



To: Town of Castle Rock | Sandy Vossler | SVossler@crgov.com

From: Kimley-Horn and Associates, Inc.

Date: April 18, 2024

Subject: Sandstone Care – Planned Development Amendment – PDP24-0003

Letter of Compliance

The purpose of the Planned Development (PD) Amendment for the property located at 864 Barranca Drive, Castle Rock, CO 80914 (Parcel #: 2351-351-16-001), is to allow for an amendment to the permitted use in this commercially zoned parcel. Specifically, the project is located on the northwest corner of the Stampede Drive and Woodlands Boulevard intersection. The existing use for the site falls within the Assisted Living/Memory Care use, which is allowed by special review per Castle Rock Code 17.28.030. The proposed use is for Institutional Care. The site is intended to be made into a Sandstone Care Center, a center for adolescent mood disorder care. Services taking place at the proposed Care Center include evidence based, age-appropriate care in the form of academic support, individual treatment, and family treatment. These services are available via inpatient, outpatient, or telehealth services. The proposed project includes the interior renovation of the existing approximate 30,000 square foot assisted living building, to be better suited as a short term teenage mental health facility. Not included in the interior renovation are any modifications to the existing plumbing or utility services. This PD Amendment does not require changes to the existing site (externally), utilities, or the associated infrastructure, in any way.

The PD Amendment is in conformance to the previously approved Final Utility Report, prepared by Perception Design Group, Inc., revised on July 12, 2010. Water system analysis, wastewater system analysis, and fire flow analysis within this report and for the existing facility, was calculated per the Town of Castle Rock Public Works Regulations. The report confirms that the utilities were sized for commercial use. The report also confirms that the existing Town infrastructure was sized adequately to serve the existing memory care building. The building is served by a 1.5" potable water meter, a ¾" irrigation meter, and a private 6" sanitary sewer service. The existing water service line and irrigation line service the property via the existing water main in Barranca Drive. The existing private sanitary sewer line ties into the existing public sanitary sewer main at the intersection of Stampede Drive and Branding Iron Lane. Because the renovation does not include any modifications of the existing plumbing, fixtures, and utility services, it is understood that there are no additional demands, and the Town's utility infrastructure adequately serves the building. Therefore, the proposed PD Amendment is in conformance to the existing Final Utility Report. See Appendix for the previously approved Final Utility Report.

The PD Amendment is in conformance to the previously approved Phase III Drainage Report, prepared by Perception Design Group, Inc., revised on June 15, 2010, as no improvements to the site are proposed for the project. See Appendix for the previously approved Phase III Drainage Report.

Sincerely,
Kimley-Horn and Associates, Inc.
Kevin Kofford, P.E.



