

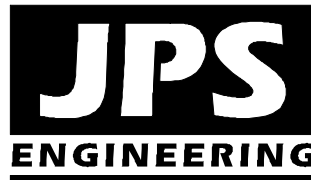
DRAINAGE LETTER REPORT
for
THE RESERVE AT CORRAL BLUFFS – FILINGS NO. 3-5

Prepared for:

Corral Ranches Development Company
1830 Coyote Point Drive
Colorado Springs, CO 80904

December 27, 2019
Revised June 23, 2020

Prepared by:



19 E. Willamette Avenue
Colorado Springs, CO 80903
(719)-477-9429
www.jpsengr.com

JPS Project No. 081104
PCD File Nos. SF207, SF208 & SF2012

DRAINAGE STATEMENT

Engineer's Statement:

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

John P. Schwab, P.E. #29891



Developer's Statement:

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

By:

Printed Name: Jake Kunstle, President
Corral Ranches Development Company
1830 Coyote Point Drive, Colorado Springs, CO 80904

1-7-20
Date

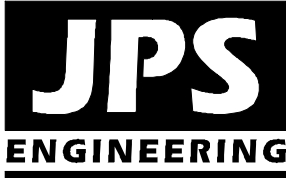
El Paso County's Statement

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

Jennifer Irvine, P.E.
County Engineer / ECM Administrator

Date

Conditions:



19 E. Willamette Avenue
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THE RESERVE AT CORRAL BLUFFS - FILINGS NO. 3-5 DRAINAGE LETTER REPORT June, 2020

I. INTRODUCTION

This Drainage Letter Report has been prepared in support of the final plat submittal for Filings No. 3-5 of The Reserve at Corral Bluffs Subdivision. The overall Reserve at Corral Bluffs Subdivision project consists of a total of 31 single-family rural residential lots, with minimum lot sizes of 5 acres. Filings No. 1 and 2 have been previously developed. The proposed Filing No. 3 consists of 6 lots along the easterly extension of Hoofprint Road and the northerly extension of Solberg Court. All remaining public infrastructure improvements for the subdivision will be completed with Filing No. 3. The proposed Filing No. 4 consists of 5 lots at the north end of Solberg Court, and the proposed Filing No. 5 consists of the final 8 lots at the south end of Solberg Court.

II. EXISTING AND PROPOSED DRAINAGE CONDITIONS

El Paso County previously approved the "Final Drainage Report for The Reserve at Corral Bluffs - Filing No. 1" prepared by JPS Engineering, dated October 24, 2013, as well as the "Drainage Letter for The Reserve at Corral Bluffs Filing No. 2" by JPS Engineering dated June 26, 2018. As shown in the attached "Figure D1: Developed Drainage Plan," the area within Filings No. 3-5 lies within Basins A1, A2, A4, A5, C, D, E, and F. Basins A1-A5, C, and D generally sheet flow northerly to the north boundary of the subdivision. Basin E sheet flows northwesterly to the west boundary of the subdivision, and Basin F sheet flows to the south boundary of the subdivision. As discussed in the previously approved subdivision drainage report, the developed drainage impact will be minimal based on the rural residential development plan for the site.

Development of this subdivision filing will include roadside ditches and culvert improvements to safely convey drainage through the site. This filing will include construction of proposed Culvert OA1 to convey drainage across a low point in Hoofprint Road. Culvert sizing calculations for Culvert OA1 were included in Appendix D of the previously approved Final Drainage Report for Filing No. 1, and the referenced calculations demonstrate that these culverts have been designed to County standards. Erosion control blankets have been specified for roadside ditch stabilization in selected locations based on the hydraulic calculations within the previously approved Final Drainage Report.

III. DRAINAGE PLANNING FOUR STEP PROCESS

El Paso County Drainage Criteria require drainage planning to include a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls.

