MEMORANDUM

DATE: October 10, 2018

TO: Kari Parsons, PCD-Project Manager

FROM: Jeff Rice/Steve Kuehster, PCD-Engineering

SUBJECT: SP-18-002 – The Retreat at Timber Ridge
Fourth Submittal
CCES Drainage Responses – South Report (Red)

Engineering Division
Planning and Community Development (PCD)-Engineering reviews plans and reports to ensure general conformance with El Paso County standards and criteria. The project engineer is responsible for compliance with all applicable criteria, including other governmental regulations. Notwithstanding anything depicted in the plans in words or graphic representation, all design and construction related to roads, storm drainage and erosion control shall conform to the standards and requirements of the most recent version of the relevant adopted El Paso County standards, including the Land Development Code (LDC), the Engineering Criteria Manual (ECM), the Drainage Criteria Manual (DCM), and the Drainage Criteria Manual Volume 2 (DCM2). Any deviations from regulations and standards must be requested, and approved by the ECM Administrator, in writing. Any modifications necessary to meet overlooked criteria after-the-fact will be entirely the developer's responsibility to rectify.

The comments include unresolved previous comments and new comments resulting from the re-submittal in ***magenta-highlighted bold italic (need to be resolved)*** ***or*** ***cyan-highlighted bold italic (may be deferred to final plat)***. All previous comments that have been resolved have been noted or deleted. A written response to all comments and redlines is required for review of the re-submittal. ***Note: no response to comments (other than drainage report redlines) was found for this or the previous review.*** Please arrange a meeting between the developer's team and County staff to review and discuss these comments and prepared revisions/responses prior to the next submittal.

General

1. Comments remaining from the TimberRidge PUD (PUD-17-003) include the following:
    a. *Cul-de-sac design needs to meet ECM Section 2.3.8. Snow storage areas/easements need to be provided for cul-de-sacs and roads adjacent to or within adjacent property. Partially resolved; response references a letter from the adjoining property owner stating that easements will be provided. This will be further addressed at the Preliminary Plan and Final Plat stages. Provide documentation from the adjoining property owner(s) that all necessary offsite easements will be able to be obtained.* Provide an exhibit showing general locations of all necessary offsite easements. Resolved for Preliminary Plan; any offsite easements will be documented at final plat.
    b. *Note: easements to other entities that overlap with future public road rights-of-way will need to be vacated/terminated at the time of platting of the rights-of-way. Documentation of separate vacation/termination documents will need to be provided showing no encumbrances on proposed rights-of-way at that time. Regarding the proposed Arroyo lane right-of-way, the existing access easement*

will need to be revised or extinguished in the area underlying the proposed ROW prior to County acceptance of the public improvements. (To be addressed at final plat.)

2. Note: Pre-development (early) grading has not been requested at this time; therefore, submittal of the associated GEC plans, SWMP report and permit applications have not been required.

Preliminary Plan

1. Ensure that all checklist items are provided (reference planning comments and redlines). Partially resolved; see updated redlines. ***Partially resolved;***
    a. *See remaining redlines.* ***See updated redlines (sheet 7) and PDR comment #8.e, below.*** **Revised PP Grading sheets 7 and 8**
    b. ***Resolved***
    c. ***Resolved***
2. through 6 – *Resolved*

Transportation / Traffic Impact Study

1. Resolved
2. Regarding the five deviation requests:
    a. ECM 2.2.7.B – Road Paving Policy: The request to construct Nature Refuge Road as a permanent gravel road has been denied. An alternative may be to phase paving and/or defer paving this road until Arroya Lane is constructed and paved; however, collateral or an escrow account for the paving improvements may still be required.
    b. ECM 2.2.7.B – Road Paving Policy: In conjunction with comment 2.a above, the request to construct a 50-foot paved apron on Nature Refuge Road at Arroya Lane has been denied.
    c. ECM 2.3.8.A – The request to allow an interim cul-de-sac length in excess of 1,600 feet for Nature Refuge Road has been approved pending fire district concurrence. **(Provide concurrence when available.)** ***Unresolved*** ***Unresolved*** **Response by LSC**
    d. ECM 2.2.5.B.1 – Access Criteria – Spacing: The request to allow an interim (shared) access from Vollmer Road to the two lots on the west side of Vollmer has been approved. This approval will require notation on the subdivision plat for these two lots that the access is interim, to be removed/relocated when the remainder parcel develops.
    e. A deviation request for a temporary emergency access gravel road was not received. Provide with the next submittal if it is desired to have this addressed prior to the subdivision that triggers the need for the second access point.

Preliminary Drainage Report (PDR) / Drainage Plans

Per DCM1 Section 1.2.2 (and 4.3), "The purpose of a Preliminary Drainage Report (PDR) is to identify and propose specific solutions to drainage problems that would occur as a result of that portion of the development considered for platting. Detailed analysis of drainage basin hydrology and hydraulics is required. Alternative solutions to drainage problems shall be noted and the capacity of drainage facilities on and off-site shall be evaluated. Specific improvements, including open channels, storm sewers, grading, site stabilization, catch basins, culverts and other improvements will be located and sized to meet requirements of the initial and major drainage system." In general, the reports submitted require a higher level of detail.