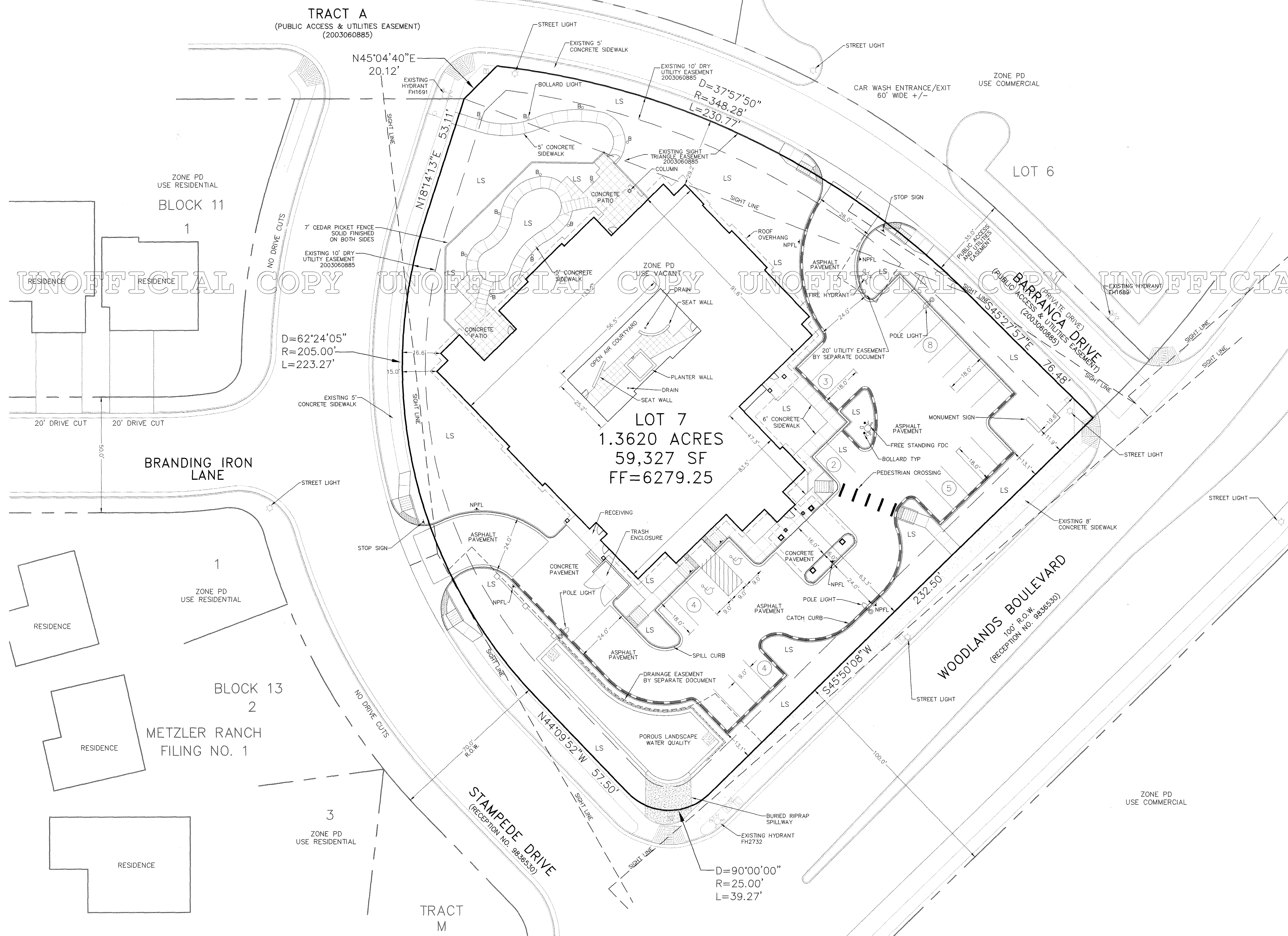
Appendix

Site Plan

FINAL PD SITE PLAN

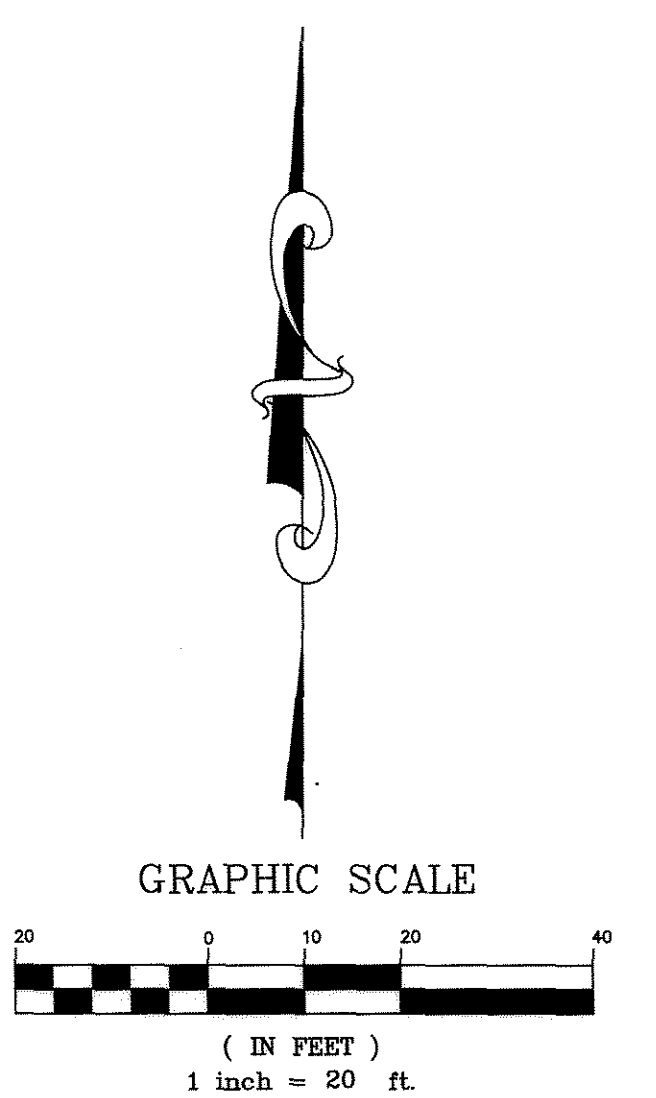
LOT 7, METZLER RANCH FILING NO. 9

A PART OF THE NORTHEAST QUARTER OF SECTION 35, TOWNSHIP 7 SOUTH, RANGE 67 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO

