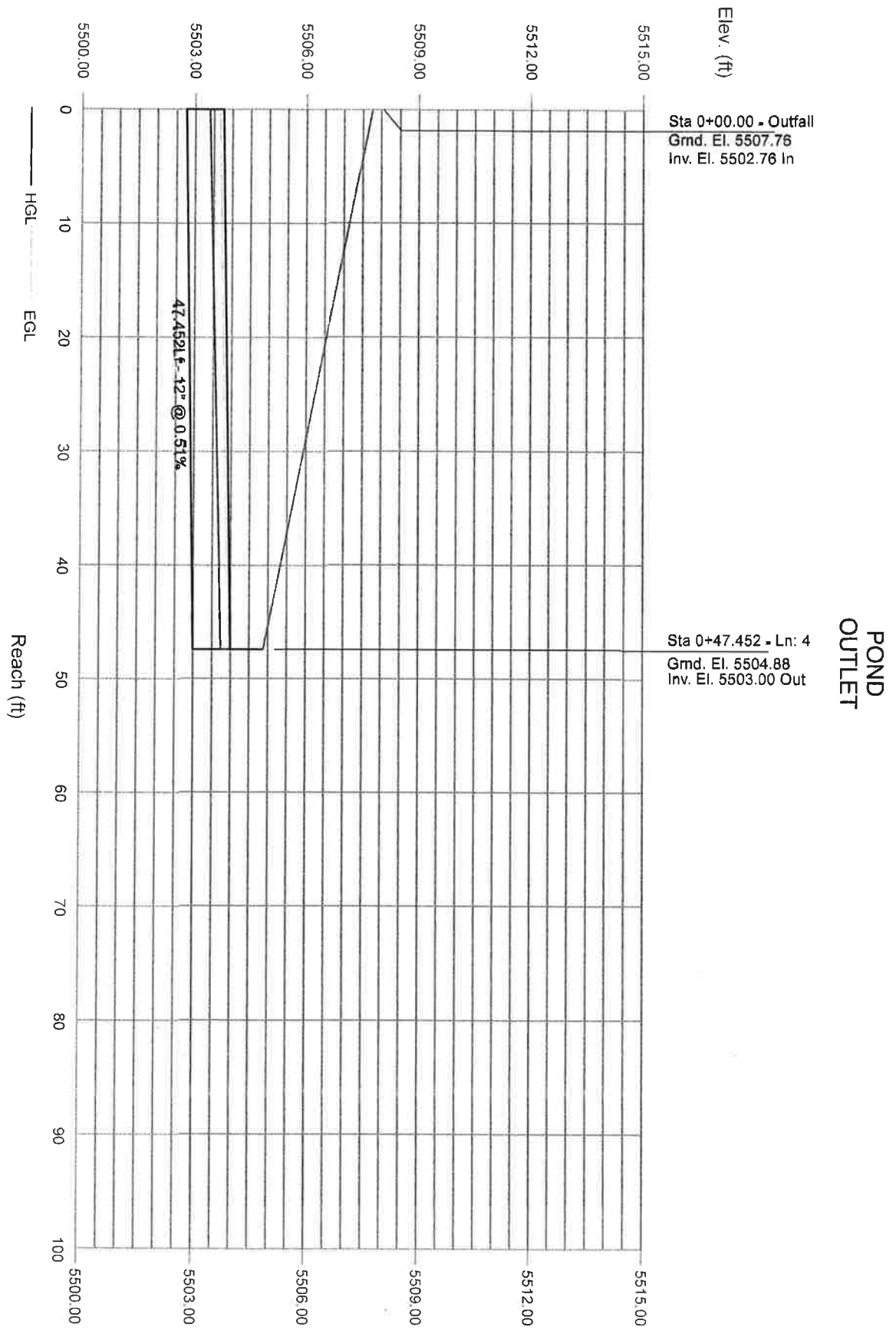


Table 9  
Detention Pond  
SPILLWAY & RIPRAP SIZING

| Parameter                         | Description                    | Value |
|-----------------------------------|--------------------------------|-------|
| <sup>1</sup> C <sub>BOW</sub>     | broad-crested weir coefficient | 3.10  |
| Z (ft)                            | side slopes (horiz:vert)       | 4.00  |
| L (ft)                            | broad-crested weir length      | 5.00  |
| H (ft)                            | head above weir crest          | 0.23  |
| S (%)                             | longitudinal slope             | 10.80 |
| <sup>2</sup> Q <sub>H</sub> (cfs) | horizontal discharge           | 5.35  |
| <sup>3</sup> Q <sub>S</sub> (cfs) | sloping discharge              | 0.25  |
| Q (cfs)                           | total discharge                | 5.60  |
| q (cfs/ft)                        | unit discharge                 | 1.12  |
| <sup>1</sup> d <sub>50</sub> (in) | riprap mean particle size      | 6.00  |

<sup>1</sup>C<sub>BOW</sub> ranges 2.6-3.0; 3.0 is typical (USDCEM 5.14.2)

<sup>2</sup>Q<sub>H</sub>=C<sub>BOW</sub>LH<sup>1.5</sup> (Eq. 12.8 USDCEM)

<sup>3</sup>Q<sub>S</sub>=2(2/5)C<sub>BOW</sub>ZH<sup>2.5</sup> (Eq. 12.9 USDCEM)

<sup>1</sup>d<sub>50</sub> (Fig. 12-21 USDCEM)

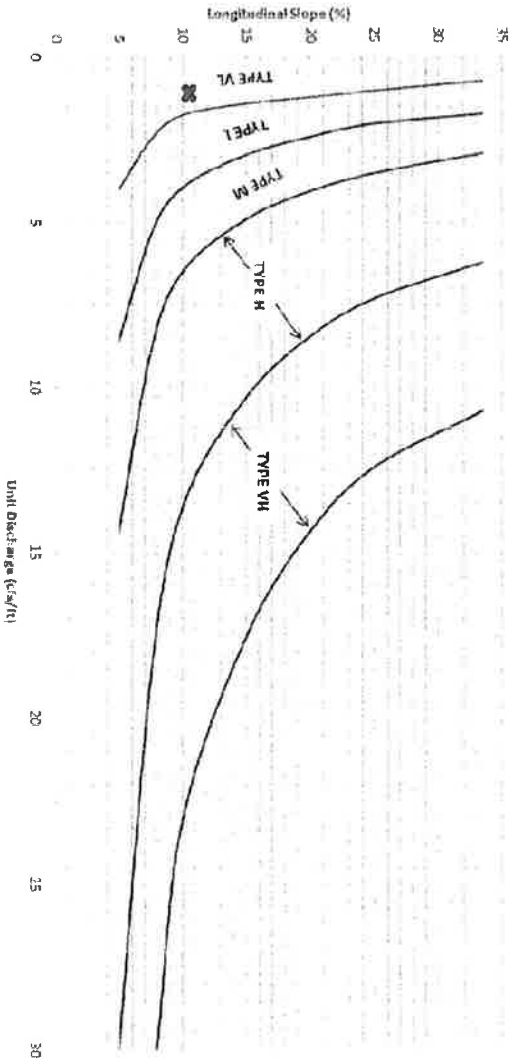


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

# Channel Report

## Drive Aisle between buildings

### User-defined

Invert Elev (ft) = 5511.50  
 Slope (%) = 1.80  
 N-Value = 0.025

### Calculations

Compute by: Known Q  
 Known Q (cfs) = 18.00

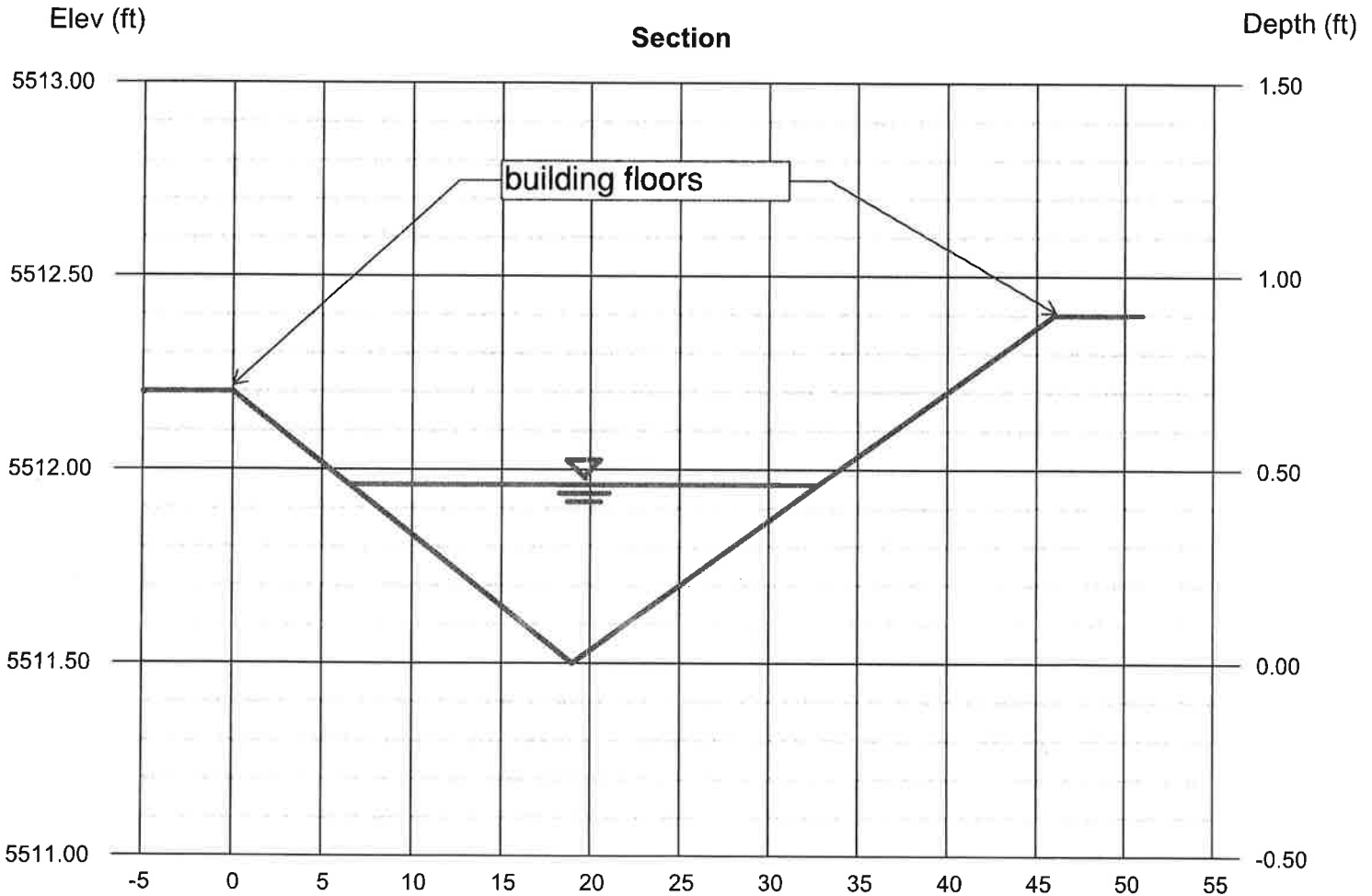
### (Sta, El, n)-(Sta, El, n)...

(0.00, 5512.20)-(19.00, 5511.50, 0.025)-(46.00, 5512.40, 0.025)

### Highlighted

Depth (ft) = 0.46  
 Q (cfs) = 18.00  
 Area (sqft) = 6.04  
 Velocity (ft/s) = 2.98  
 Wetted Perim (ft) = 26.30  
 Crit Depth, Yc (ft) = 0.48  
 Top Width (ft) = 26.28  
 EGL (ft) = 0.60

apportioned flow from HOS-4 based on property frontage x 0.8 cfs



# Channel Report

## Swale West of Building

### User-defined

Invert Elev (ft) = 5509.45  
 Slope (%) = 3.50  
 N-Value = 0.040

### Calculations

Compute by: Known Q  
 Known Q (cfs) = 25.00

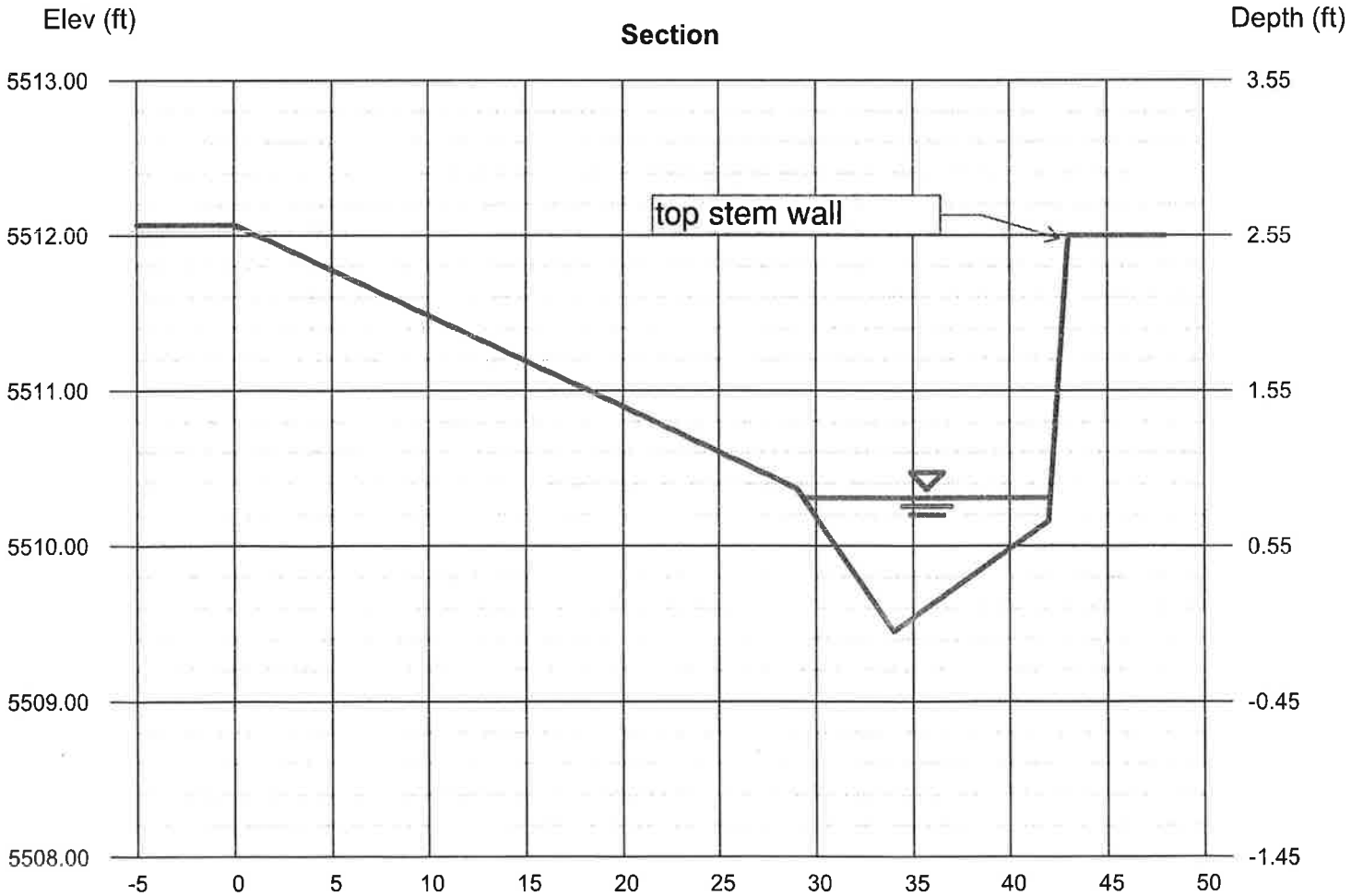
### Highlighted

Depth (ft) = 0.86  
 Q (cfs) = 25.00  
 Area (sqft) = 6.05  
 Velocity (ft/s) = 4.13  
 Wetted Perim (ft) = 12.95  
 Crit Depth, Yc (ft) = 0.88  
 Top Width (ft) = 12.76  
 EGL (ft) = 1.13

(Sta, El, n)-(Sta, El, n)...

(0.00, 5512.07)-(29.00, 5510.37, 0.040)-(34.00, 5509.45, 0.040)-(42.00, 5510.16, 0.040)-(43.00, 5512.00, 0.040)

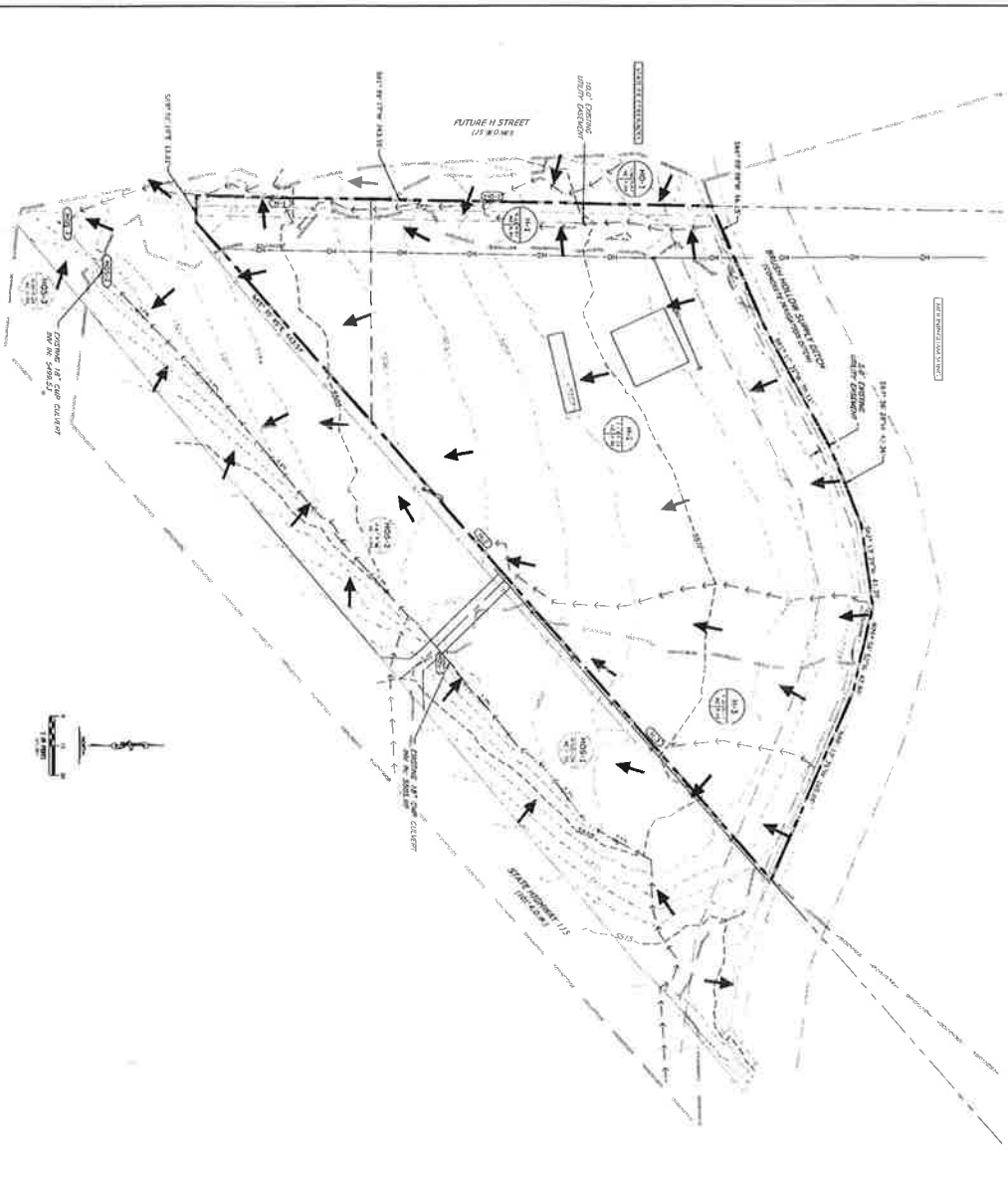
apportioned flow from HOS-4 based on property frontage x 0.8 cfs



# **APPENDIX D**

## **Drawings**

# COMMERCIAL DEVELOPMENT PLAN FOR PENROSE RV & BOAT STORAGE COMMERCIAL RECREATIONAL VEHICLE AND BOAT STORAGE FACILITY



**LEGAL DESCRIPTION:**  
 A PART OF LAND LOCATED WITHIN A PORTION OF THE NE 1/4 OF SECTION 28, TOWNSHIP 18 NORTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTY OF FREMONT, STATE OF COLORADO, BY REFERENCE TO THE DEVELOPMENT AGREEMENT BETWEEN THE COUNTY OF FLEMING AND THE STATE OF COLORADO, FILED FOR RECORD ON JANUARY 23, 1999 IN BOOK 1330 PAGE 331 AS RECORDED NO. 146211 IN THE RECORDS OF THE PUBLIC COUNTY CLERK AND RECORDED COUNTY OF FLEMING, STATE OF COLORADO.

**LEGEND**

*EXISTING*

- PROPERTY LINE
- MAJOR CONTOUR
- MINOR CONTOUR
- EASEMENT
- FENCE/GUARDRAIL
- SMALL CONTOUR
- STORM SEWER
- SLOPE & FLOW DIRECTION
- DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN FLOW PATH
- DRAINAGE BASIN DESIGN POINT
- DRAINAGE BASIN IDENTIFICATION
- DRAINAGE COEFFICIENTS (1.0 - 0.6, 1.00 - 0.10)
- DRAINAGE BASIN AREA (ACRES)

**RAINFALL STATISTICS TABLE**

| Sub Basin ID | Design Year | Annual Precipitation |        | Annual Evaporation |        | Annual Runoff |       | Annual Drainage |       |
|--------------|-------------|----------------------|--------|--------------------|--------|---------------|-------|-----------------|-------|
|              |             | AMT.                 | INCHES | INCHES             | INCHES | ACRES         | ACRES | ACRES           | ACRES |
| 1-1          | 15          | 15.1                 | 15.1   | 12.1               | 12.1   | 3.0           | 3.0   | 10.0            | 10.0  |
| 1-2          | 15          | 15.1                 | 15.1   | 12.1               | 12.1   | 3.0           | 3.0   | 10.0            | 10.0  |
| 1-3          | 15          | 15.1                 | 15.1   | 12.1               | 12.1   | 3.0           | 3.0   | 10.0            | 10.0  |
| 1-4          | 15          | 15.1                 | 15.1   | 12.1               | 12.1   | 3.0           | 3.0   | 10.0            | 10.0  |
| 1-5          | 15          | 15.1                 | 15.1   | 12.1               | 12.1   | 3.0           | 3.0   | 10.0            | 10.0  |
| 1-6          | 15          | 15.1                 | 15.1   | 12.1               | 12.1   | 3.0           | 3.0   | 10.0            | 10.0  |
| 1-7          | 15          | 15.1                 | 15.1   | 12.1               | 12.1   | 3.0           | 3.0   | 10.0            | 10.0  |
| 1-8          | 15          | 15.1                 | 15.1   | 12.1               | 12.1   | 3.0           | 3.0   | 10.0            | 10.0  |
| 1-9          | 15          | 15.1                 | 15.1   | 12.1               | 12.1   | 3.0           | 3.0   | 10.0            | 10.0  |
| 1-10         | 15          | 15.1                 | 15.1   | 12.1               | 12.1   | 3.0           | 3.0   | 10.0            | 10.0  |

TABLE 1-1: DRAINAGE BASIN DATA (DESIGN YEAR 15) (DESIGN COEFFICIENTS 1.0 - 0.6, 1.00 - 0.10)