1. See PDR redlines. Partially resolved; see updated redlines. *Partially resolved; see updated redlines.* ***Partially resolved; see updated redlines*** **CCES Responses to South Report comments**
2. Resolved
3. Address the 4-Step process described in ECM Section I.7.2.A and how these steps are being provided for on this site (north and south). Partially resolved; see redlines (north); Unresolved (south). *Resolved (north);* ***unresolved (south)*** ***Unresolved (south)*** **4-Step Process now described in PDR South Report and may be formalized in FDR**
4. Provide discussion of maintenance access and aspects of the preliminary design. Show access roads for ponds and channels on the drainage plans. Partially resolved; show conceptual access roads/easements for the Sand Creek channel. Reference ECM 3.3.3.K. ***Unresolved; in combination with the proximity of floodplain to the proposed lots, access road locations cannot be put off to the FDR.*** ***Unresolved*** **Conceptual channel access locations now shown on south report developed drainage map**
5. (South report): An overall hydrologic model (HEC-HMS and/or excerpts from the most recent DBPS or other study addressing ultimate developed conditions) and hydraulic model (HEC-RAS) are required to address overall basin-wide pre- and post-development Sand Creek channel flows and hydraulic channel conditions. The FEMA (existing) flows are higher (~2,600 cfs vs ~2,200 cfs in DBPS) in this reach. Address this in the PDR, as well as the following:
    a. Address floodplain/channel hydrology and hydraulics for the existing (FEMA) and anticipated fully developed basin detained conditions, and fully developed "emergency conditions" undetained flow analysis. Address specifically how re-routing of flows to specific outfalls on the Sand Creek channel will affect the overall channel flows, velocities, volumes and depths. (This is anticipated to be minor, but will a LOMR be required?) Ensure that proposed building areas are outside of the emergency scenario 100-year flood (DCM Update Section 12.0). Partially resolved; per comment response, state in the report that the detailed modeling including fully developed "emergency conditions" analysis will be provided in the first FDR for lots to be platted adjacent to or east of the channel. ***Unresolved*** ***Unresolved*** ***Upon the finalizing the channel hydrology/hydraulics, specific channel improvements and development grading, additional drainage analysis will be provided with first FDR for lots platted adjacent to or east of Sand Creek Channel – text added to PDR.***
    b. Address channel velocities, in the range of 8 to 11 fps per the FEMA study, above the 7 fps recommended in the DBPS, and any stabilization necessary above that called for in the DBPS. Resolved; to be further addressed with detailed modeling in the FDR.
    c. Resolved
    d. The report states that specific channel improvements have not been determined with this report. Details, including preliminary design, sizing, and modeling (to verify depths and velocities) are required, including the offsite area in Sterling Ranch adjacent to the west side of the south portion of Timber Ridge (proposed Tract G). The entire reach through and adjacent to this development needs to be addressed in this report so that final drainage reports at the final plat stage have a comprehensive plan for improvements. Partially resolved; to be addressed with comment #5a and in FDR.
    e. Regarding all of the above, coordination with Sterling Ranch design and modeling is necessary. It may be advantageous to address these issues, especially where the channel overlaps both developments, in the overall Sterling Ranch MDDP, which is a larger project already considering these issues to the

south, and may possibly be pending submittal. Note: The Sterling Ranch MDDP is currently under review and does not currently address specific overlapping issues between both projects. That MDDP calculates different Sand Creek channel flows, but also states that the Sand Creek DBPS recommendations for channel improvements will be followed. Timing of any FEMA revisions will affect channel design.

f. The culvert calculations for the Arroya Lane culverts show headwater depth not in conformance with DCM Section 6.4.2. The classification of these culverts as a bridge (even with offsite existing flows revised from DBPS values as proposed by Sterling Ranch) and the resulting freeboard requirements needs to be addressed in regard to DBPS recommendations (not 100-year design). Provide headwater calculations for the FEMA flows also. (north and south culverts) ***Partially resolved; if a deviation is proposed regarding DCM 6.4.2 (bridge freeboard) it should be requested as soon as possible to determine if design and project costs will need to be updated with the FDR.*** ***Unresolved*** **Updated culvert reports for the Arroya and Poco crossings now included, however, a deviation may be submitted along with North Report and their first phase Final Plat.**

g. Resolved

6. Regarding offsite flows:
   a. As noted in the MDDP review comments, the method of accommodating offsite flows from the east needs to be addressed in the PDR. The drainage plan (south) appears to show offsite construction of storm drain stubs to the east. Label all necessary easements (onsite and offsite) and provide preliminary grading and capture/conveyance details along the east property line. Partially resolved; show conceptual grading and overflow paths. (south) ***Unresolved*** **Conceptual grading of overflow paths and esmts. now shown**
   b. Provide headwater calculations for the culverts crossing Vollmer Road and those capturing flows from the east of the property. Show any necessary ponding easements for those on the east side. Partially resolved; provide calculations for the culverts on the east side. (south) ***Unresolved*** **Culvert calculations now provided for culverts along east side**
7. Appendices/calculations:
   a. Resolved
   b. The channel calculations appear to be for average or specific dimensions and grades. The proposed contours show a lot of channel grading with a bermed channel in some locations, with steeper grades that will require additional stabilization. Provide calculations at steepest and shallowest locations to account for necessary easements (including freeboard) and necessary stabilization. Identify all necessary stabilization on the plan. (north) ***Unresolved; see ~~comment #14 below redlines.~~*** **Addressed by Terra Nova Eng.**
8. Drainage plans:
   a. Ensure that all information will be legible on the printed version; much of the text is very small. Additional sheets may be necessary to allow for legibility without overwritten information. Partially resolved; see redlines (north); Resolved (south). ***Partially resolved; if the north report will be a FDR, additional sheets will be necessary.*** **Addressed by Terra Nova Eng.**
   b. Provide proposed roadway cross-sections or call out curb and gutter/ditch types on the Developed Condition plans. Unresolved. ***Unresolved*** **Revised developed drainage map now includes proposed street cross sections.**
   c. Resolved