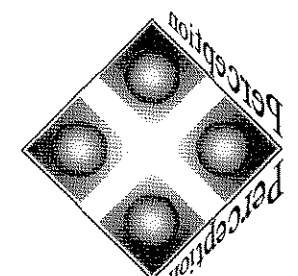


LEGEND

	PROPERTY LINE
	EXISTING CURB AND GUTTER
	PROPOSED CURB AND GUTTER
	SPILL PAN
	PROPOSED CURB AND GUTTER
	CATCH PAN
	PROPOSED SIDEWALK
	PROPOSED HANDICAP RAMP WITH DETECTABLE WARNING
	PROPOSED HANDICAP PARKING STALL
	PROPOSED PARKING COUNT PER ROW
	PROPOSED LANDSCAPED AREA
	FIRE HYDRANT
	PROPOSED SITE SIGNAGE
	NO PARKING FIRE LANE SIGN
	PROPOSED POLE LIGHT
	PROPOSED BOLLARD LIGHT
	EXISTING EASEMENT
	PROPOSED EASEMENT



SHEET 2 OF 14
SITE PLAN
JULY 14, 2010



Perception
Design Group, Inc.

Consulting Civil Engineers

6732 West Coal Mine Ave., Suite 419 • Littleton, Colorado 80123
Office: 303-232-8088 • Fax: 303-232-5255

Existing Final Utilities Report

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

Prepared By:

Perception Design Group, Inc.
6732 West Coal Mine Ave., Suite 419
Littleton, CO 80123
Contact: Jerry W. Davidson, P.E.
(303) 232-8088

Prepared For:

Woodlands Medical Center, LLC
96 Crown Point Place
Castle Rock, CO 80108
(303) 688-4796
Contact: Roger Bumgarner

Job No. 2010-003

April 3, 2010
Revised July 12, 2010

Prepared Under the Direct Supervision of
Jerry W. Davidson, P.E.
Colorado Registration No. 0226
For And On Behalf Of
Perception Design Group, Inc.

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

APPROVAL BLOCK PAGE

ENGINEER'S STATEMENT:

The enclosed utility report, and exhibits, were prepared by me, or under my direct supervision, and are correct to the best of my knowledge and belief. Said utility report has been prepared in accordance with applicable Town of Castle Rock criteria and is in conformance with the master plans for water and wastewater for the affected area. I accept responsibility for any liability caused by negligent acts, errors, or omissions on my part in preparing this report.

Jerry W. Davidson, P.E.
Colorado P.E. No. 30226
For and on behalf of Perception Design Group, Inc.

OWNER / DEVELOPER'S STATEMENT:

As Owner / Developer of land(s) identified within this report, I agree to proceed, implement and comply with all recommendations outlined herein.

Owner Name and Signature _____ Date _____

TOWN OF CASTLE ROCK APPROVALS:

Utilities Department _____ Date _____

Development Services _____ Date _____

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

TABLE OF CONTENTS	PAGE
NARRATIVE	3-6
REFERENCES	7
APPENDICES	
APPENDIX A –	WATER DEMANDS
APPENDIX B –	WATER STORAGE
APPENDIX C –	WATER CAD
APPENDIX D –	WASTEWATER FLOWS
APPENDIX E -	DOWNSTREAM SANITARY SEWER CAPACITY
APPENDIX F -	MAPS / PLANS

Preston, I'll fill in the page numbers at the end when we know what the final pages are.

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

NARRATIVE

This water and sanitary sewer study is prepared by Perception Design Group, Inc. for the commercial project proposed at the north corner of Woodlands Blvd. and Stampede in Castle Rock, Colorado. The 1.36-acre site, known as Lot 7, Metzler Ranch Filing No. 9, lies within the northeast quarter of Section 35, Township 7 South, Range 67 West of the 6th P.M., Town of Castle Rock, Douglas County, Colorado.

The site is bounded by Woodlands Blvd. to the southeast and further southeast by commercial development; Barranca Drive and commercial development to the northeast; and Stampede Drive to the west and residential development further west.

The proposed development area is currently vacant land. All construction is to be accomplished on the single lot 7. Lot 7 occupies 1.36 acres and is an infill lot amongst the aforementioned fully developed residential and commercial buildings. The proposed development consists of a single new 2 story building of 27,400 square feet. The facility is to be used for long term live in care for patients with memory disorders.

Existing water and sanitary sewer mains are present on or adjacent to the site. A 6" sanitary sewer service stub is in place at the intersection of Branding Iron Place and Stampede Drive. This stub extends up into the site and is the proposed point of connection for the 6" sewer service required for the building. Public water mains exist in the roads on all sides of the project. 8" PVC in Barranca Drive, 8" unknown material in Stampede Drive, and 20" ductile iron transmission main in Woodlands Blvd.

