

**MASTER DEVELOPMENT DRAINAGE
REPORT FOR RIVERBEND CROSSING AND
FINAL DRAINAGE REPORT FOR
RIVERBEND CROSSING COMMONS**

JUNE 2019
Revised January 2020

Prepared for:

Avatar Fountain, LP.
6800 Jericho Tpke., Suite 120W #204
Syosset, NY 11791

Prepared By:


CATAMOUNT
ENGINEERING
PO BOX 221
Woodland Park, CO 80866
719-426-2124

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Engineer's Statement:

This report and plan for the drainage design of RIVERBEND CROSSING COMMONS was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Fountain does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, error or omissions on my part in preparing this report.

Signature: _____
David L. Mijares, Colorado PE #40510
For and on behalf of Catamount Engineering

_____ Date

Developer's Statement:

AVATAR FOUNTAIN, LP. hereby certifies that the drainage facilities for RIVERBEND CROSSING COMMONS } shall be constructed according to the design presented in this report. I understand that the City of Fountain does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Fountain pursuant to the City Code; and cannot, on behalf of RIVERBEND CROSSING COMMONS, guarantee that final drainage design review will absolve AVATAR FOUNTAIN, LP. and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

Name of Developer: _____

Authorized Signature: _____ Date: _____

Printed Name: _____

Title: _____

Address: _____

City of Fountain:

Filed in accordance with the Code of the City of Fountain, 2009, as amended.

Brandy Williams, PE
For the City Engineer

_____ Date

Conditions:

MASTER DEVELOPMENT DRAINAGE REPORT FOR RIVERBEND CROSSING AND
FINAL DRAINAGE REPORT FOR RIVERBEND CROSSING COMMONS

PURPOSE

The purpose of this drainage report is to identify existing drainage patterns and establish outfall scenarios from the proposed commercial redevelopment. The site is contained within the West Little Johnson Drainage Basin and outfalls to Fountain Creek. The parcel was previously studied in the Little Johnson/Security Creek Drainage Basin Planning Study prepared by Simons, Li and Associates, dated December 1987, and the Preliminary Drainage Report for Riverbend Crossing., prepared by Nolte and Associates, dated February 14, 2007. The overall Riverbend development consists of two overall projects, The Riverbend Crossing residential subdivision filings 1 and 2 to be developed in El Paso County; and the Riverbend Crossing Commons Development to be developed within City of Fountain. This report develops broad analysis of both El Paso County and Fountain development parcels and provides Preliminary Drainage Report analysis for the commercial redevelopment with incorporated City of Fountain.

Individual lot Final Drainage Reports/Letters will be required confirming conformance with overall drainage patterns developed in this MDDP and detailing individual lot storm sewer connections to the trunk main and laterals developed in this analysis.

GENERAL LOCATION AND DESCRIPTION

The Riverbend Crossing Developments are located within the NE ¼ of Section 14, Township 15 South and Range 66 West of the 6th principal meridian. The proposed commercial parcel contains approximately 10.69 acres to be developed within the City of Fountain incorporation limits. The existing commercial development is proposed to have the majority of buildings and infrastructure demolished and reconstruction of the site will incorporate access to the proposed residential development.

The proposed residential developments contain approximately 52.0 acres of undeveloped land with approximately 10 acres located within the existing Fountain Creek 100-year floodplain. Improvements are proposed in the portions of the property identified as outside of the existing floodplain. Residential development is proposed to be completed in 2 filings. Filing No. 1 will contain 136 residential lots situated on approximately 36.5 acres within the easterly and southerly portions of the residential parcel. Filing No. 2 will contain 86 residential lots on approximately 15.5 acres. The 10 acres within the floodplain not proposed for development are contained within the boundary of Filing No. 1.

The overall development is bounded to the north and west by undeveloped land zoned A-5, to the east by U.S. Highway 85/87 and Southmoor Drive, and to the south by Fountain Creek. and to the west by Sand Creek, to the north and east by existing residential development within the Heritage Subdivision Unit 4, and south by Chelton Road. The easterly portions of the development contained within the City of Fountain incorporation limits are predominantly zoned commercial

and the southerly and westerly portions of the development are zoned PUD. An RS-5000 zone is being sought with entitlement applications within the El Paso County portions.

Existing soils on the site consist of Limon clay (Hydrologic Group 'C'), Schamber-Razor complex (Hydrologic Group 'A'), and Nunn clay loam (Hydrologic Group 'C'). Soils have been identified as determined by the Natural Resources Conservation Service Web Soil Survey. Hydrologic Group 'C' soils have been used in hydrologic calculations.

The 10.69 acres contained within the commercial site contains existing structures, paved parking, and paved drive aisles with little existing vegetation. The existing commercial site sits 10-15 feet higher than the undeveloped residential portion of the parcels and runoff sheet flows predominantly at 1%-1.5% to the south and into Southmoor Drive. Flows are contained within the Southmoor Drive roadside ditch and conveyed southwest to Fountain Creek.

The majority of the commercial development site is located within Zone X (500-year) floodplain per FIRM panels 08041C0763 G 08041C0951 G, effective December 27, 2018 as modified by LOMR 17-08-0467P effective 1/15/2019. A F.E.M.A. Firmette overlay has been provided. The proposed common extended detention basin is located outside Fountain Creek floodplain and will not be affected by existing G series floodplain.

Existing features and topography are based upon an ALTA/NSPS land title survey developed by Barron Land Surveys of the both the residential and commercial portions of the Riverbend Crossing projects, dated November 21, 2017. Additional topography for offsite analysis of reach of Fountain Creek adjacent to the southerly boundary of the residential development was obtained from Colorado Springs FIMS data.

Environmental mapping completed in the "Environmental Report for Riverbend Crossing Residential Community", completed by JDS-Hydro Consultants, Inc. Dated October 2019 indicate no suitable habitat for any listed or proposed federal species was identified on the subject property. A small location of emergent wetlands was observed within the residential portion of the projects. The identified wetlands is approximately 0.03 acres in size and lies well within the main reach of Fountain Creek. No improvements are proposed within the identified wetlands reach.

Runoff from the northerly adjacent St. Dominic's Church site is conveyed west to an on-site extended detention basin constructed with recent St. Dominic's improvements prior to release west of the proposed residential development. Runoff generated within Southmoor Drive is conveyed South within the roadside ditch adjacent to the commercial parcel and outfalls directly to the Fountain Creek Drainage. Proposed improvements to Southmoor Drive will include vertical curb and sidewalk along the Southmoor Drive Frontage conveying flows south within the improved roadway. No offsite drainage will be accepted onto the commercial parcel from adjacent development.

EXISTING DRAINAGE

The parcels are located within the West Little Johnson Drainage Basin and are directly tributary to Fountain Creek within the reach. The Little Johnson/Security Creek Drainage Basin Planning Study identifies three separate sub-basins (75,76, and 77) within the parcel. The majority of the parcels are identified as within Zone X 500-year floodplain and the southerly portion of the property not proposed for development lies with Zone AE 100-yr floodplain and floodway. The effective firm panel is included in the appendix of the report. The West Little Johnson drainage basin contains approximately five square miles located in the semi-arid region of the high plains. Precipitation within the basin ranges from 14 to 16 inches per year with thunderstorms typical in the summer months.

The existing drainage patterns for the parcel were summarized in the "Preliminary Drainage Study Riverbend Crossing", prepared by Nolte and Associates, Inc. dated 2/14/2007. No development within the parcel has been pursued since the Nolte analysis was completed and the existing drainage analysis has been accepted in this report.

The report indicates the 3 sub-basins identified in the Drainage Basin Planning Study as sub-basins 75,76, and 77. The basins are direct flow basins directly tributary to Fountain Creek and traverse the site from north to south where they enter Fountain Creek.

Basin 77 represents the existing commercial center development northwest of proposed Riverbend Crossing Filings No. 1 and 2 and the southeasterly portion of the residential filings. Redevelopment of the commercial development within the City of Fountain is being concurrently pursued by the developer of both properties. Existing flows entering the residential portion at the southern limits of the commercial development were modeled as $Q_5=25.99$ cfs, $Q_{100}=45.15$ cfs in the Preliminary Drainage Report and are conveyed in a drainage swale to outfall within Fountain Creek.

Basin 76 represents the central portion of the undeveloped parcel and the northwesterly portion of the existing commercial development and is directly tributary to Fountain Creek. The property north of Basin 76 is contained within the St. Dominic's Church Subdivision. Storm runoff from the St. Dominic's Church Subdivision is collected on-site and conveyed through a private detention pond prior to historic release east of the parcel. The Preliminary Drainage Report shows $Q_5=6.89$ cfs, $Q_{100}=12.07$ cfs entering the residential parcel from the northwest corner of the commercial development and exhibits $Q_5=11.87$ cfs, $Q_{100}=28.05$ cfs leaving the site and entering Fountain Creek.

Basin 75 contains the westerly portion of the proposed residential development. The preliminary drainage report indicates that $Q_5=20.28$ cfs, $Q_{100}=45.99$ cfs enter the west side of the parcel from the adjacent agricultural property. Topography does not indicate a channelized flow but rather overland flow from the west. The anticipated long-term use for the adjacent parcel is to remain agricultural. The foundation that owns the parcel is extending and irrigation ditch along the west boundary of the subject property to divert flows from the adjacent parcel south to Fountain Creek. An additional 15' setback is proposed in the residential development plan to allow for grading of a fill slope to convey flows south the Fountain Creek.

Runoff from the northerly adjacent St. Dominic's Church site is conveyed west to an on-site extended detention basin constructed with recent St. Dominic's improvements prior to release west of the proposed residential development. Runoff generated within Southmoor Drive is conveyed South within the roadside ditch adjacent to the commercial parcel and outfalls directly to the Fountain Creek Drainage. Proposed improvements to Southmoor Drive will include vertical curb and sidewalk along the Southmoor Drive Frontage conveying flows south within the improved roadway. No offsite drainage will be accepted onto the commercial parcel from adjacent development.

DEVELOPED DRAINAGE BASINS

The intent of the proposed development is to follow closely to historic drainage patterns while satisfying current El Paso County/City of Fountain development and water quality criteria. The area of the site proposed for impervious development will be contained within the parking/private roadway section and private on-site storm sewer system conveying flows to a full spectrum detention basin and water quality facility within the southwest portion of the site prior to outfall to Fountain Creek.

Development of the site includes 225 residential lots, roadway and utility infrastructure to be constructed in 2 filings within the westerly residential portion. Redevelopment of the commercial site includes multiple annexations into the City of Fountain, demolition, regrading, roadway and utility infrastructure, and conveyance of storm runoff to the proposed regional detention facility located within the residential portion of the overall development. The full-spectrum extended detention basin will be private and owned and maintained by the Riverbend Crossing Metro District. Storm Conveyance within the residential filings will be public and be owned and maintained by El Paso County. Storm Conveyance within the commercial development will be private and be owned and maintained by the commercial property owner's association.

Due to limited grade within the site necessitating flat roadway sections minimal drainage will be conveyed within the street roadway sections and drainage will primarily be conveyed in public storm drain systems conveying flows to outfall within a private extended detention basin. The private extended detention basin will be developed to accept developed runoff from the proposed redeveloped commercial center along the parcel's northeasterly boundary. Offsite flow from the Venetucci agricultural parcel directly west of the property will be conveyed in a swale parallel to the property boundary directly south and into Fountain Creek and will not enter the residential development. Flows generated within the proposed commercial center redevelopment will be conveyed within the commercial curb lines and private storm drain to be constructed along the southerly property boundary and outfall directly to the proposed shared extended detention basin.

'C Basins'

Basin C1 (3.56 Acres, $Q_2=9.5$ cfs, $Q_5=12.2$ cfs, $Q_{10}=14.6$ cfs, $Q_{25}=17.2$ cfs, $Q_{50}=19.6$ cfs, and $Q_{100}=22.2$ cfs) represents future commercial development within the northern portion of the commercial development and includes the existing unplatted gas station site under separate ownership. Runoff generated within the basin will sheetflow to proposed curb lines and be conveyed to proposed private inlet catchments and pipe systems to be designed with final layout

determination. 24" private storm sewer system will be stubbed to design point P1 to collect basin flows.

Basin C2 (1.12 Acres, $Q_2=3.8$ cfs, $Q_5=4.9$ cfs, $Q_{10}=5.8$ cfs, $Q_{25}=6.9$ cfs, $Q_{50}=7.9$ cfs, and $Q_{100}=8.9$ cfs) represents future commercial development within the central western portion of the commercial development and includes the proposed main street extension. Runoff generated within the basin will sheetflow to proposed curb lines and be conveyed to proposed private 10' double type R inlet and conveyed in a private 24" storm sewer system from pipe design point P2 to pipe design point P3.

Basin C3 (1.59 Acres, $Q_2=4.8$ cfs, $Q_5=6.2$ cfs, $Q_{10}=7.4$ cfs, $Q_{25}=8.7$ cfs, $Q_{50}=9.9$ cfs, and $Q_{100}=11.2$ cfs) represents future commercial development and a portion of the existing building to remain within the central western portion of the commercial development and is tributary to a 10' double type R inlet. Runoff generated within the basin will sheetflow to existing curb lines and be conveyed to proposed private 10' double type R inlet and conveyed in a private 30" storm sewer system from pipe design point P3 to pipe design point P4.

Basin C4 (2.13 Acres, $Q_2=6.3$ cfs, $Q_5=8.2$ cfs, $Q_{10}=9.7$ cfs, $Q_{25}=11.5$ cfs, $Q_{50}=13.1$ cfs, and $Q_{100}=14.9$ cfs) represents future commercial development within the central eastern portion of the commercial redevelopment. Runoff generated within the basin will sheetflow to proposed curb lines and be conveyed to proposed private inlet catchments and storm sewer to be designed with final layout determination. A proposed 18" private storm sewer system will be stubbed to the lowpoint of the lot for future extension within the lot.

Basin C5 (0.80 Acres, $Q_2=2.9$ cfs, $Q_5=3.7$ cfs, $Q_{10}=4.5$ cfs, $Q_{25}=5.3$ cfs, $Q_{50}=6.0$ cfs, and $Q_{100}=6.89$ cfs) represents proposed commercial parking t within the southeastern portion of the commercial redevelopment. Runoff generated within the basin will sheetflow to proposed curb lines and be conveyed to proposed private 5' single Type R inlet in sump condition at the low point of the site. Runoff will be conveyed in a proposed private 18" storm sewer to pipe design point P5.

Basin C6 (2.06 Acres, $Q_2=6.2$ cfs, $Q_5=8.0$ cfs, $Q_{10}=9.5$ cfs, $Q_{25}=11.3$ cfs, $Q_{50}=12.8$ cfs, and $Q_{100}=14.5$ cfs) represents proposed commercial parking and a portion of the existing commercial building to remain within the southern portion of the commercial redevelopment. Runoff generated within the basin will sheetflow to proposed curb lines and be conveyed to proposed private 10' double Type R inlet in sump condition at the low point of the site. Runoff will be conveyed in a proposed private 30" storm sewer from pipe to confluence with the proposed public storm sewer system within the residential development. From the confluence commercial runoff will be conveyed in public (El Paso County) storm sewer to outfall within the sub-regional extended detention basin.