As stated in DCM Volume 2, the Four Step Process is applicable to all new and re-development projects with construction activities that disturb 1 acre or greater or that disturb less than 1 acre but are part of a larger common plan of development. The Four Step Process has been implemented as follows in the planning of this project:

Step 1: Employ Runoff Reduction Practices

- Minimize Impacts: The proposed rural residential subdivision is an inherently low impact development. The proposed 5-acre minimum lot sizes and gravel rural roads with roadside ditches will minimize drainage impacts in comparison to higher density development alternatives.

Step 2: Stabilize Drainageways

- There are no major drainageways within or directly adjacent to this project site.

Step 3: Provide Water Quality Capture Volume (WQCV)

- Water quality detention is not required based on the rural residential development proposed (5-acre minimum lot sizes).

Step 4: Consider Need for Industrial and Commercial BMPs

- No industrial or commercial land uses are proposed as part of this development.

IV. STORMWATER DETENTION AND WATER QUALITY

As stated in the previously approved subdivision drainage report, the proposed development will result in a minimal increase in developed flows based on the rural residential development plan, and there is no requirement for on-site stormwater detention based on the minimal developed drainage impact.

The Reserve at Corral Bluffs Subdivision Filings No. 3-5 will implement permanent water quality facilities in two locations to satisfy current County stormwater quality requirements.

The proposed drainage and grading plan for this site includes a private Rain Garden (RG) at the southeast corner of Lot 4, Filing No. 4 (north side of the easterly Solberg Court cul-de-sac) to provide the required stormwater quality mitigation for Basin A1. According to the calculations in Appendix A, the required Water Quality Capture Volume (WQCV) for Design Point A1 is 2,397 cubic feet, and the proposed Rain Garden A1 provides a volume of 2,551 cubic feet.

An additional private Rain Garden (RG) will be constructed along the west boundary of Lot 5, Filing No. 3 (southeast of Solberg Court and Hoofprint Road intersection) to provide stormwater quality mitigation for Basin A2. According to the calculations in Appendix A, the required Water Quality Capture Volume (WQCV) for Design Point A2 is 3,548 cubic feet, and the proposed Rain Garden A2 provides a volume of 4,056 cubic feet.

The proposed stormwater quality facilities will be privately owned and maintained by the property owner, and maintenance access is readily available from the adjoining public roads.

V. COST ESTIMATE AND DRAINAGE FEES

The developer will finance all costs for proposed roadway and drainage improvements, and public facilities will be owned and maintained by El Paso County upon final acceptance.

This majority of these subdivision filings (Basins A, C, and D) are located in the Curtis Ranch Drainage Basin (CHWS 1000), which is an unstudied basin with no drainage basin fee or bridge fee requirement.

Filing No. 3 and 4 Drainage Basin Fees

Filings No. 3 and 4 are located entirely within the Curtis Ranch Drainage Basin, so there are no applicable drainage basin fees.

Filing No. 5 Drainage Basin Fees

The south and southwest parts of Filing No. 5 (Basins E and F) are located within the Jimmy Camp Creek Drainage Basin (FOFO 2000), which has a 2020 drainage basin fee of \$19,084 per impervious acre and a bridge fee of \$893 per impervious acre according to the schedule of El Paso County Drainage Basin Fees. No significant development activity is proposed within Basin F, so the only development area impacted by Jimmy Camp Creek Drainage Basin fee requirements is the southwesterly area within Basin E.

For the Jimmy Camp Creek Drainage Basin, the County Basin Fee Schedule also includes a surety fee based on the DBPS currently being in the process of revision. The Basin Fee Schedule states that “In addition to the Drainage Fee, a surety in the amount of \$7,285 per impervious acre shall be provided to secure payment of additional fees in the event that the DBPS results in a fee greater than the current fee. Fees paid in excess of the future revised fee will be reimbursed.”