WATER SYSTEM ANALYSIS

As shown on the Town of Castle Rock 2006 Water Facilities Master Plan, the Lot 7, Metzler Ranch Filing No. 9 development is serviced by the Town of Castle Rock Metzler South Blue Zone. The "Blue" zone is supplied by the P S Miller water treatment plant. The closest reservoir is Purple zone Reservoir No. 11 located at 2990 Crowfoot Valley Road, that serves this site. This reservoir is a concrete tank with capacity of 1.01 million gallons. In the event of a fire, water would be moved via PRV's from reservoir 11 in the "Purple" zone to meet the fire demand needed.

In this report water demand was based upon an average water demand of 1,200 gpad for commercial properties as found in the Town of Castle Rock Public Works Regulations. The 1.36 acre lot requires 1,632 gpd for the average day. Factors of 2.65 and 4.5 were applied to determine the maximum day and peak hour flows. Applying these factors, the max day flow is 4,325 gpd, or 3.0 gpm. The peak hour was determined at 7,344 gpd, or 5.1 gpm. Single family equivalents for the average day demand of 1,632 gpd are 4.08. TST, of Denver, Consulting Engineers also examined the water needs for this site in their report entitled "Water and Sanitary Sewer Study Metzler

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

Ranch Filing No. 9" dated August 15, 2001. Extrapolating the demand for lot 7 using a prorated demand per acre method, the max day demand for lot 7 was estimated at 51.6 gpm by TST.

Blue zone pressure is controlled via PRV which is set at an HGL of 6,510 Using this data and the building finished floor of 6279.25, static pressure at the building is anticipated at 230.75' or 100 psi. A pressure reducing valve is recommended for this building.

Fire flow tests were conducted at the site on March 15, 2010. The results are presented in Appendix C. Tests indicate a static pressure at the existing fire hydrant at the north corner of Woodlands Blvd. and Barranca Drive of 105 psi. This falls within the expected range based upon tank elevations discussed above.

The building is to be serviced by a 1-1/2" tap (equivalent to 4 SFEs) and meter. The allowable continuous design flow for a 1-1/2" meter is 80 gpm. A fixture unit meter sizing calc is included in the appendix. This calculation indicates required flow of 65.0 gpm. This value is less than the max allowable flow thru the proposed 1-1/2" meter.

Site irrigation needs will be met with a separate 3/4" tap (equivalent to one SFE) and irrigation meter. Calculated Irrigation demand for the largest zone is 10 gpm. The new irrigation meter shall be located adjacent to the sidewalk on Barranca Drive in an existing 10' utility easement. The new meter will be tapped off the existing 8" main in Barranca Drive. Irrigation demand shall occur during off peak hours.

Fire flow at the proposed building is a factor of both building size and construction rating. Total building area under roof is 27,400 sf with a type II rating. Required fire flow provided from the Town of Castle Rock Fire Department is 1,500 gpm for 2 hours for a fully sprinklered building. Fire flows were confirmed by the Town of Castle Rock Fire Department in a letter dated April 3, 2010 and included in appendix C.

System modeling parameters call for the examination of peak hour demand and max day plus fire flow. 5.1 gpm is indicated for the peak hour. Max day plus fire flow is 3.0 gpm plus 1,500 gpm for a total of 1503 gpm. Town regulations require a minimum residual pressure under max day plus fire flow conditions of 20psi. Peak hour requires a minimum residual of 35 psi. Max velocity with peak hour is 5 fps, and 15 fps for max day plus fire. The required Hazen Williams "C" factor is 120.

The Town of Castle Rock performed an Info Water Analysis of the water distribution system for the project. Results found that the distribution system appears to have sufficient capacity to support this new development.

Required water storage for the project consists of fire flow plus max day demand for the required fire duration. A flow of 1,500 gpm for 2 hours plus a max day of 3.0 gpm for 24 hr indicates storage required of 184,325 gallons. This is within the available storage of

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

reservoir 11 which has a capacity of 1.01 MG. Water will be moved via PRV from reservoir 11 to the site in a fire demand instance.

SANITARY SEWER SYSTEM ANALYSIS

Sanitary sewer service to Lot 7 is provided by an existing 6" service line entering the site from an existing sewer main in Stampede Drive. Town code does not permit the direct connection of a service line to a manhole as is the case with the existing 6" stub. However, a variance was granted 10/02/08 to permit this condition under Variance No. DS08-0036. Applying the land use, area of 1.36 ac and a commercial flow rate of 600 gpd/ac, a base flow of 816 gpd or 0.0013 cfs is calculated. Using the City and County of Denver Peak Flow formula, a peak factor of 5 is called for. Applying the peak factor to the average day flow, a design peak flow of 4,080 gpd or 0.0063 cfs is obtained.