Overall contribution of the redeveloped commercial development is comparable with the historical analysis contributions from basin 77 ($Q_5=25.99$ cfs, $Q_{100}=45.15$ cfs) and commercial portion of Basin 76 ($Q_5=6.89$ cfs, $Q_{100}=12.07$ cfs) for a total commercial runoff of ($Q_5=32.88$ cfs, $Q_{100}=57.22$ cfs). Developed runoff from the commercial development at Design Point P4 is $Q_5=38.5$ cfs, $Q_{100}=70.2$ cfs.

Final analysis of inlet and storm sewer sizing will be developed in the final drainage report for Riverbend Crossing Commons to be submitted upon final layout determination and concurrently with final plat application.

EXTENDED DETENTION BASIN

The parcel proposes to develop 54.90 acres within the West Little Johnson Drainage Basin directly tributary to Fountain Creek requiring development of water quality treatment and full-spectrum detention per the criteria of the El Paso County Drainage Criteria Manual Volume 2. The proposed extended detention basin will be developed to provide water quality and full spectrum detention for both the Riverbend Crossing residential development Filings No. 1 and 2 and the Riverbend Crossing Commons Commercial development within the City of Fountain. The proposed Extended Detention Basin located in the southerly portion of the development has 54.90 tributary acres of development with an average imperviousness of 65.40%. Full spectrum pond development requires 1.170 acre-ft of water quality capture volume ponding to an elevation of 5685.95, an EURV volume of 2.542-acre ft, and a total volume of 6.1169 acre-ft ponding to an elevation of 5689.98 providing full spectrum detention including the 100-YR event.

Runoff generated within the site will be conveyed to the pond through storm sewer systems or as direct sheetflow. The storm sewer systems will outfall directly to 6" concrete forebays with baffle providing adequate protection at discharge point. The concrete forebays require a total volume of 1,525 cubic feet of volume (2% of the design WQCV). The forebay will be constructed of a concrete slab with sides conforming to the pond slopes and 1' wall with a 9" rectangular notch which outfalls to the proposed trickle channel at the downstream end.

The pond will be constructed with 4:1 minimum side slope to be vegetated per the final landscape plan. A 4' wide by 6" deep concrete trickle channel with a 0.5% longitudinal slope will convey low flows across the pond bottom to the micropool/outlet structure. The trickle channel will outfall to a 17' long by 7' wide by 2.5' deep concrete micropool. The micropool will provide a surface area of 120 square feet and an initial surcharge volume of 80 cubic feet utilizing an 8" initial surcharge depth.

A portion of the pond is situated below the Base Flood Elevation of the 100-YR recurrence event within the adjacent portion of Fountain Creek, 5689.00. Excess volume exceeding the 100-YR event volume above the base flood elevation was incorporated into the pond to overcome backwater effects should the subdivision experience a 100-YR event concurrent with passage of maximum flood event within the adjacent reach of Fountain Creek.

The outlet structure will consist of a concrete box with orifice plate and screen providing water quality outlet and weir with trash rack for larger storm outfall. The pond will outfall through a private 30" RCP pipe system directly to Fountain Creek.

The emergency spillway will consist of a 60' weir along the southerly end of the pond at an elevation of 5691.00. The overflow area will consist of 12" depth of type VL soil riprap.

Outfall from the extended detention basin of $Q_2=1.0$ cfs, $Q_5=2.6$ cfs, $Q_{10}=7.8$ cfs, $Q_{25}=18.2$ cfs, $Q_{50}=27.2$ cfs, and $Q_{100}=36.4$ will be conveyed in a private 30" RCP. Combined flows at Design P-out is less than historic runoff from basins 75,76, and 77. Outfall from the onsite extended detention basin will be conveyed directly to Fountain Creek through the private 30" HDPE and full spectrum release will have no impacts on the Fountain Creek Drainage. Detained outfall from full spectrum extended detention basin calculated through Urban Drainage methodology is not directly comparable to rational calculations and are significantly below calculated rational historic values.

The pond will be located within El Paso County and provides full spectrum detention for upstream development located in both City of Fountain and El Paso County jurisdictions requiring development of a joint detention pond maintenance agreement and easement between the City of Fountain, El Paso County, Avatar Fountain LP (commercial developer), Avatar Riverbend (residential developer), and Riverbend Crossing Metropolitan District (ownership/maintenance entity). The development requires an apportionment of pond use between the City of Fountain commercial development and El Paso County residential development. Based on developed rational analysis the commercial development contributes 70.20 cfs in the major storm event (36.4% of total flows) and the residential development contributes 122.60 cfs in the major storm event (63.6% of total flows).

4-STEP PROCESS

1. The development addresses Low Impact Development strategies primarily through the utilization of landscape swales within sides and rear of proposed commercial lots and directing runoff from buildings and walkways through swales with minimal longitudinal grade prior to outfall to street collection and storm conveyance systems.
2. On-site flow is directed to the on-site private proposed full spectrum extended detention basin constructed with development of the project which outfalls directly to historic outfall within Fountain Creek. The extended detention basin provides Water Quality Capture Volume required for this site and concurrent commercial development and attenuates release of flows to approximate historic runoff.
3. The ultimate recipient of runoff from the site is Fountain Creek. Flows from the site are tributary to the full spectrum extended detention basin constructed on site with development of the Riverbend Crossing community and commercial center attenuating flows to predevelopment levels. No impacts to Fountain Creek are anticipated.
4. A Grading, Erosion Control, and Stormwater Quality Plan and narrative will be approved by City of Fountain prior to any soil disturbance. The erosion control plan will include specific source control BMP's as well as defined overall site management practices for the construction period. The grading narrative will address materials storage and spill containment during construction operations.

COST ESTIMATE

BID Private Improvements Non-reimbursable

5' Type R Inlet	1 EA	@\$	5,500/EA	\$ 5,500
10' Type R Inlet	4 EA	@\$	10,000/EA	\$ 40,000
Type I Manhole	1 EA	@\$	6,400/EA	\$ 6,400
18" RCP	595 LF	@\$	130/LF	\$ 77,350
24" RCP	497 LF	@\$	140/LF	\$ 69,580
30" RCP	680 LF	@\$	180/LF	\$ 122,400
SUBTOTAL				\$ 321,230
<i>10% CONTINGENCY</i>				<i>\$ 32,123</i>
TOTAL				\$ 353,353

Metropolitan District Improvements
Private Improvements Non-reimbursable

WATER QUALITY POND	1 EA	@\$	65,000/EA	\$ 65,000
SUBTOTAL				\$ 65,000
<i>10% CONTINGENCY</i>				<i>\$ 6,500</i>
TOTAL				\$ 71,500

OWNERSHIP AND OPERATIONS

Commercial development storm sewer collection and conveyance systems will be owned and maintained by the commercial business improvement district including proposed storm sewer crossing of Main Street.

Storm sewer conveyance through the residential development right of way will be constructed by the developer, but owned and maintained by El Paso County upon public improvement acceptance. Storm sewer conveyance outside of residential right of way will be constructed by the developer, but owned and maintained within tracts owned by the Residential Metropolitan District.

The proposed private extended detention basin to be constructed for joint benefit of the adjacent commercial and residential developments will be constructed by the developer and owned and maintained by the Residential Metropolitan District.

DRAINAGE FEE CALCULATION

Riverbend Crossing Commons contains 10.690 acres to be platted within the West Little Johnson Drainage Basin. No drainage fees are due within the West Little Johnson Drainage Basin

DRAINAGE METHODOLOGY

This drainage report was prepared in accordance to the criteria established in the City of Colorado Springs Drainage Criteria Manual Volumes 1 and 2, as revised May 2014.

The rational method for drainage basin study areas of less than 100 acres was utilized in the analysis. For the Rational Method, flows were calculated for the 2, 5, 10, 25, 50, and 100-year recurrence intervals. The average runoff coefficients, 'C' values, are taken from Table 6-6 and the Intensity-Duration-Frequency curves are taken from Figure 6-5 of the City Drainage Criteria Manual. Time of concentration for overland flow and storm drain or gutter flow are calculated per Section 3.2 of the City Drainage Criteria Manual. Calculations for the Rational Method are shown in the Appendix of this report. Due to the evolving nature of speculative commercial development a conservative impervious percentage of 95% as defined in table 6-6 was assumed for all basins within the development. Typical commercial impervious percentages range from 80%-90% impervious due to addition of perimeter and internal landscaping. The 95% impervious condition was assumed in completion of the LID IRF spreadsheet included in the appendix.

Urban Drainage and Flood Control District methodology was utilized for determination of street capacity, inlet sizing, and extended detention basin design. UD-Inlet Version 4.05 was utilized in street capacity and inlet sizing calculations. UD-Culvert Version 3.05 was utilized in developing preliminary pipe sizing. Details and analysis of final storm drain conveyance and collection system will be developed in an addendum to the final drainage report submitted with Private Storm Sewer Plans for Riverbend Crossing Commons commercial subdivision. Preliminary sizing calculations were provided in the appendix of this report. UD-Detention version 3.07 was utilized in development of extended detention basin and outfall. Calculations are included in the appendix of this report.

SUMMARY

Development of Riverbend Crossing Commons will require that flows be treated for water quality and be detained to historic levels prior to release from the site. Site runoff and storm drain and appurtenances will not adversely affect the downstream and surrounding developments. This report is in general conformance with all previously approved reports which included this site. Final drainage report/letters will be developed with final layout of individual development parcels within the overall commercial master plan and concurrently submitted site plan applications. A floodplain development permit is being sought with residential development through the El Paso County Floodplain Administrator.

REFERENCES:

City of Colorado Springs Engineering Division Drainage Criteria Manual Volumes 1 and 2,
revised May 2014

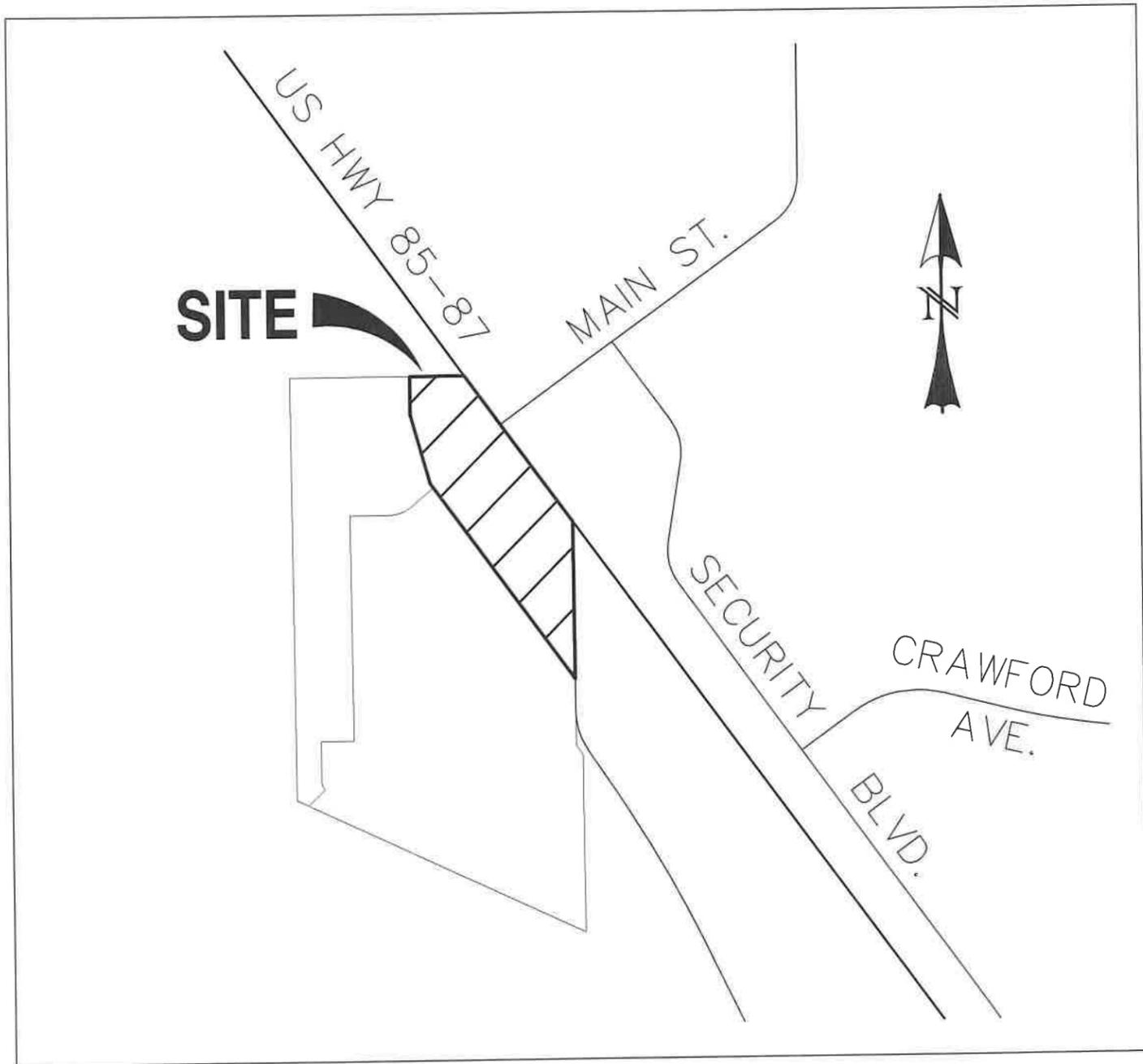
“Little Johnson/Security Creek Drainage Basin Planning Study” prepared by Simons, Li and
Associates, Inc. dated December 1987.

“Preliminary Drainage Study Riverbend Crossing” prepared by Nolte and Associates, Inc.”
accepted February 2017.

“Preliminary/Final Drainage Report for St. Dominic’s Church Subdivision”, accepted October
2007.