CIVIL RENOVATIONS  
 8300 COLGARDEN RD.  
 FARMSTONE, CO 80525  
 303.833.1466  
 WWW.CIVILRENOVATIONS.COM

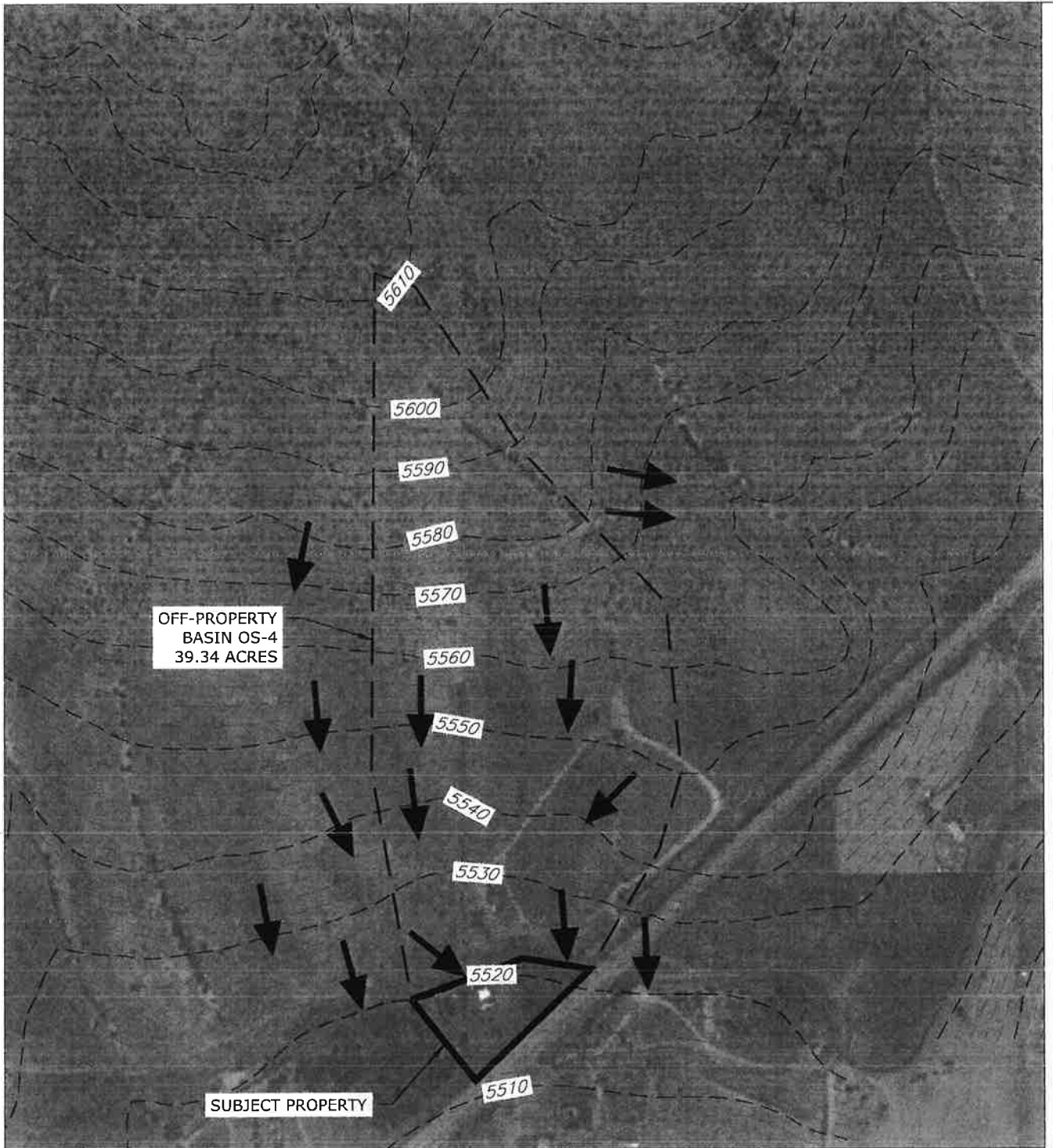
**RESURFACING CONSTRUCTION**  
 450 INDEPENDENCE  
 WINDSOR, CO 80525  
 719.330.2071

LOT 2 COYLE-VANEGMOND LOT LINE  
 ADJUSTMENT  
 PENROSE, FREMONT COUNTY, CO

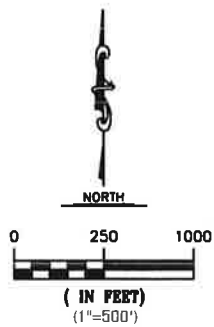
HISTORIC DRAINAGE PL  
 D-1




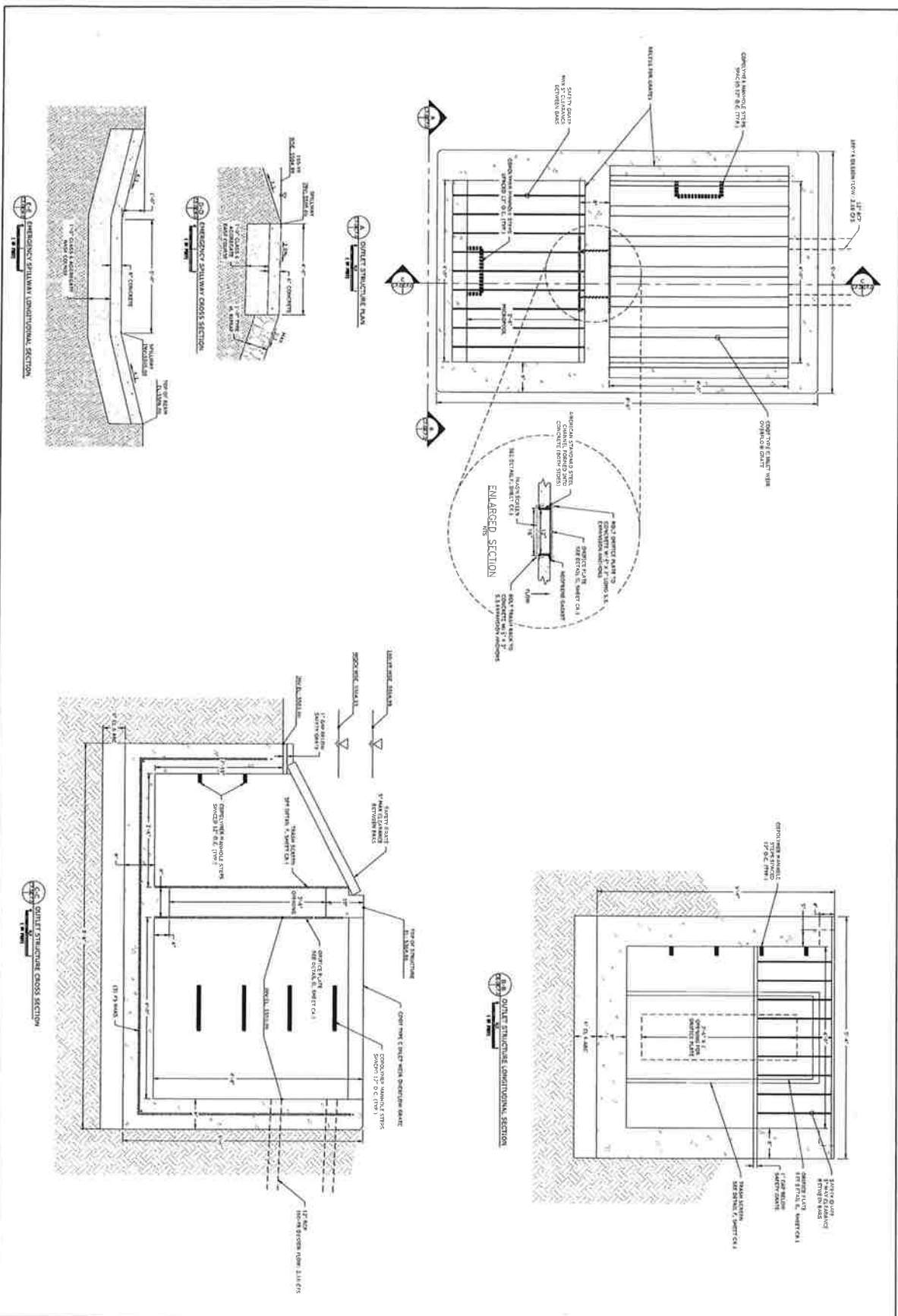




NOTE:  
 CONTOUR DATA SOURCED FROM  
 AUTODESK INFRAWORKS.



|   |                 |   |
|---|-----------------|---|
| <br>CIVIL RESOURCES |                 | <b>PENROSE RV STORAGE</b>                     |
| DATE:<br>10/01/2024   | FIGURE:<br>OS-4 | <b>OFF-SITE<br/>         DRAINAGE EXHIBIT</b> |



**CIVIL RESOURCES**

8330 COLOMBO BL.  
DENVER, CO 80231  
303.733.4488  
WWW.CIVILRESOURCES.COM

**COMMERCIAL DEVELOPMENT PLAN**  
**LOT 2 COYLE-VANEGMOND LOT LINE**  
**ADJUSTMENT**  
**DENVER, FREMONT COUNTY, CO**

650 INNOVATION CIR  
WINNICO, CO 80557

**PERKINS+WILL**  
STRUCTURAL ENGINEERS

| NO. | REVISION | DATE |
|-----|----------|------|
|     |          |      |
|     |          |      |
|     |          |      |

Project No: 2018-001

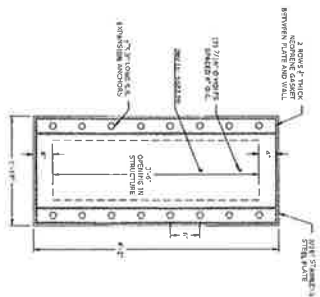
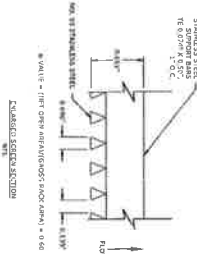
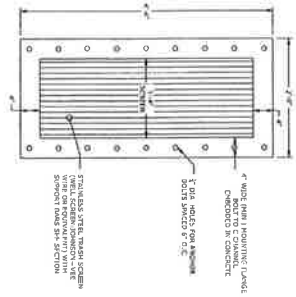
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Scale: As Shown

Drawn by: J. Smith

Checked by: M. Jones

Approved by: P. Brown

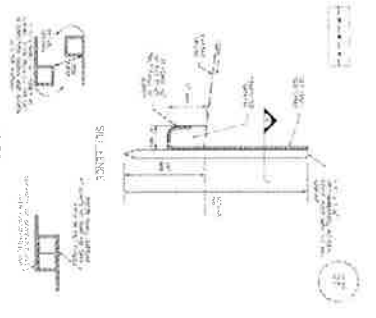
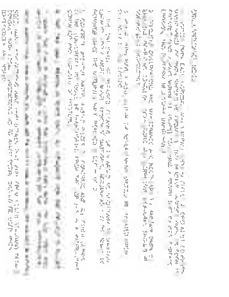
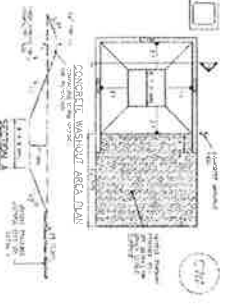


**Concrete Washout Area (CWA)**

**Concrete Washout Area (CWA)**

**Silt Fence (SF)**

**Silt Fence (SF)**



**DETAIL 1 - CONCRETE WASHOUT AREA**

1. ALL CONCRETE SHALL BE CAST IN PLACE AND SHALL BE FINISHED TO A FINISH SURFACE OF 1/4\"/>

2. ALL CONCRETE SHALL BE CAST ON A 4\"/>

3. ALL CONCRETE SHALL BE CAST ON A 4\"/>

4. ALL CONCRETE SHALL BE CAST ON A 4\"/>

5. ALL CONCRETE SHALL BE CAST ON A 4\"/>

6. ALL CONCRETE SHALL BE CAST ON A 4\"/>

7. ALL CONCRETE SHALL BE CAST ON A 4\"/>

8. ALL CONCRETE SHALL BE CAST ON A 4\"/>

9. ALL CONCRETE SHALL BE CAST ON A 4\"/>

10. ALL CONCRETE SHALL BE CAST ON A 4\"/>

**DETAIL 2 - SILT FENCE**

1. ALL SILT FENCES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

2. ALL SILT FENCES SHALL BE CONSTRUCTED WITH A MINIMUM HEIGHT OF 4\"/>

3. ALL SILT FENCES SHALL BE CONSTRUCTED WITH A MINIMUM WIDTH OF 4\"/>

4. ALL SILT FENCES SHALL BE CONSTRUCTED WITH A MINIMUM SPACING OF 100\"/>

5. ALL SILT FENCES SHALL BE CONSTRUCTED WITH A MINIMUM SPACING OF 100\"/>

6. ALL SILT FENCES SHALL BE CONSTRUCTED WITH A MINIMUM SPACING OF 100\"/>

7. ALL SILT FENCES SHALL BE CONSTRUCTED WITH A MINIMUM SPACING OF 100\"/>

8. ALL SILT FENCES SHALL BE CONSTRUCTED WITH A MINIMUM SPACING OF 100\"/>

9. ALL SILT FENCES SHALL BE CONSTRUCTED WITH A MINIMUM SPACING OF 100\"/>

10. ALL SILT FENCES SHALL BE CONSTRUCTED WITH A MINIMUM SPACING OF 100\"/>

November 2017  
Urban Drainage and Flood Control District  
Urban Storm Drainage Criteria Manual Volume 1

November 2017  
Urban Drainage and Flood Control District  
Urban Storm Drainage Criteria Manual Volume 1

November 2018  
Urban Drainage and Flood Control District  
Urban Storm Drainage Criteria Manual Volume 1

June 2018  
Urban Drainage and Flood Control District  
Urban Storm Drainage Criteria Manual Volume 1



LIVIA RESOURCES  
3030 COVINGTON BL.  
FREMONT, CO 8002  
WWW.LIVIARESOURCES.COM



450 HERRINGTON CIR.  
WINNICO, CO 8055

COMMERCIAL DEVELOPMENT PLAN  
LOT 2 COYLE-VANEGMOND LOT LINE  
ADJUSTMENT  
DENROSE, FREMONT COUNTY, CO

DETAILS 2  
C8.1

# **APPENDIX E**

## **Operations & Maintenance Manual**

**STORMWATER PERMANENT CONTROL MEASURE  
STANDARD OPERATING PROCEDURES  
PENROSE RV & BOAT STORAGE**

**TO:** Fremont County; EPCOCO REI One, LLC  
**FROM:** Civil Resources, LLC  
**DATE:** 10/1/2024  
**RE:** Stormwater Permanent Control Measures Standard Operating Procedures

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The attached standard operating procedures are to be followed for the stormwater permanent control measures of the Penrose RV & Boat Storage Facility. The attached inspection and maintenance form is to be used to document regular maintenance and inspections. By signing this form, the property owner acknowledges that the stormwater permanent control measures on-site will be maintained and inspected to the standards prescribed by the attached documents.

---

Property Owner

---

Date



**Pemrose RV & Boat Storage Facility - Grass Swale Maintenance Checklist**

Date of inspection: \_\_\_\_\_

Maintenance Personnel: \_\_\_\_\_

|                            | Maintenance Activity           | Indication Action is Needed:   | Maintenance Action   | Was maintenance action taken? YES/NO<br><small>If "NO" provide reason and schedule to correct</small> | Date of Correction |
|----------------------------|--------------------------------|--|--|---|--------------------|
| <b>Routine Maintenance</b> | Trash/Debris Removal           | Trash or debris present in grass swale                               | Remove and properly dispose of all trash and debris.   |   |                    |
|                            | Mowing                         | Excessive grass height   | Mow to 2"-4" for turf grass; 4" - 6" for native grass.<br><br>SPRING: start up system; test for even coverage and correct timer settings.<br>SUMMER: test for even coverage and correct timer settings.<br>FALL: drain and winterize system. (follow watering regulations) |   |                    |
|                            | Irrigation (Automatic)         | Areas of insufficient or excessive watering; broken or missing parts |  |   |                    |
|                            | Irrigation (Not Automatic)     | Areas of insufficient or excessive watering                          | Water as needed to maintain healthy grass; follow watering regulations.  |   |                    |
|                            | Weed Control                   | Noxious weeds/unwanted vegetation present                            | Treat with herbicide or hand pull; consult with local weed inspector.  |   |                    |
|                            | Mosquito Treatment             | Standing water/mosquito habitat present                              | Perform maintenance to eliminate standing water; treat with EPA approved chemicals.  |   |                    |
|                            | Rodent/Pest Damage             | Holes, small piles of dirt, raised burrows present                   | Evaluate damage; contact Parks Department or Division of Wildlife for guidance.  |   |                    |
|                            | Sediment Removal               | Sediment build-up  | Remove and properly dispose of sediment.   |   |                    |
|                            | Erosion Repair                 | Rills and gullies forming on slopes and other areas                  | Repair eroded areas & revegetate; address cause of erosion.  |   |                    |
|                            | Vegetation Removal             | Trees, willows, shrubs impeding conveyance zone of swale             | Remove impeding vegetation; restore correct grade and resurface.   |   |                    |
| <b>Minor Maintenance</b>   | Revegetation                   | Areas without grass present  | Replace grass by sodding or seeding.   |   |                    |
|                            | Irrigation (Automatic)         | Evidence of broken or missing parts                                  | Replace parts and test system.   |   |                    |
|                            | Level Spreader (Slotted Curbs) | Evidence of uneven flow; erosion or rills/gullies                    | Repair sections of slotted curb and address cause.   |   |                    |
|                            |                                |  |  |   |                    |



|                   |                                   |   |   |  |  |
|-------------------|-----------------------------------|---|---|--|--|
|                   | Fertilization/Soil Amendment      | Grass with pale color; area with poor grass growth not due to irrigation problems   | Consult with turf specialist; test soil.                                    |  |  |
|                   | Vehicle Tracks                    | Depressions from vehicle tracks present; vegetation damage  | Repair and fill depressions; sod or seed damaged areas.                     |  |  |
|                   | Major Sediment/ Pollutant Removal | Large quantities of sediment  | Remove and dispose of sediment. Repair vegetation as needed.                |  |  |
|                   | Major Erosion Repair              | Severe erosion including gullies, excessive soil displacement, areas of settlement, holes present                                       | Repair erosion - find cause of problem and address to avoid future erosion. |  |  |
|                   | Structural Repair                 | Deterioration and/or damage to structural components (slotted curb, grade control structures, irrigation components), and ponding water | Structural repair to restore the structure to its original design.          |  |  |
|                   | Rebuild                           | Removal of filter media and underdrain system   | Contact SEMSWA engineering.   |  |  |
| Major Maintenance |                                   |   |   |  |  |

**Penrose RV & Boat Storage Facility - Extended Detention Basin Maintenance Checklist**

Date of inspection: \_\_\_\_\_

Maintenance Personnel: \_\_\_\_\_

| Maintenance Activity             | Indication Action is Needed:  | Maintenance Action  | Was maintenance action taken? YES/NO<br><small>if "NO" provide reason and schedule to correct</small> | Date of Correction |
|----------------------------------|---|---|---|--------------------|
| <b>Routine Maintenance</b>       |   |   |   |                    |
| Mowing                           | Excessive grass height  | Mow to height of 4" to 6".  |   |                    |
| Trash/Debris Removal             | Trash or debris present in extended detention basin   | Remove and properly dispose of all trash and debris.                              |   |                    |
| Outlet Works Cleaning            | Clogged outlet structure; ponding water   | Remove and dispose of debris/trash/sediment to allow outlet to function properly. |   |                    |
| Weed Control                     | Noxious weeds/unwanted vegetation present   | Treat with herbicide or hand pull; consult with local weed inspector.             |   |                    |
| Mosquito Treatment               | Standing water/mosquito habitat present   | Treat with EPA approved chemicals.  |   |                    |
| Algae Treatment                  | Standing water/algal growth/green color   | Treat with EPA approved chemicals.  |   |                    |
| Sediment Removal                 | Sediment build-up; decrease in pond volume  | Remove and properly dispose of sediment.  |   |                    |
| Erosion Repair                   | Rills and gullies forming on side slopes, trickle channel, other areas                              | Repair eroded areas & revegetate; address cause of erosion.                       |   |                    |
| Vegetation Removal/Tree Thinning | Large trees/wood vegetation in lower chamber of pond  | Remove vegetation; restore grade and surface.                                     |   |                    |
| Drain Cleaning/Jet Vac           | Sediment build-up/non-draining system   | Clean drains; Jet Vac if needed.  |   |                    |
| Major Sediment Removal           | Large quantities of sediment; reduced pond capacity   | Remove and dispose of sediment. Repair vegetation as needed.                      |   |                    |
| Major Erosion Repair             | Severe erosion including gullies, excessive soil displacement, areas of settlement, holes present   | Repair erosion - find cause of problem and address to avoid future erosion.       |   |                    |
| Structural Repair                | Deterioration and/or damage to structural components (broken concrete, damaged pipes, outlet works) | Structural repair to restore the structure to its original design.                |   |                    |
| <b>Major Maintenance</b>         |   |   |   |                    |

Standard Operation Procedures  
for  
Inspection and Maintenance

Grass Buffers Swales and Grass  
(GB-GS)



July 2019

## **GB-GS-1 BACKGROUND**

Grass Buffers and Grass Swales are common types of Stormwater Management Facilities utilized within the Front Range of Colorado. Grass Buffers and Grass Swales promote filtration, infiltration, and settling to reduce runoff volume.

Grass Buffers are uniformly graded and densely vegetated areas of turf grass. They are designed to accommodate sheet flow rather than concentrated or channelized flow. They are typically located adjacent to impervious areas such as parking lots or along highways and roads. Grass Buffers are designed to evenly distribute runoff across the width of the buffer to achieve uniform sheet-flow conditions. A flow spreader may be incorporated for this purpose. In some cases, grass buffers may have underdrain systems.

Grass Swales are densely vegetated drainageways with low-pitched side slopes that collect and convey runoff. Design of their longitudinal slope and cross section forces the flow to be slow and shallow, thereby facilitating sedimentation while limiting erosion. Berms or check dams may be installed perpendicular to the flow to decrease the slope and slow down the flow. Grass swales are used in open space and landscaped areas to collect and convey overland flows, and can be used as an alternative to curb and gutter to collect and convey street flows. Some grass swales are designed with underdrain systems.

## **GB-GS-2 INSPECTING GRASS BUFFERS AND SWALES (GB-GS)**

### **GB-GS-2.1 Access and Easements**

Inspection and maintenance personnel may utilize the stormwater facility map located in Appendix G containing the locations of the access points and maintenance easements of the GB-GSs within this development.

### **GB-GS-2.2 Stormwater Management Facilities Locations**

Inspection and maintenance personnel may utilize the stormwater facility map located in Appendix G containing the locations of the GB-GSs within this development.

### **GB-GS-2.3 Grass Buffer - Grass Swale (GB-GS) Features**

GB-GSs are unique stormwater quality facilities, in that they are typically viewed as landscaping or ground cover, and are often overlooked as water quality treatment facilities. GB-GSs have a number of features that are designed to serve a particular function. It is important for maintenance personnel to understand the function of each of these features. Below is a list of the common features of a Grass Swale or Grass Buffer and the corresponding maintenance inspection items that can be anticipated:

**Table GB-GS-1  
Typical Inspection & Maintenance Requirements Matrix**

|                                     | <b>Sediment Removal</b> | <b>Mowing Weed control</b> | <b>Trash &amp; Debris Removal</b> | <b>Erosion</b> | <b>Removal/ Replacement</b> | <b>Structural Repair</b> |
|-------------------------------------|-------------------------|----------------------------|-----------------------------------|----------------|-----------------------------|--------------------------|
| <b>Swale Bottom</b>                 | X                       | X                          | X                                 | X              |                             |                          |
| <b>Side Slope</b>                   |                         | X                          | X                                 | X              |                             |                          |
| <b>Buffer Strip</b>                 | X                       | X                          | X                                 | X              |                             |                          |
| <b>Inflows</b>                      | X                       | X                          | X                                 | X              | X                           | X                        |
| <b>Underdrain System</b>            |                         |                            |                                   |                | X                           |                          |
| <b>Grade Control/Level Spreader</b> |                         |                            |                                   | X              |                             | X                        |
| <b>Irrigation System</b>            |                         |                            |                                   |                | X                           |                          |

**GB-GS-2.3.1 Grass Swale Bottom and Side Slopes; Grass Buffer Strips**

Grass Swales and Grass Buffers require general maintenance of the turf grass and repair of any rill or gully development. The bottom and side slopes of grass swales and the area of grass buffer strips should be maintained with dense vegetative cover, and should not be eroded or bare. Inspection over the first few years will help to determine if any problems are developing.

*The typical maintenance items that are required at the side slopes and bottoms of grass swales and within grass buffer areas are as follows:*

- a. Sediment Accumulation* – The purpose of the grass swale or buffer is to slow down flow and allow sedimentation to occur. To prevent a loss in performance of the swale or buffer, sediment that accumulates must be removed on a timely basis.
  
- b. Vegetation Sparse* – Grass Swales and Buffers rely on a healthy, dense cover of grass to decrease the flow velocities and promote sedimentation and infiltration. Grasses that are diseased, dying or otherwise damaged should be replaced. All bare areas should be reseeded or patched. Causes which contribute to the damaged grass cover, including lack of adequate irrigation, traces of pedestrian or vehicular traffic, uncontrolled weeds etc., should be identified and remedied.
  
- c. Erosion Present* – Lack of adequate vegetative cover or excessive flow velocities may result in rill or gully development, and erosion of the swale

or buffer strip. Erosion will require maintenance to prevent further damage to the area and to prevent sediment transport.

d. *Standing Water/Boggy Areas* – Grass swales and buffers are generally intended to drain and be dry in between rain events. If areas of standing water are present, the swale or buffer may need to be evaluated for proper grade to ensure drainage. In some cases, where underdrains are used, the underdrains should be inspected to ensure that they are not clogged.