Water fixture unit calcs indicate a peak flow of 65.0 gpm. Converting to cubic feet per second, 0.1448 cfs is calculated. This will be used to size the sewer service line capacity. Using a design peak flow of 0.1448 cfs, a 6" service line at 1.00% will provide adequate capacity with normal depth of 0.17 feet and velocity of 2.4 fps.

The Town of Castle Rock performed a downstream sanitary sewer analysis of the subject property to the PCWA facility. Based upon this analysis the segment analyzed appears to have sufficient capacity to support the new development. In the aforementioned TST Water and Sanitary Sewer Study, the peak flow from Filing No. 9 was estimated at 0.573 cfs. Adjusting for prorated area, Lot 7 was estimated to contribute 0.0857 cfs under the peak flow condition. The estimate calculated in this study indicates 0.0063 cfs for peak flow, less than that considered in the previous downstream analysis. Reference Appendix E for downstream analysis.

CONCLUSION

Based upon site specific development data, existing Town infrastructure is adequate to service the proposed 2 story memory care building located at Lot 7, Metzler Ranch Filing No. 9. Summarized results indicate:

Water Flows	1,632 gpd for the average day 4,325 gpd for the max day 7,344 gpd for the peak hour
Fire Flow	1,500 gpm for 2 hours
Waste Flows	816 gpd base flow 4,050 gpd peak flow

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

This project is in compliance with the 2006 Water Facilities Master Plan dated September 2006 and the Wastewater and Reclaimed Water Master Plans dated December 2003.

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

REFERENCES

Town of Castle Rock Public Works Regulations Chapters 14 and 15, 2/15/99
Town of Castle Rock 2006 Water Facilities Master Plan, September 2006
Town of Castle Rock Wastewater and Reclaimed Water Master Plans, December 2003
Water and Sanitary Sewer Study Metzler Ranch Filing No. 9, TST, of Denver, Consulting Engineers dated August 15, 2001

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

APPENDIX A – WATER DEMANDS

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

APPENDIX B – WATER STORAGE

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

APPENDIX C – WATER CAD

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010**

APPENDIX D – WASTEWATER FLOWS

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx**

**Revised July 12, 2010
APPENDIX E - DOWNSTREAM SANITARY SEWER CAPACITY**

The Town of Castle Rock performed a downstream sanitary sewer analysis of the subject property to the Plum Creek Interceptor. Based upon this analysis the segment analyzed appears to have sufficient capacity to support the new development.

**FINAL UTILITY REPORT
LOT 7, METZLER RANCH FILING NO. 9
WOODLANDS BLVD AND STAMPEDE DRIVE
CASTLE ROCK, COLORADO
PROJECT NO. FPD 10-00xx
Revised July 12, 2010
APPENDIX F - MAPS / PLANS**

Existing Phase III Drainage Report

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

Owner / Developer:

Woodlands Medical Center, LLC
96 Crown Point Place
Castle Rock, CO 80108
(303) 688-4796
Contact: Mr. Roger Bumgarner

Engineer:

Perception Design Group, Inc.
6732 West Coal Mine Road, Suite 419
Littleton, CO 80123
(303) 232-8088
Contact: Jerry W. Davidson, P.E.

Perception Design Job No. 2010-003

April 5, 2010
Revised June 15, 2010

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

TABLE OF CONTENTS

I.	Certifications Statements	1
II.	General Location and Description	2
II.	Drainage Basins and Sub-Basins	3
IV	Drainage Design Criteria	5
V.	Stormwater Management Facility Design	6
VI.	Conclusions	9
VII.	References	9
Appendix A	Hydrologic Computations	
Appendix B	Hydraulic Computations	
Appendix C	Water Quality Enhancement BMP's	
Appendix D	Referenced Information	
Back Pocket	Drainage Plan and Details	

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

ENGINEER'S STATEMENT:

I affirm that this report and plan for the Phase III drainage design of Lot 7, Metzler Ranch Filing No. 9 was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Castle Rock Drainage Design and Technical Criteria for the owners thereof. I understand that the Town of Castle Rock does not and will not assume liability for drainage facilities designed by others.

Jerry W. Davidson, P.E.
Colorado Reg. #30226

OWNER / DEVELOPER'S STATEMENT:

"Woodlands Medical Center, LLC hereby certifies that the drainage facilities for Lot 7, Metzler Ranch Filing No. 9 shall be constructed according to the design presented in this report. I understand that the Town of Castle Rock does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that the Town of Castle Rock reviews drainage plans pursuant to the Municipal Code; but cannot, on behalf of the Owner or Developer, guarantee that final drainage design review will absolve the Developer and/or their successors and/or assigns of future liability for improper design."