Natural Resources Conservation Service Web Soil Survey

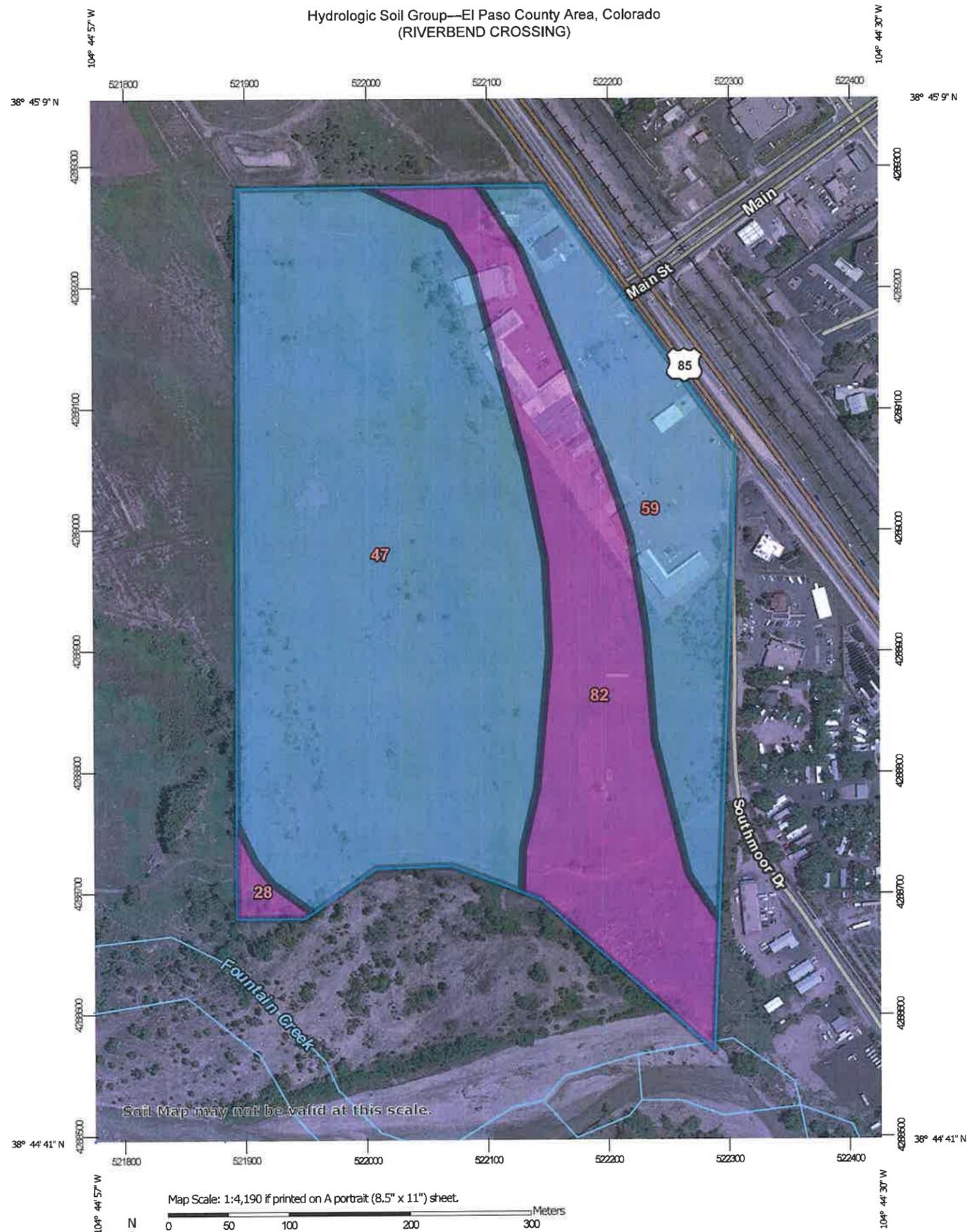
APPENDIX



VICINITY MAP

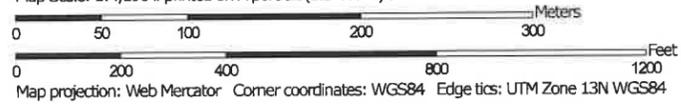
SCALE: N.T.S.

Hydrologic Soil Group—El Paso County Area, Colorado
(RIVERBEND CROSSING)



Soil Map may not be valid at this scale.

Map Scale: 1:4,190 if printed on A portrait (8.5" x 11") sheet.



Description

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

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

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

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

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

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

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

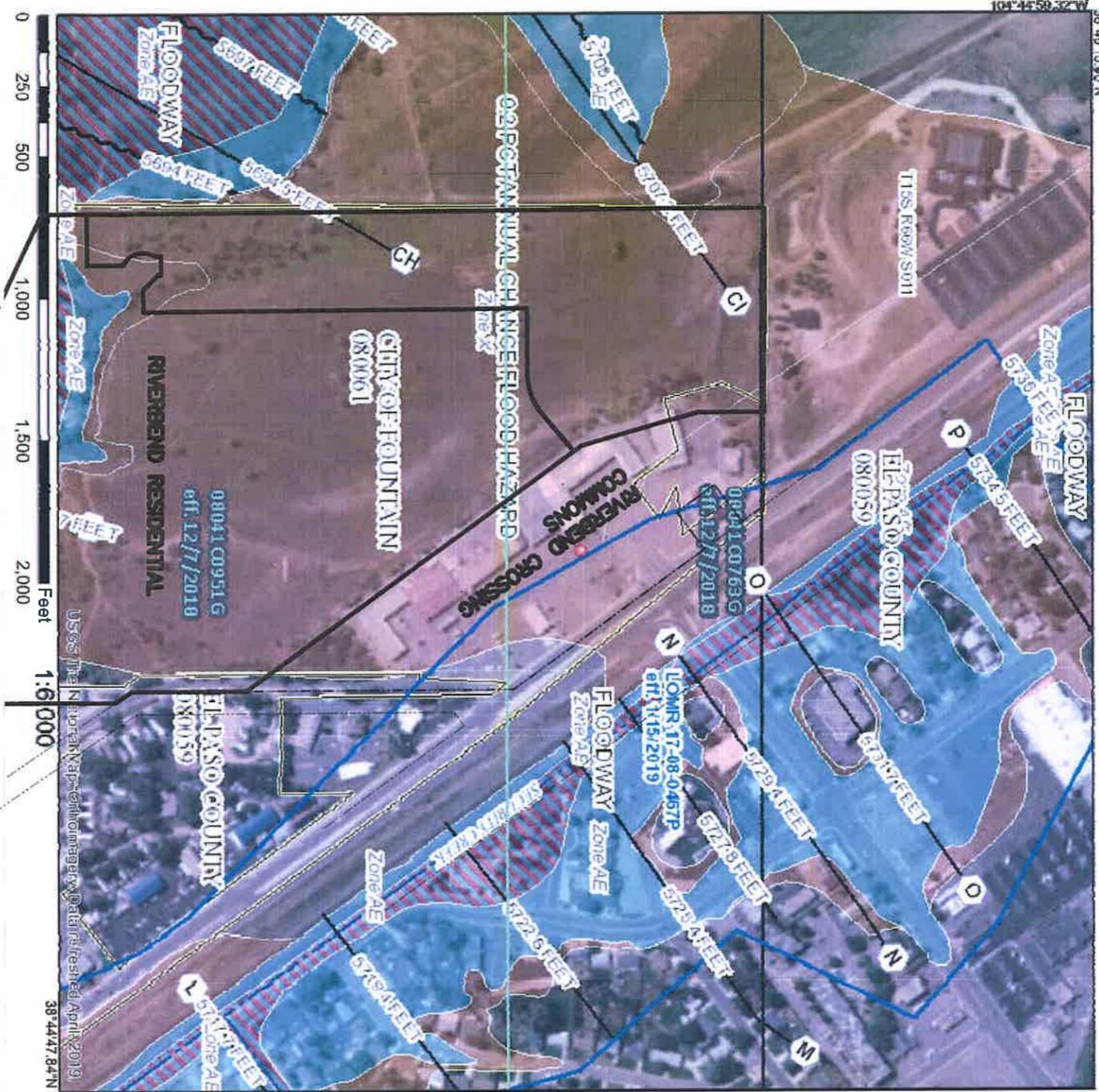
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

National Flood Hazard Layer FIRMette



Legend

38°45'15.00"N 104°44'59.32"W

SPECIAL FLOOD HAZARD AREAS	Description
	Without Base Flood Elevation (BFE) Zone A, V, AE, or With BFE or Depth zone AE, AO, AH, VE, AF
	Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD	Description
	0.2% Annual Chance Flood Hazard; Areas of 1% annual chance flood with average depth less than one foot; or with drainage areas of less than one square mile Zone X
	Future Conditions 1% Annual Chance Flood Hazard Zone X
	Areas with Reduced Flood Risk due to Levees, Sea Walls, Zone X
	Areas with Flood Risk due to Landslides or

OTHER AREAS OF FLOOD HAZARD	Description
	NO BOUNDARY Areas of Unlabeled Flood Hazard Zone B
	ETAS/ETA/COM/RA Areas of Unlabeled Flood Hazard Zone B
	Channel, Ditch, or Storm Sewer
	Levee, Dam, or Floodwall

OTHER FEATURES	Description
	2025 Cross Sections with 1% Annual Chance
	Water Surface Elevation
	Coastal Transport
	Base Flood Elevation Line (BFE)
	Level of Study
	Statistical Boundary
	Coastal Transport Boundary
	Profile Baseline
	Hydrographic Feature

MAP PANELS	Description
	Digital Data Available
	No Digital Data Available
	Unmapped

The map is provided with FEMA's standards for the use of digital flood maps. If it is not void an digital map, the basemap shown on the map with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL, which is provided by FEMA. This map was updated on 4/15/2020 at 8:26:29 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and other information may change or become superseded by new data over time.

This map is provided in part or more of the following map elements do not appear basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, right panel number, and FIRM effective date. Map images for unimaged and unimaged areas below the map for regulatory purposes.

**DETENTION POND
MAINTENANCE AGREEMENT AND EASEMENT**

This DETENTION POND MAINTENANCE AGREEMENT AND EASEMENT ("Agreement") is made by and between EL PASO COUNTY by and through THE BOARD OF COUNTY COMMISSIONERS OF EL PASO COUNTY, COLORADO ("County"), the CITY OF FOUNTAIN ("City"), AVATAR FOUNTAIN LP ("Avatar Fountain"), AVATAR RIVERBEND LP ("Avatar Riverbend"), and RIVERBEND CROSSING METROPOLITAN DISTRICT ("District"). The above may occasionally be referred to herein singularly as "Party" and collectively as "Parties."

Recitals

A. WHEREAS, Avatar Fountain is the owner of certain real estate (the "Fountain Property") in Fountain, Colorado, which Fountain Property is legally described in Exhibit A attached hereto and incorporated herein by this reference; and

B. WHEREAS, Avatar Fountain wishes to develop on the Fountain Property a commercial development to be known as Riverbend Crossing; and

C. WHEREAS, Avatar Riverbend is the owner of certain real estate (the "County Property") in unincorporated El Paso County, Colorado, which County Property is legally described in Exhibit B attached hereto and incorporated herein by this reference; and

D. WHEREAS, Avatar Riverbend wishes to develop on the County Property two subdivisions to be known as Riverbend Residential Filing No. 1 and Riverbend Residential Filing No. 2; and

E. WHEREAS, the development of the County Property will materially increase the volume and decrease the quality of stormwater runoff from such property; therefore, it is in the best interest of the public health, safety and welfare for the County to condition approval of the Riverbend Residential subdivisions on the construction of adequate drainage control facilities and permanent stormwater quality structural control measures, which measures are also known as Best Management Practices ("BMPs"), for the subdivisions; and

F. WHEREAS, the El Paso County Land Development Code, as periodically amended, requires the construction and maintenance of detention ponds and other drainage facilities adequate to maintain historic stormwater flow patterns, protect natural and man-made drainage conveyances, and prevent property damage in connection with the development of subdivisions, and further requires that subdivision developers enter into maintenance agreements and easements with the County for such drainage facilities; and

G. WHEREAS, the El Paso County Drainage Criteria Manual, Volumes 1 and 2, as amended by Appendix I of the El Paso County Engineering Criteria Manual ("ECM"), as each may be periodically amended, promulgated pursuant to the County's Permit for Stormwater Discharges Associated with Municipal Separate Storm Sewer Systems ("MS4 Permit"), which

MS4 Permit requires that the County take measures to protect the quality of stormwater from sediment and other contaminants, requires subdividers, developers, landowners, and owners of facilities located in the County's rights-of-way or easements to provide adequate permanent stormwater quality BMPs with new development or significant redevelopment and to enter into maintenance agreements and easements with the County for such BMPs; and

H. WHEREAS, Section 2.9 of the El Paso County Drainage Criteria Manual, Volume I provides for a developer's promise to maintain a development's drainage facilities in the event the County does not assume such responsibility; and

I. WHEREAS, Avatar Fountain has similar requirements to maintain historic stormwater flow patterns and protect stormwater quality with respect to its commercial development in Fountain; and

J. WHEREAS, Avatar Fountain and Avatar Riverbend desire to construct for their respective developments one detention pond on the County Property as the means for providing adequate drainage and stormwater runoff control and to meet the requirements of the County's and the City's MS4 Permits; and

K. WHEREAS, Avatar Fountain shall be charged with the duty of constructing the detention pond on the property legally described in Exhibit C, attached hereto; and

L. WHEREAS, the District shall be charged with the duties of operating, cleaning, maintaining and repairing the detention pond on the property described in Exhibit C; and

M. WHEREAS, the County and the City, in order to protect the public health, safety and welfare, desire the means to access, construct, maintain, and repair the detention pond, and to recover their costs incurred in connection therewith, in the event Avatar Fountain and the District fail to meet their obligations to do the same; and

N. WHEREAS, the County conditions approval of the Riverbend Residential subdivisions on Avatar Fountain's promise to construct the detention pond, on the District's promise to clean, maintain and repair the detention pond, and on the promise of the responsible parties, as set forth herein, to reimburse the County in the event the burden falls upon the County to construct, clean, maintain or repair the detention pond serving these developments; and

O. WHEREAS, the County, in order to secure performance of the promises contained herein, conditions approval of this Agreement and the Riverbend Residential subdivisions upon Avatar Riverbend's grant herein of a perpetual Easement on the County Property, or a portion thereof, for the purpose of allowing the County to periodically access, inspect, and, when necessary, to construct, clean, maintain or repair the detention pond.

Agreement

NOW, THEREFORE, in consideration of the mutual Promises contained herein, the sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Incorporation of Recitals: The Parties incorporate the Recitals above into this Agreement.

2. Covenants Running with the Land: Avatar Fountain and Avatar Riverbend agree that this entire Agreement and the performance thereof shall become a covenant running with the land, which land is legally described in Exhibits A and B attached hereto, and that this entire Agreement and the performance thereof shall be binding upon themselves and their respective successors and assigns.

3. Construction: Avatar Fountain shall construct on the property described in Exhibit C, attached hereto and incorporated herein by this reference, one detention pond adequate to serve both the Fountain Property and the County Property. Avatar Fountain shall not commence construction of the detention pond until the El Paso County Planning and Community Development Department (PCD) has approved in writing the plans and specifications for the detention pond, this Agreement has been signed by all Parties and returned to the PCD, collateral to guarantee construction acceptable to the County and City in both form and amount has been provided to PCD, and all necessary permits have been obtained from the County. Avatar Fountain shall complete construction of the detention pond in substantial compliance with the County-approved plans and specifications. Avatar Fountain shall also provide certification from a Colorado-registered Professional Engineer that the detention pond was constructed in accordance with and provides the volume and capacity required by such plans and specifications. Avatar Fountain shall not commence construction on the Fountain Property and no commercial development will begin prior to the detention pond being constructed in conformance with the requirements of this Agreement. Failure to meet these requirements shall be a material breach of this Agreement, and shall entitle the County or the City to pursue any remedies available to it at law or in equity to enforce the same. Construction of the detention pond shall be substantially completed within one (1) year (defined as 365 days), which one year period will commence to run on the date the plans and specifications are approved by PCD. Rough grading of the detention pond must be completed and inspected by the PCD prior to commencing road construction.