#### GB-GS-2.3.2 Inflow Points

Inflow points are the points of stormwater discharge into the swale or buffer. Inflow points are typically pipe outfalls, other grass swales or buffers, or curb cuts from upstream impervious areas, such as parking lots. Some form of energy dissipation is typically provided immediately downstream of the inflow point into the grass swale or buffer. Energy dissipation devices may include riprap aprons, or flow spreader devices.

*The typical maintenance items that are required at inflow points are as follows:*

a. *Riprap Displaced/Rundown Damaged* – Often, because of the repeated impact/force of water, the riprap can shift and settle. If any portion of the riprap rundown or apron appears to have settled, if soil is present between the riprap, or if the riprap has shifted, maintenance may be required to ensure future erosion is prevented.

b. *Erosion Present/Outfall Undercut* – In some situations, an energy dissipater may have not been provided, or may not have been sized, constructed, or maintained appropriately and erosion has occurred. Any erosion within the vicinity of the inflow point will require maintenance to prevent damage to the structure(s) and sediment transport within the facility.

c. *Sediment Accumulation* – Because of the turbulence in the water created by the energy dissipater, sediment often deposits immediately downstream of the inflow point. To prevent a loss in performance, sediment that accumulates in this area must be removed on a timely basis.

#### GB-GS-2.3.3 Underdrain System

Some grass swales and buffers that have a flatter slope or soils which do not allow adequate percolation or are in areas with a continuous base flow may have been installed with an underdrain system. Underdrains typically consist of a layer of geotextile fabric, gravel storage area and perforated

PVC pipe. The geotextile fabric is utilized to prevent the filter material from entering the underdrain system. The gravel storage area allows for storage of treated stormwater runoff prior to the discharge of the runoff through the perforated PVC pipe.

*The typical maintenance activities that are required for the underdrain system are as follows:*

With proper maintenance of the grassed areas, there should be a minimum amount of maintenance required on the underdrain system. Generally the only maintenance performed on the underdrain system is jet-vac cleaning in the event that it becomes clogged.

#### GB-GS-2.3.4 Grade Control Level Spreader

Grass swales that are installed in areas with steep longitudinal slopes often necessitate the use of grade control checks or drop structures. Grade control structures are typically either concrete walls or rip rap structures that serve to provide a reinforced drop at specific locations in the channel, reducing the longitudinal slope between the control structures.

Level Spreaders are installed on the upstream of grass buffers to evenly distribute flows along the design length. Level spreaders may consist of slotted curbing, modular block porous pavement, level walls or other spreader devices.

*The typical maintenance activities that are required for grade control structures and level spreaders are as follows:*

*a. Erosion present* – Grade control structures and level spreaders are provided to reduce the potential for erosion of the grassed swale or buffer areas. Erosion within the vicinity of the control structure or level spreader indicates that the structure is not functioning as intended and requires maintenance to prevent future erosion and damage.

*b. Structural damage* – Structural damage can occur at anytime along the life of the facility. Typically, structural damage occurs with the deterioration of concrete, including cracking, spalling or settling and the erosion and deterioration of the riprap structures. Level spreaders may settle unevenly creating low areas, which concentrate the flows.

#### GB-GS-2.3.5 Irrigation

Grass Buffers and Grass Swales depend on healthy, dense turf grass to function, and therefore require an irrigation system, to provide a consistent

water supply. Typically, the condition of the grass cover will provide evidence of the effectiveness and maintenance needs of the irrigation system.

*The typical maintenance activities that are required for irrigation systems are as follows:*

Irrigation systems will generally require routine periodic maintenance and adjustment to ensure that proper amounts of water are being applied given the weather conditions, and that they are providing coverage to all areas of the grass to eliminate bare spots.

#### GB-GS-2.3.6 Miscellaneous

There are a variety of inspection/maintenance issues that may not be attributed to a single feature within the GB-GS. This category on the inspection form is for maintenance items that are commonly found in the GB-GS, but may not be attributed to an individual feature.

*a. Encroachment in Easement Area* – SEMSWA requires that GB-GS be located in tracts or drainage easements. Property owners may place landscaping, trash, fencing, or other items within the easement area that may affect maintenance or the operation of the facility.

*b. Public Hazards* – Public hazards include items such as containers of unknown/suspicious substances, and exposed metal/jagged concrete on structures. **If any hazard is found within the facility area that poses an immediate threat to public safety, contact the local Sheriff's Office at 911 immediately.**

*c. Burrowing Animals/Pests*– Prairie dogs and other burrowing rodents may cause damage to the GB-GS features and negatively affect the vegetation within the GB-GS.

*d. Other* – Any miscellaneous inspection/maintenance items not contained on the form should be entered here.

### **GB-GS-3 MAINTAINING GRASS BUFFERS & GRASS SWALES (GB-GS)**

#### **GB-GS-3.1 Maintenance Personnel**

Maintenance personnel must be experienced to properly maintain GB-GSs. Inadequately trained personnel can cause additional problems resulting in additional maintenance costs.



### **GB-GS-3.2 Equipment**

It is imperative that the appropriate equipment and tools are taken to the field with the operations crew. The types of equipment/tools will vary depending on the task at hand. Below is a list of tools, equipment, and material(s) that may be necessary to perform maintenance on a GB-GS:

- 1.) Mowing Tractors
- 2.) Trimmers (extra string)
- 3.) Shovels
- 4.) Rakes
- 5.) All Surface Vehicle (ASVs)
- 6.) Engineers Level (laser)
- 7.) Erosion Control Blanket(s)
- 8.) Mulch
- 9.) Sod or Seed
- 10.) Illicit Discharge Cleanup Kits
- 11.) Trash Bags
- 12.) Stormwater Facility Operation and Maintenance Manual

Some of the items identified above may not be needed for every maintenance operation. However, this equipment should be available to the maintenance operations crews should the need arise.

### **GB-GS-3.3 Maintenance Categories and Activities**

A typical GB-GS Maintenance Program will consist of three broad categories of work: Routine, Minor and Major. Within each category of work, a variety of maintenance activities can be performed on a GB-GS. A maintenance activity can be specific to each feature within the GB-GS, or general to the overall facility. This section of the SOP explains each of the categories and briefly describes the typical maintenance activities for a GB-GS.

A variety of maintenance activities are typical of GB-GSs. The maintenance activities range in magnitude from routine trash pickup to the reconstruction of the GB-GS or underdrain system. Below is a description of each maintenance activity, the objectives, and frequency of actions.

### **GB-GS-3.4 Routine Maintenance Activities**

The majority of this work consists of scheduled mowing, trash and debris pickups and landscape care for the GB-GS during the growing season. It also includes activities such as weed control. These activities normally will be performed numerous times during the year. These items do not require

any prior approval by SEMSWA, however, completed inspection and maintenance forms shall be submitted to SEMSWA for each inspection and maintenance period.

The Routine Maintenance Activities are summarized below, and further described in the following sections.

**Table GB-GS-2  
Summary of Routine Maintenance Activities**

| <b>Maintenance Activity</b>               | <b>Minimum Frequency</b>                                | <b>Indication Action is Needed:</b>                               | <b>Maintenance Action</b>  |
|---|---|---|--|
| <b>Trash/Debris Removal</b>               | Twice annual and before mowing                          | Trash & debris in GB-GS   | Remove and properly dispose of trash and debris  |
| <b>Mowing</b>                             | Routine – as necessary to maintain 2" – 4" grass height | Excessive grass height/aesthetics                                 | 2"-4" grass height for turf grass; 4" to 6" for native grass   |
| <b>Irrigation (Automatic)</b>             | Three times annually                                    | Areas of insufficient or excess watering; broken or missing parts | SPRING: start up system; test for even coverage and correct timer settings<br>SUMMER: test for even coverage and correct timer settings<br>FALL: drain and winterized system (follow watering regulations) |
| <b>Irrigation (Not Automatic)</b>         | As needed to maintain healthy grass                     | Areas of insufficient or excess watering                          | Water as needed to maintain healthy grass; (follow watering regulations)   |
| <b>Weed Control</b>                       | Minimum twice annually                                  | Noxious weeds; Unwanted vegetation                                | Treat w/herbicide or hand pull; consult a local Weed Inspector   |
| <b>Mosquito Treatment</b>                 | As needed, based upon inspections                       | Standing water/ mosquito habitat                                  | Perform maintenance to eliminate standing water; Treat w/ EPA-approved chemicals   |
| <b>Level Spreader (Grass Buffer only)</b> | As needed, based upon inspections                       | Evidence of uneven flow/localized erosion                         | Look for cause; repair, fill or revegetate areas of erosion  |
| <b>Rodent Damage</b>                      | As needed, based upon inspections                       | Holes, small piles of dirt, raised burrows                        | Evaluate damage; contact Parks Dept. or Division of Wildlife for guidance  |

**GB-GS-3.4.1 Trash/Debris Removal**

Trash and debris must be removed from the GB-GS area to allow for proper functioning and to improve aesthetics. This activity must be performed prior to mowing operations.

*Frequency* – Routine – Prior to mowing operations and a minimum of twice annually.

**GB-GS-3.4.2 Mowing**

Routine mowing of the turf grass embankments is necessary to maintain an appropriate grass height and to improve the overall appearance of the

GB-GS. Turf grass should be mowed to a height of 2 to 4- inches (4 – 6- inches for native grass) and shall be bagged to prevent potential contamination of the filter media.

*Frequency* – Routine – as necessary to maintain grass height.

#### GB-GS-3.4.3 Irrigation

Irrigation systems should be maintained in proper working order to provide an adequate water supply to support the grass cover. When automatic irrigation systems are not available, alternate methods for providing a water supply during times of drought must be provided.

Automatic irrigation systems should be maintained routinely throughout the growing season to ensure that they are providing the appropriate amounts of water, and are providing complete coverage of the area. Sprinkler heads should be adjusted as necessary, and checked for broken or missing parts.

*Frequency* - Routine as needed throughout the growing season, plus the following:

SPRING: Start up the system and test for even coverage and correct timer settings.

SUMMER: Test for even coverage and correct timer settings.

FALL: Drain and winterize the system.

#### GB-GS-3.4.4 Weed Control

Noxious weeds and other unwanted vegetation must be treated as needed throughout the GB-GS. This activity can be performed either through mechanical means (mowing/pulling) or with herbicide. Consultation with a local Weed Inspector is highly recommended prior to the use of herbicide. Herbicides should be utilized sparingly and as a last resort. All herbicide applications should be in accordance with the manufacturer's recommendations.

*Frequency* – Routine – As needed based upon inspections.

#### GB-GS-3.4.5 Mosquito Treatment

GB-GS facilities are intended to drain, and should not have areas of standing water which creates mosquito habitat. Causes of the standing water or boggy conditions should be investigated and remediated as necessary to eliminate the standing water. Only EPA approved chemicals should be applied in accordance with the recommendations of the manufacturer.

*Frequency* – As needed based upon inspections.

**GB-GS-3.4.6 Level Spreader (Grass Buffer only)**

Evidence of uneven flow and localized erosion downstream of the level spreader indicate that the flow is not evenly distributed along the length of the spreader. Areas of erosion should be repaired, filled and revegetated. Causes for the erosion should be investigated and repaired.

*Frequency* – As needed based upon inspections.

**GB-GS-3.4.7 Rodent Damage**

Small holes, piles of dirt, and raised burrows are evidence of rodent damage. Damaged areas should be repaired and revegetated. Consultation with an animal control specialist or the Division of Wildlife may be required for persistent problems.

*Frequency* – As needed based on inspections.

**GB-GS-3.5 Minor Maintenance Activities**

This work consists of a variety of isolated or small-scale maintenance/operational problems. Most of this work can be completed by a small crew, hand tools, and small equipment. These items require approval by SEMSWA. Completed inspection and maintenance forms shall be submitted to SEMSWA for each inspection and maintenance activity.

**Table GB-GS-3  
Summary of Minor Maintenance Activities**

| <b>Maintenance Activity</b>               | <b>Minimum Frequency</b>          | <b>Indication Action is Needed:</b>                 | <b>Maintenance Action</b>                            |
|---|-----------------------------------|---|--|
| <b>Sediment Removal</b>                   | As needed.                        | Sediment build-up.                                  | Remove and properly dispose of sediment              |
| <b>Erosion Repair</b>                     | As needed, based upon inspection  | Rills and gullies forming on slopes and other areas | Repair eroded areas & revegetate; address cause      |
| <b>Vegetation Removal</b>                 | As needed, based upon inspection  | Trees, willows, shrubs impeding flow                | Remove vegetation; restore correct grade and surface |
| <b>Revegetation</b>                       | As needed, based upon inspection  | Areas without grass                                 | Replace grass by sodding or seeding                  |
| <b>Irrigation (Automatic)</b>             | As needed, based upon inspection. | Evidence of broken or missing parts                 | Replace parts and test system                        |
| <b>Level Spreader (Grass Buffer Only)</b> | As needed, based upon             | Evidence of uneven flow; erosion; or                | Repair sections of level spreader and                |

|  | inspection.                       | rills/gullies  | address cause  |
|--|-----------------------------------|--|--|
| <b>Fertilization or Soil Amendment</b> | As needed, minimize fertilization | Grass with pale color; areas with poor grass growth not due to irrigation problems | Consult with turf specialist; Test soil                |
| <b>Vehicle Tracks (Along Roadways)</b> | As needed, based upon inspection  | Depressions from vehicle tracks; vegetation damage                                 | Repair and fill depressions; sod or seed damaged areas |

#### GB-GS-3.5.1 Sediment Removal

Sediment removal is necessary to ensure proper function of the grass swale or buffer. Care should be taken when removing sediment to prevent damage to the turf grass and surrounding areas. Excessive amounts of sediment are an indication of upstream erosion or lack of adequate BMPs during construction activities. Causes for contributions of excess sediment should be investigated and addressed.

*Frequency* – As needed based upon inspections.

#### GB-GS-3.5.2 Erosion Repair

The repair of eroded areas is necessary to ensure the proper functioning of the GB-GS, to minimize sediment transport, and to reduce potential impacts to other features. Erosion can vary in magnitude from minor repairs to vegetation and embankments, to rills and gullies in the embankments and inflow points. The repair of eroded areas may require the use of excavators, riprap, concrete, and sod. Extreme care should be taken when utilizing motorized or heavy equipment to ensure damage to the underdrain system does not occur. Major erosion in a GS-GB is generally the result of excessive velocities caused by steep slopes. It may be necessary to make design improvements to the swale or buffer when erosion becomes a major maintenance item.

*Frequency* – As necessary, based upon inspections.

#### GB-GS-3.5.3 Vegetation Removal

Weeds, Shrubs, Willows and other unwanted vegetation that develops in the grass swale or buffer area may impede the flow and cause standing water or back flow problems. It is necessary to remove unwanted vegetation as soon as it appears. Remove the unwanted vegetation, and restore the correct grade. Revegetate with seed or sod.

*Frequency* – As necessary, based upon inspections.

#### GB-GS -3.5.4 Revegetation

Bare areas should be repaired as soon as possible. Repair bare areas with grass or sod. Causes of the problem, such as inadequate water supply or diseased grasses, should be investigated and resolved.

*Frequency* – As necessary, based upon inspections.

#### GB-GS-3.5.5 Irrigation (Automatic)

Irrigation systems require routine maintenance in accordance with the manufacturer's recommendations (valves, timer, etc.), and maintenance of the pipe and heads to ensure that even coverage is being applied, and that there are no missing or broken parts. Timing systems should be checked to verify that the correct amount of water is being applied to the grassed areas for the seasonal conditions.

*Frequency* – As necessary, based upon inspections.

#### GB-GS-3.5.6 Level Spreader

Level Spreaders that are no longer level, or have developed damaged areas of cracking or spalling, allow flows to concentrate in these depressed areas instead of being distributed over the length of the structure. Also, build up of grasses along the edge of the spreader may create an uneven flow distribution. Rills, gullies and other erosion that develops downstream of level spreaders should be repaired and reseeded or sodded. Causes of the erosion should be investigated and addressed.

*Frequency* – As necessary, based upon inspections.

#### GB-GS-3.5.7 Fertilization/Soil Amendment

Grass Buffers and Swales rely on healthy, dense turf in order to function properly. Grasses that appear to be diseased, dying or unhealthy may require amendments. Fertilizers should be applied in the minimum amounts recommended by the manufacturer.

*Frequency* – As necessary, based upon inspections.

#### GB-GS-3.5.8 Vehicle Tracks

GB-GSs that are adjacent to roadway sections may be damaged by vehicle tracks. Rutted areas should be filled in and revegetated as soon as possible. Frequent problems associated with vehicle traffic (such as

around corners) may require a barrier or sign to avoid vehicular traffic within the grassed areas.

*Frequency* – As necessary, based upon inspections.

**GB-GB-3.6 Major Maintenance Activities**

This work consists of larger maintenance/operational problems and failures within the stormwater management facilities. All of this work requires consultation with SEMSWA Engineering to ensure the proper maintenance is performed. This work requires that SEMSWA Engineering Staff review the original design and construction drawings to assess the situation and assign the necessary maintenance. This work may also require more specialized maintenance equipment, design/details, surveying, or assistance through private contractors and consultants.

**Table GB-GS-4  
Summary of Major Maintenance Activities**

| <b>Maintenance Activity</b>             | <b>Minimum Frequency</b>                     | <b>Look for:</b>   | <b>Maintenance Action</b>  |
|---|--|--|--|
| <b>Major Sediment/Pollutant Removal</b> | As needed – based upon scheduled inspections | Large quantities of sediment   | Remove and dispose of sediment. Repair vegetation as needed                |
| <b>Major Erosion Repair</b>             | As needed – based upon scheduled inspections | Severe erosion including gullies, excessive soil displacement, areas of settlement, holes  | Repair erosion – find cause of problem and address to avoid future erosion |
| <b>Structural Repair</b>                | As needed – based upon scheduled inspections | Deterioration and/or damage to structural components – level spreader, grade control structures, irrigation components, and ponding water. | Structural repair to restore the structure to its original design          |
| <b>GB-GS Rebuild</b>                    | As needed – due to complete failure of PLD   | Removal of filter media and underdrain system  | Contact SEMSWA Engineering   |

GB-GS-3.6.1            Major Sediment/Pollutant Removal

Major sediment removal consists of removal of large quantities of pollutants/sediment /landscaping material. Stormwater sediments removed from GB-GSs do not meet the regulatory definition of “hazardous waste”. However, these sediments can be contaminated with a wide array of organic and inorganic pollutants and handling must be done with care to insure proper removal and disposal. Sediments should be transported by motor vehicle only after they are dewatered. All sediments must be taken to a licensed landfill for proper disposal. Should a spill occur during transportation, prompt and thorough cleanup and disposal is imperative. Vegetated areas need special care to ensure design volumes and grades are preserved or may need to be replaced due to the removal activities.

*Frequency* – Non-routine – Repair as needed, based upon inspections.

GB-GS-3.6.2            Major Erosion Repair

Major erosion repair consists of filling and revegetating areas of severe erosion. Determining the cause of the erosion as well as correcting the condition that caused the erosion should also be part of the erosion repair. Care should be given to ensure design grades and volumes are preserved.

*Frequency* – Non-routine – Repair as needed, based upon inspections.

GB-GS-3.6.3            Structural Repair

A GB-GS generally includes level spreader and grade control structure that can deteriorate or be damaged during the service life of the facility. These structures are constructed of steel and concrete that can degrade or be damaged and may need to be repaired or re-constructed from time to time. Major repairs to structures may require input from a structural engineer and specialized contractors. Consultation with SEMSWA Engineering Staff shall take place prior to all structural repairs.

*Frequency* – Non-routine – Repair as needed, based upon inspections.

GB-GS-3.6.4            GB-GS Rebuild

In very rare cases, a GB-GS may need to be rebuilt. Generally, the need for a complete rebuild is a result of improper construction, improper maintenance resulting in structural damage to the underdrain system, or



extensive contamination of the GB-GS. Consultation with SEMSWA Engineering Staff shall take place prior to any rebuild project.

*Frequency* – Non-routine – As needed based upon inspections.

**Reference:**

This Manual is adapted from the Douglas County, Colorado, Standard Operating Procedure for Extended Detention Basin (EDB) Inspection and Maintenance, July 2005

Standard Operation Procedures  
for  
Inspection and Maintenance

Extended Detention Basins  
(EDBs)



July 2019

## **EDB-1 BACKGROUND**

Extended Detention Basins (EDBs) are one of the most common types of Stormwater Management Facilities utilized within the Front Range of Colorado. An EDB is a sedimentation basin designed to "extend" the runoff detention time, but to drain completely dry sometime after stormwater runoff ends. The EDB's drain time for the water quality portion of the facility is typically 40 hours. The basins are considered to be "dry" because the majority of the basin is designed not to have a significant permanent pool of water remaining between runoff events.

EDBs are an adaptation of a detention basin used for flood control, with the primary difference is the addition of forebays, micropools and a slow release outlet design. Forebays are shallow concrete "pans" located at the inflow point to the basin and are provided to facilitate sediment removal within a contained area prior to releasing into the pond. These forebays collect and briefly hold stormwater runoff resulting in a process called sedimentation, dropping sediment out of the stormwater. The stormwater is then routed from the forebay into the concrete trickle channel and upper basin, the large grassy portion of the basin. The EDB uses a much smaller outlet that extends the emptying time of the more frequently occurring runoff events to facilitate pollutant removal. An EDB should have a small micropool just upstream of the outlet. This micropool is designed to hold a small amount of water to keep sediment and floatables from blocking the outlet orifices.

## **EDB-2 INSPECTING EXTENDED DETENTION BASINS (EDBs)**

### **EDB-2.1 Access and Easements**

Inspection or maintenance personnel may utilize the stormwater facility map located in Appendix G containing the location(s) of the access points and maintenance easements of the EDB(s) within this development.

### **EDB-2.2 Stormwater Management Facilities Locations**

Inspection or maintenance personnel may utilize the stormwater facility map located in Appendix G containing the location(s) of the EDB(s) within this development.

### **EDB-2.3 Extended Detention Basin (EDB) Features**

EDBs have a number of features that are designed to serve a particular function. Many times the proper function of one feature depends on another. For example, if a forebay is not properly maintained, it could negatively affect the performance of a feature downstream (trickle channel, micropool, etc.).

Therefore, it is critical that each feature of the EDB is properly inspected and maintained to ensure that the overall facility functions as it was intended. Below is a list and description of the most common features within an EDB and the corresponding maintenance inspection items that can be anticipated:

**Table EDB-1  
Typical Inspection & Maintenance Requirements Matrix**

| EDB Features             | Sediment Removal | Mowing/ Weed control | Trash & Debris Removal | Erosion | Overgrown Vegetation Removal | Standing Water (mosquito/ algae control) | Structure Repair |
|--------------------------|------------------|----------------------|------------------------|---------|------------------------------|--|------------------|
| Inflow Points (outfalls) | X                |                      | X                      |         |                              |  | X                |
| Forebay                  | X                |                      | X                      |         |                              |  | X                |
| Low-flow channel         | X                |                      | X                      | X       | X                            |  | X                |
| Bottom Stage             | X                | X                    | X                      | X       | X                            | X  |                  |
| Micropool                | X                |                      | X                      |         | X                            | X  | X                |
| Outlet Works             | X                |                      | X                      |         |                              |  | X                |
| Emergency Spillway       |                  |                      | X                      | X       | X                            |  | X                |
| Upper Stage              |                  |                      | X                      | X       |                              |  |                  |
| Embankment               |                  | X                    |                        | X       | X                            |  |                  |

#### EDB-2.3.1 Inflow Points

Inflow Points or Outfalls into EDBs are the point source of the stormwater discharge into the facility. An inflow point is commonly a storm sewer pipe with a flared end section that discharges into the EDB. In some instances, an inflow point could be a drainage channel or ditch that flows into the facility.

An energy dissipater (riprap or hard armor protection) is typically immediately downstream of the discharge point into the EDB to protect from erosion. In some cases, the storm sewer outfall can have a toe-wall or cut-off wall immediately below the structure to prevent undercutting of the outfall from erosion.

*The typical maintenance items that are found with inflow points are as follows:*

- a. *Riprap Displaced* – Many times, because the repeated impact/force of water, the riprap can shift and settle. If any portion of the riprap apron appears to have settled, soil is present between the riprap, or

the riprap has shifted, maintenance may be required to ensure future erosion is prevented.

*b. Erosion Present/Outfall Undercut* – In some situations, the energy dissipater may not have been sized, constructed, or maintained appropriately and erosion has occurred. Any erosion within the vicinity of the inflow point will require maintenance to prevent damage to the structure(s) and sediment transport within the facility.

*c. Sediment Accumulation* – Because of the turbulence in the water created by the energy dissipater, sediment often deposits immediately downstream of the inflow point. To prevent a loss in hydraulic performance of the upstream infrastructure, sediment that accumulates in this area must be removed in a timely manner.

*d. Structural Damage* – Structural damage can occur at anytime during the life of the facility. Typically, for an inflow, the structural damage occurs to the pipe flared end section (concrete or steel). Structural damage can lead to additional operating problems with the facility, including loss of hydraulic performance.