Owner / Developer

TOWN OF CASTLE ROCK APPROVALS:

Utilities Department

Date

Development Services

Date

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

I. GENERAL LOCATION AND DESCRIPTION

A. Site Location

1. A vicinity map showing the location of the proposed property is included in Appendix D.
2. The property is known as Lot7, Metzler Ranch Filing No. 9, County of Douglas, Colorado. It is located in the Northeast quarter of Section 35, Township 7 South, Range 67 West of the Sixth Principal Meridian.
3. The triangular site is bounded on the south by Woodlands Boulevard, the northeast by Barranca Drive, and the west by Stampede Drive. All of the streets are asphalt with curb, gutter, and sidewalk.
4. The site is zoned commercial. Similar commercial uses lie across the right of way to the north and east. Metzler Ranch Filing No. 1, a residential subdivision lies to the west.

B. Description of Property and Development

1. Area = 1.36 acres (59,327 square feet)
2. The site is currently covered in native grasses and slopes generally from the northeast toward the southwest at grades around three percent.
3. A print of the NRCS soils map for the property is included in Appendix D. The soils are BrB, Bresser sandy loam, hydrologic soil group B, which makes up the majority of the site. A very small area in the extreme northwest corner is indicated to be KtE, Kutch sandy loam, hydrologic soil group D. For this report hydrologic soil group B will be used for the hydrologic calculations.
4. Major and Minor Drainageways, along with existing facilities and previously approved master drainage studies, are described in the Metzler Ranch Filing No. 9 Final Drainage Study prepared by TST, July 2002 (TST Filing 9 Report).
5. The site does not appear to be within a regulatory floodplain. Refer to the Firmette prepared for this report in Appendix D.
6. There are no irrigation facilities or canals on this site.
7. The proposed site will accommodate a new 27,400 square foot building with a parking area and associated landscaping. The intended use for the proposed building is an extended stay medical facility.

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Drainage Basins

1. Major Drainage Basins are referenced in the TST Filing 9 report contained in Appendix E of this report. According to that report the area was previously studied as part of The Metzler Ranch Master Drainage Study prepared by Inter-Mountain Engineering, 1997. Further, the TST report goes on to say that conveyance elements for Filing 9 lie within platted easements to a regional detention pond within Filing 1 as described in the Final Drainage Report for Metzler Ranch Filing No. 1, prepared by Rocky Mountain Consultants, 1998.
2. Metzler Ranch Filing No. 9 is a commercial subdivision. Filing No. 1, to the west, is residential.
3. Master Planning for the major basin of which this project is a part was done in the Metzler Ranch Master Drainage Study, Inter-Mountain Engineering, 1997.
4. The proposed development has no adverse impact to the existing drainage facilities. Lot 7 complies with anticipated development in that the calculated percentage of landscaping as shown Final PD Site Plan is greater than the 8% prescribed in the TST report. In fact it is much less as shown on the runoff coefficient worksheet in Appendix B.
5. There is no runoff introduced to Lot 7 from off-site basins.

B. Minor Drainage Basins

1. Basin Descriptions, refer to the Drainage Plan in the Back Pocket of this report for basin delineation.

Basin A is a 0.30 acre area at the northernmost part of the site. It is comprised of roof, landscaped area, sidewalk, and patio. Runoff is conveyed off of the roof and piped to Design Point 1 where it is released into Storm Inlet-1 and into on-site storm sewer toward the porous landscape detention area in the southernmost portion of the site.

Basin B is 0.14 acres and is made up of the roof and interior courtyard of the building. Runoff is captured internally and piped to Storm Manhole-1 at Design Point 2 where it enters storm sewer and is directed toward the porous landscaped detention area in the south part of the site. The courtyard is completely contained inside the building walls. The courtyard area should be designed by the architect to provide adequate freeboard during substantial runoff events. Additionally, the conveyance pipe and inlets must be regularly maintained and inspected to prevent overflow damage to the building. A type

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

C inlet with close mesh grate is selected for this area. It provides 5.2 cfs of capacity while 0.85 cfs is indicated.

Basin C is 0.04 acres and represents the westernmost portion of the roof. Runoff from this area is collected by gutters and downspouts and conveyed toward Design Point 2 via private underground storm sewer where it enters Storm Manhole-1 and into storm sewer where it is directed toward the porous landscaped detention area in the south part of the site.