In the event construction is not substantially completed within the one-year period, then the County or City may, at least one week following written notice to the other Party of its intent, exercise its discretion to execute on the collateral provided by Avatar Fountain and complete the detention pond. If the collateral is insufficient to cover the actual costs and expenses incurred in the process of completing construction, the Party not completing construction shall pay the difference to the Party completing construction, up to its Proportionate Share, within thirty (30) days of a written request to do so. The Proportionate Share constitutes the City's and County's respective share of the actual costs and expenses for construction and is based upon the percentage of runoff entering the detention pond attributable to the Fountain Property and to the County Property. The City's Proportionate Share has been calculated to be __%, and the County's Proportionate Share has been calculated to be __%. The County and the City shall have the right to seek reimbursement from Avatar Fountain and its successors and assigns for the actual costs and expenses incurred in the process of completing construction.

4. **Maintenance:** The District agrees for itself and its successors and assigns that it will regularly and routinely inspect, clean, maintain and repair the detention pond in compliance with the County ~~reviewed Operation and Maintenance Manual~~ standards for operation and maintenance and otherwise keep the same in good repair, all at its own cost and expense. No trees or shrubs that will impair the structural integrity of the detention pond shall be planted or allowed to grow in the basin of the detention pond.

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Commented [LS1]: The County does not currently have standards for detention basin or BMP operation and maintenance

Commented [TJ2]: What was the intention of including this? We just want to make sure it is clear about how the basin is defined.

Commented [DRW3]: Normally, detention pond land is deeded to the district upon completion for liability and tax reasons. Can leave the District on the easement but note for future transfer.

5. **Creation of Easement:** Avatar Riverbend hereby grants Avatar Fountain, the District, the County, and the City each a non-exclusive perpetual easement upon and across the property described in Exhibit C. The purpose of the easement is to allow Avatar Fountain to access and construct the detention pond, the District to access, clean, repair and maintain the detention pond, and the County and City to access, inspect, construct clean, repair and maintain the detention pond. The creation of the easement does not expressly or implicitly impose on the County or the City a duty to so inspect, construct, clean, repair or maintain the detention pond.

6. **County's and City's Maintenance Rights and Obligations:** Any time the County or City determines, ~~in the sole exercise of its discretion,~~ that the detention pond has not been properly cleaned, maintained, or otherwise kept in good repair according to objective standards and requirements as promulgated and applicable to all detention and stormwater facilities in the County, the County or City shall give reasonable notice of such to all Parties and their successors and assigns. The notice shall provide a reasonable time to correct the problems. Should the District fail to correct the specified problems, the County or City may enter upon the property described in Exhibit C to perform the needed work. The City shall obtain any necessary permits from the County prior to commencing work, e.g. approval of amended construction drawings or an erosion and stormwater quality control permit. The Party not performing the work shall pay to the Party performing the work, within thirty (30) days of a written request to do so, its Proportionate Share of the actual costs and expenses of performing the work incurred by the Party who performs the work. The County and the City shall have the right to seek reimbursement from the District for the actual costs and expenses in performing the work. Notice shall be effective to the above by the deposit of the same into the regular United States mail, postage pre-paid. Notwithstanding the foregoing, this Agreement does not expressly or implicitly impose on the County or the City a duty to inspect, construct, clean, repair or maintain the detention pond.

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7. **Actual Costs and Expenses:** Avatar Fountain, Avatar Riverbend, and the District agree and covenant, for themselves and their successors and assigns, that they will reimburse the County and City for their actual costs and expenses incurred in the process of completing construction of, cleaning, maintaining, or repairing the detention pond pursuant to the provisions of this Agreement.

The term "actual costs and expenses" as used in this Agreement shall be liberally construed in favor of the County and City, and shall include, but shall not be limited to, labor costs, tools and equipment costs, supply costs, and engineering and design costs, regardless of whether the County or City uses its own personnel, tools, equipment and supplies, etc. to perform the work. In the event the County or City initiates any litigation or engages the services of legal counsel in order to enforce the provisions arising herein, the County and City shall be

entitled to its damages and costs, including reasonable attorney's fees, regardless of whether the County or City contracts with outside legal counsel or utilizes in-house legal counsel for the same.

8. Contingencies of Land Use/Land Disturbance Approval: Avatar Fountain's and Avatar Riverbend's execution of this Agreement is a condition of subdivision, land use, or land disturbance approval.

The County shall have the right, in the sole exercise of its discretion, based on applicable law and stormwater regulations to approve or disapprove any documentation submitted to it under the conditions of this Paragraph, including but not limited to, any separate agreement or amendment, if applicable, identifying any specific maintenance responsibilities not addressed herein. The County's rejection of any documentation submitted hereunder shall mean that the appropriate condition of this Agreement has not been fulfilled.

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9. Agreement Monitored by El Paso County Planning and Community Development Department and/or El Paso County Department of Public Works: Any and all actions and decisions to be made hereunder by the County shall be made by the Executive Director of the El Paso County Planning and Community Development Department and/or the El Paso County Engineer. Accordingly, any and all documents, submissions, plan approvals, inspections, etc. shall be submitted to and shall be made by the Executive Director of the Planning and Community Development Department and/or the El Paso County Engineer.

10. Enforcement of County Regulations: Nothing in this Agreement shall be construed to limit the County's authority to enforce any of its laws, regulations or ordinances as they may apply to this Agreement or to the design, construction, inspection, maintenance and repair of the detention pond that is the subject of this Agreement.

11. Effect of Annexation: Upon annexation of the property described in Exhibit C by the City, all of the County's rights and obligations under this Agreement shall be terminated without the need for further action by the Parties, effective as of the date of annexation.

12. Indemnification and Hold Harmless: Avatar Fountain and Avatar Riverbend agree, for themselves and their successors and assigns, that they will indemnify, defend, and hold the County and the City harmless from any and all loss, costs, damage, injury, liability, claim, lien, demand, action and causes of action whatsoever, whether at law or in equity, arising from or related to their intentional or negligent acts, errors or omissions or that of their agents, officers, servants, employees, invitees and licensees in the design, construction, operation, inspection, cleaning (including analyzing and disposing of any solid or hazardous wastes as defined by State and/or Federal environmental laws and regulations), maintenance, and repair of the detention pond, and such obligation arising under this Paragraph shall be joint and several. Nothing in this Paragraph shall be deemed to waive or otherwise limit the defenses available to the District, County and the City pursuant to the Colorado Governmental Immunity Act, Sections 24-10-101, *et seq.* C.R.S., or as otherwise provided by law.

Commented [DRW4]: District cannot indemnify

13. Assignment: Neither the City, the County, nor the District shall assign the rights or responsibilities under this Contract without the express, written consent of both the City and the County, which may be withheld for any reason or for no reason.

14. Severability: In the event any Court of competent jurisdiction declares any part of this Agreement to be unenforceable, such declaration shall not affect the enforceability of the remaining parts of this Agreement.

15. Third Parties: This Agreement does not and shall not be deemed to confer upon or grant to any third party any right to claim damages or to bring any lawsuit, action or other proceeding against any Party to this Agreement, or their respective successors and assigns, because of any breach hereof or because of any terms, covenants, agreements or conditions contained herein.

16. Solid Waste or Hazardous Materials: Should any refuse from the detention pond be suspected or identified as solid waste or petroleum products, hazardous substances or hazardous materials (collectively referred to herein as "hazardous materials"), the Avatar Fountain, Avatar Riverbend, and the District shall take all necessary and proper steps to characterize the solid waste or hazardous materials and properly dispose of it in accordance with applicable State and/or Federal environmental laws and regulations, including, but not limited to, the following: Solid Wastes Disposal Sites and Facilities Acts, §§ 30-20-100.5 – 30-20-119, C.R.S., Colorado Regulations Pertaining to Solid Waste Disposal Sites and Facilities, 6 C.C.R. 1007-2, *et seq.*, Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992k, and Federal Solid Waste Regulations 40 CFR Ch. I. The County and the City shall not be responsible or liable for identifying, characterizing, cleaning up, or disposing of such solid waste or hazardous materials. Notwithstanding the previous sentence, should any refuse cleaned up and disposed of by the County be determined to be solid waste or hazardous materials, Avatar Fountain, Avatar Riverbend, and the District, but not the County, shall be responsible and liable as the owner, generator, and/or transporter of said solid waste or hazardous materials.

17. Applicable Law and Venue: The laws, rules, and regulations of the State of Colorado and El Paso County shall be applicable in the enforcement, interpretation, and execution of this Agreement, except that Federal law may be applicable regarding solid waste or hazardous materials. Venue shall be in the El Paso County District Court.

18. Annual Appropriation: The obligations of the City, County and District as set forth in this Agreement are expressly subject to annual appropriation by the respective entity and nothing contained herein shall be construed as a multiple fiscal year obligation of the City, County or District as defined in Article X, Section 20 of the Colorado Constitution.

IN WITNESS WHEREOF, the Parties affix their signatures below.

[Rest of page intentionally left blank]

Executed this _____ day of _____, 20____, by:

AVATAR FOUNTAIN LP

By: _____
[Insert name], [Insert title (e.g. President/Manager)]

The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by [Insert name], as [Insert title (President/Manager)] of Avatar Fountain LP.

Witness my hand and official seal.

My commission expires: _____

Notary Public

Executed this _____ day of _____, 20____, by:

AVATAR RIVERBEND LP

By: _____
[Insert name], [Insert title (e.g. President/Manager)]

The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by [Insert name], as [Insert title (President/Manager)] of Avatar Riverbend LP.

Witness my hand and official seal.

My commission expires: _____

Notary Public

Executed this _____ day of _____, 20____, by:

RIVERBEND CROSSING METROPOLITAN DISTRICT

By: _____
[Insert name], [Insert title (e.g. President/Manager)]

The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by [Insert name], as [Insert title (President/Manager)] of Riverbend Crossing Metropolitan District.

Witness my hand and official seal.

My commission expires: _____

Notary Public

Executed this _____ day of _____, 20 __, by:

BOARD OF COUNTY COMMISSIONERS
OF EL PASO COUNTY, COLORADO

By: _____
Craig Dossey, Executive Director
Planning and Community Development Department
Authorized Signatory pursuant to LDC

The foregoing instrument was acknowledged before me this _____ day of _____, 20 __, by _____, Executive Director, Planning and Community Development Department.

Witness my hand and official seal.

My commission expires: _____

Notary Public

Approved as to Content and Form:

Assistant County Attorney

[Insert City of Fountain signature block]

October 9, 2019

Alan Toth
Avatar Equities, LLC
6800 Jericho Turnpike,
Suite 120W #204
Syosset, NY 11791

Dear Mr. Toth,

Thank you for the opportunity to perform environmental services for Avatar's proposed residential community of Riverbend Crossing. Attached is the environmental report that documents existing environmental conditions on the property and potential impacts that would occur as a result of the proposed project.

In summary, no federally listed threatened and endangered species or their habitat were identified onsite. Therefore, the project will not affect any federally listed species and no coordination with the U.S. Fish and Wildlife Service is necessary. One water of the U.S. (Fountain Creek) and one jurisdictional emergent wetland were found on the property. However, current design of the residential development show that neither would be impacted by the project. Therefore, a Section 404 permit and coordination with the U.S. Army Corps of Engineers would not be needed. Lastly, there is potential for migratory birds to use the property as nesting habitat. Therefore it is important that all clearing activities occur outside of the nesting season: November 1 to April 1.

Please let me know if you need any additional information or wish to discuss this further.

Sincerely,



Sarah Itz
Biologist, JDS Hydro Consultants, Inc.
sarahitz@JDSHydro.com

CC: Ms. Irene Shen, Level Up Properties LP

ENVIRONMENTAL REPORT

For

RIVERBEND CROSSING RESIDENTIAL COMMUNITY

AVATAR EQUITIES, LLC
6800 JERICHO TURNPIKE,
SUITE 120W #204
SYOSSET, NY 11791

October 2019

Prepared By:



CONSULTANTS, INC.

Riverbend Crossing Residential Community

Environmental Report

October 2019

I. Introduction

Avatar Equities, LLC proposes to develop two currently undeveloped parcels totaling approximately 52 acres in southern El Paso County, Colorado. The property lies southwest of US-85/87, west of Southmoor Drive, and west of the incorporated areas of Security/Widefield. The proposed development will consist of 225 new single family homes and a 14-acre open space area.

Environmental laws that apply to this project include the following:

- Endangered Species Act (ESA) of 1973 – this act aims to provide a framework to conserve and protect endangered and threatened species and their habitats.
- Section 404 of the Clean Water Act (CWA) – this act establishes a program to regulate the discharge or dredged and fill material into waters of the United States, including wetlands.
- Migratory Bird Treaty Act (MBTA) - this act makes it illegal to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid Federal permit.

This environmental report will document existing environmental conditions at the property and effects on threatened and endangered species, jurisdictional waters and wetlands, and migratory birds as a result of the proposed project. Figures of the property are attached in **Appendix A**, a photo log is in **Appendix B**, wetland data forms are in **Appendix C**, and the list of threatened and endangered species is provided in **Appendix D**.

II. Threatened and Endangered Species

Desktop Review

According to the official species listed obtained from the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) website accessed on September 26, 2019, there are nine threatened, endangered, or proposed threatened species that could potentially occur in the project area: North American wolverine (*Gulo gulo luscus*), Least Tern (*Sterna antillarum*), Mexican Spotted Owl (*Strix occidentalis lucida*), Piping Plover (*Charadrius melodus*), Whooping Crane (*Grus americana*), greenback cutthroat trout (*Oncorhynchus clarkia stomias*), pallid sturgeon (*Scaphirhynchus albus*), Ute ladies'-tresses (*Spiranthes diluvialis*), and western prairie fringed orchid (*Platanthera praeclara*). There are no critical habitats within the project area. The IPaC list is attached in **Appendix D**.

Recent aerial photography and field investigations indicate most of the property is open, grassy, undeveloped land. Along the southern portion of the property, there are some wooded and shrubby areas within the floodplain of Fountain Creek. To the north and east of the property, there is

commercial and residential development. To the west, it is mostly undeveloped and cropland. Fountain Creek flows eastward in a well-defined channel with steep banks south of the property. The figures in **Appendix A** show the property on various map bases.

Habitat Assessment

A habitat assessment was conducted on October 3, 2019 by JDS Hydro personnel to identify potential threatened and endangered species habitat within the subject property. Loose transects were walked throughout the entire property. Site photographs are provided in **Appendix B**.