d. See drainage plan redlines for additional comments. Partially resolved; see updated redlines. ***Partially resolved; see updated redlines.*** ***See remaining redlines.*** ***Developed drainage map*** **Design Point information table already includes acreage for each Design Point and contributing basins. This same information now included on the Pre-developed Drainage Map.**

e. Provide an informational overall grading plan, including proposed WQCV facilities. This can be within the south PDR or standalone. ***Partially resolved; see redlines on sheet 7 of the Preliminary Plan.*** **See revised Preliminary Plan sheet 7 and revised developed drainage map.**

9. Note: per the PDR, individual lot sediment control BMPs will be required for Lots 11 and 12 west of Vollmer Road. This should be noted on the Preliminary Plan.
10. Note: Detention basin calculations were not reviewed in detail. See redline comment on potential reimbursements; if all design storms (2- to 100-year) are not detained to historic rates the ponds may not be partially deductible from drainage fees. Further design adjustments may be necessary with the Final Drainage Report.
11. Note: A wetlands mitigation map will be required showing the proposed/required locations of mitigation (replacement areas). If this is not provided with the Preliminary Plan, notes will be required on the Preliminary Plan regarding the timing and responsibilities for the report and associated mitigation.
12. A deviation request from ECM Section I.7.1.B will be required addressing all urban lot and road areas not provided with WQCV.
    a. Resolved
    b. If a deviation is requested for any urban lots, address roof drains being required to drain to the front yards. To be addressed at final Plat/FDR stage.
    c. Any urban lot areas draining directly offsite may require an easement or other documentation from the adjoining owner(s) that the proposed developed condition is acceptable. To be addressed at final Plat/FDR stage.
13. Various details between the north and south report are not consistent. Verify consistency between the reports. It is assumed that the proposed culvert crossing Arroya Lane will be constructed when Arroya is paved. Address short-term and long-term WQCV for Arroya Lane. ***Unresolved;***
    a. The south report describes what might be done, but because improvements to Arroya Lane will be necessary with the development north of Arroya Lane, the north report needs to provide preliminary design for the WQCV, accommodating the paved conditions. ***Unresolved*** ***Revised developed drainage map now shows conceptual locations of SWQ facilities for Arroya Lane.***
    b. See redlines regarding box culvert sizing. ***Unresolved*** ***See response to 5.f.***
14. ***Resolved***
15. *The north PDR states that maintenance of Tract B will be by the HOA; the preliminary plan lists the TimberRidge Metro District in the table on sheet 1. Verify and revise one or the other document as appropriate.* ***Unresolved*** **Addressed by Terra Nova Eng.**

Attachments

1. Preliminary Plan redlines
2. Preliminary Drainage Report redlines (north)
3. Preliminary Drainage Report redlines (south)

CN VALUES - EXISTING CONDITIONS

BASIN (label)	BASIN AREA (Ac)	SOIL TYPE B		WEIGHTED C=
		CN	AREA (Ac.)	
EX-1	156.9	61	156.9	61
EX-2	9.2	61	9.2	61
EX-3	24.9	61	24.9	61
EX-4	35.2	63	35.2	63
EX-6	6.7	61	6.7	61
SC-1	12.5	63	12.5	63
SC-2	350.0	63	350.0	63
OS-1	49.1	61	49.1	61
OS-2	2.1	61	2.1	61
OS-3	5.7	65	5.7	65
OS-4	16.1	63	16.1	63
OS-5	27.6	63	27.6	63

TIME OF CONCENTRATION - EXISTING CONDITIONS

BASIN	Cn	C(5)	OVERLAND			STREET / CHANNEL FLOW				Tc TOTAL (min)	Tc LAG (min)	Tc LAG (hr)
			Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)			
EX-1	63.0	0.08	300	8	23.1	1600	3.8%	1.3	20.5	43.6	26.2	0.44
EX-2	61.0	0.08	300	10	21.4					21.4	12.9	0.21
EX-3	61.0	0.08	300	8	23.1	1500	4.0%	1.5	16.7	39.7	23.8	0.40
EX-4	63.0	0.08	300	24	16.3	1900	6.0%	1.8	17.6	33.7	20.2	0.34
EX-6	61.0	0.08	300	14	19.2	800	1.0%	1.0	13.3	32.5	19.5	0.33
SC-1	63.0	0.08	200	6	18.3	500	2.0%	1.2	6.9	25.1	15.0	0.25
SC-2	63.0	0.08	300	12	20.2	3500	1.8%	1.3	44.9	65.1	39.0	0.65
OS-1	61.0	0.08	300	22	16.5	1300	4.0%	1.5	14.4	31.0	18.6	0.31
OS-2	61.0	0.08	300	12	20.2	550	5.0%	1.7	5.4	25.6	15.3	0.26
OS-3	65.0	0.08	300	10	21.4	250	3.0%	0.5	1.2	22.6	13.6	0.23
OS-4	63.0	0.08	300	22	16.5	1300	4.0%	1.4	13.1	29.6	17.8	0.30
OS-5	63.0	0.08	300	10	21.4	1300	3.0%	1.2	18.1	39.5	23.7	0.39