Basin D is 0.02 acres and represents southwest roof area of the proposed building. Runoff is piped to Design Point 3 where it enters Storm MH-2 and into storm sewer that directs the runoff toward the porous landscape detention in the south part of the site.

Basin E is 0.35 acres and lies at the easternmost part of the site. It is made up mostly of paved parking area but includes walks, roof, and landscape. Runoff is directed toward Design Point 5 where it enters Storm Inlet-3 and is released into storm sewer that directs runoff south toward the porous landscaped detention area.

Basin F is 0.21 acres and is made up of the drive and parking area southeast of the proposed building. It is made up of pavement, sidewalk, landscaping, and roof. Runoff from this area is directed toward Design Point 6 where it is collected by Storm Inlet-4 and released into storm sewer that directs runoff toward the porous landscaped detention area.

Basin G is 0.04 acres and lies at the southernmost part of the site. It is the porous landscaped detention area. Design Point 4 lies at the west end of the basin and designates the point where runoff enters the basin from storm sewer coming from the west side. Similarly, Design Point 7 represents the point where runoff enters the basin from the east side. Design Point 8, at the southernmost part of the basin represents the point where total developed runoff exits the site thru a Type C inlet.

Basin U1 is 0.19 acres and represents runoff from the landscaped area and part of the entry drive along the northeast side of Stampede Drive. Runoff from this basin is released without passing thru the water quality facility and is conveyed in curb and gutter south toward Design Point 9 where it enters an existing storm sewer inlet.

Basin U2 is 0.07 acres and represents a landscaped area along the northwest side of Woodlands Boulevard. Modest runoff from this area enters curb and gutter in the roadway and is conveyed west to the existing inlet at Design Point 9.

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

2. The proposed site will contain a 27,400 square foot residential medical building with associated parking area and landscape.
3. No irrigation facilities will be impacted by this development.
4. No off-site flows enter the site.

Runoff leaving the site is expected to be much less than anticipated since the imperviousness is less than anticipated in the TST Filing 9 report. Runoff will be directed in storm sewer or in curb and gutter toward the existing storm sewer inlet at Design Point 9 which is at the corner of Woodlands Boulevard and Stampede Drive.

A **Basin Summary Table** has been included on the Drainage Plan in the back pocket of this report.

III. DRAINAGE DESIGN CRITERIA

A. Regulations

1. The Town of Castle Rock Storm Drainage Design and Technical Criteria Manual was used as the primary source for drainage design criteria.
2. The Urban Drainage and Flood Control District (UDFCD) Criteria Manual Volumes I, II, and III were also used as part of this design.

B. Drainage Studies, Master Plans, Site Constraints

1. The grading and storm sewer for this project was designed to comply with the Final Drainage Report for Metzler Ranch Filing No. 9 by TST of Denver Consulting Engineers. Parameters for development within Filing 9 were set forth in the TST Filing 9 report, excerpts of which are contained in the Appendix.
2. As referenced in the TST Filing 9 report, The Metzler Ranch Master Drainage Study, by Inter-Mountain Engineering, 1997 and The Final Drainage Report for Metzler Ranch Filing No. 1, by Rocky Mountain Consultants, 1998 are both integral in accommodating the proposed project.
3. The drainage design for this project complies with previous studies.
4. The impacts of this site to existing stormwater management facilities are less than anticipated since the imperviousness calculated for this site is less than that anticipated in previous reports.

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

C. Hydrology

1. Developed runoff was calculated using the rational method ($Q=CIA$) as described in the Town Criteria.
2. Calculations were done for the 5-year, and 100-year rainfall events. Results can be found in Appendix A.
3. Point rainfalls from the Town Criteria were used in conjunction with UDFCD Equations RA-3 to determine rainfall intensities.
4. Detention storage was not part of this design. Detention is provided in a regional detention pond in Metzler Ranch Filing No. 1.
5. Detention release rates were not calculated as part of this design. Detention is provided in a regional detention pond in Metzler Ranch Filing No. 1.

D. Hydraulics

1. Storm sewer was designed using Manning's Equation for open channels. Since the runoff is minor and the pipe outlets are not submerged there is no pressure flow exhibited within the storm sewer pipes. Hydraulic grade lines are coincident with water surfaces within the pipes.
2. Hydraulic grade lines are coincident with water surfaces within the pipes since runoff is small. Manning's equation for open channels was used to determine hydraulic grade lines. In all cases, the hydraulic grade line is equal to the normal depth of flow.
3. Water surface profiles were calculated using Manning's equation.
4. No detention pond routing was required for this design.