Fountain Creek is a perennial stream that runs eastward along the southern tip of the property. There is a wide floodplain associated with Fountain Creek. The floodplain contains mature Great Plains cottonwood (*Populus deltoides*), narrowleaf cottonwood (*Populus angustifolia*), black locust (*Robinia pseudoacacia*), and narrowleaf willow (*Salix exigua*) trees with very little understory. Much of the floodplain contains bare sand with scattered areas of herbs and grass (**Appendix B, Photos 4-6**).

North of the Fountain Creek floodplain is an upland terrace that slopes gently towards the south. A mix of native and introduced grass and herbaceous species was observed, including lambs quarters (*Chenopodium album*), western ragweed (*Ambrosia psilostachya*), sunflower (*Helianthus* sp.), aster (*Aster* sp.), needle-and-thread grass (*Hesperostipa comata*), prickly pear (*Opuntia polycantha*), Indian grass (*Sorghastrum nutans*), western wheatgrass (*Pascopyrum smithii*), and various bluestem and grama grasses (**Appendix B, Photos 1-3, 9**).

Effects to Threatened and Endangered Species

The table below shows the species the USFWS considers as potentially occurring on the property or surrounding areas, their federal status, and their habitat requirements. While there is a riparian corridor along Fountain Creek that extends into the property, the soils found on site are sandy and would not be expected to support Ute ladies'-tresses. No suitable habitat for any of these listed or proposed listed species was identified on the subject property. Therefore, the project will not affect federally listed species.

Table 1. Listed Species of Potential Occurrence in the Project Area

Species	Federal Status	Suitable Habitat	Habitat within Project Area?
North American Wolverine (<i>Gulo gulo luscus</i>)	Proposed Threatened	High, alpine environments	No
Least Tern (<i>Sterna antillarum</i>)*	Endangered	Sandy or pebbly beaches, well above the water line, around lakes and reservoirs or on sandy soil sandbars in river channels	No
Mexican Spotted Owl (<i>Strix occidentalis lucida</i>)	Threatened	Mixed conifer forests, Madrean pine-oak forests, and rocky canyons	No
Piping Plover (<i>Charadrius melodus</i>)*	Threatened	Sandy lakeshore beaches, sandbars within riverbeds or even sandy wetland pastures. An important aspect of this habitat is that of sparse vegetation	No

Table 1. Listed Species of Potential Occurrence in the Project Area

Species	Federal Status	Suitable Habitat	Habitat within Project Area?
Whooping Crane (<i>Grus americana</i>)*	Endangered	Mudflats around reservoirs and in agricultural areas. While wintering, they live on salt flats that are dominated by coastal salt grass. Their nesting grounds are wetland communities dominated by bulrush	No
Greenback Cutthroat Trout (<i>Oncorhynchus clarkia stomias</i>)	Threatened	Cold, clear, gravelly headwater streams and mountain lakes which provide an abundant food supply of insects	No
Pallid Sturgeon (<i>Scaphirhynchus albus</i>)*	Endangered	Pallid sturgeons evolved and adapted to living close to the bottom of large, silty rivers with natural a hydrograph. Their preferred habitat has a diversity of depths and velocities formed by braided channels, sand bars, sand flats and gravel bars	No
Ute Ladies'-tresses (<i>Spiranthes diluvialis</i>)	Threatened	Occurs along riparian edges, gravel bars, old oxbows, high flow channels, and moist to wet meadows along perennial streams. It typically occurs in stable wetland and seepy areas associated with old landscape features within historical floodplains of major rivers. Found in loamy calcareous wetland soils with gley features, generally high in micronutrients and organic matter	No
Western Prairie Fringed Orchid (<i>Platanthera praeclara</i>)*	Threatened	Moist tallgrass prairies and sedge meadows	No

*These species only need to be considered under the following conditions: Water-related activities/use in the N. Platte, S. Platte, and Laramie River Basins may affect listed species in Nebraska.

III. Waters and Wetlands

Regulatory Overview

Section 404 of the CWA established programs to regulate the discharge of dredged or fill material and other work in waters of the U.S., including wetlands and other special aquatic sites. The CWA is administered by the U.S. Army Corps of Engineers (USACE), with U.S. Environmental Protection Agency (EPA) oversight. Under Section 404 of the CWA, regulated waters of the U.S. are broadly categorized to include the territorial seas, tidal waters, and non-tidal waters of the U.S., including inland features such as intrastate lakes, rivers, streams, mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, and natural ponds (33 Code of Federal Regulations [CFR] §323 and 328).

The “discharge” of dredged and fill material is defined as follows:

- Discharge of Dredged Material – Any addition of dredged material (including the redeposit of dredged or excavated material other than incidental fallback) into a water of the U.S. The USACE and EPA regard the use of mechanized earth-moving equipment to conduct land clearing, ditching, channelization, in-stream mining, side-casting, temporary stockpiling, and other ground-disturbing activities within a water of the U.S. as resulting in a discharge of dredged material.
- Discharge of Fill Material – Any addition of fill material into a water of the U.S. An example of a discharge of fill material would be the placement of clean soil into a wetland to create dry land so that a road could be built on the site. Another example would be placing or extending a culvert within a streambed.

Discharges of dredged or fill material may be permanent or temporary. Permanent discharges include those that will permanently affect a water of the U.S. by filling, flooding, excavation, or drainage. Permanent effects to waters of the U.S. are considered a “loss of waters of the U.S.” if the discharges change an aquatic area to dry land, increase the bottom elevation of a water of the U.S., or change the use of a water body. In addition to losses of physical areas of waters of the U.S. as a result of discharges, the USACE regulates the loss of functions or values of waters of the U.S. in some circumstances when actual permanent discharges are not involved, such as clearing a forested wetland or changing the hydrology of a water of the U.S. upstream or downstream of a permitted activity.

Examples of temporary discharges include the placement of fill within waters of the U.S. for temporary project components such as cofferdams or temporary access roads (including crane paths), where the fill will be removed in its entirety and the area will be restored to its pre-construction contours upon project completion. Note that, in some cases, the USACE considers temporary project components as causing a permanent loss to waters of the U.S. An example is when fill for a temporary access road will remain within a wetland for such a long period of time that it impacts the potential for the wetland to reestablish after the fill is removed.

Discharges of dredged or fill material and other work in waters subject to regulation under Section 404 of the CWA typically require permit authorization before the discharges occur, unless the activity is exempt from regulation. Section 404 permits that are commonly issued by the USACE include Standard Individual Permits and General Permits, including Nationwide Permits (NWPs) and Regional General Permits. NWPs are a type of general permit designed to regulate, with little to no delay or paperwork, certain activities having minimal impacts. The use of a NWP requires compliance with the General Conditions (GCs) for NWPs. Key GCs crucial to project development include addressing impacts to federally-listed threatened and endangered species and cultural resources within the permit area at each waters of the U.S. crossing.

Field investigations and delineations for the Riverbend Crossing project relied on methods outlined in the USACE’s 1987 Wetland Delineation Manual and the 2010 Regional Supplement to the Wetland Delineation Manual for the Western Mountains, Valleys, and Coast Region (Version 2.0).

Field Investigations

A field investigation on the property was performed by JDS staff on October 3, 2019. Loose transects were walked to identify all waters and wetlands onsite. Fountain Creek extends into the southern tip of the property and flows towards the east (**Appendix B, Photos 5-6**). One emergent wetland was observed on the property. Duckweed (*Lemna minor*), flatsedge (*Cyperus odoratus*), narrowleaf willow (*Salix exigua*), and Great Plains cottonwood (*Populus deltoides*) were the dominant species observed in the wetland. Gley soils were observed at a depth of six inches and met hydric soils indicator F2. The following are primary hydrology indicators that were observed: surface water, high water table, water marks, and sparsely vegetated concave surface (**Appendix B, Photo 7-8**). The wetland is approximately 0.03 acre in size. Fountain Creek and the wetland are shown on **Figure 4 in Appendix A**. No other wetlands, creeks, tributaries, or other potential waters of the U.S. were observed on the property.

Impacts to Waters and Wetlands

The Fountain Creek stream channel will not be altered as part of this proposed development. It will remain as open space and serve as a natural corridor for riparian and wildlife environments and recreational opportunities. Additionally, according to current design (August 2019), no impacts to the wetland would result from the project. The proposed retaining wall and water quality detention pond are approximately 85 to 110 feet, respectively, northeast of the wetland. The limits of disturbance extend approximately 5 feet north of the wetland, according to staking completed at the site (**Appendix B, Photo 8**). Therefore, no impacts to the wetland are anticipated.

Since no waters of the U.S. or wetlands would be dredged, filled, or otherwise impacted, no Section 404 permit would be required. No coordination would be necessary with the USACE.

IV. Migratory Birds

The MBTA makes it illegal to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid Federal permit.

A migratory bird and nest survey was conducted on the property. The wooded area within the Fountain Creek floodplain contains suitable nesting sites for migratory birds. However, no nests were observed in this area. Prairie dog holes were observed in the northwestern portion of the property that Burrowing Owls (*Athene cunicularia*) and Ferruginous Hawks (*Buteo regalis*) may utilize for burrowing/nesting habitat (**Figure 4 in Appendix A, and Photo 3 in Appendix B**). However, field observations found that the holes appear to be abandoned. Intact spider webs were found on many of the entrances to the holes. No evidence of owls or hawks was observed in this area. Though no nests or migratory birds were observed during the field investigation in October 2019, all clearing/grubbing activities must be completed between November 1st and April 1st to avoid impacts to migratory birds that may use the property as habitat in the coming year.

V. Conclusion

No federally listed species or their habitat were observed on the property; therefore, the project will not affect any federally listed species. No coordination with the USFWS would be required.

Fountain Creek and one emergent wetland were identified on the property. No impacts to either of these jurisdictional waters would occur as a result of the project. Therefore, no Section 404 permit is necessary and no coordination with the USACE would be required.

In order to avoid impacts to migratory birds, clearing and grubbing activities should be performed between November 1st and April 1st when migratory birds are absent.

Appendix A
Figures

Source: ESRI World Street Map

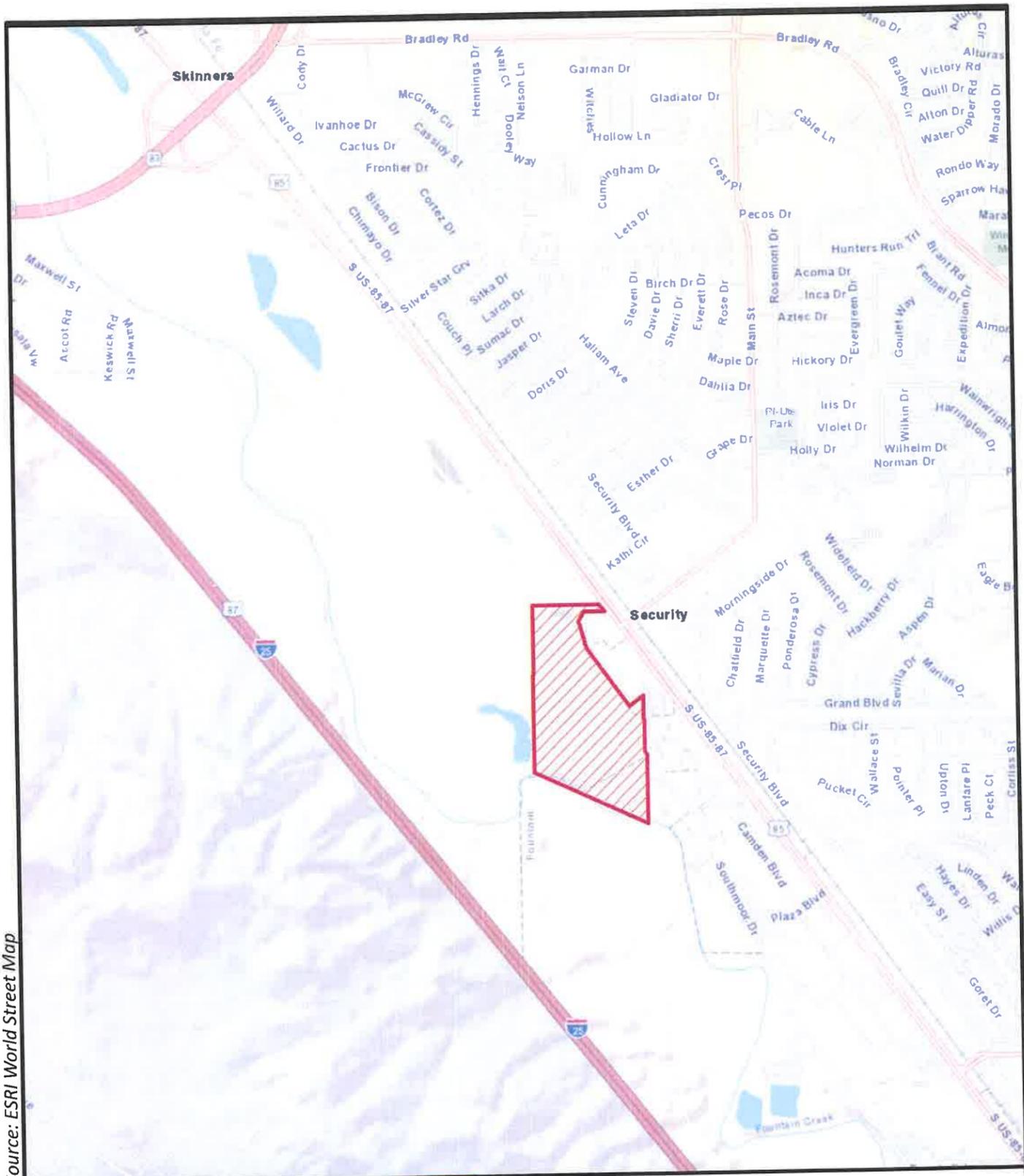
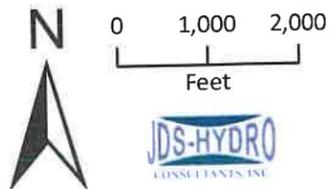


FIGURE 1
Project Location Map

 Project Area



Riverbend Crossing Residential Development
Avatar Equities, LLC

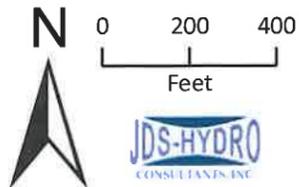
Source: ESRI World Imagery



FIGURE 2 Aerial Map with NWI Data

Riverbend Crossing Residential Development
Avatar Equities, LLC

-  Project Area
- NWI Wetland Type**
-  Freshwater Emergent Wetland
-  Freshwater Forested/Shrub Wetland
-  Freshwater Pond
-  Riverine



JDS-HYDRO
CONSULTANTS, INC.