*e. Woody Growth/Weeds Present* – Undesirable vegetation can grow in and around the inflow area to an EDB that can significantly affect the performance of the drainage facilities discharging into the facility. This type of vegetation includes trees (typically cottonwoods) and dense areas of shrubs (willows). If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate, resulting in blockage of the discharge. Also, tree roots can cause damage to the structural components of the inflow. Routine maintenance is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree). In addition, noxious weeds growing in the facility can result in the loss of desirable native vegetation and impact adjacent open spaces/land.

#### EDB-2.3.2 Forebay

A forebay is a solid surface (pad), typically constructed of concrete, immediately downstream of the inflow point. The forebay is designed to capture larger particles and trash to prevent them from entering the main portion of the EDB. The solid surface is designed to facilitate mechanical sediment removal (skid steer). The forebay typically includes a small diameter discharge pipe or v-notch weir on the downstream end and designed to drain the forebay in a specified period of time to promote sedimentation. The forebays vary in size and depth depending on the design and site constraints.

*The typical maintenance items that are found with forebays are as follows:*

*a. Sediment/Debris Accumulation* – Because this feature of the EDB is designed to provide the initial sedimentation, debris and sediment frequently accumulate in this area. If the sediment and debris is not removed from the forebay on a regular basis, it can significantly affect the function of other features within the EDB. Routine sediment removal from the forebay can **significantly** reduce the need for dredging of the main portion of the EDB using specialized equipment (long reach excavators). Routine removal of sediment from the forebay can **substantially** decrease the long-term sediment removal costs of an EDB.

*b. Concrete Cracking/Failing* – The forebay is primarily constructed of concrete, which cracks, spalls, and settles. Damage to the forebay can result in decreased performance and impact maintenance efforts.

*c. Drain Pipe/Weir Clogged* – Many times the drainpipe or weir can be clogged with debris, and prevent the forebay from draining properly. If standing water is present in the forebay (and there is not a base flow), the forebay is most likely not draining properly. This can result in a decrease in performance and create potential nuisances with stagnant water (mosquitoes).

*d. Weir/Drain Pipe Damaged* – Routine maintenance activities, vandalism, or age may cause the weir or drain pipe in the forebay to become damaged. Weirs are typically constructed of concrete, which cracks and spalls. The drainpipe is typically smaller in diameter and constructed with plastic, which can fracture.

#### EDB-2.3.3 Trickle Channel (Low-Flow)

The trickle channel conveys stormwater from the forebay to the micro-pool of the EDB. The trickle channel is typically made of concrete. However, grass lined (riprap sides protected) is also common and can provide for an additional means of water quality within the EDB. The trickle channel is typically 6-9 inches in depth and can vary in width.

*The typical maintenance items that are found with trickle channels are as follows:*

*a. Sediment/Debris Accumulation* – Trickle channels are typically designed with a relatively flat slope that can promote sedimentation and the collection of debris. Also, if a trickle channel is grass lined it can accumulate sediment and debris at a much quicker rate. Routine

removal of accumulated sediment and debris is essential in preventing flows from circumventing the trickle channel and affecting the dry storage portion of the pond.

*b. Concrete/Riprap Damage* – Concrete can crack, spall, and settle and must be repaired to ensure proper function of the trickle channel. Riprap can also shift over time and must be replaced/repaired as necessary.

*c. Woody Growth/Weeds Present* – Because of the constant moisture in the area surrounding the trickle channel, woody growth (cottonwoods/willows) can become a problem. Trees and dense shrub type vegetation can affect the capacity of the trickle channel and can allow flows to circumvent the feature.

*d. Erosion Outside of Channel* – In larger precipitation events, the trickle channel capacity will likely be exceeded. This can result in erosion immediately adjacent to the trickle channel and must be repaired to prevent further damage to the structural components of the EDB.

#### EDB-2.3.4 Bottom Stage

The bottom stage is at least 1.0 to 2.0 feet deeper than the upper stage and is located in front of the outlet works structure. The bottom stage is designed to store the smaller runoff events, assists in keeping the majority of the basin bottom dry resulting in easier maintenance operations, and enhances the facilities pollutant removal capabilities. This area of the EDB may develop wetland vegetation.

*The typical maintenance items that are found with the bottom stage are as follows:*

*a. Sediment/Debris Accumulation* – The micro-pool can frequently accumulate sediment and debris. This material must be removed to maintain pond volume and proper function of the outlet structure.

*b. Woody Growth/Weeds Present* - Because of the constant moisture in the soil surrounding the micro-pool, woody growth (cottonwoods/willows) can create operational problems for the EDB. If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate outside of the micro-pool, which can cause problems with other EDB features. Also, tree roots can cause damage to the structural components of the outlet works. Routine management is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree).

c. *Bank Erosion* – The micro-pool is usually a couple feet deeper than the other areas of the ponds. Erosion can be caused by water dropping into the micro-pool if adequate protection/armor is not present. Erosion in this area must be mitigated to prevent sediment transport and other EDB feature damage.

d. *Mosquitoes/Algae Treatment* – Nuisance created by stagnant water can result from improper maintenance/treatment of the micro-pool. Mosquito larvae can be laid by adult mosquitoes within the permanent pool. Also, aquatic vegetation that grows in shallow pools of water can decompose causing foul odors. Chemical/mechanical treatment of the micro-pool may be necessary to reduce these impacts to adjacent homeowners.

e. *Petroleum/Chemical Sheen* – Many indicators of illicit discharges into the storm sewer systems will be present in the micro-pool area of the EDB. These indicators can include sheens, odors, discolored soil, and dead vegetation. If it is suspected that an illicit discharge has occurred, contact the supervisor immediately. Proper removal/mitigation of contaminated soils and water in the EDB is necessary to minimize any environmental impacts downstream.

#### EDB-2.3.5 Micro-pool

The micro-pool is a concrete or grouted boulder walled structure directly in front of the outlet works. At a minimum, the micropool is 2.5 feet deep and is designed to hold water. The micro-pool is critical in the proper function of the EDB; it allows suspended sediment to be deposited at the bottom of the micro-pool and prevents these sediments from being deposited in front of the outlet works causing clogging of the outlet structure, which results in marshy areas within the top and bottom stages.

*The typical maintenance items that are found with micro-pools are as follows:*

a. *Sediment/Debris Accumulation* – The micro-pool can frequently accumulate sediment and debris. This material must be removed to maintain pond volume and proper function of the outlet structure.

b. *Woody Growth/Weeds Present* - Because of the constant moisture in the soil surrounding the micro-pool, woody growth (cottonwoods/willows) can create operational problems for the EDB. If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate outside of the micro-pool, which



can cause problems with other EDB features. Also, tree roots can cause damage to the structural components of the outlet works. Routine management is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree).

*c. Mosquitoes/Algae Treatment* – Nuisance created by stagnant water can result from improper maintenance/treatment of the micro-pool. Mosquito larvae can be laid by adult mosquitoes within the permanent pool. Also, aquatic vegetation that grows in shallow pools of water can decompose causing foul odors. Chemical/mechanical treatment of the micro-pool may be necessary to reduce these impacts to adjacent homeowners.

*d. Petroleum/Chemical Sheen* – Many indicators of illicit discharges into the storm sewer systems will be present in the micro-pool area of the EDB. These indicators can include sheens, odors, discolored soil, and dead vegetation. If it is suspected that an illicit discharge has occurred, contact the supervisor immediately. Proper removal/mitigation of contaminated soils and water in the EDB is necessary to minimize any environmental impacts downstream.

#### EDB-2.3.6 Outlet Works

The outlet works is the feature that drains the EDB in specified quantities and periods of time. The outlet works is typically constructed of reinforced concrete into the embankment of the EDB. The concrete structure typically has steel orifice plates anchored/embedded into it to control stormwater release rates. The larger openings (flood control) on the outlet structure typically have trash racks over them to prevent clogging. The water quality orifice plate (smaller diameter holes) will typically have a well screen covering it to prevent smaller materials from clogging it. The outlet structure is the single most important feature in the EDB operation. Proper inspection and maintenance of the outlet works is essential in ensuring the long-term operation of the EDB.

*The typical maintenance items that are found with the outlet works are as follows:*

*a. Trash Rack/Well Screen Clogged* – Floatable material that enters the EDB will most likely make its way to the outlet structure. This material is trapped against the trash racks and well screens on the outlet structure (which is why they are there). This material must be removed on a routine basis to ensure the outlet structure drains in the specified design period.

*b. Structural Damage* - The outlet structure is primarily constructed of concrete, which can crack, spall, and settle. The steel trash racks and well screens are also susceptible to damage.

*c. Orifice Plate Missing/Not Secure* – Many times residents, property owners, or maintenance personnel will remove or loosen orifice plates if they believe the pond is not draining properly. Any modification to the orifice plate(s) will significantly affect the designed discharge rates for water quality and/or flood control. Modification of the orifice plates is not allowed without approval from SEMSWA.

*d. Manhole Access* – Access to the outlet structure is necessary to properly inspect and maintain the facility. If access is difficult or not available to inspect the structure, chances are it will be difficult to maintain as well.

*e. Woody Growth/Weeds Present* - Because of the constant moisture in the soil surrounding the outlet works, woody growth (cottonwoods/willows) can create operational problems for the EDB. If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate around the outlet works, which can cause problems with other EDB features. Also, tree roots can cause damage to the structural components of the outlet works. Routine management is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree).

#### EDB-2.3.7 Emergency Spillway

An emergency spillway is typical of all EDBs and designed to serve as the overflow in the event the volume of the pond is exceeded. The emergency spillway is typically armored with riprap (or other hard armor) and is sometimes buried with soil. The emergency spillway is typically a weir (notch) in the pond embankment. Proper function of the emergency spillway is essential to ensure flooding does not affect adjacent properties.

*The typical maintenance items that are found with emergency spillways are as follows:*

*a. Riprap Displaced* – As mentioned before, the emergency spillway is typically armored with riprap to provide erosion protection. Over the life of an EDB, the riprap may shift or dislodge due to flow.

*b. Erosion Present* – Although the spillway is typically armored, stormwater flowing through the spillway can cause erosion damage.

Erosion must be repaired to ensure the integrity of the basin embankment, and proper function of the spillway.

*c. Woody Growth/Weeds Present* – Management of woody vegetation is essential in the proper long-term function of the spillway. Larger trees or dense shrubs can capture larger debris entering the EDB and reduce the capacity of the spillway.

*d. Obstruction Debris* – The spillway must be cleared of any obstruction (man made or natural) to ensure the proper design capacity.

#### EDB-2.3.8 Upper Stage (Dry Storage)

The upper stage of the EDB provides the majority of the water quality flood detention volume. This area of the EDB is higher than the micro-pool and typically stays dry, except during storm events. The upper stage is the largest feature/area of the basin. Sometimes, the upper stage can be utilized for park space and other uses in larger EDBs. With proper maintenance of the micro-pool and forebay(s), the upper stage should not experience much sedimentation; however, bottom elevations should be monitored to ensure adequate volume.

*The typical maintenance items that are found with upper stages are as follows:*

*a. Vegetation Sparse* – The upper basin is the most visible part of the EDB, and therefore aesthetics is important. Adequate and properly maintained vegetation can greatly increase the overall appearance and acceptance of the EDB by the public. In addition, vegetation can reduce the potential for erosion and subsequent sediment transport to the other areas of the pond.

*b. Woody Growth/Undesirable Vegetation* – Although some trees and woody vegetation may be acceptable in the upper basin, some thinning of cottonwoods and willows may be necessary. Remember, the basin will have to be dredged to ensure volume, and large trees and shrubs will be difficult to protect during that operation.

*c. Standing Water/Boggy Areas* – Standing water or boggy areas in the upper stage is typically a sign that some other feature in the pond is not functioning properly. Routine maintenance (mowing, trash removal, etc) can be extremely difficult for the upper stage if the ground is saturated. If this inspection item is checked, make sure you have identified the root cause of the problem.

*d. Sediment Accumulation* – Although other features within the EDB are designed to capture sediment, the upper storage area will collect sediment over time. Excessive amounts of sedimentation will result in a loss of storage volume. It may be more difficult to determine if this area has accumulated sediment without conducting a field survey.

Below is a list of indicators:

1. Ground adjacent to the trickle channel appears to be several inches higher than concrete/riprap
2. Standing water or boggy areas in upper stage
3. Uneven grades or mounds
4. Micro-pool or Forebay has excessive amounts of sediment

*e. Erosion (banks and bottom)* – The bottom grades of the dry storage are typically flat enough that erosion should not occur. However, inadequate vegetative cover may result in erosion of the upper stage. Erosion that occurs in the upper stage can result in increased dredging/maintenance of the micro-pool.

*f. Trash/Debris* – Trash and debris can accumulate in the upper area after large events, or from illegal dumping. Over time, this material can accumulate and clog the EDB outlet works.

*g. Maintenance Access* – Most EDBs typically have a gravel/concrete maintenance access path to either the upper stage or forebay. This access path should be inspected to ensure the surface is still drivable. Some of the smaller EDBs may not have maintenance access paths; however, the inspector should verify that access is available from adjacent properties.

#### EDB-2.3.9 Miscellaneous

There are a variety of inspection/maintenance issues that may not be attributed to a single feature within the EDB. This category on the inspection form is for maintenance items that are commonly found in the EDB, but may not be attributed to an individual feature.

*a. Encroachment in Easement Area* – Private lots/property can sometimes be located very close to the EDBs, even though they are required to be located in tracts with drainage easements. Property owners may place landscaping, trash, fencing, or other items within the easement area that may affect maintenance or the operation of the facility.

*b. Graffiti/Vandalism* – Damage to the EDB infrastructure can be caused by vandals. If criminal mischief is evident, the inspector should forward this information to the local Sheriff's Office.

*c. Public Hazards* – Public hazards include items such as vertical drops of greater than 4-feet, containers of unknown/suspicious substances, exposed metal/jagged concrete on structures. **If any hazard is found within the facility area that poses an immediate threat to public safety, contact the local Sheriff at 911 immediately!**

*d. Burrowing Animals/Pests* – Prairie dogs and other burrowing rodents may cause damage to the EDB features and negatively affect the vegetation within the EDB.

*e. Other* – Any miscellaneous inspection/maintenance items not contained on the form should be entered here.

### **EDB-3 MAINTAINING EXTENDED DETENTION BASINS (EDBS)**

#### **EDB-3.1 Maintenance Personnel**

Maintenance personnel must be qualified to properly maintain EDBs. Inadequately trained personnel can cause additional problems resulting in additional maintenance costs.

#### **EDB-3.2 Equipment**

It is imperative that the appropriate equipment and tools are taken to the field with the operations crew. The types of equipment/tools will vary depending on the task at hand. Below is a list of tools, equipment, and material(s) that may be necessary to perform maintenance on an EDB:

- 1.) Loppers/Tree Trimming Tools
- 2.) Mowing Tractors
- 3.) Trimmers (extra string)
- 4.) Shovels
- 5.) Rakes
- 6.) All Surface Vehicle (ASVs)
- 7.) Skid Steer
- 8.) Back Hoe
- 9.) Track Hoe/Long Reach Excavator
- 10.) Dump Truck

- 11.) Jet-Vac Machine
- 12.) Engineers Level (laser)
- 13.) Riprap (Minimum - Type M)
- 14.) Filter Fabric
- 15.) Erosion Control Blanket(s)
- 16.) Seed Mix (Native - Foothills)
- 17.) Illicit Discharge Cleanup Kits
- 18.) Trash Bags
- 19.) Tools (wrenches, screw drivers, hammers, etc)
- 20.) Chain Saw
- 21.) Confined Space Entry Equipment
- 22.) Approved Stormwater Facility Operation and Maintenance Manual

Some of the items identified above may not be needed for every maintenance operation. However, this equipment should be available to the maintenance operations crews should the need arise.

### **EDB-3.3 Safety**

Vertical drops may be encountered in areas located within and around the facility. Avoid walking on top of retaining walls or other structures that have a significant vertical drop. If a vertical drop is identified within the EDB that is greater than 48" in height, make the appropriate note/comment on the maintenance inspection form.

### **EDB-3.4 Maintenance Categories and Activities**

A typical EDB Maintenance Program will consist of three broad categories of work. Within each category of work, a variety of maintenance activities can be performed on an EDB. A maintenance activity can be specific to each feature within the EDB, or general to the overall facility. This section of the SOP explains each of the categories and briefly describes the typical maintenance activities for an EDB.

A variety of maintenance activities are typical of EDBs. The maintenance activities range in magnitude from routine trash pickup to the reconstruction of drainage infrastructure. Below is a description of each maintenance activity, the objectives, and frequency of actions:

### EDB-3.5 Routine Maintenance Activities

The majority of this work consists of regularly scheduled mowing and trash and debris pickups for stormwater management facilities during the growing season. This includes items such as the removal of debris/material that may be clogging the outlet structure well screens and trash racks. It also includes activities such as weed control, mosquito treatment, and algae treatment. These activities normally will be performed numerous times during the year. These items can be completed without any prior correspondence with the Southeast Metro Stormwater Authority; however, completed inspection and maintenance forms shall be submitted to the SEMSWA for each inspection and maintenance activity.

The Maintenance Activities are summarized below, and further described in the following sections.

**TABLE – EDB-2  
Summary of Routine Maintenance Activities**

| MAINTENANCE ACTIVITY  | MINIMUM FREQUENCY   | LOOK FOR:                                | MAINTENANCE ACTION   |
|-----------------------|---|--|--|
| Mowing                | Twice annually  | Excessive grass height/aesthetics        | Mow grass to a height of 4" to 6"  |
| Trash/Debris Removal  | Twice annually  | Trash & debris in EDB                    | Remove and dispose of trash and debris   |
| Outlet Works Cleaning | As needed - after significant rain events – twice annually min. | Clogged outlet structure; ponding water  | Remove and dispose of debris/trash/sediment to allow outlet to function properly |
| Weed control          | Minimum twice annually  | Noxious weeds; Unwanted vegetation       | Treat w/ herbicide or hand pull; Consult the local weed specialist               |
| Mosquito Treatment    | As needed   | Standing water/mosquito habitat          | Treat w/ EPA approved chemicals  |
| Algae Treatment       | As needed   | Standing water/ Algal growth/green color | Treat w/ EPA approved chemicals  |

#### EDB-3.5.1 Mowing

Occasional mowing is necessary to limit unwanted vegetation and to improve the overall appearance of the EDB. Native vegetation should

be mowed to a height of 4-to-6 inches tall. Grass clippings should be collected and disposed of properly.

*Frequency* – Routine - Minimum of twice annually or depending on aesthetics.

#### EDB-3.5.2 Trash/Debris Removal

Trash and debris must be removed from the entire EDB area to minimize outlet clogging and to improve aesthetics. This activity must be performed prior to mowing operations.

*Frequency* – Routine – Prior to mowing operations and minimum of twice annually.

#### EDB-3.5.3 Outlet Works Cleaning

Debris and other materials can clog the outlet work's well screen, orifice plate(s) and trash rack. This activity must be performed anytime other maintenance activities are conducted to ensure proper operation.

*Frequency* - Routine – After significant rainfall event or concurrently with other maintenance activities.

#### EDB-3.5.4 Weed Control

Noxious weeds and other unwanted vegetation must be treated as needed throughout the EDB. This activity can be performed either through mechanical means (mowing/pulling) or with herbicide. Consultation with the local Weed Inspector is highly recommended prior to the use of herbicide.

*Frequency* – Routine – As needed based on inspections.

#### EDB-3.5.5 Mosquito/Algae Treatment

- Treatment of permanent pools is necessary to control mosquitoes and undesirable aquatic vegetation that can create nuisances. Only EPA approved chemicals/materials can be used in areas that are warranted.

*Frequency* – As needed.



### **EDB- 3.6 Minor Maintenance Activities**

This work consists of a variety of isolated or small-scale maintenance or operational problems. Most of this work can be completed by a small crew, tools, and small equipment. These items require prior correspondence with SEMSWA and require completed inspection and maintenance forms to be submitted to SEMSWA for each inspection and maintenance activity.

**Table – EDB-3  
Summary of Minor Maintenance Activities**

| MAINTENANCE ACTIVITY                    | MINIMUM FREQUENCY                     | LOOK FOR:  | MAINTENANCE ACTION   |
|---|---------------------------------------|--|--|
| <b>Sediment Removal</b>                 | As needed; typically every 1 –2 years | Sediment build-up; decrease in pond volume                         | Remove and dispose of sediment                               |
| <b>Erosion Repair</b>                   | As needed, based upon inspection      | Rills/gullies forming on side slopes, trickle channel, other areas | Repair eroded areas<br>Revegetate; address source of erosion |
| <b>Vegetation Removal/Tree Thinning</b> | As needed, based upon inspection      | Large trees/wood vegetation in lower chamber of pond               | Remove vegetation; restore grade and surface                 |
| <b>Drain Cleaning/Jet Vac</b>           | As needed, based upon inspection      | Sediment build-up /non draining system                             | Clean drains; Jet Vac if needed                              |

#### **EDB-3.6.1 Sediment Removal**

Sediment removal is necessary to maintain the original design volume of the EDB and to ensure proper function of the infrastructure. Regular sediment removal (minor) from the forebay, inflow(s), and trickle channel can significantly reduce the frequency of major sediment removal activities (dredging) in the upper and lower stages. The minor sediment removal activities can typically be addressed with shovels and smaller equipment. Major sediment removal activities will require larger and more specialized equipment. The major sediment activities

will also require surveying with an engineer's level, and consultation with SEMSWA Engineering Staff to ensure design volumes/grades are achieved.

Stormwater sediments removed from EDBs do not meet the criteria of "hazardous waste". However, these sediments are contaminated with a wide array of organic and inorganic pollutants and handling must be done with care. Sediments from permanent pools must be carefully removed to minimize turbidity, further sedimentation, or other adverse water quality impacts. Sediments should be transported by motor vehicle only after they are dewatered. All sediments must be taken to a landfill for proper disposal. Prompt and thorough cleanup is important should a spill occur during transportation.

*Frequency* – Nonroutine – As necessary based upon inspections. Sediment removal in the forebay and trickle channel may be necessary as frequently as every 1-2 years.

#### EDB-3.6.2 Erosion Repair

The repair of eroded areas is necessary to ensure the proper function of the EDB, minimize sediment transport, and to reduce potential impacts to other features. Erosion can vary in magnitude from minor repairs to trickle channels, energy dissipaters, and rilling to major gullies in the embankments and spillways. The repair of eroded areas may require the use of excavators, earthmoving equipment, riprap, concrete, erosion control blankets, and turf reinforcement mats. Major erosion repair to the pond embankments, spillways, and adjacent to structures will require consultation with SEMSWA engineering staff.

*Frequency* – Nonroutine – As necessary based upon inspections.

#### EDB-3.6.3 Vegetation Removal/Tree Thinning

Dense stands of woody vegetation (willows, shrubs, etc) or trees can create maintenance problems for the infrastructure within an EDB. Tree roots can damage structures and invade pipes/channels thereby blocking flows. Also, trees growing in the upper and lower stages of the EDB will most likely have to be removed when sediment/dredging operations occur. A small tree is easier to remove than a large tree, therefore, regular removal/thinning is imperative. All trees and woody vegetation that is growing in the bottom of the EDB or near structures (inflows, trickle channels, outlet works, emergency spillways, etc) should be removed. Any trees or woody vegetation in the EDB should be limited to the upper portions of the pond banks.

*Frequency – Nonroutine – As necessary based upon inspections.*

#### EDB-3.6.4 Clearing Drains/Jet-Vac

An EDB contains many structures, openings, and pipes that can be frequently clogged with debris. These blockages can result in a decrease of hydraulic capacity and create standing water in areas outside of the micro-pool. Many times the blockage to this infrastructure can be difficult to access and/or clean. Specialized equipment (jet-vac machines) may be necessary to clear debris from these difficult areas.

*Frequency – Nonroutine – As necessary based upon inspections.*

### EDB-3.7 Major Maintenance Activities

This work consists of larger maintenance/operational problems and failures within the stormwater management facilities. All of this work requires consultation with SEMSWA to ensure the proper maintenance is performed. This work requires that the engineering staff review the original design and construction drawings to assess the situation and assign the necessary maintenance. **A public improvements permit shall be required for all major maintenance activities.** This work may also require more specialized maintenance equipment, design/details, surveying, or assistance through private contractors and consultants.