For Filing No. 5, applicable drainage basin fees within the Jimmy Camp Creek Drainage Basin are summarized as follows:

Total Developed Residential Lot Area (Basin E) = 15.89 acres (per Sh. D1)
Filing No. 2 Residential Lot Area (Basin E) = 8.22 acres
(Basin fees previously paid during Filing No. 2 recording)
Filing No. 5 Residential Lot Area (Basin E) = **7.67 acres**
(Basin fees due for Filing No. 5 recording)

Percent impervious = 5.16%
(per Site-Specific Impervious Calculation in Appendix C of previously
approved subdivision drainage report)
Filing No. 5 Impervious area = (5.16% * 7.67 ac.) = 0.396 ac.
Adjusted Impervious area = (0.396 ac) * 75% = 0.297 ac.
(includes 25% reduction on drainage fees for 5-acre lots)

Drainage Basin Fee = (0.297 ac.) @ \$19,084/ac. = **\$5,667.95**

Bridge Fee = (0.297 ac.) @ \$893/ac. = **\$265.22**

Drainage Basin Surety Fee = (0.297 ac.) @ \$7,285/ac. = **\$2,163.65**

TOTAL DRAINAGE & BRIDGE FEES = \$8,096.82

VI. SUMMARY

The Reserve at Corral Bluffs Filings No. 3-5 comprise the final 19 lots of this rural residential subdivision. All remaining public infrastructure improvements for the subdivision will be completed with Filing No. 3. The proposed rural residential subdivision, consisting of 5-acre minimum lot sizes, is consistent with the surrounding zoning and character of this site.

The proposed development of The Reserve at Corral Bluffs Filings No. 3-5 conforms to the previously approved drainage plan for this subdivision as detailed in the "Final Drainage Report for The Reserve at Corral Bluffs - Filing No. 1." This final phase of development will include culverts, roadside ditches, and drainage improvements as detailed in the approved subdivision drainage report.

Development of the proposed subdivision is anticipated to result in a minimal increase in developed runoff from the site, and erosion control best management practices will be implemented to mitigate developed drainage impacts. Two rain gardens will be constructed to meet current County stormwater quality requirements.

The proposed drainage patterns will remain consistent with historic conditions, and new drainage facilities will be constructed on-site to El Paso County standards to safely convey runoff to adequate outfalls. Implementation and maintenance of proper drainage and erosion control measures will ensure that this development has no significant adverse drainage impact on downstream properties.

APPENDIX A
DRAINAGE CALCULATIONS & EXHIBITS

Design Procedure Form: Rain Garden (RG)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 2

Designer: JPS
 Company: JPS
 Date: June 23, 2020
 Project: CORRAL BLUFFS FILING NO. 3
 Location: BASIN A1

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of rain garden)</p> <p>B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)</p> <p>C) Water Quality Capture Volume (WQCV) for a 12-hour Drain Time (WQCV = $0.8 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$)</p> <p>D) Contributing Watershed Area (including rain garden area)</p> <p>E) Water Quality Capture Volume (WQCV) Design Volume Vol = (WQCV / 12) * Area</p> <p>F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p>	<p>$I_a =$ <u>2.6</u> %</p> <p>$i =$ <u>0.026</u></p> <p>WQCV = <u>0.02</u> watershed inches</p> <p>Area = <u>1,844,330</u> sq ft</p> <p>$V_{WQCV} =$ <u>2,397</u> cu ft</p> <p>$d_6 =$ _____ in</p> <p>$V_{WQCV \text{ OTHER}} =$ _____ cu ft</p> <p>$V_{WQCV \text{ USER}} =$ _____ cu ft</p>
<p>2. Basin Geometry</p> <p>A) WQCV Depth (12-inch maximum)</p> <p>B) Rain Garden Side Slopes ($Z = 4$ min., horiz. dist per unit vertical) (Use "0" if rain garden has vertical walls)</p> <p>C) Minimum Flat Surface Area</p> <p>D) Actual Flat Surface Area</p> <p>E) Area at Design Depth (Top Surface Area)</p> <p>F) Rain Garden Total Volume ($V_T = ((A_{Top} + A_{Actual}) / 2) * \text{Depth}$)</p>	<p>$D_{WQCV} =$ <u>12</u> in</p> <p>$Z =$ <u>4.00</u> ft / ft</p> <p>$A_{Min} =$ <u>959</u> sq ft</p> <p>$A_{Actual} =$ <u>2138</u> sq ft</p> <p>$A_{Top} =$ <u>2965</u> sq ft</p> <p>$V_T =$ <u>2,551</u> cu ft</p>
<p>3. Growing Media</p>	<p>Choose One</p> <p><input checked="" type="radio"/> 18" Rain Garden Growing Media</p> <p><input type="radio"/> Other (Explain): _____</p>
<p>4. Underdrain System</p> <p>A) Are underdrains provided?</p> <p>B) Underdrain system orifice diameter for 12 hour drain time</p> <p>i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice</p> <p>ii) Volume to Drain in 12 Hours</p> <p>iii) Orifice Diameter, 3/8" Minimum</p>	<p>Choose One</p> <p><input checked="" type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p>$y =$ <u>2.0</u> ft</p> <p>$Vol_{12} =$ <u>2,397</u> cu ft</p> <p>$D_o =$ <u>1 1/8</u> in</p>