Source: USGS Topographic Map, Colorado Springs Quad, 1994

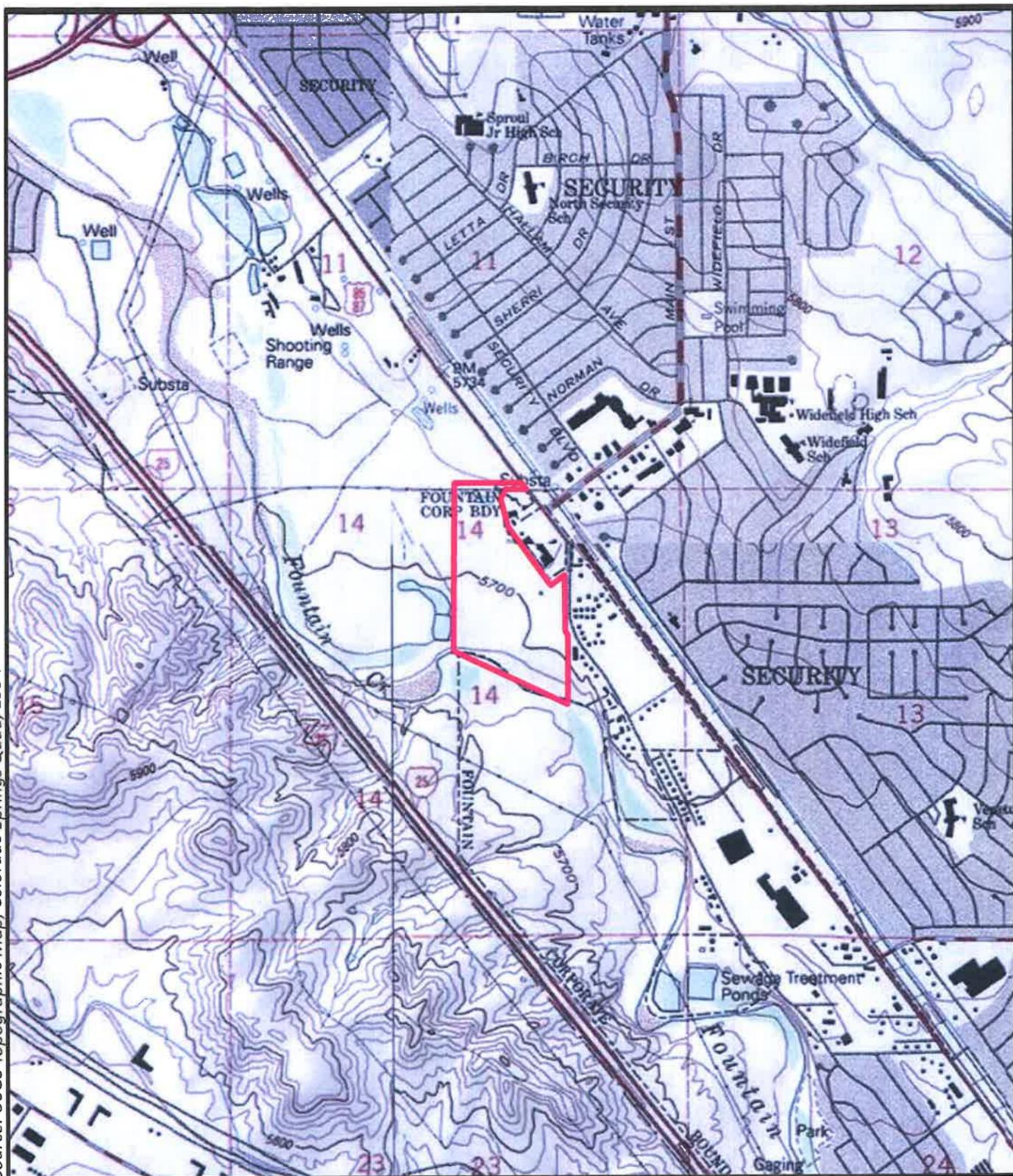
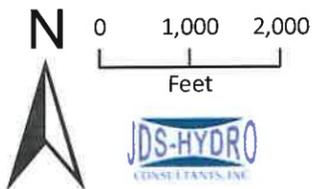


FIGURE 3 USGS Topographic Map

Riverbend Crossing Residential Development
Avatar Equities, LLC

 Project Area



Source: ESRI World Imagery

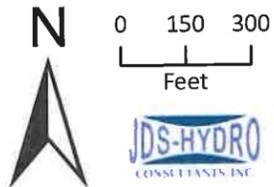


FIGURE 4

Prairie Dog Holes, Waters & Wetlands

Riverbend Crossing Residential Development
Avatar Equities, LLC

-  Project Area
-  Prairie Dog Holes
-  Water of the U.S.
-  Wetland
-  Wetland Data Point



JDS-HYDRO
CONSULTANTS, INC.

**HYDROLOGIC AND HYDRAULIC
CALCULATIONS**

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

Designer: David Mjires
 Company: Catamount Engineering
 Date: January 16, 2020
 Project: Riverbend Crossing Commons
 Location:

***Design Storm: 1-Hour Rain Depth: 1.19 inches
 ***Minor Storm: 1-Hour Rain Depth: 1.50 inches
 ***Major Storm: 1-Hour Rain Depth: 2.52 inches

Optional User Defined Storm CUIP
 (CUIP) NOAA 1-Hour Rainfall Depth and Frequency for User Defined Storm

Max Intensity for Optional User Defined Storm: 0

SITE INFORMATION (USER INPUT)

Sub-basin Identifier	C1	C2	C3	C4	C5	C6
Receiving Previous Area Soil Type	Clay Loam					
Total Area Loc., Sum of DCU, UUA, RPA, & SPA	3.560	1.120	1.590	2.130	0.800	2.060
Directly Connected Impervious Area (DCU, acres)	3.380	1.060	1.510	2.030	0.760	1.960
Unconnected Impervious Area (UUA, acres)	0.000	0.000	0.000	0.000	0.000	0.000
Receiving Previous Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000	0.000
Separate Previous Area (SPA, acres)	0.180	0.060	0.080	0.110	0.040	0.100
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area Loc. (check against input)	3.560	1.120	1.590	2.130	0.800	2.060
Directly Connected Impervious Area (DCU, %)	94.9%	94.6%	95.0%	94.8%	95.0%	95.1%
Unconnected Impervious Area (UUA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Receiving Previous Area (RPA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Separate Previous Area (SPA, %)	5.1%	5.4%	5.0%	5.2%	5.0%	4.9%
A _s (RPA / UUA)	0.000	0.000	0.000	0.000	0.000	0.000
I _s Check	1.000	1.000	1.000	1.000	1.000	1.000
f / I for 2-Year Event:	0.2	0.2	0.2	0.2	0.2	0.2
f / I for 5-Year Event:	0.2	0.2	0.2	0.2	0.2	0.2
f / I for 100-Year Event:	0.1	0.1	0.1	0.1	0.1	0.1
IRF for 2-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00
IRF for 5-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00
IRF for 100-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00
Total Site Imperviousness: See IRF for Optional User Defined Storm CUIP:	94.9%	94.6%	95.0%	94.8%	95.0%	95.1%
Effective Imperviousness for 2-Year Event:	94.9%	94.6%	95.0%	94.8%	95.0%	95.1%
Effective Imperviousness for 5-Year Event:	94.9%	94.6%	95.0%	94.8%	95.0%	95.1%
Effective Imperviousness for 100-Year Event:	94.9%	94.6%	95.0%	94.8%	95.0%	95.1%

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

This line only for WQCV Event	N/A										
This line only for 10-Year Event	N/A										
100-Year Event CREDIT** Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
User Defined CUIP CREDIT: Reduce Detention By:											

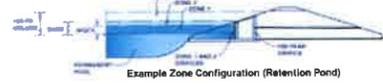
Total Site Imperviousness:	94.9%
Total Site Effective Imperviousness for 2-Year Event:	94.9%
Total Site Effective Imperviousness for 5-Year Event:	94.9%
Total Site Effective Imperviousness for 100-Year Event:	94.9%

Notes:
 * Use Green-Ampt average infiltration rate values from Table 3-3.
 ** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.
 *** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposes

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: RIVERBEND CROSSING
Basin ID: EXTENDED DETENTION BASIN



Required Volume Calculation

Selected BMP Type	EDB
Watershed Area	54.90 acres
Watershed Length	1.821 ft
Watershed Slope	0.027 ft/ft
Watershed Imperviousness	65.40% percent
Percentage Hydraulic Soil Group A	24.3% percent
Percentage Hydraulic Soil Group B	0.0% percent
Percentage Hydraulic Soil Group C/D	75.7% percent
Desired WQCV Drain Time	40.0 hours
Location for 1-hr Rainfall Depth	Dormer - Capital Building
Water Quality Capture Volume (WQCV)	1.170 acre-feet
Excess Urban Runoff Volume (EURV)	3.712 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.)	3.254 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.)	4.304 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.)	5.530 acre-feet
25-yr Runoff Volume (P1 = 2 in.)	6.972 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.)	8.199 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.)	9.691 acre-feet
500-yr Runoff Volume (P1 = 2.14 in.)	12.841 acre-feet
Approximate 2-yr Detention Volume	2.058 acre-feet
Approximate 5-yr Detention Volume	4.247 acre-feet
Approximate 10-yr Detention Volume	4.914 acre-feet
Approximate 25-yr Detention Volume	5.393 acre-feet
Approximate 50-yr Detention Volume	5.847 acre-feet
Approximate 100-yr Detention Volume	6.169 acre-feet

Optional User Override 1-hr Precipitation	1.19 inches
	1.50 inches
	1.75 inches
	2.00 inches
	2.25 inches
	2.52 inches

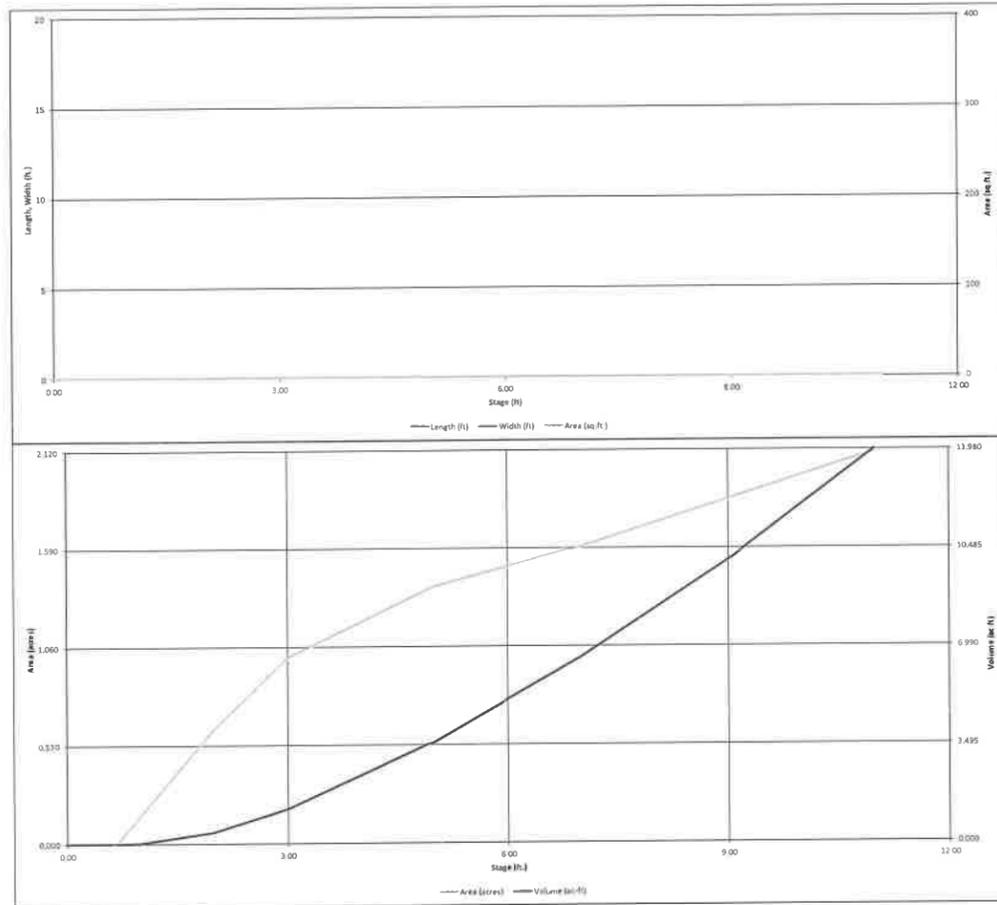
Stage-Storage Calculation

Zone 1 Volume (WQCV)	1.170 acre-feet
Zone 2 Volume (EURV - Zone 1)	2.542 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	2.458 acre-feet
Total Detention Basin Volume	6.169 acre-feet
Initial Surcharge Volume (ISV)	user ft ³
Initial Surcharge Depth (ISD)	user ft
Total Available Detention Depth (H _{ad})	user ft
Depth of Trickle Channel (H _t)	user ft
Slope of Trickle Channel (S _t)	user ft/ft
Slopes of Main Basin Sides (S _{mb})	user H:V
Basin Length-to-Width Ratio (R _{mb})	user
Initial Surcharge Area (A _{is})	user ft ²
Surcharge Volume Length (L _{sv})	user ft
Surcharge Volume Width (W _{sv})	user ft
Depth of Basin Floor (H _{bf})	user ft
Length of Basin Floor (L _{bf})	user ft
Width of Basin Floor (W _{bf})	user ft
Area of Basin Floor (A _{bf})	user ft ²
Volume of Basin Floor (V _{bf})	user ft ³
Depth of Main Basin (H _{mb})	user ft
Length of Main Basin (L _{mb})	user ft
Width of Main Basin (W _{mb})	user ft
Area of Main Basin (A _{mb})	user ft ²
Volume of Main Basin (V _{mb})	user ft ³
Calculated Total Basin Volume (V _{total})	user acre-feet

Depth Increment (ft)	i	h	Stage - Storage Description	Stage (ft)	Optional Override Slope (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acres)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	0.00	--	--	--	--	--	--	120	0.003	--	--	--
ISV	0.67	--	--	--	--	--	--	120	0.003	79	0.002	
6684	1.00	--	--	--	--	--	--	6,682	0.153	1,133	0.026	
6685	3.00	--	--	--	--	--	--	36,906	0.816	17,716	0.407	
6686	3.00	--	--	--	--	--	--	43,800	1.001	53,236	1.223	
6687	5.00	--	--	--	--	--	--	60,185	1.362	157,031	3.605	
6688	7.00	--	--	--	--	--	--	69,452	1.594	286,660	6.581	
6689	9.00	--	--	--	--	--	--	80,524	1.849	426,636	10.024	
6694	11.00	--	--	--	--	--	--	91,656	2.124	608,818	13.877	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

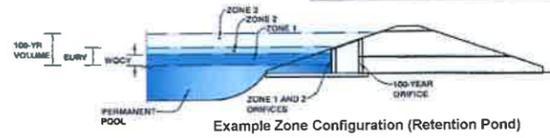
UD-Detention, Version 3.07 (February 2017)



Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: RIVERBEND CROSSING
Basin ID: EXTENDED DETENTION BASIN



	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.95	1.170	Orifice Plate
Zone 2 (EURV)	5.08	2.542	Orifice Plate
Zone 3 (100-year)	6.74	2.458	Weir&Pipe (Restrict)
		6.169	Total