**Table – EDB-4  
Summary of Major Maintenance Activities**

| <b>MAINTENANCE ACTIVITY</b> | <b>MINIMUM FREQUENCY</b>                     | <b>LOOK FOR:</b>  | <b>MAINTENANCE ACTION</b>  |
|-----------------------------|--|---|--|
| Major Sediment Removal      | As needed – based upon scheduled inspections | Large quantities of sediment; reduced pond capacity                                       | Remove and dispose of sediment. Repair vegetation as needed                |
| Major Erosion Repair        | As needed – based upon scheduled inspections | Severe erosion including gullies, excessive soil displacement, areas of settlement, holes | Repair erosion – find cause of problem and address to avoid future erosion |
| Structural Repair           | As needed – based upon scheduled inspections | Deterioration and/or damage to structural components – broken concrete,                   | Structural repair to restore the structure to its original design          |

|  |  |                                |  |
|--|--|--------------------------------|--|
|  |  | damaged pipes,<br>outlet works |  |
|--|--|--------------------------------|--|

EDB-3.7.1 Major Sediment Removal

Major sediment removal consists of removal of large quantities of sediment or removal of sediment from vegetated areas. Care shall be given when removing large quantities of sediment and sediment deposited in vegetated areas. Large quantities of sediment need to be carefully removed, transported and disposed of. Vegetated areas need special care to ensure design volumes and grades are preserved.

*Frequency* – Nonroutine – Repair as needed based upon inspections.

EDB-3.7.2 Major Erosion Repair

Major erosion repair consist of filling and revegetating areas of severe erosion. Determining the cause of the erosion as well as correcting the condition that caused the erosion should also be part of the erosion repair. Care should be given to ensure design grades and volumes are preserved.

*Frequency* – Nonroutine – Repair as needed based upon inspections.

EDB-3.7.3 Structural Repair

An EDB includes a variety of structures that can deteriorate or be damaged during the course of routine maintenance. These structures are constructed of steel and concrete that can degrade or be damaged and may need to be repaired or re-constructed from time to time. These structures include items like outlet works, trickle channels, forebays, inflows and other features. In-house operations staff can perform some of the minor structural repairs. Major repairs to structures may require input from a structural engineer and specialized contractors. Consultation with SEMSWA Engineering Staff should take place prior to all structural repairs.

*Frequency* – Nonroutine – Repair as needed based upon inspections.

**Reference:**

**This manual is adapted from Town of Parker, Colorado, *STORMWATER PERMANENT BEST MANAGEMENT PRACTICES (PBMP) LONG-TERM OPERATION AND MAINTENANCE MANUAL*,  
October 2004**





**COLORADO**  
Department of  
Transportation

Region 2 Traffic Section  
5615 Wills Blvd., Suite A  
Pueblo, Colorado 81008  
(719) 546-5732 Fax:

Permit No. **224022**

March 26, 2024

To:  
McCauley Constructors  
Anna Fluckey  
650 Innovation Circle  
Windsor, Colorado 80550

Dear Applicant:

1. Please **review** the attached State Highway Access Permit (Form #101) and all enclosed attachments.
2. If you choose **NOT** to act on the permit, within 60 days of the date of this transmittal letter, Colorado Department of Transportation will consider this permit withdrawn and reapplication will be required.
3. If you wish to **APPEAL** the Terms and Conditions of the permit, please refer to the attached Form 101, Pages 2 and 3 for an explanation of the appeal procedures.
4. If you **ACCEPT** the Permit and its Terms and Conditions and are authorized to sign as legal owner of the property or as an authorized representative, please sign and date the DocuSign Access Permit form #101 on the line marked "PERMITTEE". Your signature confirms your agreement to all the listed Terms and Conditions. **The file will be returned electronically to the permit Author for final signatures and completion. The executed DocuSign envelope will be returned to you electronically through email once the permit author has signed, executing the permit. Keep in mind that this by no means grants access, permission to construct or perform any work in the CDOT right-of-way. This will come with a Notice to Proceed to construct.** This agreement step merely states that we have an agreement to grant access at the given location to you.
5. **Upon affixing the Permittees signature or authorized signatory a link to pay the fee will be provided through PAYPAL. The link will be for the total amount due of \$100.00.** If the Permittee is not paying the fee and the fee is being paid by third party a PayPal link can be requested through your permit author. **If the link is missed contact the permit author and they will send the link via email.**
6. As described in the attached Terms and Conditions, you must make a written request to obtain a Notice to Proceed. DO NOT begin any work within the State Highway Right-of-Way without a validated Access Permit and Notice to Proceed. Use of this permit without the Colorado Department of Transportation's validation shall be considered a violation of State Law and the permit will be revoked.

If you have any questions please call Arthur Gonzales, Access Manager at [arthur.gonzales@state.co.us](mailto:arthur.gonzales@state.co.us) or office (719) 546-5732 (email is best).

|  |                                 |   |  |
|--|---------------------------------|---|--|
| <b>COLORADO DEPARTMENT OF TRANSPORTATION</b><br><b>STATE HIGHWAY ACCESS PERMIT</b> |                                 |   | CDOT Permit No.<br><b>224022</b>                     |
|  |                                 |   | State Highway No / Mp / Side<br>115A / 17.190 / Left |
| Permit Fee<br>\$100.00   | Date of Transmittal<br>03/26/24 | Region / Section / Patrol / Name<br>2 / 04 / 023 James (Jamie) Buford | Local Jurisdiction<br>CDOT                           |

|   |   |
|---|---|
| <b>The Permittee(s):</b><br><br>Epcoco Rei one, LLC<br>John Edgar<br>17225 Highway 115<br>Penrose, Colorado 81240 | <b>The Applicant(s):</b><br><br>McCauley Constructors<br>Anna Fluckey<br>650 Innovation Circle<br>Windsor, Colorado 80550 |
|---|---|

is hereby granted permission to have an access to the state highway at the location noted below. The access shall be constructed, maintained and used in accordance with this permit, including the State Highway Access Code and any attachments, terms, conditions and exhibits. This permit may be revoked by the Issuing Authority if at any time the permitted access and its use violate any parts of this permit. The issuing authority, the Department and their duly appointed agents and employees shall be held harmless against any action for personal injury or property damage sustained by reason of the exercise of the permit.

Location: 17225 State Hwy 115, Penrose CO |

| Access to Provide Service to: (Land Use Code)                     | (Size)       | (Units)      |
|---|--------------|--------------|
| <b>150 - Warehousing RV/Boat Storage/Mini Warehouse on 17,760</b> | <b>1.36</b>  | <b>Acres</b> |
| <b>1000 - Other RV/Boat Storage Office - Lounge</b>               | <b>1,000</b> | <b>SqFt</b>  |
| <b>1097 - Agricultural Field Approach Vacant Land</b>             | <b>1.36</b>  | <b>Acres</b> |

**Additional Information:**

Please see additional documentation in the electronic folder.

**MUNICIPALITY OR COUNTY APPROVAL**


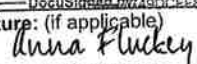
Required only when the appropriate local authority retains issuing authority.

|           |            |      |       |
|-----------|------------|------|-------|
| Signature | Print Name | Date | Title |
|-----------|------------|------|-------|

Upon the signing of this permit the permittee agrees to the terms and conditions and referenced attachments contained herein. All construction shall be completed in an expeditious and safe manner and shall be finished within 45 days from initiation. The permitted access shall be completed in accordance with the terms and conditions of the permit prior to being used.


**The permittee shall notify Ron Young with the Colorado Department of Transportation, at 719-289-8718 at least 5-day hours prior to commencing construction within the State Highway right-of-way.**

The person signing as the permittee must be the owner or legal representative of the property served by the permitted access and have full authority to accept the permit and its terms and conditions.

|   |                            |                                 |
|---|----------------------------|---------------------------------|
| Permittee Signature:<br>                 | Print Name<br>Anna Fluckey | Date<br>3/28/2024   4:44 PM MDT |
| Applicant Signature: (if applicable)<br> | Print Name<br>Anna Fluckey | Date<br>3/28/2024   4:41 PM MDT |

This permit is not valid until signed by a duly authorized representative of the Department.

**COLORADO DEPARTMENT OF TRANSPORTATION**

|  |                               |                              |   |
|--|-------------------------------|------------------------------|---|
| Signature<br> | Print Name<br>Arthur Gonzales | Title<br>R2 - Access Manager | Date (of issue)<br>3/1/2024   4:10 PM MDT |
|--|-------------------------------|------------------------------|---|



**State Highway Access Permit  
Form 101, Page 2**

The following paragraphs are excerpts of the State Highway Access Code. These are provided for your convenience but do not alleviate compliance with all sections of the Access Code. A copy of the State Highway Access Code is available from your local issuing authority (local government) or the Colorado Department of Transportation (Department). When this permit was issued, the issuing authority made its decision based in part on information submitted by the applicant, on the access category which is assigned to the highway, what alternative access to other public roads and streets is available, and safety and design standards. Changes in use or design not approved by the permit or the issuing authority may cause the revocation or suspension of the permit.

**APPEALS**

1. Should the permittee or applicant object to the denial of a permit application by the Department or object to any of the terms or conditions of a permit placed there by the Department, the applicant and permittee (appellant) have a right to appeal the decision to the [Transportation] Commission [of Colorado]. To appeal a decision, submit a request for administrative hearing to the Transportation Commission of Colorado within 60 days of transmittal of notice of denial or transmittal of the permit for signature. Submit the request to the Transportation Commission of Colorado, 4201 East Arkansas Avenue, Denver, Colorado 80222-3400. The request shall include reasons for the appeal and may include changes, revisions, or conditions that would be acceptable to the permittee or applicant.
2. Any appeal by the applicant or permittee of action by a local issuing authority shall be filed with the local authority and be consistent with the appeal procedures of the local authority.
3. In submitting the request for administrative hearing, the appellant has the option of including within the appeal a request for a review by the Department's internal administrative review committee pursuant to [Code] subsection 2.10. When such committee review is requested, processing of the appeal for formal administrative hearing, 2.9(5) and (6), shall be suspended until the appellant notifies the Commission to proceed with the administrative hearing, or the appellant submits a request to the Commission or the administrative law judge to withdraw the appeal. The two administrative processes, the internal administrative review committee, and the administrative hearing, may not run concurrently.
4. Regardless of any communications, meetings, administrative reviews or negotiations with the Department or the internal administrative review Committee regarding revisions or objections to the permit or a denial, if the permittee or applicant wishes to appeal the Department's decision to the Commission for a hearing, the appeal must be brought to the Commission within 60 days of transmittal of notice of denial or transmittal of the permit.

**PERMIT EXPIRATION**

1. A permit shall be considered expired if the access is not under construction within one year of the permit issue date or before the expiration of any authorized extension. When the permittee is unable to commence construction within one year after the permit issue date, the permittee may request a one year extension from the issuing authority. No more than two one-year extensions may be granted under any circumstances. If the access is not under construction within three years from date of issue the permit will be considered expired. Any request for an extension must be in writing and submitted to the issuing authority before the permit expires. The request should state the reasons why the extension is necessary, when construction is anticipated, and include a copy of page 1 (face of permit) of the access permit. Extension approvals shall be in writing. The local issuing authority shall obtain the concurrence of the Department prior to the approval of an extension, and shall notify the Department of all denied extensions within ten days. Any person wishing to reestablish an access permit that has expired may begin again with the application procedures. An approved Notice to Proceed, automatically renews the access permit for the period of the Notice to Proceed.

**CONSTRUCTION**

1. Construction may not begin until a Notice to Proceed is approved. (Code subsection 2.4)
2. The construction of the access and its appurtenances as required by the terms and conditions of the permit shall be completed at the expense of the permittee except as provided in subsection 2.14. All materials used in the construction of the access within the highway right-of-way or on permanent easements, become public property. Any materials removed from the highway right-of-way will be disposed of only as directed by the Department. All fencing, guard rail, traffic control devices and other equipment and materials removed in the course of access construction shall be given to the Department unless otherwise instructed by the permit or the Department inspector.
3. The permittee shall notify the individual or the office specified on the permit or Notice to Proceed at least two working days prior to any construction within state highway right-of-way. Construction of the access shall not proceed until both the access permit and the Notice to Proceed are issued. The access shall be completed in an expeditious and safe manner and shall be finished within 45 days from initiation of construction within the highway right-of-way. A construction time extension not to exceed 30 working days may be requested from the individual or office specified on the permit.
4. The issuing authority and the Department may inspect the access during construction and upon completion of the access to ensure that all terms and conditions of the permit are met. Inspectors are authorized to enforce the conditions of the permit during construction and to halt any activities within state right-of-way that do not comply with the provisions of the permit, that conflict with concurrent highway construction or maintenance work, that endanger highway property, natural or cultural resources protected by law, or the health and safety of workers or the public.

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5. Prior to using the access, the permittee is required to complete the construction according to the terms and conditions of the permit. Failure by the permittee to abide by all permit terms and conditions shall be sufficient cause for the Department or issuing authority to initiate action to suspend or revoke the permit and close the access. If in the determination of the Department or issuing authority the failure to comply with or complete the construction requirements of the permit create a highway safety hazard, such shall be sufficient cause for the summary suspension of the permit. If the permittee wishes to use the access prior to completion, arrangements must be approved by the issuing authority and Department and included in the permit. The Department or issuing authority may order a halt to any unauthorized use of the access pursuant to statutory and regulatory powers. Reconstruction or improvement of the access may be required when the permittee has failed to meet required specifications of design or materials. If any construction element fails within two years due to improper construction or material specifications, the permittee shall be responsible for all repairs. Failure to make such repairs may result in suspension of the permit and closure of the access.

6. The permittee shall provide construction traffic control devices at all times during access construction, in conformance with the M.U.T.C.D. as required by section 42-4-104, C.R.S., as amended.

7. A utility permit shall be obtained for any utility work within highway right-of-way. Where necessary to remove, relocate, or repair a traffic control device or public or private utilities for the construction of a permitted access, the relocation, removal or repair shall be accomplished by the permittee without cost to the Department or issuing authority, and at the direction of the Department or utility company. Any damage to the state highway or other public right-of-way beyond that which is allowed in the permit shall be repaired immediately. The permittee is responsible for the repair of any utility damaged in the course of access construction, reconstruction or repair.

8. In the event it becomes necessary to remove any right-of-way fence, the posts on either side of the access shall be securely braced with an approved end post before the fence is cut to prevent any slacking of the remaining fence. All posts and wire removed are Department property and shall be turned over to a representative of the Department.

9. The permittee shall ensure that a copy of the permit is available for review at the construction site at all times. The permit may require the contractor to notify the individual or office specified on the permit at any specified phases in construction to allow the field inspector to inspect various aspects of construction such as concrete forms, subbase, base course compaction, and materials specifications. Minor changes and additions may be ordered by the Department or local authority field inspector to meet unanticipated site conditions.

10. Each access shall be constructed in a manner that shall not cause water to enter onto the roadway or shoulder, and shall not interfere with the existing drainage system on the right-of-way or any adopted municipal system and drainage plan.

11. By accepting the permit, permittee agrees to save, indemnify, and hold harmless to the extent allowed by law, the issuing authority, the Department, its officers, and employees from suits, actions, claims of any type or character brought because of injuries or damage sustained by any person resulting from the permittee's use of the access permit during the construction of the access.

#### CHANGES IN ACCESS USE AND PERMIT VIOLATIONS

1. It is the responsibility of the property owner and permittee to ensure that the use of the access to the property is not in violation of the Code, permit terms and conditions or the Act. The terms and conditions of any permit are binding upon all assigns, successors-in-interest, heirs and occupants. If any significant changes are made or will be made in the use of the property which will affect access operation, traffic volume and or vehicle type, the permittee or property owner shall contact the local issuing authority or the Department to determine if a new access permit and modifications to the access are required.

2. When an access is constructed or used in violation of the Code, section 43-2-147(5)(c), C.R.S., of the Act applies. The Department or issuing authority may summarily suspend an access permit and immediately order closure of the access when its continued use presents an immediate threat to public health, welfare or safety. Summary suspension shall comply with article 4 of title 24, C.R.S.

#### MAINTENANCE

1. The permittee, his or her heirs, successors-in-interest, assigns, and occupants of the property serviced by the access shall be responsible for meeting the terms and conditions of the permit, the repair and maintenance of the access beyond the edge of the roadway including any cattle guard and gate, and the removal or clearance of snow or ice upon the access even though deposited on the access in the course of Department snow removal operations. Within unincorporated areas the Department will keep access culverts clean as part of maintenance of the highway drainage system. However, the permittee is responsible for the repair and replacement of any access-related culverts within the right-of-way. Within incorporated areas, drainage responsibilities for municipalities are determined by statute and local ordinance. The Department will maintain the roadway including auxiliary lanes and shoulders, except in those cases where the access installation has failed due to improper access construction and/or failure to follow permit requirements and specifications in which case the permittee shall be responsible for such repair. Any significant repairs such as culvert replacement, resurfacing, or changes in design or specifications, requires authorization from the Department.

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Access Permit No. 224022

Permittee: Epcoco Rei, LLC (John Edgar)

Applicant: McCauley Constructors, Inc (Anna Fluckey)

1. A NOTICE TO PROCEED TO CONSTRUCTION, CDOT Form 1265, is required before beginning the construction of the access or any activity in the highway right-of-way. All submittals, documents, plans, and other items that must be completed shall be submitted and approved by the Department before a NOTICE TO PROCEED to construction will be issued.
2. The access is located on the west side of State Highway 115, a distance of 1003-feet North from milepost 17 (17.19) with a known address of 17225 State Hwy 115, Penrose, CO in Fremont County.
3. This section of highway is a Category R-A highway. The information submitted with the application requires the following improvements be designed and installed:
  - a. A concrete hard surfaced single point of access shall be constructed for  $\frac{3}{4}$  left in access movement for ingress/egress traffic movements at this access point. Left turn out of the access are not allowed without the proper acceleration lane northbound.
  - b. The access shall be placed adjacent from the existing 1<sup>st</sup> Street connection.
  - c. A concrete paved section is required to be placed 20-feet from edge of roadway surface and doveled into the existing highway paving back toward property line.
  - d. The access width shall be 24-feet measured at the Right of Way.
  - e. A 36" x 36" R1-1 STOP sign shall be placed at the access for egressing vehicles.
  - f. Upon inspection, if it is determined that the existing culvert pipe is damaged or a culvert pipe is required for the access, the culvert pipe shall be removed and replaced in kind or new 18-inch culvert pipe will be installed.
  - g. Fence work is required as part of this permit per CDOT Standards.
  - h. Remove of existing Rumble Strips from highway shoulder at the access point are required to be removed and replaced with a smooth flat surface panel.
4. The Permittee/Applicant shall provide the Department with the following submittals, documents, plans and other items for review prior to the issuance of a NOTICE TO PROCEED to construction:
  - a. A written request for a NOTICE TO PROCEED including the access permit number listed above.
  - b. The Permittee, through a Colorado registered professional engineer, shall provide design, construction, pavement striping and signing plans to the Department and/or Issuing Authority for approval. The plans must include, but not limited to, layout of auxiliary lanes, utility locations, present and proposed right-of-way lines, present and proposed traffic control devices, cross sections on 50-foot intervals (NO CONTOURS), typical sections showing proposed surfacing requirements, and seeding requirements. Upon approval and prior to issuing a NOTICE TO PROCEED, the auxiliary lane(s) and intersection improvement plans shall be provided and shall be stamped and sealed by a Colorado registered professional engineer. The final plans will be incorporated into this Access Permit. The Permittee shall furnish the Department with a minimum of three sets of final plans.
  - c. Cost estimate for the improvements of the highway.
  - d. Current title policy or warranty deed.
  - e. A copy of the final recorded plat.
5. This Access Permit is issued to re-permit an existing access to State Highway 115 for a change in use. It replaces Access Permit Number 215075, issued, and expired in 2015. The access was previously permitted to allow access to car lot sales, service, and a single-family residence/Office but never constructed that reverted back to vacant land. This new permit will now allow access to the 17,760-SF Penrose RV & Boat Storage, Mini-Warehouse, and 1,000-SF Office-Lounge on 1.36-acres of land.

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- If **ANY DEVELOPMENT** occurs adjacent to the recorded Fremont H Street boundaries and H Street is constructed, the access located on SH115 closed and removed at the owner's expense with all access to be obtained from the developed H Street. The site plan shows the projected access point to H Street. The removal of the existing access shall include, but not limited to, the return of highway right-of-way slopes, ditches, and fences to match existing adjacent conditions, including removal of asphalt aprons and culverts. Any asphalt removed from the highway shall result in a smooth finished edge.
6. The Annual Average Daily Traffic (AADT) volumes for this access shall not exceed 36-trips.
7. The Peak Hour Volumes (PHV) volumes using this access shall not exceed 3-AM Peak Hour trips and 4-PM Peak Hour trips.

| Code         | Land Use  | AADT      | PHV_AM   | PHV_PM   |
|--------------|---|-----------|----------|----------|
| 151          | Mini Storage Warehouse (RV & Boat Storage)                      | 26        | 2        | 3        |
| 210          | Single Family Detached Housing (Owners Lounge/Caretakers Space) | 10        | 1        | 1        |
| <b>TOTAL</b> |   | <b>35</b> | <b>3</b> | <b>4</b> |

8. Future roadway improvements may be required if:
- a. If the vehicular volume of the access meet warrants as required by Section 3 of the State Highway Access Code, or if the warrants for a signal are met in accordance with the Manual on Uniform Traffic Control Devices (M.U.T.C.D.) or safety issue arise with eh access, a new access permit will be required.
  - b. If in the future, the traffic volumes increase by greater than 20% of the permitted number, the permittee (property owner) is required to apply for a new Access Permit and may be required to construct highway improvements.
  - c. If the vehicular volumes exceed the stated Peak Hour volumes, as determined by the Department, the appropriate warranted highway improvements shall be designed and installed within the earliest construction season unless specifically allowed otherwise, in writing by the Department. The highway improvements shall be designed and constructed by the Permittee at no cost to the Department. Documenting of this will be with a new Access Permit. Failure by the Permittee to provide such warranted improvements may result in the revoking of the Access Permit and closure of the access approach.
  - d. If the installation of auxiliary lane(s) are deemed necessary (i.e., right/left acceleration lanes, right/left deceleration lanes) and/or a traffic signal or median islands to prohibit traffic movements may be required in the future as determined by the Department. These improvements will be determined based on safety problems created by the access. The improvements shall be designed and installed by the Permittee in a timely manner to the Department's standards and specifications and at no cost to the Department. Failure by the Permittee to provide such improvements shall result in the revocation of this access permit and closure of the access approach. Documentation of this shall be through a new Access Permit.

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9. All costs associated with the installation of this access are the responsibility of the Permittee. This includes the design, construction, utility relocation, testing of materials and inspection.
10. All required access improvements shall be installed prior to the herein-authorized use of this access.
11. If in the future, the traffic volumes increase by greater than 20% of the permitted number, the permittee (property owner) is required to apply for a new Access Permit and may be required to construct highway improvements.
12. The highway improvements shall be designed and constructed by the Permittee at no cost to the Department. Failure by the Permittee to provide such warranted improvements may result in the revoking of the Access Permit and closure of the access approach.
13. This access will be allowed 3/4 movements (right in, right out, left in). Left turns out of the access are not allowed.
14. **The Permittee/Applicant shall notify the Department of Transportation Inspector Ron Young in Pueblo (719)289-8718 upon completion of the access improvements for:**
  - a) A final inspection for the temporary access and to request a Letter of Acceptance for use of the temporary access.
  - b) A cost estimate for any of the highway improvements made within the CDOT Right of Way shall be submitted to the Access Inspector at the time of acceptance by the Permittee.
  - c) **Reconstruction or improvements to the access may be required when the Permittee/Applicant has failed to meet the required design and/or materials specifications. If any construction element fails within the 2-year timeline, repairs to the access shall be reconstructed in a timely manner and the Permittee shall be responsible for all repairs.** Failure to make such repairs may result in the revoking of the permit and closure of the access. A new 2-year warranty period shall be established once newly constructed items are accepted for the failed work. Unaffected work/improvement items will be remaining under the original acceptance period and warranty period for the work.
15. Under no circumstances shall the construction of a private driveway by a private interest interfere with the completion of a public highway construction project. The private interest shall coordinate work the CDOT resident engineer named below.
16. The ditches may not be used for any construction purposes unless allowed under appropriate legal permits; any construction traffic accessing SH115 under permits shall have appropriate flagging or traffic control.
17. Equipment and vehicles cannot be parked in the clear zone; this includes when occupied by construction personnel; the clear zone shall be kept clear of vehicles, equipment, and stockpile to prevent accidents.
18. No additional access will be allowed to State Highway 115A along the frontage of the property boundary and the CDOT ROW boundary.
19. The Permittee shall refer to all additional standard requirements attached to this permit. This includes CDOT Form 101, enclosed additional terms, conditions, exhibits, and noted attachments.