BASIN SUMMARY - EXISTING CONDITIONS

BASIN (label)	TOTAL BASIN AREA (acres)	WEIGHTED CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
EX-1	156.9	61	0.44	2.6	17.7	140.3
EX-2	9.2	61	0.21	0.2	1.7	12.2
EX-3	24.9	61	0.40	0.4	3.0	23.7
EX-4	35.2	63	0.34	1.3	6.9	41.8
EX6	6.7	61	0.33	0.1	0.9	7.1
SC-1	12.5	63	0.25	0.5	3.0	17.3
SC-2	350.0	63	0.65	9.9	44.2	275.3
OS-1	49.1	61	0.31	0.9	7.0	53.9
OS-2	2.1	61	0.26	0.04	0.3	2.5
OS-3	5.7	65	0.23	0.6	2.1	9.9
OS-4	16.1	63	0.30	0.6	3.4	20.7
OS-5	27.6	63	0.39	1.0	5.2	32.1

DESIGN POINTS SURFACE ROUTING SUMMARY - EXISTING CONDITIONS

Design Point (label)	Contributing Basins	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
EX DP-1	BASINS OS-1, OS-2, OS-3, OS-5, EX-1, EX-2, EX-3, EX-4	5.6	36.0	281.7
EX DP-2	BASINS OS-2, EX-2	0.2	2.0	14.7
EX DP-3	BASIN EX-3	0.4	3.0	23.7
EX-DP-4	BASIN EX-6	0.1	1.0	7.1
Ex. 36" CMP at Vollmer	SC-1	0.5	3.0	17.3
Ex. 60" CMP at Vollmer	SC-2	9.88	44.2	275.3

Delete?

Provide column with design point contributing area

Acreage for each D.P. now included

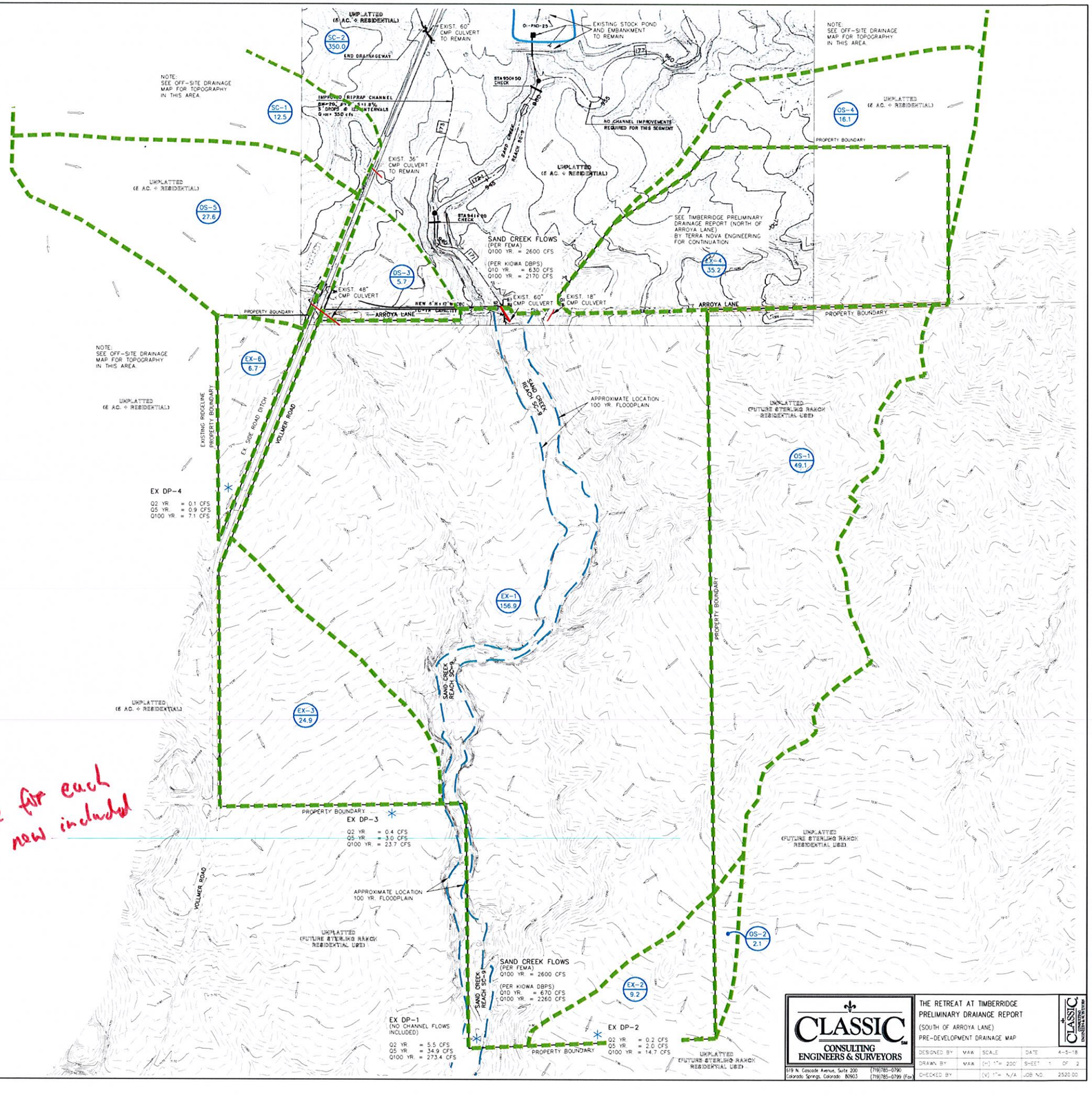
LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY	
DESIGN POINT	*
BASIN IDENTIFIER / AREA IN ACRES	89 / 15.6
EXISTING DIRECTION OF FLOW	
STORM SEWER	