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.69	3.39					
Orifice Area (sq. inches)	5.56	5.56	12.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	5.08	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	8.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	6.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _g =	6.58	N/A	feet
Over Flow Weir Slope Length =	6.18	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.06	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	34.63	N/A	ft ²
Overflow Grate Open Area w/ Debris =	17.32	N/A	ft ²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	30.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	30.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	4.91	N/A	ft ²
Outlet Orifice Centroid =	1.25	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = feet
Spillway End Slopes = H:V
Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway

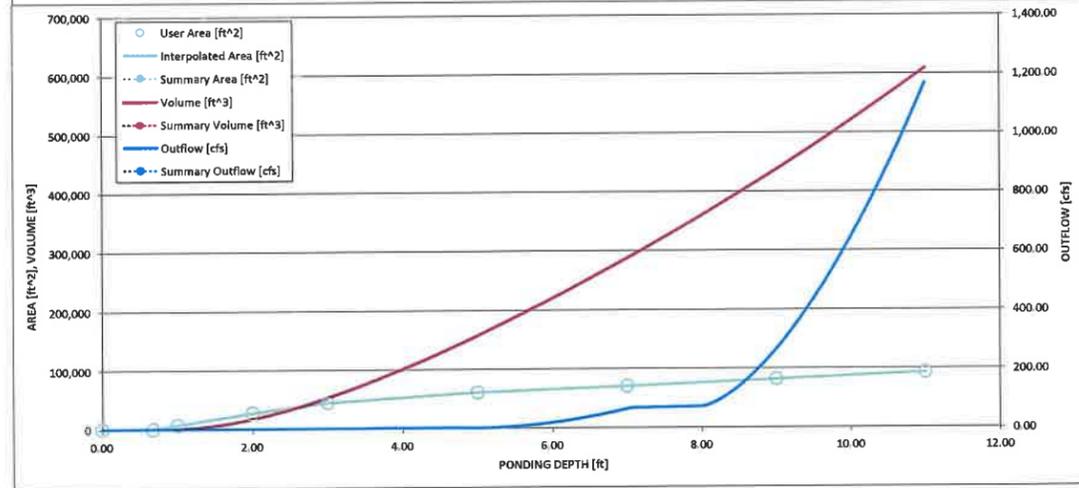
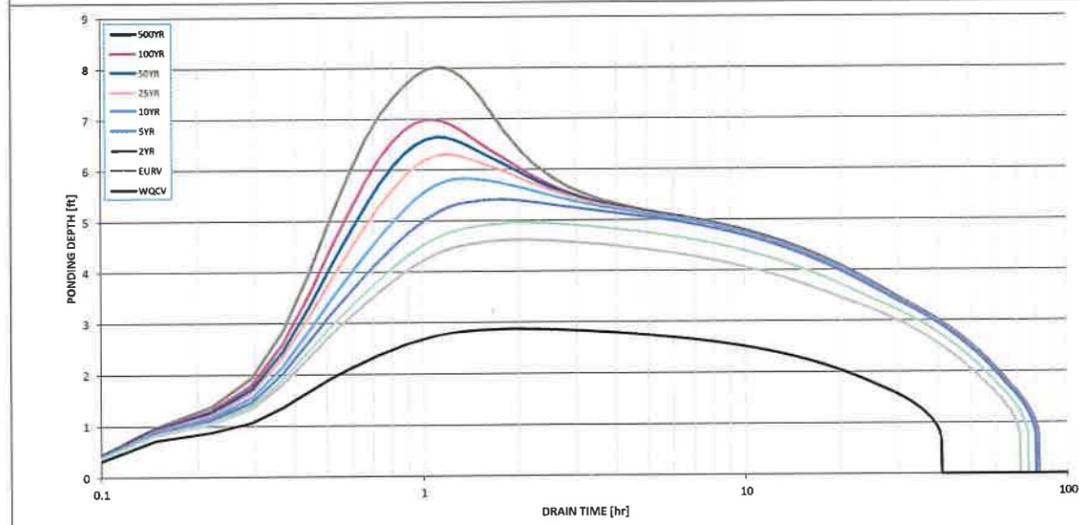
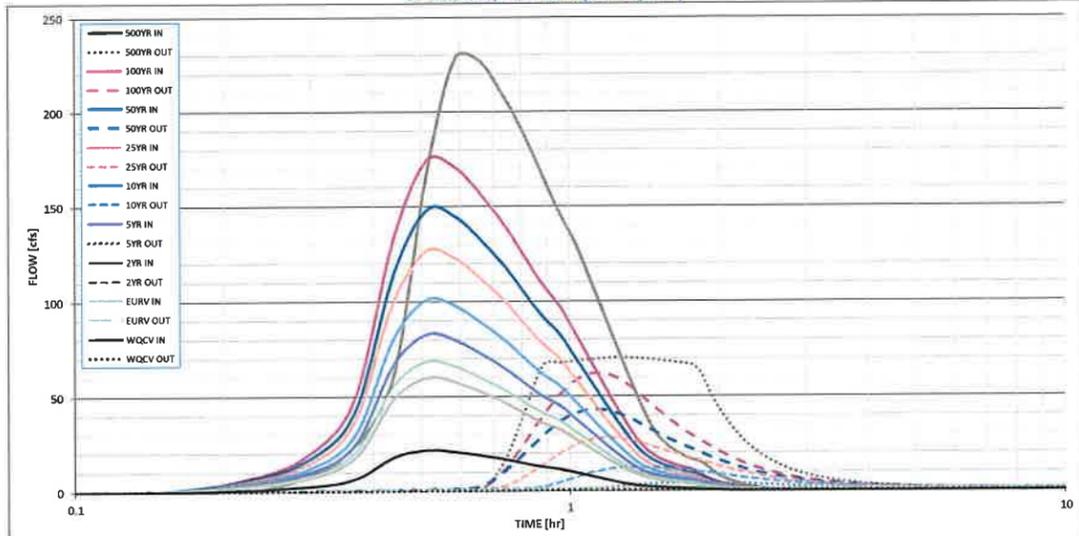
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.14
Calculated Runoff Volume (acre-ft) =	1.170	3.712	3.254	4.504	5.530	6.972	8.198	9.691	12.843
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.169	3.707	3.250	4.499	5.516	6.964	8.180	9.671	12.826
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.11	0.30	0.70	0.97	1.32	2.01
Predevelopment Peak Q (cfs) =	0.0	0.0	0.7	6.1	16.7	38.3	53.1	72.3	110.4
Peak Inflow Q (cfs) =	21.8	68.2	60.0	82.5	100.7	126.4	147.8	173.9	228.4
Peak Outflow Q (cfs) =	0.5	1.3	1.2	4.2	12.3	28.2	42.8	61.8	70.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	0.7	0.7	0.8	0.9	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Grate 1	Spillway				
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.3	0.8	1.2	1.7	2.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	69	65	72	71	69	67	66	62
Time to Drain 99% of Inflow Volume (hours) =	40	74	69	77	77	77	76	75	74
Maximum Ponding Depth (ft) =	2.87	4.95	4.62	5.41	5.82	6.30	6.63	6.98	8.02
Area at Maximum Ponding Depth (acres) =	0.95	1.37	1.31	1.42	1.47	1.52	1.56	1.59	1.72
Maximum Volume Stored (acre-ft) =	1.095	3.536	3.093	4.166	4.759	5.491	5.998	6.549	8.256

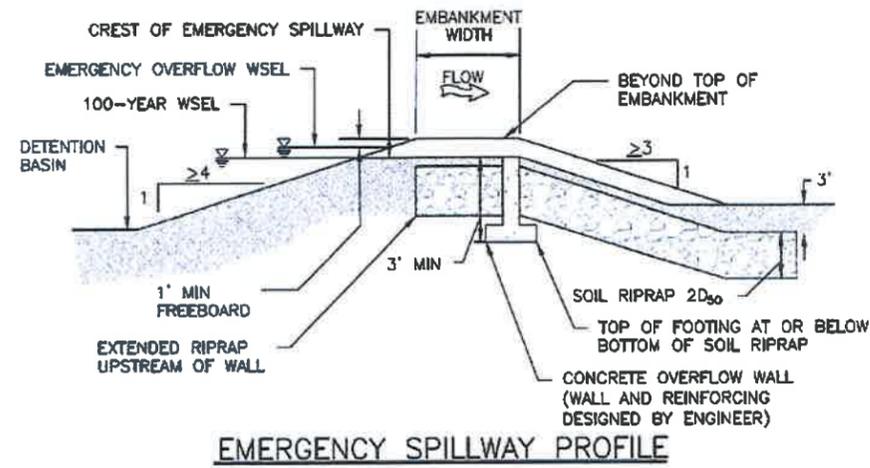
Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