Design Procedure Form: Rain Garden (RG)

Sheet 2 of 2

Designer: JPS
Company: JPS
Date: June 23, 2020
Project: CORRAL BLUFFS FILING NO. 3
Location: BASIN A1

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric

A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?

Choose One

☐ YES

☒ NO

6. Inlet / Outlet Control

A) Inlet Control

Choose One

☐ Sheet Flow- No Energy Dissipation Required

☒ Concentrated Flow- Energy Dissipation Provided

7. Vegetation

Choose One

☒ Seed (Plan for frequent weed control)

☐ Plantings

☐ Sand Grown or Other High Infiltration Sod

8. Irrigation

A) Will the rain garden be irrigated?

Choose One

☐ YES

☐ NO

Notes: _____

Design Procedure Form: Rain Garden (RG)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 2

Designer: JPS
 Company: JPS
 Date: June 23, 2020
 Project: CORRAL BLUFFS FILING NO. 3
 Location: BASIN A2

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of rain garden)</p> <p>B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)</p> <p>C) Water Quality Capture Volume (WQCV) for a 12-hour Drain Time (WQCV = $0.8 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$)</p> <p>D) Contributing Watershed Area (including rain garden area)</p> <p>E) Water Quality Capture Volume (WQCV) Design Volume Vol = (WQCV / 12) * Area</p> <p>F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p>	<p>$I_a =$ <u>7.0</u> %</p> <p>$i =$ <u>0.070</u></p> <p>WQCV = <u>0.04</u> watershed inches</p> <p>Area = <u>1,084,208</u> sq ft</p> <p>$V_{WQCV} =$ <u>3,548</u> cu ft</p> <p>$d_6 =$ _____ in</p> <p>$V_{WQCV \text{ OTHER}} =$ _____ cu ft</p> <p>$V_{WQCV \text{ USER}} =$ _____ cu ft</p>
<p>2. Basin Geometry</p> <p>A) WQCV Depth (12-inch maximum)</p> <p>B) Rain Garden Side Slopes ($Z = 4$ min., horiz. dist per unit vertical) (Use "0" if rain garden has vertical walls)</p> <p>C) Minimum Flat Surface Area</p> <p>D) Actual Flat Surface Area</p> <p>E) Area at Design Depth (Top Surface Area)</p> <p>F) Rain Garden Total Volume ($V_T = ((A_{Top} + A_{Actual}) / 2) * \text{Depth}$)</p>	<p>$D_{WQCV} =$ <u>12</u> in</p> <p>$Z =$ <u>4.00</u> ft / ft</p> <p>$A_{Min} =$ <u>1518</u> sq ft</p> <p>$A_{Actual} =$ <u>3235</u> sq ft</p> <p>$A_{Top} =$ <u>4877</u> sq ft</p> <p>$V_T =$ <u>4,056</u> cu ft</p>
<p>3. Growing Media</p>	<div> Choose One <input checked="" type="radio"/> 18" Rain Garden Growing Media <input type="radio"/> Other (Explain): _____ _____ </div>
<p>4. Underdrain System</p> <p>A) Are underdrains provided?</p> <p>B) Underdrain system orifice diameter for 12 hour drain time</p> <p>i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice</p> <p>ii) Volume to Drain in 12 Hours</p> <p>iii) Orifice Diameter, 3/8" Minimum</p>	<div> Choose One <input checked="" type="radio"/> YES <input type="radio"/> NO </div> <p>$y =$ <u>2.0</u> ft</p> <p>$Vol_{12} =$ <u>3,548</u> cu ft</p> <p>$D_o =$ <u>1 3/8</u> in</p>