N

200 100 0 200 400

SCALE: 1" = 200'



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THE RETREAT AT TIMBERRIDGE
PRELIMINARY DRAINAGE REPORT
(SOUTH OF ARROYA LANE)
PRE-DEVELOPMENT DRAINAGE MAP

DESIGNED BY	MAK	SCALE		DATE	4-5-18
DRAWN BY	MAK	(H) 1"= 200'		SHEET	1 OF 2
CHECKED BY		(V) 1"= N/A		JOB NO.	2520.00

PRELIMINARY DRAINAGE REPORT – BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
A1	0.77	1.79	5.12	0.14	100	2.4	16.1	740	2.9%	1.6	7.8	22.9	2.37	3.89	6.84	1.8	5	25
A2	0.41	0.97	2.76	0.14	300	12	16.0	420	4.0%	2.0	3.3	22.3	2.39	3.92	6.90	1.0	3	14
A3	0.35	0.83	2.36	0.14	300	9	21.7	420	3.0%	1.7	3.8	25.6	2.16	3.72	6.57	0.8	2	11
A4	0.25	0.42	0.92	0.20	180	8	13.3	180	4.0%	2.0	1.5	14.8	2.82	3.54	5.94	0.7	1	5
A5	0.33	0.77	2.20	0.14	280	10	18.1					18.1	2.53	3.16	5.31	0.8	2	12
B1	1.13	2.63	7.52	0.14	300	10.5	15.9	1260	3.3%	1.8	11.9	31.8	1.92	2.39	4.02	2.2	6	30
B2	0.48	1.12	3.20	0.14	300	10.5	15.9					15.9	2.48	3.10	5.20	1.2	3	17
B3	1.28	1.89	3.08	0.14	300	10.5	15.9	370	1.9%	1.2	5.0	24.9	2.21	2.76	4.63	2.8	5	14
B4	0.78	1.82	5.20	0.14	300	10.5	15.9					15.9	2.48	3.10	5.20	1.9	6	27
C1	1.13	2.13	5.25	0.17	300	12	16.4	800	2.0%	2.8	3.5	21.9	2.30	2.85	4.85	2.7	6	26
C2	0.52	0.86	1.80	0.20	300	14	16.9					16.9	2.87	3.56	5.61	1.4	3	11
C3	0.77	1.46	3.61	0.17	300	17	16.4					16.4	2.71	3.39	5.65	2.1	5	21
D1	1.02	1.28	2.72	0.21	200	4	16.0	820	2.0%	2.8	3.5	21.6	2.38	2.98	5.03	2.4	4	14
D2	2.54	3.53	6.63	0.25	150	3	16.0	920	3.0%	3.5	4.3	20.3	2.51	3.14	5.28	6.4	11	35
D3	0.68	0.86	1.91	0.21	150	3	15.6	375	2.0%	2.8	2.2	17.8	2.61	3.28	5.48	1.8	3	10
D4	1.76	1.94	3.30	0.27	150	3	14.6	820	3.5%	3.7	3.7	17.3	2.66	3.31	5.59	3.5	6	18
D5	2.30	3.20	6.02	0.25	150	3	15.0	1080	2.8%	3.2	5.5	20.5	2.46	3.09	5.13	5.5	10	31
D6	3.75	3.80	7.16	0.25	150	3	15.0	1200	2.0%	2.8	7.1	22.0	2.34	2.94	4.89	8.5	14	35
D7	0.19	0.43	1.11	0.18	150	3	16.5					16.5	2.75	3.37	5.67	0.5	1	6
D8	0.28	0.45	0.75	0.25	70	2.8	8.1					8.1	3.54	4.44	7.46	1.0	2	6
D9	0.38	0.53	0.90	0.25	70	2.8	8.1					8.1	3.54	4.44	7.46	1.3	2	7
D10	0.31	0.43	0.80	0.25	80	3.2	8.7					8.7	3.46	4.34	7.29	1.1	2	6
E	1.16	1.17	1.26	0.28	30	7.5	2.9	420	5.0%	2.2	3.0	5.9	3.82	4.82	8.27	4.5	6	10
F1	0.54	1.83	6.52	0.28	60	3	8.3	2400	2.0%	1.4	28.3	36.6	1.75	2.18	3.85	1.0	4	24
F2	0.14	0.41	1.66	0.28	60	6	6.8	1200	2.0%	1.4	14.1	20.7	2.42	3.05	5.09	0.5	1	8
H	0.40	0.94	2.68	0.14	300	11	16.8	920	2.0%	1.4	10.8	30.2	1.96	2.47	4.15	0.8	2	11
OS-1A	0.14	0.43	1.73	0.28	300	15	16.8	420	5.0%	4.5	1.5	20.1	2.47	3.08	5.18	0.4	1	9
OS-1B	0.70	2.11	8.42	0.28	300	15	16.8	1320	5.0%	4.5	4.5	22.0	2.30	2.88	4.83	1.6	6	41
OS-2A	0.26	0.78	3.12	0.28	300	12	20.0					20.0	2.47	3.09	5.19	0.7	2.6	16
OS-2B	0.07	0.21	0.85	0.28	300	12	20.0					20.0	2.47	3.09	5.19	0.2	0.6	4
OS-2C	0.45	1.34	5.36	0.28	300	12	20.0	1320	3.0%	3.5	4.8	24.8	2.21	2.77	4.64	1.0	4	25
OS-2D	0.03	0.08	0.31	0.28	250	12	17.2					17.2	2.58	3.23	5.42	0.07	0.3	2
OS-2E	0.09	0.28	1.12	0.28	300	12	20.0					20.0	2.47	3.09	5.19	0.2	0.9	6
OS-3	0.42	0.74	2.21	0.28	300	10	21.4	280	3.0%	3.5	1.2	22.6	2.32	2.90	4.87	1	2	11
OS-5	0.55	2.21	8.85	0.28	300	12	20.2	1020	3.0%	3.5	7.2	27.4	2.10	2.62	4.39	1	6	42