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20. The following criteria were used to establish this Access Permit:
- a. The Application for Access Permit (CDOT Form 137) dated 03/26/24 and accepted by the regional office on 03/26/24 and all attachments.
  - b. State Highway Access Code, Volume 2, CCR-601-1; Effective date March 2002
  - c. The State Highway Access Category Assignment Schedule, as revised.
  - d. The Colorado Department of Transportation (CDOT) M&S Standard Plans (see website for details)
  - e. Vicinity Map
  - f. Attached Details
  - g. Environmental Clearances Information Summary
  - h. Preliminary Design/Construction Plans
  - i. Standard Special Provision - Compliance with NCHRP 350 Crashworthiness Certification for Work Zone Traffic Control Devices.
21. The Permittee is required to comply with the Americans with Disabilities Act Accessibility Guidelines (ADAAG) that have been adopted by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board) and incorporated by the U.S. Attorney General as a federal standard. These guidelines are defining traversable slope requirements and prescribing the use of a defined pattern of truncated domes as detectable warnings at street crossings. The new Standards Plans and can be found on the Design and Construction Project Support web page at: <https://www.codot.gov/business/designsupport/standard-plans>.
22. ALL discharges are subject to the provisions of the Colorado Water Quality Control Act and the Colorado Discharge Permit Regulations. Prohibited discharges include substances such as: wash water, paint, automotive fluids, solvents, oils, or soaps.
23. Unless otherwise identified by CDOT or the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division (WQCD) as significant sources of pollutants to the waters of the State, the following discharges to storm water systems are allowed without a Colorado Discharge Permit System permit: landscape irrigation, diverted stream flows, uncontaminated ground water infiltration to separate storm sewers, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, springs, footing drains; water line flushing, flows from riparian habitats and wetlands, and flow from firefighting activities. However, construction activities may require a Construction Stormwater Permit. Contact the CDOT R2 Water Quality Specialist, Troy Rice at (719) 227-3260.
24. This Access Permit is issued in accordance with the 2002 State Highway Access Code (2CCR 601-1) and is based in part upon the information submitted by the Permittee. This Access Permit is only for the use and purpose stated in the Application and on the Permit. Any changes, based upon existing and/or anticipated future conditions in traffic volumes, drainage, types of traffic, or other operational aspects may render this permit void, requiring a new Application for Access Permit to be submitted for review by the Department and/or Issuing Authority.
25. If necessary, minor changes, corrections and/or additions to the Permit may be ordered by the Department Inspector, other Department representative, or the local authority, to meet unanticipated site conditions. Changes may not be in violation of the State Highway Access Code. All major changes to the permit must be approved in writing by the Department prior to commencement of any work on or within the State Highway right-of-way.

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26. All work is to conform to the plans referenced by this permit on file with the Colorado Department of Transportation or as modified by this Permit or a valid Notice to Proceed. If discrepancies arise, this permit and the valid Notice to Proceed shall take precedence over the plans. The Department plan review is only for the general conformance with the Department's design and code requirements. The Department is not responsible for the accuracy and adequacy of the design, dimensions, elevations, or any other elements, which shall be confirmed and correlated at the work site. The Department through the approval of this document assumes no responsibility for the completeness and/or accuracy of the plans.
27. The Department standards, specifications, and regulations shall override the design/construction plans incorporated in this permit should an oversight, omission, or conflict occur. The Department assumes no liability or responsibility whatsoever for the accuracy, completeness or correctness of the Permittee's design/construction plans. Any design plan errors are the sole responsibility of the Permittee and/or the engineer.
28. The access shall be completed in an expeditious and safe manner and shall be finished within 45 days from initiation of construction within State Highway right-of-way.
29. Backing maneuvers within and into the State Highway right-of-way are strictly prohibited. All vehicles shall enter and exit the highway right-of-way in a forward movement. Backing into the right-of-way shall be considered a violation of the Terms and Conditions of the Access Permit and may result in the revocation of the Permit by the Department and/or Issuing Authority.
30. **A Fully Executed Complete Copy of this Permit and a valid Notice to Proceed to Construction must be on the job site with the contractor at all times during the construction.** Failure to comply with this or any other construction requirement may result in the immediate suspension of the work by order of the Department Inspector or the Issuing Authority.
31. The Permittee is responsible for obtaining any necessary additional federal, state and/or local government agency permits or clearances required for construction of the access. Approval of this access permit does not constitute verification of this action by the Permittee.
32. Whenever there is work within the highway right of way, the Permittee shall develop and implement a construction traffic control plan. This plan shall utilize traffic control devices as necessary to ensure the safe and expeditious movement of traffic around and through the work site as well as ensure the safety of the work force. The approved traffic control plan shall be on site and followed at all times during construction within the right-of-way. A certified Traffic Control Supervisor or a Professional Traffic Engineer may prepare the traffic control plan. The plan shall be in conformance with the latest Manual on Uniform Traffic Control Devices (MUTCD) and other applicable standards. The plan must be submitted and approved by the Senior Maintenance Supervisor listed below five working days prior to beginning construction within the highway right of way. The approved traffic control plan will be attached to the Permit and the NOTICE TO PROCEED TO CONSTRUCTION and must be available on site throughout the duration of the construction. All work that requires traffic control shall be supervised by a registered professional traffic engineer or by a certified traffic control supervisor. The contractor in accordance with the Department Standards shall certify flagging personnel, when required.
33. Five working days prior to beginning construction, the Permittee/Contractor must contact Mr. Jamie Buford, Senior Maintenance Supervisor, to coordinate the construction. Mr. Buford can be contacted in Pueblo at (719) 546-5765. Failure to comply with this requirement may result in the revocation of this permit.

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34. Two-way traffic shall be maintained throughout the work area at all times.
35. WORK HOUR ALLOWANCES:
- a) All work time will be verified with State Highway Lane Closure Strategy.
  - b) No work is allowed within the highway right-of-way on weekends or State/Federal holidays.
  - c) No construction vehicles shall be parked, or construction materials stockpiled on the highway right-of-way overnight.
  - d) No private vehicles may be parked on the highway right-of-way at any time. Modifications to this condition may be allowed as determined by the CDOT Inspector for this permit and area only.
  - e) No interference with traffic will be allowed after 12:00 Noon the day before a 3- or 4-day holiday weekend, as listed under 108.06 of the Standard Specifications for Road and Bridge Construction.
36. Signing and striping are the responsibilities of the Permittee. All signs shall be manufactured in accordance with the Manual on Uniform Traffic Control Devices (M.U.T.C.D.). The sheeting for the signs shall be highway intensity sheeting (ASTM Type III retro reflective sheeting). The Department shall approve the striping.
37. All workers within the State Highway right of way shall comply with their employer's safety and health policies/procedures and all applicable US Occupational Safety and Health Administration (OSHA) regulations- including but not limited to the applicable sections of 29 CFR Part 1910 - Occupational Safety and Health Standards and 29 CFR Part 1926 - Safety and Health Regulations for Construction.
38. Personal protective equipment (e.g. head protection, footwear, high visibility apparel, safety glasses, hearing protection, respirators, gloves, etc.) shall be worn as appropriate for the work being performed and as specified in regulation. At a minimum, all workers in the State Highway right of way, except when in their vehicles, shall wear the following personal protective equipment:
- a. Head protection that complies with the ANSI Z89.1-2014 standard
  - b. At all construction sites or whenever there is danger of injury to feet, workers shall comply with OSHA's PPE requirements for foot protection per 29 CFR 1910.136, 1926.95, and 1926.96. If required, such footwear shall meet the requirements of ASTM F 2412-05 and ASTM F 2413-05
  - c. High visibility apparel as specified in the Traffic Control provisions of this permit (at a minimum, ANSI/ISEA 107-1999, Class 2)
  - d. Where any of the above-referenced ANSI standards have been revised, the most recent version of the standard shall apply.
39. All construction materials, techniques and processes shall be in conformance with the specification on the permit and shall be consistent with Department standard specifications for road construction as set forth in the latest "Standard Specifications for Road and Bridge Construction" manual.
40. The Permittee is responsible for any utilities and/or traffic control devices disrupted by the construction of this access and all expenses incurred for repair. There are existing utilities on the highway right-of-way by permit. Owners of those utilities must be contacted. Any work necessary



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to protect existing permitted utilities, such as encasements, bulwarks, etc. will be the responsibility of the Permittee.

- a. The Permittee is hereby advised that other utilities may exist within the proposed permit area. Permittee shall implement any and all measures to protect any existing utilities from damage.
  - b. Non-Destructive Air-vacuum Excavation (potholing) to expose the utilities being surveyed to determine their exact depth and location maybe necessary before any work commences. A core hole saw cut is the recommended method of entry through pavement for potholing. Flowfill is required for backfill of the core hole under the pavement or on the roadway.
  - c. The vacuum excavation technique is used not only to expose utilities but also for other uses that are benefited by the non-invasive/non-destructive, environmentally friendly technology such as dewatering or drill fluid/saw cutting fluid removal.
  - d. The Contractor shall utilize a spotter to assist in the visual inspection of all excavation work as it progresses near existing CDOT Intelligent Transportation Systems fiber optic line conduits, pull boxes and manholes. The Contractor shall provide a spotter to aid equipment operators when construction activities are near marked or unmarked fiber lines.
  - e. The spotter shall observe all excavation work as it progresses to ensure that no damage occurs to existing underground fiber lines. When the spotter has visual sight of the underground conduit, the spotter shall notify the equipment operator of the proximity to the conduit and begin to guide the excavation work. The spotter shall guide all excavation work around the conduit to ensure no damage occurs.
41. It is the responsibility of the permittee to comply with the Subsurface Utility Engineering (SUE) requirements as defined in the ASCE 38 (American Society for Civil Engineering).
  42. Additional CDOT permits are required for work involving water, sanitary sewer, gas, electrical, telephone and landscaping within the right-of-way.
  43. Any damage to existing highway facilities shall be repaired immediately at no cost to the Department and prior to continuing other work. Any mud or other material tracked or otherwise deposited on the roadway shall be removed daily or as ordered by the Department inspector.
  44. The Department Inspector or the Issuing Authority may suspend any work due to non-compliance with the provisions of this permit, adverse weather or traffic conditions, concurrent highway construction or maintenance in conflict with permit work or any condition deemed unsafe for workers or the general public. The work may be resumed upon notice from the Department Inspector or Issuing Authority.
  45. The Permittee shall maintain adequate, unobstructed sight distance in both directions from the access. When determining the distance between accesses, the point of tangent shall be used where a radius is present, or the beginning of the curb cut. **The minimum sight distance that shall be maintained along the highway for the access shall be 650-feet. The minimum sight distance that shall be maintained for the vehicle entering the highway shall be 1,000-feet.**
  46. Any landscaping or potentially obstructing objects such as but not limited to advertising signs, structures, trees, and bushes, shall be designed, placed, and maintained at a height not to interfere with the sight distance needed by any vehicle using the access. Planting of tree(s), which will be over 4 inches in caliper at maturity, will not be allowed within 30 feet of the edge of the traveled way. All other objects shall not exceed a total height of thirty inches from the top of final

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- grade. The Department will require any object or landscaping that becomes unsightly or is considered to be a traffic hazard to be removed by the Permittee at no cost to the Department.
47. is CDOT Standard Plan M-203-1, entitled "Approach Roads". The radii, surfacing, side drains, and side slope requirements shall be as specified in this permit.
48. The access width, for an access without curbs, shall be measured exclusive of the radii or flares. The width of any non-traversal median is not counted as part of the access width. Only the travel portion is measured.
49. The equivalent turning radii of the access shall accommodate the turning radius of the largest vehicle using the access on a daily basis. Where roadway shoulders are present, the radius is measured to the edge of the closest lane. Where roadway shoulders are not present, the minimum access radii are to be 20-feet. Where paved shoulders are present, the radius is measured to the edge of the closest lane.
50. The access width shall be 24-feet measured at the CDOT right-of-way line.
51. For any access that is not a curb cut, including streets and private access using curb returns, the first 20 feet beyond the closest highway lane, including speed change lanes or the distance to the side drain, whichever is greater, shall slope down and away from the highway at a two percent grade to ensure proper drainage control.
52. The access shall be surfaced upon completion of earthwork construction and prior to being used. The access shall be surfaced from the highway roadway to the right-of-way line.
- The access shall have a hard surface concrete pavement for a minimum distance of 20 feet from the traveled way. The first 20 feet of the access shall be surfaced with 12-inches Concrete Paving and 12 inches of Aggregate Base Course (Class 6). The remainder of the access within the highway right-of-way shall be surfaced with 12 inches of Aggregate Base Course (Class 6).
  - The Permittee will be responsible for removing the existing rumble strips that are located in the shoulder of the existing highway at the access connection point. The rumble strips must be removed 300 feet east and west from the point of tangent of the radii along the highway.
  - If hard surfacing (concrete or bituminous pavement) abuts existing pavement, the existing pavement shall be saw cut and removed a minimum of one (1) foot back from the existing edge of pavement.
  - Compaction of the Aggregate Base Course shall comply with section 304.06.
  - Compaction of sub-grade, embankments and backfills shall be in accordance with section 203.07 of the Department's standard specification.
  - Placement of base course materials shall be in accordance with section 304.04 of the standard specifications. Compaction shall be in conformance with AASHTO procedure T-99.
  - You must obtain a new NTP following the suspension of work through the winter. If the permit has expired and no other extensions are available to you, then a new access permit application must be submitted to CDOT.
53. When highway widening is necessary, the following apply:
- Prior to placement of fill material, the permitted owner/contractor shall clear and grub the affected access area. Clearing and grubbing shall consist of clearing, grubbing,

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removing, and disposing of vegetation and debris within the limits of construction and/or fill placement. Upon completion of clearing and grubbing activities, the area shall be proof-rolled with heavy construction equipment to provide assurance that no soft spots are present that would prove detrimental to the final product. Soft spots shall be removed and/or stabilized with suitable material.

- b. If fill is placed, it shall be constructed with suitable soil in maximum 8-inch loose lifts and compacted as specified before the next lift is placed. Once the fill section is complete, the area shall be proof-rolled with heavy construction equipment to provide assurance that no soft spots are present that would prove detrimental to the final product.
  - c. Base course shall be constructed in maximum 8-inch loose lifts and compacted as specified before the next lift is placed. Prior to asphalt/concrete placement, the area shall be proof-rolled with heavy construction equipment to provide assurance that no soft spots are present that would prove detrimental to the final product.
54. The design of the horizontal and vertical curves, super-elevations, transitions, and related specifications shall be no less than the current highway design.
  55. Within the right-of-way, maximum grades shall be limited to eight percent for all accesses except field and residential.
  56. The horizontal axis of an access to the highway shall be at a right angle to the centerline of the highway and extend a minimum of 40 feet from the edge of pavement or to the right-of-way line, whichever is greater.
  57. The horizontal axis of an access to the highway shall be an angle of 90 degrees if significant physical constraints require a skew angle less than 90 degrees, Department approval is required and the angle must be approved by the issuing authority and the Department based upon site-specific conditions.
  58. Fill slopes and cut slopes shall be constructed to current Department minimum standards.
  59. Fill slopes and cut slopes shall be constructed to the slope of the existing highway near the access.
  60. Soil preparation including topsoil, seeding, and mulching is required with the highway right-of-way on all disturbed areas not surfaced and those areas beyond the highway that may erode and send debris into the highway right-of-way. The Department or local municipality shall provide minimum seed mixes, types and rates of seeding and preparation. (See attached Exhibit)
  61. Installation or removal of any right-of-way fence by the Permittee shall be consistent with right-of-way fence law in section 35-46-111 C.R.S. The Permittee is required to obtain a highway right-of-way fence agreement for a special fence if the Permittee desires to remove the existing standard highway fencing in the area. The Permittee shall contact TJ Thiebaut at (719) 546-5413 or [Thomas.Thiebaut@state.co.us](mailto:Thomas.Thiebaut@state.co.us) for information regarding the fence agreement.
  62. In the event it becomes necessary to remove any right-of-way fence, the posts on either side of the entrance shall be securely braced with an approved end post before the fence is cut to prevent any slacking of the remaining fence. This shall be in conformance with the Department's Standard M-607-1.
  63. All right-of-way fence posts and wire removed are Department property and shall be turned over to a representative of the Department.

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64. Installation of any traffic control device necessary for the safe and proper operation and control of the access shall be required by the permit at the cost of the Permittee.
65. All traffic control devices (permanent or temporary) within the highway or other public right-of-way or access that serve the general public shall conform to the M.U.T.C.D.
66. If any traffic control devices are evident within 50 feet of the construction area, the Permittee/ Contractor must contact Mr. Jimmy Biren, Asst. Traffic Operations Engineer, in Pueblo. Mr. Biren can be contacted in Pueblo at (719) 546-5404. Matt Jagow, Traffic Operations Engineer, in Pueblo. Mr. Jagow can be contacted in Pueblo at (719) 546-5751.
67. Prior to removing any existing highway signs within the limits of the construction activities, the Permittee must contact Mr. Walter Garcia in Pueblo. Mr. Garcia can be contacted at (719) 546-5767.
68. Physical separation and delineation along a property frontage such as curb and gutter or fencing, may be required when necessary to ensure that access will be limited to permitted locations.
  - a. Survey markers or monuments must be preserved in their original positions. Notify Mr. Dennis Pirtle, CDOT Land Surveyor, at (719) 546-5746 immediately upon damage to or discovery of any such markers or monuments at the work site.
  - b. Any survey markers or monuments disturbed during the execution of this permit shall be repaired and/or replaced immediately to the satisfaction of the CDOT Land Surveyor at the expense of the Permittee.
  - c. All survey procedures and minimum tolerances shall be in conformance with the Department Survey Manual and the "Manual of Instruction for the Survey of Public Lands of the United States" 1972 and section 38-53-101 et seq, C.R.S.
  - d. Monuments shall conform to Department Standard M-629-1.
69. **Each access shall be constructed in a manner that shall not cause water to enter onto the roadway or shoulder and shall not interfere with the existing drainage system in the right-of-way or any adopted municipal system and drainage plan.**
70. **The highway drainage system is for the protection of the state highway right-of-way, structures, and appurtenances. It is not designed nor intended to serve the drainage requirement of abutting or other properties beyond undeveloped historical flow. Drainage to the state highway right-of-way shall not exceed the undeveloped historical rate of flow.**
71. If determined the Permittee shall provide, at their own expense, drainage structures for access that will become an integral part of the existing drainage system. Drainage structures under the access should extend beyond the access radius to accommodate the side slopes.
72. If determined the Permittee shall install a new at minimum 18-inch corrugated metal pipe. It shall be a sufficient length to allow for the side slopes.
73. Any work in area adjacent to open water (streams, drainage, ponds, etc.) will require adequate erosion control measures in accordance with Section 107.25 of the Department standard specifications.

## Terms and Conditions

Date: March 26, 2024

Page - 11

Access Permit No. 224022

Permittee: Epcoco Rei, LLC (John Edgar)

Applicant: McCauley Constructors, Inc (Anna Fluckey)

74. All drainage appurtenances required for detention and release shall be located and fully maintainable outside the highway right-of-way.
75. This Permit hereby replaces all previous access permit(s) for this ownership, which now become null and void.
76. A certificate of insurance naming the Colorado Department of Transportation (CDOT) as an additional insured is required to be submitted before work begins. The insurance certificate shall also list the Access Permit number.
77. The Permittee or the contractor shall be required to provide comprehensive general liability and property damage insurance naming the Department and the issuing authority (if applicable) as an additional insured party, in the amounts of not less than \$600,000 per occurrence and automobile liability insurance of \$600,000 combined single limit bodily injury and property damage for each accident, during the period of access construction. By accepting the permit, the Permittee agrees to save, indemnify, and hold harmless to the extent allowed by law, the issuing authority, the Department, its officers, and employees from suits, actions, claims of any type or character brought because of injuries or damage sustained by any person resulting from the Permittee's use of the access permit during the construction of the access.
78. CDOT retains the right to perform any necessary maintenance work in this area.
79. READ ALL ADDITIONAL STANDARD REQUIREMENTS ON THE ATTACHED FORM 101 AND OTHER TERMS AND CONDITIONS ON THESE ATTACHED SHEETS. A COPY OF THIS PERMIT MUST BE ON THE JOB SITE WITH THE CONTRACTOR. Call for an inspection of forms at least one working day prior to placing any concrete. The Colorado Department of Transportation inspection is not an approval of the grade or alignment of the work. The contractor and/or engineer are responsible for the proper grade and alignment. Minor changes or additions may be ordered by the field inspector to meet field conditions. Any survey markers or monuments disturbed during the execution of this permit shall be repaired immediately at the expense of the permittee. Minimum cover for buried utilities shall be 48 inches.

**COLORADO DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ACCESS PERMIT APPLICATION**

Issuing authority application acceptance date:

Instructions:

**Please print or type**

- Contact the Colorado Department of Transportation (CDOT) or your local government to determine your issuing authority.
- Contact the issuing authority to determine what plans and other documents are required to be submitted with your application.
- Complete this form (some questions may not apply to you) and attach all necessary documents and Submit it to the issuing authority.
- Submit an application for each access affected.
- If you have any questions contact the issuing authority.
- For additional information see CDOT's Access Management website at <http://www.dot.state.co.us/AccessPermits/index.htm>

|   |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
|---|--|---|---|---------|-------------|-------|-----|---------|----------|-------|----------------|------------------------|--|----------|--|--|--|
| 1) Property owner (Permittee)<br><b>Epcoco Rei One, LLC</b>   |  | 2) Applicant or Agent for permittee (if different from property owner)<br><b>McCauley Constructors, Attn: Anna Fluckey</b>  |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| Street address<br><b>3455 Fillmore Ridge Heights</b>  |  | Mailing address<br><b>650 Innovation Cir.</b>   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| City, state & zip<br><b>Colorado Springs, CO 80907</b>  | Phone #  | City, state & zip<br><b>Windsor, CO 80550</b>   | Phone # (required)<br><b>970-686-6300</b> |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| E-mail address<br><b>john@edgartruck.com</b>  |  | E-mail address if available<br><b>anna.fluckey@mccauleyconstructors.com</b>   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 3) Address of property to be served by permit (required)<br><b>17225 State HWY 115, Penrose, CO</b>   |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 4) Legal description of property: If within jurisdictional limits of Municipality, city and/or County, which one?<br><table style="width: 100%; border: none;"> <tr> <td style="border: none;">county</td> <td style="border: none;">subdivision</td> <td style="border: none;">block</td> <td style="border: none;">lot</td> <td style="border: none;">section</td> <td style="border: none;">township</td> <td style="border: none;">range</td> </tr> <tr> <td style="border: none;"><b>Fremont</b></td> <td style="border: none;"><b>Coyle-Vanegmond</b></td> <td style="border: none;"></td> <td style="border: none;"><b>2</b></td> <td style="border: none;"></td> <td style="border: none;"></td> <td style="border: none;"></td> </tr> </table> |  |   |   | county  | subdivision | block | lot | section | township | range | <b>Fremont</b> | <b>Coyle-Vanegmond</b> |  | <b>2</b> |  |  |  |
| county  | subdivision  | block   | lot                                       | section | township    | range |     |         |          |       |                |                        |  |          |  |  |  |
| <b>Fremont</b>  | <b>Coyle-Vanegmond</b>   |   | <b>2</b>                                  |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 5) What State Highway are you requesting access from?<br><b>HWY 115</b>   |  | 6) What side of the highway?<br><input type="checkbox"/> N <input type="checkbox"/> S <input type="checkbox"/> E <input checked="" type="checkbox"/> W  |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 7) How many feet is the proposed access from the nearest mile post?<br><b>Aprx 510</b> feet <input checked="" type="checkbox"/> N <input type="checkbox"/> S <input type="checkbox"/> E <input type="checkbox"/> W from: <b>MM17</b>  |  | How many feet is the proposed access from the nearest cross street?<br><b>Aprx 2115</b> feet <input checked="" type="checkbox"/> N <input type="checkbox"/> S <input type="checkbox"/> E <input type="checkbox"/> W from: <b>2nd St to W G-St to East</b> |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 8) What is the approximate date you intend to begin construction?<br><b>5/1/2024</b>  |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 9) Check here if you are requesting a:<br><input type="checkbox"/> new access <input type="checkbox"/> temporary access (duration anticipated: _____) <input checked="" type="checkbox"/> improvement to existing access<br><input type="checkbox"/> change in access use <input type="checkbox"/> removal of access <input type="checkbox"/> relocation of an existing access (provide detail)   |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 10) Provide existing property use<br><b>Vacant Land</b>   |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 11) Do you have knowledge of any State Highway access permits serving this property, or adjacent properties in which you have a property interest?<br><input checked="" type="checkbox"/> no <input type="checkbox"/> yes, if yes - what are the permit number(s) and provide copies: <b>219009</b> and/or, permit date: <b>4/5/2019</b><br><b>This permit has expired</b>  |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 12) Does the property owner own or have any interests in any adjacent property?<br><input checked="" type="checkbox"/> no <input type="checkbox"/> yes, if yes - please describe:   |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 13) Are there other existing or dedicated public streets, roads, highways or access easements bordering or within the property?<br><input type="checkbox"/> no <input checked="" type="checkbox"/> yes, if yes - list them on your plans and indicate the proposed and existing access points.  |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 14) If you are requesting agricultural field access - how many acres will the access serve?<br><b>N/A</b>   |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 15) If you are requesting commercial or industrial access please indicate the types and number of businesses and provide the floor area square footage of each.   |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| business land use   | square footage   | business  | square footage                            |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| <b>Penrose RV &amp; Boat Stor - Mini-warehouse</b>  | <b>17,760</b>  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| <b>Penrose RV &amp; Boat Stor - SFDH</b>  | <b>210</b>   |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 16) If you are requesting residential development access, what is the type (single family, apartment, townhouse) and number of units?   |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| type  | number of units  | type  | number of units                           |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| <b>N/A</b>  |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| <b>N/A</b>  |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| 17) Provide the following vehicle count estimates for vehicles that will use the access. Leaving the property then returning is two counts.   |  |   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| Indicate if your counts are<br><input type="checkbox"/> peak hour volumes or <input type="checkbox"/> average daily volumes.  | # of passenger cars and light trucks at peak hour volumes<br><b>26</b> | # of multi unit trucks at peak hour volumes<br><b>0</b>   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |
| # of single unit vehicles in excess of 30 ft  | # of farm vehicles (field equipment)                                   | <b>Total count of all vehicles</b><br><b>26</b>   |   |         |             |       |     |         |          |       |                |                        |  |          |  |  |  |

18) Check with the issuing authority to determine which of the following documents are required to complete the review of your application.