Design Procedure Form: Rain Garden (RG)

Sheet 2 of 2

Designer: JPS
 Company: JPS
 Date: June 23, 2020
 Project: CORRAL BLUFFS FILING NO. 3
 Location: BASIN A2

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric

A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?

Choose One

☐ YES

☒ NO

6. Inlet / Outlet Control

A) Inlet Control

Choose One

☐ Sheet Flow- No Energy Dissipation Required

☒ Concentrated Flow- Energy Dissipation Provided

7. Vegetation

Choose One

☒ Seed (Plan for frequent weed control)

☐ Plantings

☐ Sand Grown or Other High Infiltration Sod

8. Irrigation

A) Will the rain garden be irrigated?

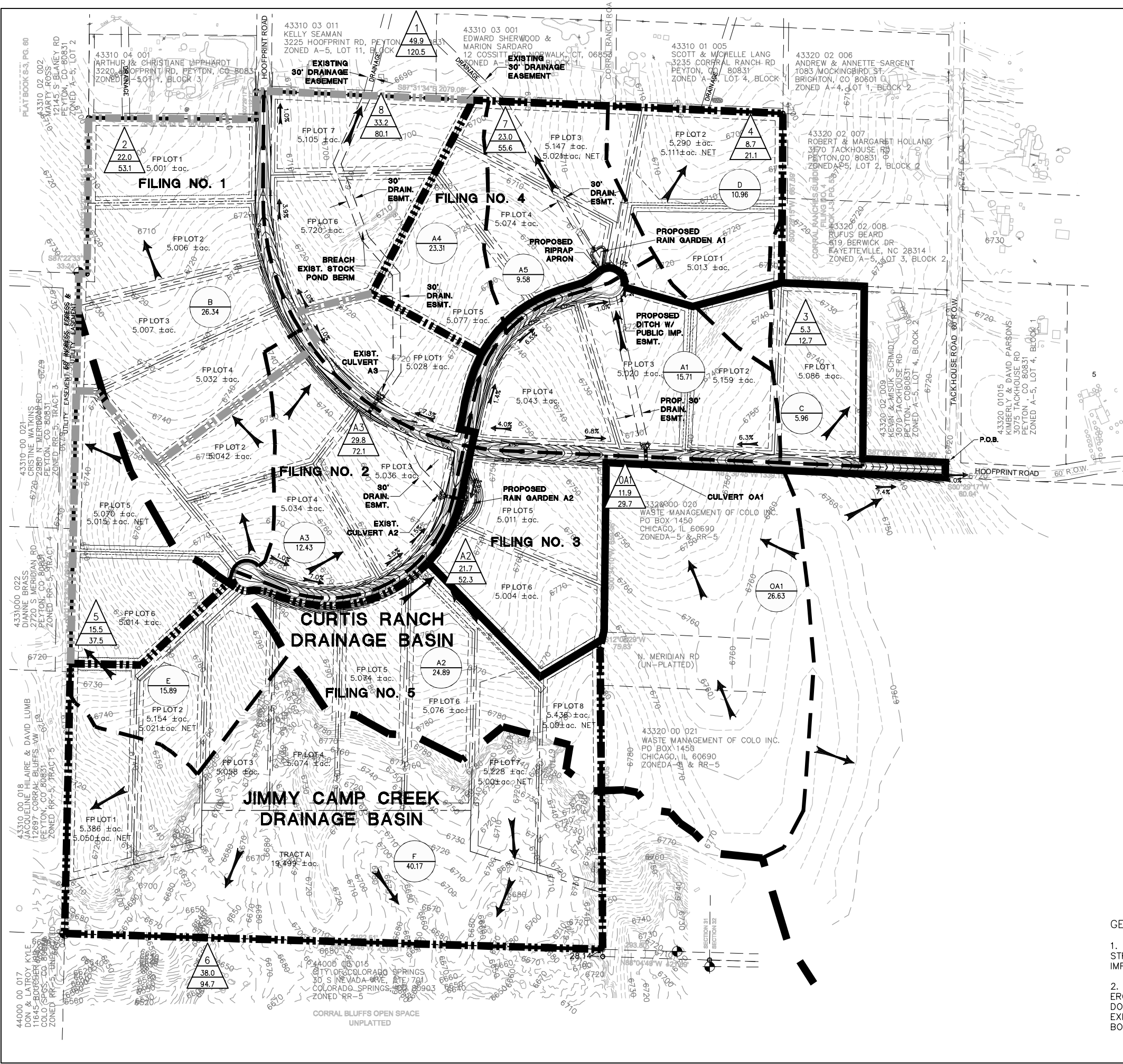
Choose One

☐ YES

☐ NO

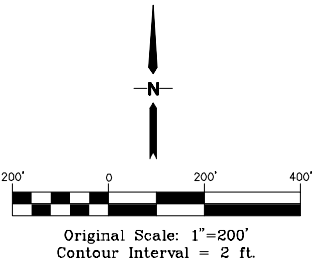
Notes: _____

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LEGEND

- FILING LIMITS
- MAJOR DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN BOUNDARY
- EXISTING CONTOUR
- PROPOSED SPOT ELEVATION (FLOWLINE)