PRELIMINARY DRAINAGE REPORT – BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA / STREETS AREA (AC)	IMPERVIOUS AREA / STREETS C(2)	IMPERVIOUS AREA / STREETS C(5)	IMPERVIOUS AREA / STREETS C(100)	LANDSCAPE / DEVELOPED AREAS AREA (AC)	LANDSCAPE / DEVELOPED AREAS C(2)	LANDSCAPE / DEVELOPED AREAS C(5)	LANDSCAPE / DEVELOPED AREAS C(100)	WEIGHTED C(2)	WEIGHTED C(5)	WEIGHTED C(100)	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)
A1	12.8	0.00	0.89	0.95	0.96	12.80	0.06	0.14	0.40	0.06	0.14	0.40	0.77	1.79	5.12
A2	6.9	0.00	0.89	0.95	0.96	6.90	0.06	0.14	0.40	0.06	0.14	0.40	0.41	0.97	2.76
A3	5.9	0.00	0.89	0.95	0.96	5.90	0.06	0.14	0.40	0.06	0.14	0.40	0.35	0.83	2.36
A4	2.1	0.00	0.89	0.95	0.96	2.10	0.12	0.20	0.44	0.12	0.20	0.44	0.25	0.42	0.92
A5	5.5	0.00	0.89	0.95	0.96	5.50	0.06	0.14	0.40	0.06	0.14	0.40	0.33	0.77	2.20
B1	18.8	0.00	0.89	0.95	0.96	18.80	0.06	0.14	0.40	0.06	0.14	0.40	1.13	2.63	7.52
B2	8.0	0.00	0.89	0.95	0.96	8.00	0.06	0.14	0.40	0.06	0.14	0.40	0.48	1.12	3.20
B3	6.10	1.10	0.89	0.95	0.96	5.00	0.06	0.14	0.40	0.21	0.28	0.50	1.28	1.89	3.05
B4	13.0	0.00	0.89	0.95	0.96	13.00	0.06	0.14	0.40	0.06	0.14	0.40	0.78	1.82	5.20
C1	12.5	0.00	0.89	0.95	0.96	12.50	0.09	0.17	0.42	0.09	0.17	0.42	1.13	2.13	5.25
C2	4.3	0.00	0.89	0.95	0.96	4.30	0.12	0.20	0.44	0.12	0.20	0.44	0.52	0.86	1.89
C3	8.6	0.00	0.89	0.95	0.96	8.60	0.09	0.17	0.42	0.09	0.17	0.42	0.77	1.46	3.61
D1	6.0	0.00	0.89	0.95	0.96	6.00	0.17	0.21	0.45	0.17	0.21	0.45	1.02	1.28	2.72
D2	14.1	0.00	0.89	0.95	0.96	14.10	0.16	0.25	0.47	0.16	0.25	0.47	2.24	3.53	6.63
D3	4.0	0.00	0.89	0.95	0.96	4.00	0.17	0.21	0.45	0.17	0.21	0.45	0.68	0.86	1.81
D4	8.8	0.00	0.89	0.95	0.96	8.80	0.20	0.27	0.49	0.20	0.27	0.49	1.76	1.94	3.30
D5	12.8	0.00	0.89	0.95	0.96	12.80	0.18	0.25	0.47	0.18	0.25	0.47	2.30	3.20	6.02
D6	15.3	0.00	0.89	0.95	0.96	15.30	0.18	0.25	0.47	0.18	0.25	0.47	2.75	3.83	7.19
D7	2.7	0.00	0.89	0.95	0.96	2.70	0.57	0.16	0.41	0.07	0.16	0.41	0.19	0.43	1.11
D8	1.6	0.00	0.89	0.95	0.96	1.60	0.18	0.25	0.47	0.18	0.25	0.47	0.29	0.40	0.75
D9	2.1	0.00	0.89	0.95	0.96	2.10	0.18	0.25	0.47	0.18	0.25	0.47	0.38	0.53	0.99
D10	1.7	0.00	0.89	0.95	0.96	1.70	0.18	0.25	0.47	0.18	0.25	0.47	0.31	0.43	0.80
E	1.3	1.30	0.89	0.95	0.96	0.00	0.18	0.25	0.47	0.89	0.95	0.96	1.16	1.17	1.25
F1	18.1	0.00	0.89	0.95	0.96	18.10	0.03	0.09	0.36	0.03	0.09	0.36	0.54	1.83	6.52
F2	4.6	0.00	0.89	0.95	0.96	4.60	0.03	0.09	0.36	0.03	0.09	0.36	0.14	0.41	1.66
H	6.7	0.00	0.89	0.95	0.96	6.70	0.06	0.14	0.40	0.06	0.14	0.40	0.40	0.94	2.68
OS-1A	4.8	0.00	0.89	0.95	0.96	4.80	0.03	0.09	0.36	0.03	0.09	0.36	0.14	0.43	1.73
OS-1B	23.4	0.00	0.89	0.95	0.96	23.40	0.03	0.09	0.36	0.03	0.09	0.36	0.70	2.11	8.42
OS-2A	2.0	0.00	0.89	0.95	0.96	2.00	0.03	0.09	0.36	0.03	0.09	0.36	0.06	0.18	0.72
OS-2B	2.3	0.00	0.89	0.95	0.96	2.30	0.03	0.09	0.36	0.03	0.09	0.36	0.07	0.21	0.83
OS-2C	14.9	0.00	0.89	0.95	0.96	14.90	0.03	0.09	0.36	0.03	0.09	0.36	0.45	1.34	5.36
OS-2D	0.85	0.00	0.89	0.95	0.96	0.85	0.03	0.09	0.36	0.03	0.09	0.36	0.03	0.08	0.31
OS-2E	3.1	0.00	0.89	0.95	0.96	3.10	0.03	0.09	0.36	0.03	0.09	0.36	0.09	0.28	1.12
OS-3	5.7	0.35	0.89	0.95	0.96	5.35	0.02	0.08	0.35	0.07	0.13	0.39	0.42	0.74	2.21
OS-5	27.6	0.50	0.89	0.95	0.96	27.60	0.02	0.08	0.35	0.02	0.08	0.35	0.55	2.21	9.66