- a) Property map indicating other access, bordering roads and streets.
- b) Highway and driveway plan profile.
- c) Drainage plan showing impact to the highway right-of-way.
- d) Map and letters detailing utility locations before and after development in and along the right-of-way.
- e) Subdivision, zoning, or development plan.
- f) Proposed access design.
- g) Parcel and ownership maps including easements.
- h) Traffic studies.
- i) Proof of ownership.

1- It is the applicant's responsibility to contact appropriate agencies and obtain all environmental clearances that apply to their activities. Such clearances may include Corps of Engineers 404 Permits or Colorado Discharge Permit System permits, or ecological, archeological, historical or cultural resource clearances. The CDOT Environmental Clearances Information Summary presents contact information for agencies administering certain clearances, information about prohibited discharges, and may be obtained from Regional CDOT Utility/Special Use Permit offices or accessed via the CDOT Planning/Construction-Environmental-Guidance webpage <http://www.dot.state.co.us/environmental/Forms.asp>.

2- All workers within the State Highway right of way shall comply with their employer's safety and health policies/procedures, and all applicable U.S. Occupational Safety and Health Administration (OSHA) regulations - including, but not limited to the applicable sections of 29 CFR Part 1910 - Occupational Safety and Health Standards and 29 CFR Part 1926 - Safety and Health Regulations for Construction.

Personal protective equipment (e.g. head protection, footwear, high visibility apparel, safety glasses, hearing protection, respirators, gloves, etc.) shall be worn as appropriate for the work being performed, and as specified in regulation. At a minimum, all workers in the State Highway right of way, except when in their vehicles, shall wear the following personal protective equipment: High visibility apparel as specified in the Traffic Control provisions of the documentation accompanying the Notice to Proceed related to this permit (at a minimum, ANSI/ISEA 107-1999, class 2); head protection that complies with the ANSI Z89.1-1997 standard; and at all construction sites or whenever there is danger of injury to feet, workers shall comply with OSHA's PPE requirements for foot protection per 29 CFR 1910.136, 1926.95, and 1926.96. If required, such footwear shall meet the requirements of ANSI Z41-1999.



Where any of the above-referenced ANSI standards have been revised, the most recent version of the standard shall apply.

3- The Permittee is responsible for complying with the Revised Guidelines that have been adopted by the Access Board under the American Disabilities Act (ADA). These guidelines define traversable slope requirements and prescribe the use of a defined pattern of truncated domes as detectable warnings at street crossings. The new Standards Plans and can be found on the Design and Construction Project Support web page at: <http://www.dot.state.co.us/DesignSupport/>, then click on *Design Bulletins*.

If an access permit is issued to you, it will state the terms and conditions for its use. Any changes in the use of the permitted access not consistent with the terms and conditions listed on the permit may be considered a violation of the permit.

**The applicant declares under penalty of perjury in the second degree, and any other applicable state or federal laws, that all information provided on this form and submitted attachments are to the best of their knowledge true and complete.**

**I understand receipt of an access permit does not constitute permission to start access construction work.**

|  |                                   |                           |
|--|-----------------------------------|---------------------------|
| Applicant or Agent for Permittee signature<br>  | Print name<br><b>Anna Fluckey</b> | Date<br><b>01.25.2024</b> |
| If the applicant is not the owner of the property, we require this application also to be signed by the property owner or their legally authorized representative (with other acceptable written evidence). This signature shall constitute agreement with this application by all owners-of-interest unless stated in writing. If a permit is issued, the property owner, in most cases, will be listed as the permittee. |                                   |                           |
| Property owner signature<br>  | Print name                        | Date<br><b>3/26/2024</b>  |

LETTER OF AUTHORIZATION

I, John Edgar, the undersigned property Owner hereby acknowledges that Mrs. Anna Fluckey of McCauley Constructors, Inc., is to act on my behalf in all manners relating to my application to Fremont County for Commercial Development Plan review and the Board of Zoning Adjustment for the premises located at 17225 SH 115 in Penrose, Colorado, effective the date of my signing below.

My signature below indicates my acknowledgment that I do not object to Mrs. Anna Fluckey applying on my behalf and receiving under my name from the County of Penrose, all coordination communication from the County for the purposes of completing the applications noted above with the County to the end of the review and approval process on the property listed above, which I own.

I understand that for the application review process to begin I must pay the appropriate application fees, to be included with this Letter of Authorization along with the physical applications.

Thank you,

John Edgar  
Property Owner, Printed Name

703-897-2624  
Property Owner, Telephone

3455 Fillmore Ridge Heights  
Property Owner, Street Address

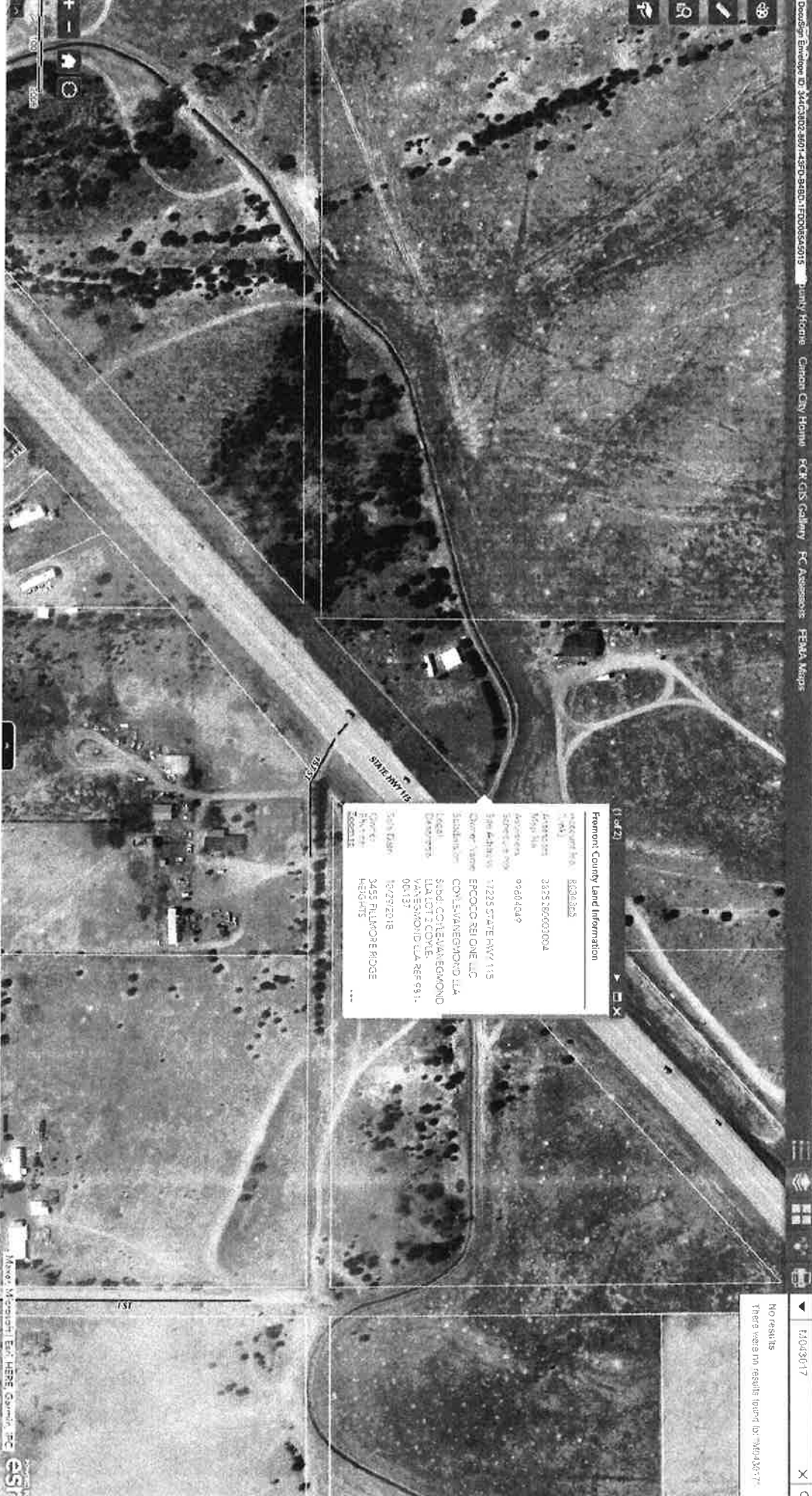
John@EdgarTruck.com  
Property Owner, Email Address

Colorado Springs, CO 80907  
Property Owner, State Zip

DocuSigned by:  
  
537762658100418  
Property Owner, Signature

2/12/2024  
Date



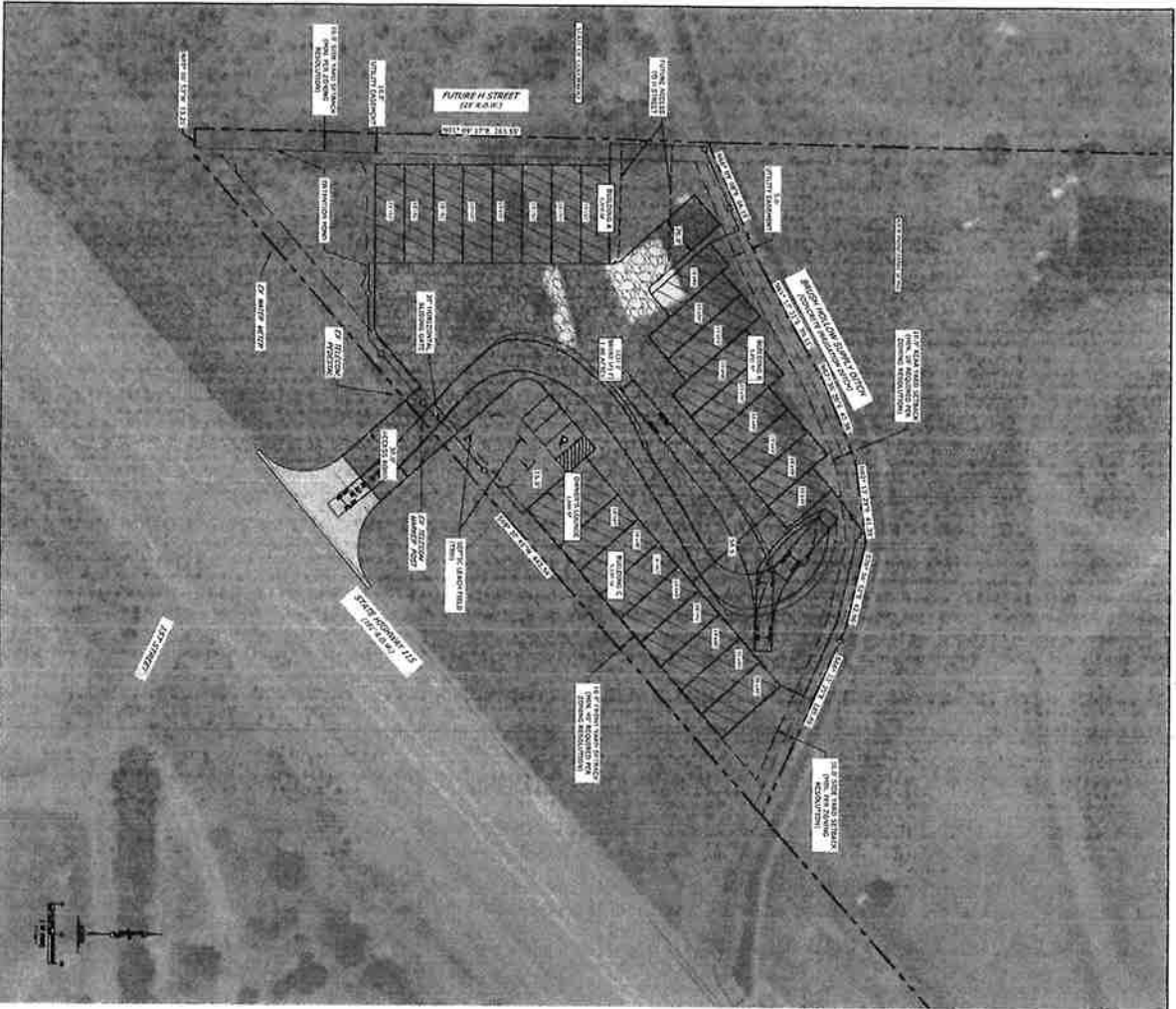


(1 of 2)

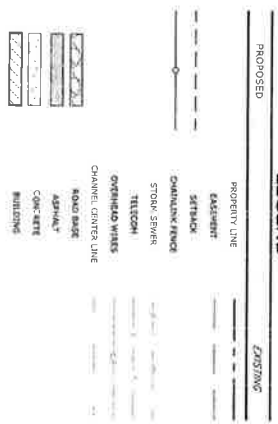
**Fremont County Land Information**

|                      |                                      |
|----------------------|--------------------------------------|
| Account No.          | 8528285                              |
| Assess. Dist.        | 3225-280000004                       |
| Map No.              |                                      |
| Assess. District No. | 0000040                              |
| Site Address         | 3225 STATE HWY 115                   |
| Owner Name           | EPCOCC REZONE LLC                    |
| Subdivisor           | CONLS VANEGHOND LLA                  |
| Legal                | Subd. CONLEVANEGHOND LLA LOT 2 COYLE |
| Character            | VANEGHOND LLA REF 0911-00-137        |
| Year Exam            | 10/27/2018                           |
| Parcel Elevation     | 3455 FULLMOOR RIDGE HEIGHTS          |
| Zone                 | ...                                  |

FA043017  
No results  
There were no results found to "FA043017"



**LEGEND**



| UNIT EVALUATION - OPTION 1C |           |             |           |
|-----------------------------|-----------|-------------|-----------|
| UNIT                        | ACRES (L) | DEVELOP (L) | TOTAL (L) |
| 1                           | 15.3      | 80.0        | 792       |
| 2                           | 15.3      | 80.0        | 792       |
| 3                           | 15.3      | 80.0        | 792       |
| 4                           | 15.3      | 80.0        | 792       |
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| 97                          | 15.3      | 80.0        | 792       |
| 98                          | 15.3      | 80.0        | 792       |
| 99                          | 15.3      | 80.0        | 792       |
| 100                         | 15.3      | 80.0        | 792       |



SITE PLAN  
OPTION 1D

PENROSE RV STORAGE  
17225 SH 115, PENROSE, CO  
CONCEPTUAL SITE PLAN

850 INNOVATION CIR  
WINDSOR, CO 80551

CIVIL RESOURCES  
598 CO ROAD 80  
SUITE 205  
PINESTRAW, CO 80450  
WWW.CIVILRESOURCES

## TECHNICAL MEMORANDUM

**TO:** Colorado Department of Transportation

**FROM:** Civil Resources, LLC

**DATE:** January 16, 2024

**RE:** Trip Generation Memo  
Penrose RV Storage

---

### PROJECT DESCRIPTION

The Commercial Development Plan is for an RV storage facility located at 17225 State Highway 115 in Penrose, Colorado (Figure 1). The development includes approximately 16,970 square-feet of warehouse storage space, a 1,000 SF owner's lounge/caretaker's space, gravel drive aisles, and parking spaces. The overall site is 1.36 acres. The site is intended for RV/vehicle storage, and expected to generate very low traffic volumes.

The study area includes Colorado State Highway 115 (SH 115), located southeast of the site. Access to the proposed development will be from SH 115. At the location of the site, the highway is two-lanes in each direction, with a painted median.

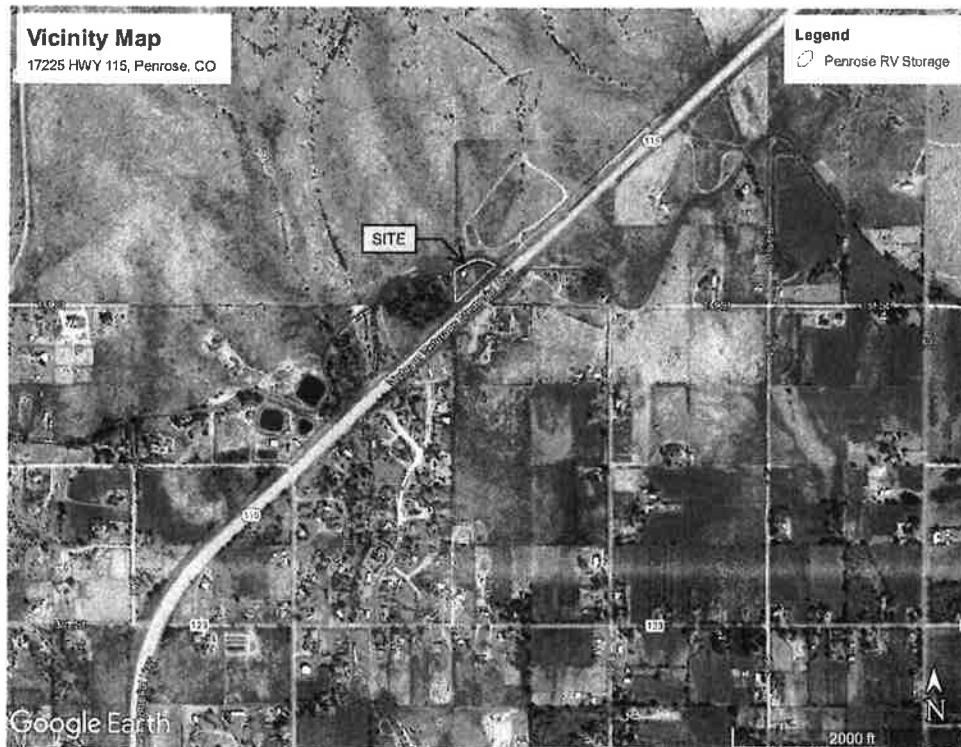


Figure 1- Vicinity Map

**TRIP GENERATION**

The volume of traffic that the proposed development is expected to generate was estimated using the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10<sup>th</sup> Edition*. The development will consist of 16,970 square-feet of mini-warehouse area, and 1 owner's lounge/caretaker's space, classified as a single-family residential dwelling unit. The mini-warehouse area will generate an additional 26 trips per day, and the dwelling unit will generate an additional 10 trips per day, totaling 36 additional trips per day for the Site.

The morning peak hour rates for mini-warehouse areas and single dwell units are 0.10 and 0.74, respectively. This totals 3 trips during the peak morning hour. The evening peak hour rates are 0.17 for mini-warehouse areas, and 0.99 for single dwelling units. This totals 5 trips during the peak evening hour.

Table 1 summarizes the trip generation calculations.

**Table 1- Trip Generation**

| LAND USE                       | ITE CODE | SIZE  | UNIT     | AVERAGE DAILY TRIPS |           |           |           | AM PEAK HOUR TRIPS |          |          |          | PM PEAK HOUR TRIPS |          |          |          |
|--------------------------------|----------|-------|----------|---------------------|-----------|-----------|-----------|--------------------|----------|----------|----------|--------------------|----------|----------|----------|
|                                |          |       |          | RATE                | TOTAL     | IN        | OUT       | RATE               | TOTAL    | IN       | OUT      | RATE               | TOTAL    | IN       | OUT      |
| Mini-Warehouse                 | 151      | 16.97 | 1,000 SF | 1.51                | 26        | 13        | 13        | 0.10               | 2        | 1        | 1        | 0.17               | 3        | 1        | 2        |
| Single-Family Detached Housing | 210      | 1.00  | DU       | 9.44                | 10        | 5         | 5         | 0.74               | 1        | 0        | 1        | 0.99               | 1        | 1        | 0        |
| <b>TOTAL</b>                   | -        | -     | -        | -                   | <b>36</b> | <b>18</b> | <b>18</b> | -                  | <b>3</b> | <b>1</b> | <b>2</b> | -                  | <b>4</b> | <b>2</b> | <b>2</b> |

\*Trip generation estimate based on rates outlined in ITE Trip Generation Manual, 10th Edition

**ADJACENT TRAFFIC CONDITIONS**

Colorado State Highway 115 (SH 115) is classified by the Colorado Department of Transportation (CDOT) as a regional highway (RA). The Site is approximately located at station 17. The annual average daily traffic for the stretch of SH 115 adjacent to the Site is 11,000 vehicles, as counted in 2021. The CDOT State Highway Access Code requires auxiliary turn lanes if the following parameters are met:

- Left turn deceleration: projected peak hour left ingress turning volume greater than 10 vehicles per hour (vph),
- Right turn deceleration: projected peak hour right ingress turning volume greater than 25 vph,
- Right turn acceleration: projected peak hour right turning volume greater than 50 vph, when the posted speed on the highway is greater than 40 mph.

The maximum peak hour trips for the Site is 4 trips; therefore, the site does not require auxiliary turning lanes for SH 115.

**APPENDIX**

- Plat
- Site Plan
- Land use traffic rates from ITE *Trip Generation Manual*
- CDOT System Classification
- CDOT AADT Data

Digitally signed by Jim Brzostowicz, P.E.  
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 OU=Civil Resources,  
 CN=Jim Brzostowicz, P.E.\*  
 Date: 2024.01.16  
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Prepared by: Rebekah Janquart, E.I.  
 Reviewed by: Jim Brzostowicz, P.E.