- EXISTING SPOT ELEVATION (FLOWLINE)
- DRAINAGE CHANNEL
- PROPOSED FLOW DIRECTION ARROW
- PROPOSED CULVERT W/ FLARED END SECTIONS
- DESIGN POINT
- Q_s (cfs)
- Q₁₀₀(cfs)
- BASIN DESIGNATION
- BASIN AREA (ACRES)



GENERAL DRAINAGE NOTES:

- INDIVIDUAL BUILDERS SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM STRUCTURES AND ACCOUNT FOR POTENTIAL CROSS-LOT DRAINAGE IMPACTS WITHIN EACH LOT.
- BUILDERS AND PROPERTY OWNERS SHALL IMPLEMENT & MAINTAIN EROSION CONTROL BEST MANAGEMENT PRACTICES FOR PROTECTION OF DOWNSTREAM PROPERTIES AND FACILITIES INCLUDING PROTECTION OF EXISTING GRASS BUFFER STRIPS ALONG THE DOWNSTREAM PROPERTY BOUNDARIES.

THE RESERVE AT CORRAL BLUFFS SUBDIVISION FIL NO. 3

JPS
ENGINEERING

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No.	REVISION	BY	DATE

DEVELOPED DRAINAGE
PLAN

HORZ. SCALE: 1"=200'
VERT. SCALE: N/A
SURVEYED: LWA
CREATED: 01/30/12
PROJECT NO: 081104
SHEET:

DRAWN: MSP
DESIGNED: JPS
CHECKED: JPS
LAST MODIFIED: 6/23/20
MODIFIED BY: MSP

D1