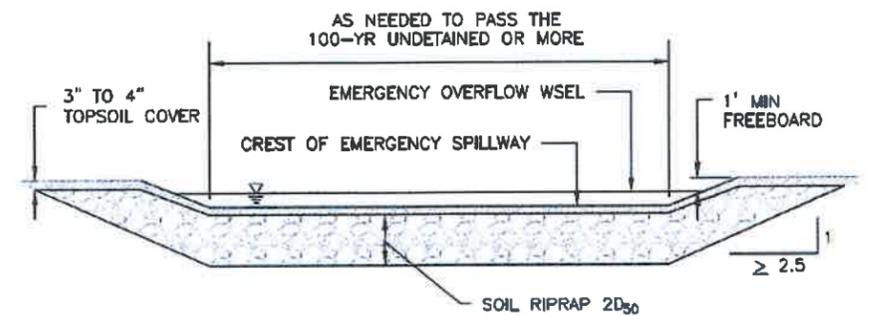


S-A-V-D Chart Axis Override

	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			



EMERGENCY SPILLWAY PROFILE



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

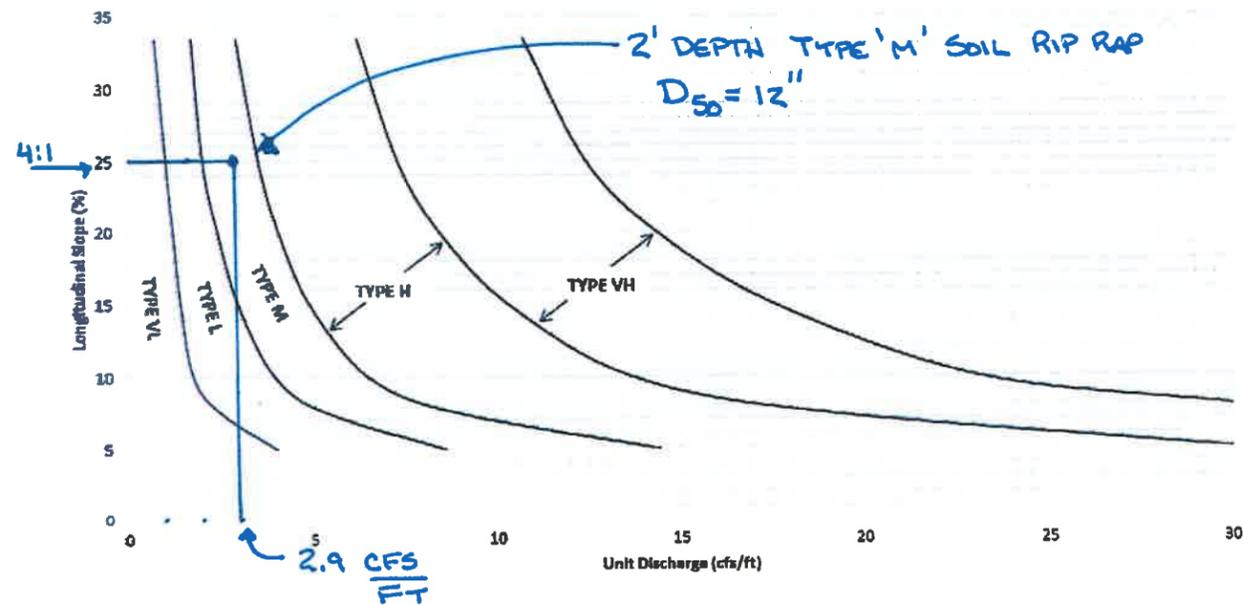
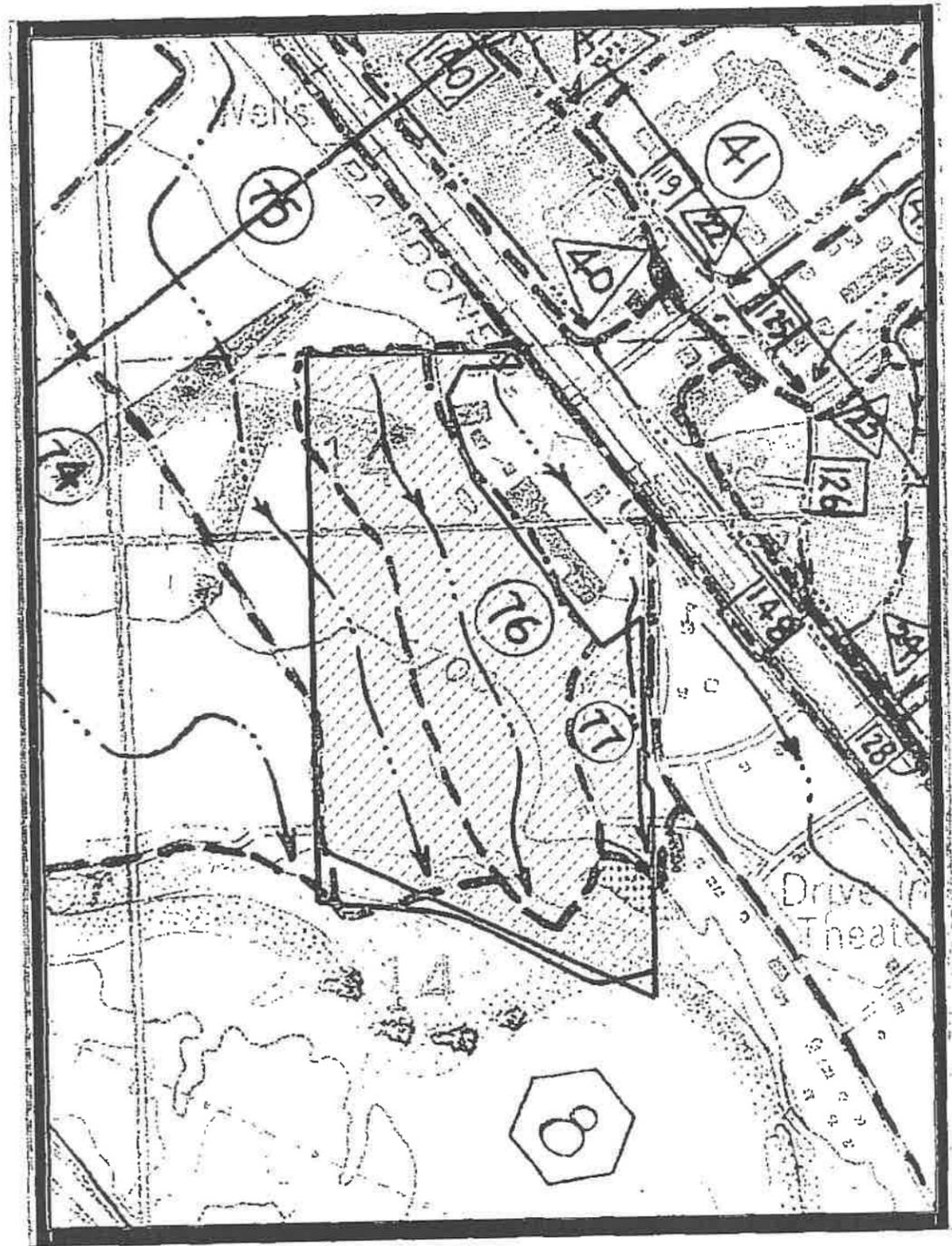
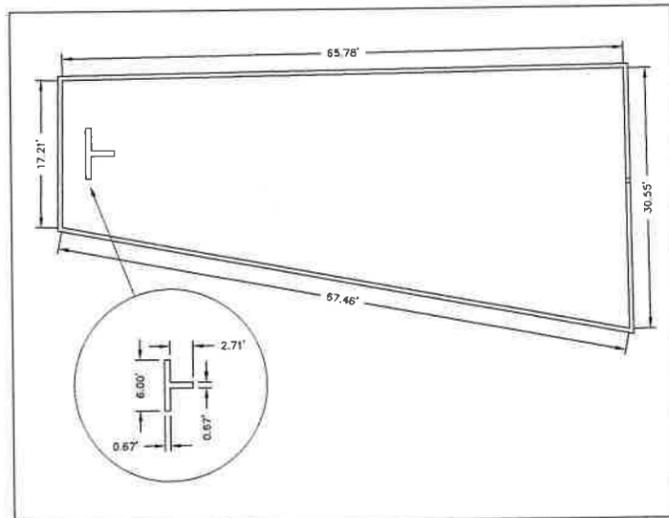
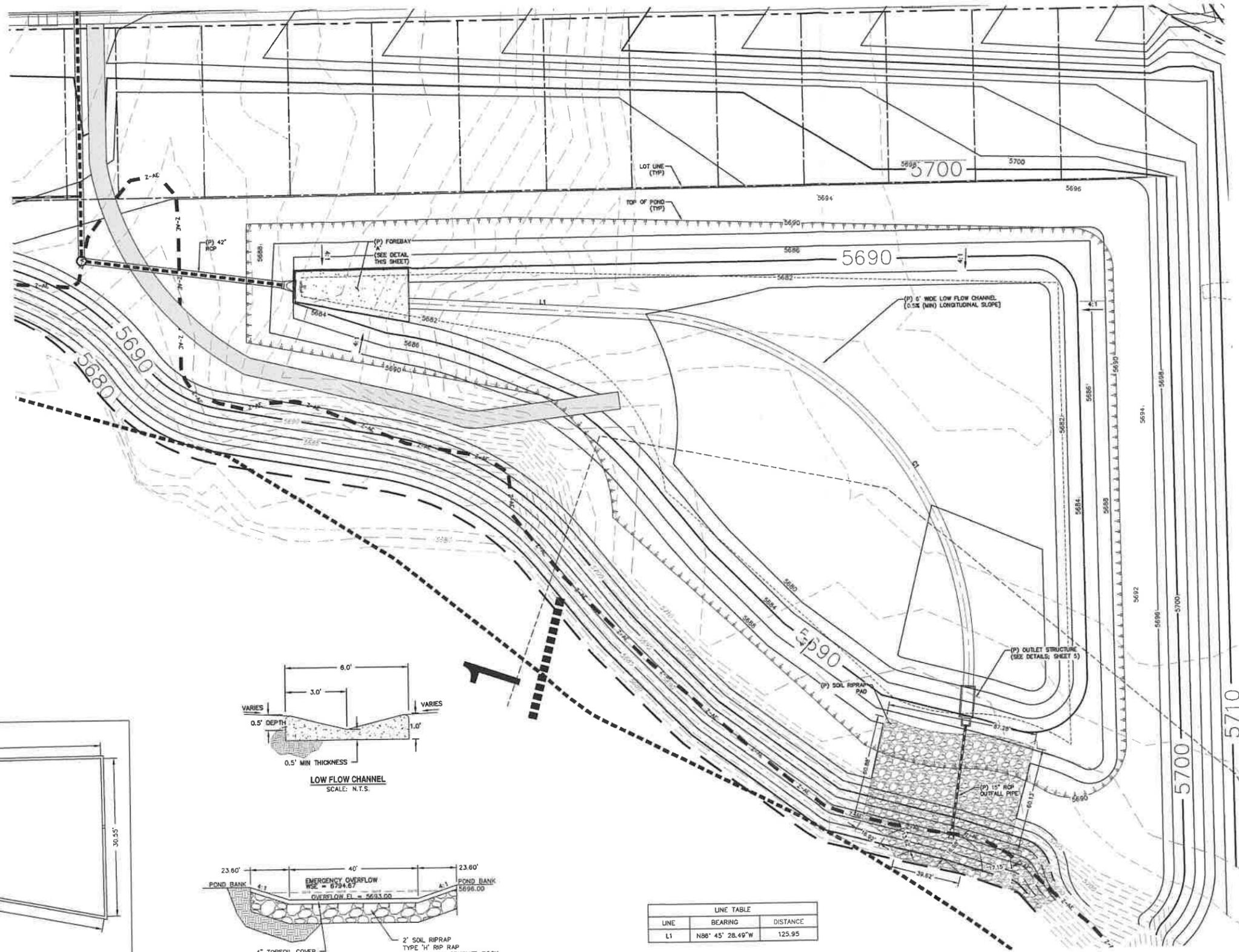


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

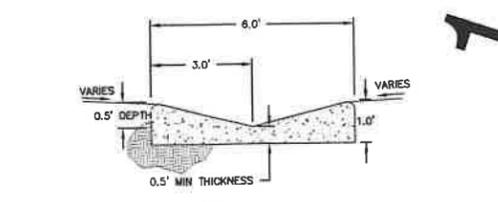
DRAINAGE MAP

FIGURE A4 – Drainage Patterns as Depicted in the DBPS

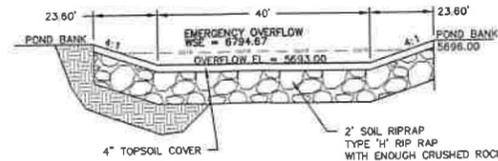




FOREBAY 'A' DETAIL
SCALE: N.T.S.



LOW FLOW CHANNEL
SCALE: N.T.S.



POND OVERFLOW
SCALE: N.T.S.

LINE TABLE		
LINE	BEARING	DISTANCE
L1	N86° 45' 28.49"W	125.95

CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C1	91°21'53"	209.81	334.57

- LEGEND**
- EXISTING (E)
 - PROPOSED (P)
 - CURB AND CUTTER C&G
 - BOUNDARY
 - RIGHT-OF-WAY
 - LOT LINE
 - (E) CONTOUR, INDEX
 - (E) CONTOUR
 - (P) CONTOUR, INDEX
 - (P) CONTOUR
 - (E) STORM SEWER
 - (P) STORM SEWER

REV.	DESCRIPTION	DATE



PREPARED FOR:
AVATAR EQUITIES, LLC
8600 JERICHO TURNPIKE
SUITE 120W #204
SYOSSET, NY 11791

PREPARED UNDER MY DIRECT SUPERVISION FOR AND BEHALF OF CATAMOUNT ENGINEERING.
DAVID L. MIJARES, COLORADO PE #40510



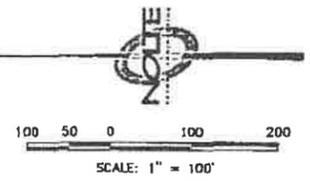
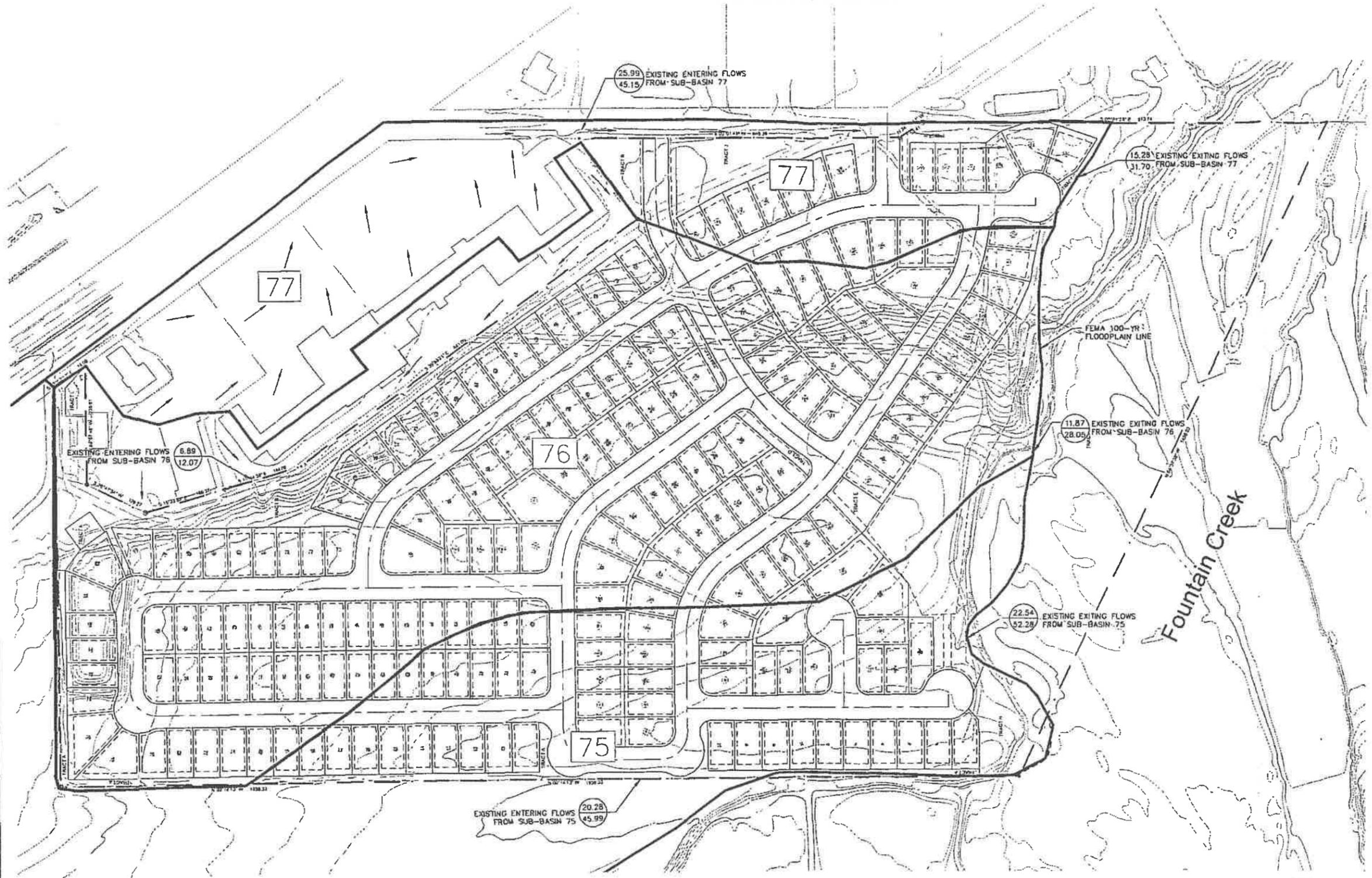
RIVERBEND CROSSING
FILING NOs 1 & 2
STORMWATER QUALITY
FACILITY DETAILS

DESIGNED BY:	DLM	DRAWN BY:	MGP
SCALE:	1" = 30'	DATE:	11/07/18
JOB NUMBER:	17-114	SHEET:	4 OF 20

RIVERBEND CROSSING

EXISTING DRAINAGE CONDITONS MAP

DATE: 1/19/07 FILE: 3.29.10 PL. DRAWING NAME: RIVERBEND CROSSING
 SHEET: 0550 DESIGNER: JHJ PROJ. NO.: 0101 PLOTTED BY: JHJ
 PLOT: H:\PROJECTS\0550\0550.DWG



LEGEND

	BOUNDARY
	EXISTING MAJOR CONTOURS
	EXISTING MINOR CONTOURS
	5-YR. FLOW (cfs)
	100-YR. FLOW (cfs)
	FLOW DIRECTION ARROW
	SUB-BASIN BOUNDARY
	SUB-BASIN IDENTIFICATION

EXISTING DRAINAGE BASINS 75, 76 AND 77 WERE TAKEN FROM THE APPROVED LITTLE JOHNSON DRAINAGE BASIN PLANNING STUDY, DATED: APRIL, 1988

WATERSHED	TOTAL AREA (acres)	COMPOSITE RAINFALL COEFF. C		COMPOSITE RAINFALL COEFF. C	OVERLAND COMPONENT		CHANNEL COMPONENT				TOTAL I _p (inches)	RUNOFF COEFFICIENT, C _r		DENSITY (inches)		FLOWS (cfs)					
		C ₁	Area (acres)		C ₂	Area (acres)	Length (ft)	Slope (ft/ft)	Length (ft)	Area (sq ft)		Vel. (ft/s)	Flow (cfs)	C ₁	C ₂	1 yr	100 yr	5 yr	100 yr		
75 (in)	59.11	0.25	49.31	0	0.25	1000	1.2	0.004	37.65	140	2	0.002	2.1	0.5	11.34	0.25	0.25	1.4	30	20.28	45.99
76 (in)	20.18	0.25	20.18	0	0.25	1000	1.2	0.004	37.65	140	2	0.002	2.1	0.5	11.34	0.25	0.25	1.4	30	20.28	45.99
77 (in)	7.37	0.25	7.37	0	0.25	1000	1.2	0.004	37.65	140	2	0.002	2.1	0.5	11.34	0.25	0.25	1.4	30	20.28	45.99
77 (out)	7.37	0.25	7.37	0	0.25	1000	1.2	0.004	37.65	140	2	0.002	2.1	0.5	11.34	0.25	0.25	1.4	30	20.28	45.99

NOTE

BEYOND ENGINEERING
 5115 N. ACADEMY BLVD., SUITE 304
 719.268.8590 TEL. 719.268.9100 FAX

PRELIMINARY
 NOT FOR CONSTRUCTION

SHEET NUMBER
DP01
 1 OF 2 SHEETS
 SCALE
 VERTICAL: N/A
 HORIZONTAL: 1" = 100'
 JOB NUMBER
 CSB011202

RIVERBEND CROSSING
 EXISTING DRAINAGE CONDITIONS

PREPARED FOR: DR. HORTON - MELODY SERIES
 DATE SUBMITTED: FEB 17, 2006
 The engineer preparing these plans will not be responsible for any errors or omissions in the information furnished hereon, and must be approved by the engineer of these plans.