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ITE Trip Generation, 10<sup>th</sup> Edition

| ITE No.                        | Land Use Description                         | unit       | Daily Rate | Peak Hour of Adjacent Street Rate |     |     |          |     |     |
|--------------------------------|--|------------|------------|-----------------------------------|-----|-----|----------|-----|-----|
|                                |  |            |            | AM (7-9)                          |     |     | PM (4-6) |     |     |
|                                |  |            |            | Total                             | In  | Out | Total    | In  | Out |
| <b>Industrial/Agricultural</b> |  |            |            |                                   |     |     |          |     |     |
| 110                            | General Light Industrial                     | ksf        | 4.96       | 0.70                              | 88% | 12% | 0.63     | 13% | 87% |
|                                |  | emp.       | 3.05       | 0.52                              | 83% | 17% | 0.49     | 22% | 78% |
| 130                            | Industrial Park                              | ksf        | 3.37       | 0.40                              | 81% | 19% | 0.40     | 21% | 79% |
|                                |  | emp.       | 2.91       | 0.44                              | 86% | 14% | 0.42     | 20% | 80% |
| 140                            | Manufacturing                                | ksf        | 3.93       | 0.62                              | 77% | 23% | 0.67     | 31% | 69% |
|                                |  | ac.        | 35.02      | 4.62                              | 90% | 10% | 4.54     | 43% | 57% |
| 150                            | Warehousing                                  | ksf        | 1.74       | 0.17                              | 77% | 23% | 0.19     | 27% | 73% |
|                                |  | emp.       | 5.05       | 0.61                              | 72% | 28% | 0.66     | 36% | 64% |
| 151                            | Mini-Warehouse                               | ksf        | 1.51       | 0.10                              | 60% | 40% | 0.17     | 47% | 53% |
| 160                            | Data Center                                  | ksf        | 0.99       | 0.11                              | 55% | 45% | 0.09     | 30% | 70% |
| <b>Residential</b>             |  |            |            |                                   |     |     |          |     |     |
| 210                            | Single-Family Detached Housing               | DU         | 9.44       | 0.74                              | 25% | 75% | 0.99     | 63% | 37% |
| 220                            | Multifamily Housing (Low-Rise)               | DU         | 7.32       | 0.46                              | 23% | 77% | 0.56     | 63% | 37% |
| 231                            | Mid-Rise Residential w/ 1st-Floor Commercial | DU         | 3.44       | 0.30                              | 28% | 72% | 0.36     | 70% | 30% |
| 240                            | Mobile Home Park                             | DU         | 5.00       | 0.26                              | 31% | 69% | 0.46     | 62% | 38% |
| 251                            | Senior Adult Housing - Detached              | DU         | 4.27       | 0.24                              | 33% | 67% | 0.30     | 61% | 39% |
| 252                            | Senior Adult Housing - Attached              | DU         | 3.70       | 0.20                              | 35% | 65% | 0.26     | 55% | 45% |
| 253                            | Congregate Care Facility                     | DU         | 2.02       | 0.07                              | 60% | 40% | 0.18     | 53% | 47% |
| 254                            | Assisted Living                              | beds       | 4.24       | 0.39                              | 78% | 22% | 0.49     | 30% | 70% |
| 255                            | Continuing Care Retirement Community         | units      | 2.40       | 0.14                              | 65% | 35% | 0.16     | 39% | 61% |
| 270                            | Residential Planned Unit Development         | DU         | 7.38       | 0.57                              | 22% | 78% | 0.69     | 75% | 25% |
| <b>Lodging</b>                 |  |            |            |                                   |     |     |          |     |     |
| 310                            | Hotel  | rooms      | 8.36       | 0.47                              | 59% | 41% | 0.60     | 51% | 49% |
| 311                            | All Suites Hotel                             | rooms      | 4.46       | 0.34                              | 53% | 47% | 0.36     | 48% | 52% |
| 312                            | Business Hotel                               | rooms      | 4.02       | 0.39                              | 42% | 58% | 0.32     | 55% | 45% |
| 320                            | Motel  | rooms      | 3.35       | 0.38                              | 37% | 63% | 0.38     | 54% | 46% |
| 330                            | Resort Hotel                                 | rooms      | n/a        | 0.32                              | 72% | 28% | 0.41     | 43% | 57% |
| <b>Recreational</b>            |  |            |            |                                   |     |     |          |     |     |
| 411                            | Public Park                                  | ac.        | 0.78       | 0.02                              | 59% | 41% | 0.11     | 55% | 45% |
| 416                            | Campground/Recreational Vehicle Park         | occ. sites | n/a        | 0.21                              | 36% | 64% | 0.27     | 65% | 35% |
| 444                            | Movie Theatre                                | screens    | 220.00     | n/a                               | n/a | n/a | 14.60    | 44% | 56% |
| 445                            | Multiplex Movie Theatre                      | screens    | 292.50     | n/a                               | n/a | n/a | 13.73    | 51% | 49% |
| 488                            | Soccer Complex                               | fields     | 71.33      | 0.99                              | 61% | 39% | 16.43    | 66% | 34% |
| 490                            | Tennis Courts                                | courts     | 30.32      | n/a                               | n/a | n/a | 4.21     | n/a | n/a |
| 491                            | Racquet/Tennis Club                          | courts     | 27.71      | n/a                               | n/a | n/a | 3.82     | n/a | n/a |
| 492                            | Health/Fitness Club                          | ksf        | n/a        | 1.31                              | 51% | 49% | 3.45     | 57% | 43% |
| 495                            | Recreational Community Center                | ksf        | 28.82      | 1.76                              | 66% | 34% | 2.31     | 47% | 53% |

| CDOT SYSTEM CLASSIFICATION |           |         |        |                                   |              |                              |        |
|----------------------------|-----------|---------|--------|-----------------------------------|--------------|------------------------------|--------|
| ROUTE                      | BEGIN REF | END REF | LENGTH | ACCESS CONTROL                    | ADMIN CLASS  | FUNCTIONAL CLASS             | NHS DE |
| 115A                       | 0         | 1.223   | 1.129  | NR-B: Non-Rural Arterial          | CDOT Highway | 4 Minor Arterial             | 0 No   |
| 115A                       | 1.223     | 4.661   | 3.56   | R-A: Regional Highway             | CDOT Highway | 4 Minor Arterial             | 0 No   |
| 115A                       | 4.661     | 7.129   | 2.39   | R-A: Regional Highway             | CDOT Highway | 5 Major Collector            | 0 No   |
| 115A                       | 7.129     | 7.789   | 0.63   | NR-B: Non-Rural Arterial          | CDOT Highway | 5 Major Collector            | 0 No   |
| 115A                       | 7.789     | 9       | 1.303  | NR-C: Non-Rural Arterial          | CDOT Highway | 5 Major Collector            | 0 No   |
| 115A                       | 9         | 9.616   | 0.544  | NR-B: Non-Rural Arterial          | CDOT Highway | 5 Major Collector            | 0 No   |
| 115A                       | 9.616     | 13.96   | 4.314  | R-A: Regional Highway             | CDOT Highway | 5 Major Collector            | 0 No   |
| 115A                       | 13.96     | 14      | 0.143  | R-A: Regional Highway             | CDOT Highway | 4 Minor Arterial             | 0 No   |
| 115A                       | 14        | 16.776  | 2.63   | NR-A: Non-Rural Principal Highway | CDOT Highway | 4 Minor Arterial             | 0 No   |
| 115A                       | 16.776    | 27.168  | 10.327 | R-A: Regional Highway             | CDOT Highway | 4 Minor Arterial             | 0 No   |
| 115A                       | 27.168    | 40.344  | 13.009 | E-X: Expressway Major Bypass      | CDOT Highway | 4 Minor Arterial             | 0 No   |
| 115A                       | 40.344    | 46      | 5.463  | E-X: Expressway Major Bypass      | CDOT Highway | 3 Principal Arterial - Other | 1 Mai  |
| 115A                       | 46        | 47.496  | 1.537  | NR-A: Non-Rural Principal Highway | CDOT Highway | 3 Principal Arterial - Other | 1 Mai  |

| CDOT TRAFFIC COUNTS |           |         |        |       |        |           |             |              |          |       |
|---------------------|-----------|---------|--------|-------|--------|-----------|-------------|--------------|----------|-------|
| ROUTE               | BEGIN REF | END REF | LENGTH | AADT  | AADTYR | COUNTYEAR | SINGLE UNIT | COMB. TRUCKS | % TRUCKS | 20-YR |
| 115A                | 0         | 0.537   | 0.531  | 13000 | 2021   | 2020      | 170         | 120          | 2.2      | 1     |
| 115A                | 0.537     | 0.672   | 0.138  | 9800  | 2021   | 2020      | 170         | 70           | 2.4      | 1     |
| 115A                | 0.672     | 1.081   | 0.311  | 8900  | 2021   | 2019      | 180         | 80           | 2.9      | 1     |
| 115A                | 1.081     | 1.325   | 0.244  | 5800  | 2021   | 2021      | 120         | 70           | 3.3      | 1     |
| 115A                | 1.325     | 1.811   | 0.489  | 6600  | 2021   | 2021      | 110         | 80           | 2.9      | 1     |
| 115A                | 1.811     | 2.35    | 0.607  | 6500  | 2021   | 2021      | 90          | 80           | 2.7      | 1     |
| 115A                | 2.35      | 2.911   | 0.557  | 5000  | 2021   | 2021      | 90          | 90           | 3.4      | 1     |
| 115A                | 2.911     | 3.405   | 0.492  | 4700  | 2021   | 2021      | 110         | 90           | 4.3      | 1     |
| 115A                | 3.405     | 4.24    | 0.825  | 5200  | 2021   | 2019      | 60          | 80           | 2.7      | 1     |
| 115A                | 4.24      | 4.661   | 0.495  | 6000  | 2021   | 2020      | 70          | 70           | 2.4      | 1     |
| 115A                | 4.661     | 5.696   | 0.972  | 7700  | 2021   | 2020      | 60          | 80           | 1.8      | 1     |
| 115A                | 5.696     | 8.076   | 2.312  | 5800  | 2021   | 2021      | 90          | 50           | 2.4      | 1     |
| 115A                | 8.076     | 8.36    | 0.293  | 5200  | 2021   | 2021      | 90          | 60           | 2.9      | 1     |
| 115A                | 8.36      | 8.487   | 0.08   | 4500  | 2021   | 2018      | 130         | 90           | 4.8      | 1     |
| 115A                | 8.487     | 8.694   | 0.25   | 7700  | 2021   | 2019      | 200         | 100          | 3.9      | 1     |
| 115A                | 8.694     | 8.985   | 0.324  | 7200  | 2021   | 2021      | 260         | 100          | 5        | 1     |
| 115A                | 8.985     | 10.255  | 1.264  | 8000  | 2021   | 2020      | 200         | 100          | 3.8      | 1     |
| 115A                | 10.255    | 11.046  | 0.776  | 4900  | 2021   | 2019      | 90          | 140          | 4.7      | 1     |
| 115A                | 11.046    | 13.96   | 2.91   | 5000  | 2021   | 2019      | 180         | 180          | 7.1      | 1     |
| 115A                | 13.96     | 14.782  | 0.835  | 11000 | 2021   | 2019      | 280         | 530          | 7.3      | 1     |
| 115A                | 14.782    | 18.2    | 3.309  | 11000 | 2021   | 2019      | 240         | 560          | 7.3      | 1     |
| 115A                | 18.2      | 36.709  | 18.508 | 9900  | 2021   | 2021      | 270         | 610          | 8.9      | 1     |

# Potential Access Location SH115



Created:  
Date: 2/27/2023  
Time: 9:23:26 AM



0 0.06 0.12 0.18  
mi

1:9,028

### Legend

- Find Route Point
- ◆ Override 1
- Find Route Line
- Mileposts
- Highways
- Counties



## COLORADO DEPARTMENT OF TRANSPORTATION

### Environmental Clearances Information Summary

**PURPOSE** - This summary is intended to inform entities external to CDOT that may be entering the state highway right-of-way to perform work related to their own facilities (such as Utility, Special Use or Access Permittees), about some of the more commonly encountered environmental permits/clearances that may apply to their activities. This listing is not all-inclusive—additional environmental or cultural resource permits/clearances may be required in certain instances. Appropriate local, state and federal agencies should be contacted for additional information if there is any uncertainty about what permits/clearances are required for a specific activity. **IMPORTANT: Please Review The Following Information Carefully – Failure to Comply With Regulatory Requirements May Result In Suspension or Revocation of Your CDOT Permit, Or Enforcement Actions By Other Agencies.**

**CLEARANCE CONTACTS** - As indicated in the permit/clearance descriptions listed below, the following agencies may be contacted for additional information:

- Colorado Department of Public Health and Environment (CDPHE): General Information – (303) 692-2000  
Water Quality Control Division (WQCD): (303) 692-3500  
Environmental Permitting Website <https://www.colorado.gov/pacific/cdphe/all-permits>
- CDOT Water Quality Program Manager: (303) 512-4053 <https://www.codot.gov/programs/environmental/water-quality>
- CDOT Asbestos Project Manager: (303) 512-5519
- Colorado Office of Archaeology and Historic Preservation: (303) 866-5216
- U.S. Army Corps of Engineers, District Regulatory Offices:  
Omaha District (Northeastern CO), Denver Office (303) 979-4120  
<http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/Colorado.aspx>  
Sacramento District (Western CO), Grand Junction Office (970) 243-1199  
<http://www.spk.usace.army.mil/Missions/Regulatory.aspx>  
Albuquerque District (Southeastern CO), Pueblo Office (719) 543-9459  
<http://www.spa.usace.army.mil/Missions/RegulatoryProgramandPermits.aspx>
- CDOT Utilities, Special Use and Access Permitting: (303) 757-9654 <https://www.codot.gov/business/permits>

**Wildlife Resources** - Disturbance of wildlife shall be avoided to the maximum extent practicable. Entry into areas of known or suspected threatened or endangered species habitat requires special authorization from the CDOT permitting office. If any threatened or endangered species are encountered during the progress of the permitted work, work in the subject area shall be halted and the CDOT Regional Permitting Office and Region Planning and Environmental Manager shall be contacted immediately. Authorization must be provided by CDOT prior to the continuation of work. Information about threatened or endangered species may be obtained from the CDOT website, <http://www.codot.gov/programs/environmental/wildlife/guidelines>, or the Colorado Parks and Wildlife (CPW) website, <http://www.cpw.state.co.us/learn/Pages/SOC-ThreatenedEndangeredList.aspx>. Additional guidance may be provided by the appropriate Region Planning and Environmental Manager (RPEM).

**Cultural Resources** - The applicant must request a file search of the permit area through the Colorado Office of Archaeology and Historic Preservation (OAHP), Denver, to ascertain if historic or archaeological resources have previously been identified (<https://www.historycolorado.org/file-access>; 303-866-5216). Inventory of the permit area by a qualified cultural resources specialist may be necessary, per the recommendation of CDOT. If archaeological sites/artifacts or historic resources are encountered as the project progresses, all work in the subject area shall be halted and the CDOT Regional Permitting Office and Region Planning and Environmental Manager shall be contacted immediately. Authorization must be provided by CDOT prior to the continuation of work. Additional guidance may be provided by the Regional Permitting Office and RPEM.

**Paleontological Resources** - The level of effort required for paleontological resources is dependent on the amount of ground disturbance, including rock scaling, digging, trenching, boring, ground leveling, and similar activities.

- If the permit will involve extensive ground disturbance (generally involving more than one mile of CDOT ROW), a full review will be required by a qualified paleontologist, including map, file, and locality searches, with final recommendations provided by the CDOT paleontologist upon receipt of the report. Based on results of the review, a survey or inventory of the permit area may be necessary.
- If the permit will involve a small amount of ground disturbance (less than one mile of ROW), the applicant must request a fossil locality search through the University of Colorado Museum of Natural History (<https://www.colorado.edu/cumuseum/research-collections/paleontology/policies-procedure>) and the Denver Museum of Nature and Science (<https://www.dmns.org/science/earth-sciences/earth-sciences-collections/>). The museum collections manager will provide information about localities in the project area. If there are no known localities, the permit requirement for paleontology is complete upon submitting that information to CDOT. If there are known localities, the CDOT paleontologist will be contacted by the museum with details, and additional recommendations will be made if necessary. Note that museum staff are not required to disclose the details of fossil localities to the permit applicant, nor is detailed locality information required for the permit application to proceed.
- If the permit involve no ground disturbance, no action is required for paleontological resources. If fossils are encountered during the permitted action, all work in the immediate area of the find should stop and the CDOT Staff Paleontologist and the Region Environmental Manager should be contacted immediately. Authorization must be provided by CDOT prior to the continuation of work. Additional guidance may be provided by the Regional Permitting Office in the Permit Special Provisions. Contact Information: See the museum websites listed above. The CDOT Paleontologist is not able to conduct locality searches independently. For further information contact CDOT Paleontologist Nicole Peavey at [nicole.peavey@state.co.us](mailto:nicole.peavey@state.co.us) or (303)757-9632.

**Hazardous Materials, Solid Waste** - The Solid Wastes Disposal Sites and Facilities Act C.R.S. 30-20-100, et al, and Regulations Pertaining to Solid Waste Disposal Sites and Facilities (6 CCR 1007-2), prohibit solid waste disposal without an approved Certificate of Designation (a landfill permit). The Colorado Hazardous Waste Act C.R.S. 25-15-301 et al, and the Colorado Hazardous Waste Regulations (6 CCR 1007-3) prohibit the transfer, storage or disposal (TSD) of hazardous waste except at permitted TSD sites. There are no permitted landfills or TSD sites within the State Highway Right of Way. Therefore, all solid or hazardous wastes that might be generated by the activities of entities entering the State Highway Right of Way must be removed from the ROW and disposed of at a permitted facility or designated collection point (e.g., for solid waste, a utility or construction company's own dumpster). If pre-existing solid waste or hazardous materials contamination (including oil or petroleum contaminated soil, asbestos, chemicals, mine tailings, etc.) is encountered during the performance of work, the permittee shall halt work in the affected area and immediately contact the CDOT Regional Permitting Office for direction as to how to proceed.  
**Contact Information:** Theresa Santangelo-Dreiling, CDOT Hazardous Materials Management Supervisor: (303) 512-5524.

**Asbestos Containing Materials, Asbestos Contaminated Soil** - All work on asbestos containing materials (ACM) must comply with the applicable requirements of the CDPHE Air Pollution Control Division's (APCD) Regulation 8. Disposal of ACM, and work done in asbestos-contaminated soil, must comply with the CDPHE Hazardous Materials and Waste Management Division's (HMWMD) Solid Waste Regulations. The application for any CDOT permit must specifically identify any ACM involved in the work for which authorization is being requested. Additional guidance or requirements may be specified in the permit special provisions.  
**Contact Info:** CDPHE APCD and HMWMD Regulations can be accessed via the CDPHE Environmental Permitting Website listed above. Additional information **concerning clearance on CDOT projects** is available from the CDOT Asbestos Project Manager (303) 512-5519, or Theresa Santangelo-Dreiling, Hazardous Materials Management Supervisor: (303) 512-5524.

**Transportation of Hazardous Materials** - No person may offer or accept a hazardous material for transportation in commerce unless that person is registered in conformance with the United States Department of Transportation regulations at 49 CFR, Part 171. The hazardous material must be properly classed, described, packaged, marked, labeled, and in condition for shipment as required or authorized by applicable requirements, or an exemption, approval or registration has been issued. Vehicles requiring a placard, must obtain authorization and a State HAZMAT Permit from the Colorado Public Utilities Commission. **Contact Information:** For authorization and more info call the Federal Motor Safety Carrier Administration, US DOT for inter- and intra-state HAZMAT Registration (303) 969-6748. Colorado Public Utilities Commission: (303) 894-2868.

**Discharge of Dredged or Fill Material – 404 Permits Administered By the U.S. Army Corps of Engineers, and Section 401 Water Quality Certifications Issued by the CDPHE WQCD** - Clean Water Act section 404 permits are often required for the discharge of dredged or fill material into waters of the U.S., including wetlands. Several types of section 404 permits exist, including nationwide, regional general, and individual permits. Nationwide permits are the most commonly authorized type for activities with relatively minor impacts. If an individual 404 permit is required, section 401 water quality certification from the CDPHE WQCD is also required. Contact the appropriate Corps District Regulatory Office for information about what type of 404 permit may be required (contact information above). Contact the CDPHE Water Quality Control Division at (303) 692-3500.

**Working on or in any stream or its bank** - In order to protect and preserve the state's fish and wildlife resources from actions that may obstruct, diminish, destroy, change, modify, or vary a natural existing stream or its banks or tributaries, it may be necessary to obtain a Senate Bill 40 certification from the Colorado Department of Natural Resources. A stream is defined as 1) represented by a solid blue line on USGS 7.5' quadrangle maps; and/or 2) intermittent streams providing live water beneficial to fish and wildlife; and/or 3) segments of streams supporting 25% or more cover within 100 yards upstream or downstream of the project; and/or 4) segments of streams having wetlands present within 200 yards upstream or downstream of the project measured by valley length. The CPW application, as per guidelines agreed upon by CDOT and CPW, can be accessed at <https://www.codot.gov/programs/environmental/wildlife/guidelines>.

**Erosion and Sediment Control Practices** - Any activities that disturb one or more acres of land require a Stormwater Construction Permit (SCP) from the CDPHE-WQCD. Erosion & sediment control requirements will be specified in that permit. In situations where a stormwater permit is *not* required, all reasonable erosion and sediment control measures should be taken to minimize erosion and sedimentation. Control practices should be in accordance with CDOT Standard Specifications 107.25, 208, 213 and 216 (<https://www.codot.gov/business/designsupport/cdot-construction-specifications>). The CDOT Erosion Control and Stormwater Quality Guide (website: <https://www.codot.gov/programs/environmental/landscape-architecture/erosion-storm-quality>) can also be used to design erosion/sediment controls. **Contact Information:** Contact the CDPHE-WQCD at (303) 692-3500. Website: <https://www.colorado.gov/pacific/cdphe/wq-construction-general-permits>

**Site Stabilization** - All disturbances require a stabilization plan, native seeding or landscape design plan according to applicable CDOT Standard Specifications 212-217 and 623. The CDOT Erosion Control and Stormwater Quality Guide should also be used to plan restoration of disturbed vegetation. Website: <https://www.codot.gov/programs/environmental/landscape-architecture/erosion-storm-quality>

**Stormwater Discharge From Industrial Facilities** - Discharges of stormwater runoff from certain types of industrial facilities, such as concrete batch plants - require a CDPS Stormwater Permit. **Contact Information:** Contact the CDPHE-WQCD at (303) 692-3500. Website: <https://colorado.gov/pacific/cdphe/wq-commerce-and-industry-permits>

**Concrete Washout** - Waste generated from concrete activities shall NOT be allowed to flow into the drainage ways, inlets, receiving waters, or in the CDOT ROW. Concrete waste shall be placed in a temporary concrete washout facility and must be located a minimum of 50 feet from state waters, drainageways, and inlets. Concrete washout shall be in accordance to CDOT specifications and guidelines at <https://www.codot.gov/business/designsupport/cdot-construction-specifications> and refer to the specifications and their revisions for sections 101, 107 and 208.

**Construction Dewatering (Discharge or Infiltration) and Remediation Activities** - Discharges of water encountered during excavation or work in wet areas may require a Construction Dewatering or Remediation Activities Discharge Permit. **Contact**

**Information:** Contact the CDPHE-WQCD at (303) 692-3500. For Applications and Instructions:  
<https://www.colorado.gov/pacific/cdphe/wq-construction-general-permits>.

**Municipal Separate Storm Sewer System (MS4) Requirements** - When working in a MS4 area, discharges to the storm sewer system are subject to CDOT's or other municipalities' MS4 Permit. For activities within the boundaries of a municipality that has a MS4 permit, the owner of such activity should contact the municipality regarding stormwater related requirements. All discharges to the CDOT highway drainage system or within the Right of Way (ROW) must comply with the applicable provisions of the Colorado Water Quality Control Act, the Water Quality Control Commission (WQCC) Regulations (<https://www.colorado.gov/pacific/cdphe/wqcc-regulations-and-policies-and-water-quality-statutes>) and the CDOT MS4 Permit #COS-000005 (<https://www.codot.gov/programs/environmental/water-quality/documents>). Discharges are subject to inspection by CDOT and CDPHE. For CDOT-related MS4 programs and requirements, go to:  
<https://www.codot.gov/programs/environmental/water-quality/stormwater-programs>.

**Post-Construction Permanent Water Quality** - When working in a CDOT MS4 area and the activity disturbs one or more acres, permanent water quality control measures may be required. Information on the requirements can be found under the CDOT Permanent Water Quality MS4 Program at: <https://www.codot.gov/programs/environmental/water-quality/stormwater-programs/pwq-permanent-water-quality>

#### **Discharges to Storm Sewer Systems**

**Prohibited Discharges** - All discharges are subject to the provisions of the Colorado Water Quality Control Act and the Colorado Discharge Permit Regulations. Prohibited discharges include, but are not limited to, substances such as wash water, paint, automotive fluids, solvents, oils or soaps and sediment.

**Allowable Discharges** - The following discharges to stormwater systems are allowed without a permit from the CDPHE-WQCD: landscape irrigation, diverted stream flows, uncontaminated ground water infiltration to separate storm sewers, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, uncontaminated springs, footing drains, water line flushing, flows from riparian habitats and wetlands, and flow from firefighting activities. **Contact Information:** Contact the CDPHE-WQCD at (303) 692-3500. Information can also be found in the CDOT Illicit Discharge MS4 Program PDD at:  
<https://www.codot.gov/programs/environmental/water-quality/stormwater-programs/idde.html>.

**Spill Reporting** - Spills shall be contained and cleaned up as soon as possible. Spills shall NOT be washed down into the storm drain or buried. All spills shall be reported to the CDOT Illicit Discharge Hotline at (303) 512-4426 (4H20), as well as the Regional Permitting Office and Regional Maintenance Supervisor. Spills on highways, into waterways, any spill in the highway right-of-way exceeding 25 gallons, or that may otherwise present an immediate danger to the public shall be reported by calling 911, and shall also be reported to the CDPHE at 1-877-518-5608. More information can be found at  
<https://www.colorado.gov/pacific/cdphe/emergency-reporting-line>.

**Disposal of Drilling Fluids** - Drilling fluids used in operations such as Horizontal Directional Drilling may be classified as "discharges" or "solid wastes," and in general, should be pumped or vacuumed from the construction area, removed from the State Highway Right of Way, and disposed of at permitted facilities that specifically accept such wastes. Disposal of drilling fluids into storm drains, storm sewers, roadside ditches or any other type of man-made or natural waterway is prohibited by Water Quality Control and/or Solid Waste regulations. Small quantities of drilling fluid solids (less than 1 cubic yard of solids) may be left on-site after either being separated from fluids or after infiltration of the water, provided: 1) the drilling fluid consists of only water and bentonite clay, or, if required for proper drilling properties, small quantities of polymer additives that are approved for use in drinking water well drilling; 2) the solids are fully contained in a pit, and are not likely to pose a nuisance to future work in the area, 3) the solids are covered and the area restored as required by CDOT permit requirements (Utility, Special Use, or Access Permits, etc.). **Contact Information:** Contact CDPHE (telephone #'s listed above).

**Noxious Weeds and Invasive Species Management Plan** - Noxious Weeds and Invasive Species guidance can be found by contacting the Colorado Department of Agriculture (<https://www.colorado.gov/pacific/agconservation/noxiousweeds>) and the Colorado Division of Parks and Wildlife (<http://cpw.state.co.us/aboutus/Pages/RS-NoxiousWeeds.aspx>). In either case, management plans involving the control of noxious weeds associated with the permitted activity and cleaning of equipment will be required.