PRELIMINARY DRAINAGE REPORT – SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Culvert / Inlet Size
1	OS-5 (27.6 ac.)	2.21	9.66	27.4	2.62	4.39	6	42	EX. 48" CMP
2	OS-3 (5.7 ac.)	0.74	2.21	22.6	2.90	4.87	2	11	24" RCP
3	OS-2, A-1 (18.5 ac.)	2.54	7.33	23.6	2.84	4.76	7	35	30" RCP
4	A2 (6.9 ac.)	0.97	2.76	22.3	2.92	4.91	3	14	24" RCP
5	D5-3, D7-4, A3 (31.3 ac.)	4.33	12.45	25.6	2.72	4.57	12	57	DUAL 30" RCP CULVERTS
6	D7-3, A1, A5, A3 and A4 (POND B INFLOW - 33.4 ac.)	4.87	13.37	26.6	2.66	4.47	13	60	
7	B1 (18.8 ac.)	1.13	7.52	31.8	2.39	4.02	6	30	30" RCP
8	B3 (6.1 ac.)	1.69	3.05	24.9	2.76	4.63	5	14	S Type R surplus
9	B1, B2 and B3 (POND C INFLOW - 32.9ac.)	5.44	13.78	34.8	2.25	3.79	12	52	
10	C1, OS-1A (17.3 ac.)	2.50	6.98	23.4	2.85	4.79	7	33	30" RCP
11	C2 (4.3 ac.)	0.86	1.89	16.9	3.34	5.61	3	11	S Type R surplus
12	C3, OS-2A (16.1 ac.)	3.71	7.25	20.0	3.09	5.19	11	38	10 Type R surplus
13	D1, OS-2D (8.3 ac.)	1.40	3.55	21.6	2.98	5.00	4	18	S Type R surplus
14	D3, OS-2D (4.85 ac.)	0.93	2.12	17.8	3.25	5.46	3	12	S Type R surplus
15	D2, OS-2E (15.9 ac.)	3.48	7.13	20.5	3.05	5.13	11	37	10 Type R surplus
16	D4 (8.8 ac.)	1.84	3.30	17.3	3.31	5.56	6	18	S Type R surplus
17	D5 (15.3 ac.)	3.83	7.19	22.0	2.94	4.94	11	36	10 Type R surplus
18	D6 thru D9-1 and OS-1B, 2B, 2C, 2D (POND D INFLOW - 129.9 ac.)	22.55	54.40	27.8	2.60	4.36	59	237	

Acreage included in each D.P.

provide contributing acreage column

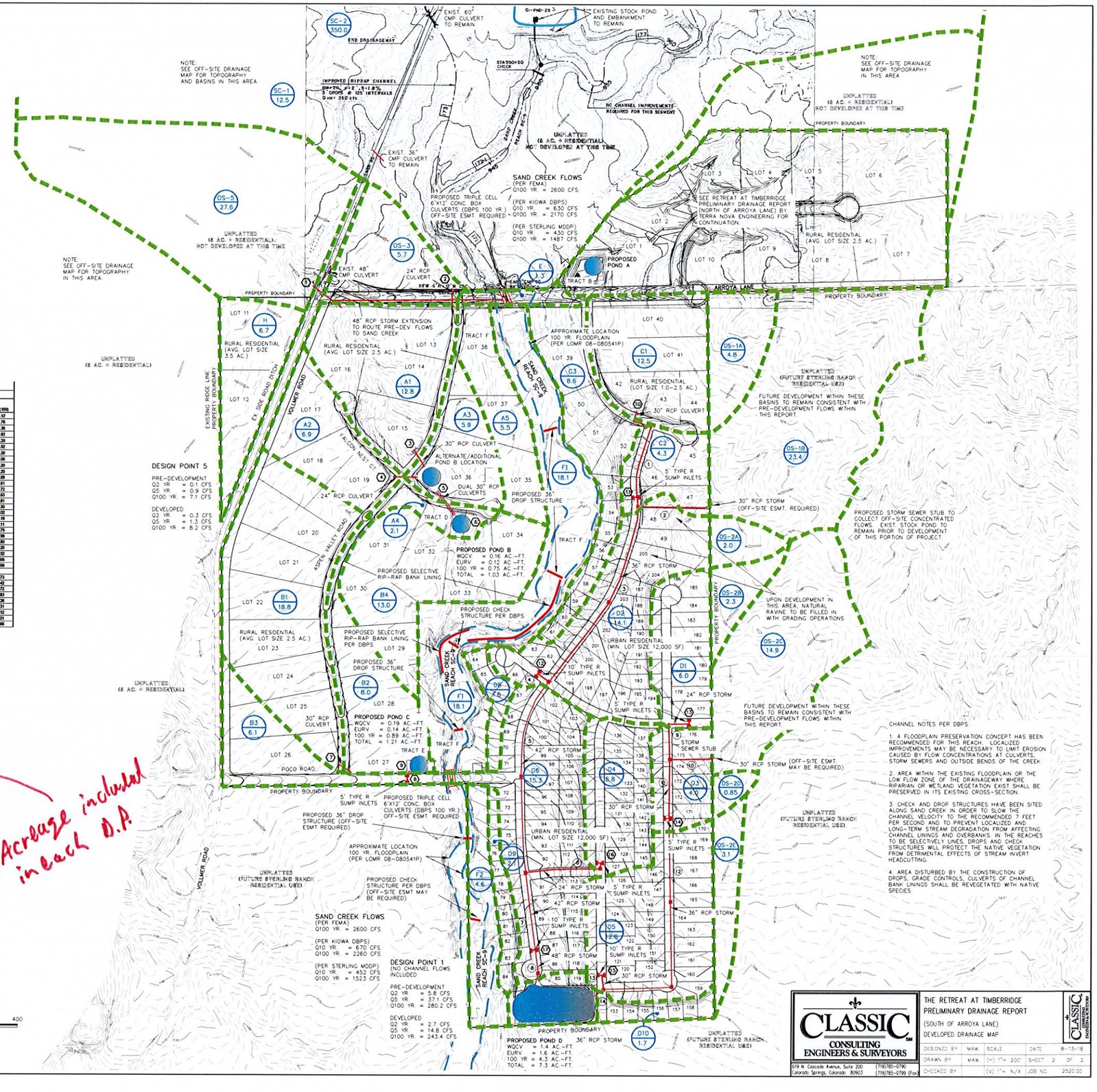
LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY	
BASIN IDENTIFIER / AREA IN ACRES	B1 / 18.8
DESIGN POINT	1
EXISTING DIRECTION OF FLOW	
PROPOSED DIRECTION OF FLOW	
PROPOSED DRAINAGE IMPROVEMENTS	
PROPOSED DETENTION/SWQ POND	

N

200 100 0 200 400

SCALE: 1" = 200'



CHANNEL NOTES PER DBPS:

1. A FLOODPLAIN PRESERVATION CONCEPT HAS BEEN RECOMMENDED FOR THIS REACH. LOCALIZED IMPROVEMENTS MAY BE NECESSARY TO LIMIT EROSION CAUSED BY FLOW CONCENTRATIONS AT CULVERTS, STORM SEWERS AND OUTSIDE BENDS OF THE CREEK.

2. AREA WITHIN THE EXISTING FLOODPLAIN OR THE LOW FLOW ZONE OF THE DRAINAGEWAY WHERE RIPARIAN OR WETLAND VEGETATION EXIST SHALL BE PRESERVED IN ITS EXISTING CROSS-SECTION.

3. CHECK AND DROP STRUCTURES HAVE BEEN SITED ALONG SAND CREEK IN ORDER TO SLOW THE CHANNEL VELOCITY TO THE RECOMMENDED 7 FEET PER SECOND AND TO PREVENT LOCALIZED AND LONG-TERM STREAM DEGRADATION FROM AFFECTING CHANNEL LININGS AND OVERBANKS. IN THE REACHES TO BE SELECTIVELY LINED, DROPS AND CHECK STRUCTURES WILL PROTECT THE NATIVE VEGETATION FROM DETRIMENTAL EFFECTS OF STREAM INVERT HEADCUTTING.

4. AREA DISTURBED BY THE CONSTRUCTION OF DROPS, GRADE CONTROLS, CULVERTS OF CHANNEL BANK LININGS SHALL BE REVEGETATED WITH NATIVE SPECIES.

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THE RETREAT AT TIMBERRIDGE
PRELIMINARY DRAINAGE REPORT
(SOUTH OF ARROYA LANE)
DEVELOPED DRAINAGE MAP

DESIGNED BY	MAK	SCALE		DATE	8-13-18
DRAWN BY	MAK	(H) 1"= 200'		SHEET	2 OF 2
CHECKED BY		(V) 1"= N/A		JOB NO.	2520.00