E. Water Quality Management

1. The project will include a porous landscape detention (PLD) basin in the south part of the site. Since detention for 10-year and 100-year events is provided off-site, these larger storms will be allowed to pass into a Type C inlet in the basin and released into storm sewer within the right-of-way. For extremely large storms an emergency overflow is provided to direct runoff into the right-of-way.
2. The design procedure for a PLD was taken from the UDFCD Criteria, Volume III. A design form summarizing the parameters is included in Appendix C.

IV. STORMWATER MANAGEMENT FACILITY DESIGN

A. Stormwater Conveyance Facilities

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

1. Runoff will be conveyed generally south, overland and in storm sewer to a porous landscape detention pond before being released into the storm sewer in the right-of-way.
2. Runoff is conveyed overland and in curb and gutter to storm sewer inlets located at various low points around the perimeter of the site. Stormwater collected in the inlets is released into storm sewer that directs runoff south toward a porous landscape detention basin at the south end of the site. From there stormwater is either allowed to infiltrate into the ground or is piped to an existing storm inlet at the corner of Stampede Drive and Woodlands Boulevard. Once in the right-of-way storm water is conveyed to a regional detention facility located in Metzler Ranch Filing No. 1.
3. The exterior storm sewer is all 18-inch diameter reinforced concrete pipes, class 3 or better, which represents the minimum size allowed by Town criteria. The available capacity is greater than the developed runoff therefore the hydraulic grade line falls within the pipe. Manning's equation can be used to check the storm sewer and generate hydraulic grade line information. The pipe material under the building to inlet 2 will be dictated by the building department code.
4. There are two branches of storm sewer that terminate in the porous landscape detention basin. Rip-rap outfall protection will be used in each instance to dissipate energy. The outlet structure from the PLD is piped to an existing inlet.
5. The outfall from the site is piped to an existing storm inlet at the corner of Stampede Drive and Woodlands Boulevard. According to the TST Filing 9 report the runoff will be conveyed thru existing storm sewer within Metzler Ranch Filing 1 to a regional detention facility.
6. There are no significant channels or swales that are part of this project that required special design.
7. Street capacities were not considered as part of this design.
8. The porous landscaped detention basin was placed within an easement. The grading at the emergency overflow was adjusted to accommodate access from the right-of-way into the basin.
9. From the previous reports it appears that the downstream facilities are adequate to accommodate runoff from this project. Especially since the reduced imperviousness will result in lower peak runoff than anticipated.

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

10. No lot-to-lot drainage was considered as part of this project.

B. Stormwater Storage Facilities

A detention pond is not part of this project. Detention is accommodated off-site in a regional detention pond located in Metzler Ranch Filing No. 1.

C. Water Quality Enhancement Best Management Practices

1. The design will include a Porous Landscape Detention Basin (PLD) at the south part of the site. Runoff will collect at low points around the site and be conveyed in storm sewer toward the basin. The basin is designed and sized to accommodate the tributary area of 1.14 acres. The remainder of the property is in Basins U1 and U2 which are minor and release into the right-of-way.
2. Since the soils on the site are predominantly of Hydrologic Soil Group B the water quality capture volume (WQCV) may be allowed to infiltrate. However, due to potential water damage due to infiltration on the sub grade of the adjacent street, under-drains will be provided within the filter media. For storms in excess of the WQCV an inlet is provided within the basin to collect the runoff and direct it, by way of a storm sewer pipe, to an existing inlet at the corner of Stampede Drive and Woodlands Boulevard. From there runoff will proceed, as described in the TST Filing 9 Report, to the regional drainage facility located in Metzler Ranch Filing No. 1.
3. This project does not require additional downstream water quality facilities.
4. The Porous Landscape Detention requires maintenance in accordance with UDFCD recommendations. In summary, expected maintenance items include:
 - a. Lawn mowing and vegetative care – routinely based on landscaper recommendations.
 - b. Inspections – periodically based on hydraulic performance.
 - c. Debris and litter removal – as needed depending on aesthetic requirements.
 - d. Landscaping removal and replacement – every 5 to 15 years, depending on infiltration rates needed to drain the WQCV completely in 24 hours or less. When water remains in the pond in

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

excess of the 24 hour drain time, consideration should be given to removal and replacement of the filter soil. At the time of CD preparation, an operation and maintenance manual will be provided for the PLD facility.

D. Floodplain Modification

No floodplain modifications are required by this project.

E. Additional Permitting Requirements

No additional permitting requirements are anticipated.

F. General

Tables, forms, figures, etc. are included in the various Appendices adjacent to and within the appropriate sections.

V. CONCLUSIONS

A. Compliance with Standards

The drainage design for this project complies with criteria set forth by the Town of Castle Rock and the Urban Drainage and Flood Control District. Further, the site complies with parameters set forth in the Final Drainage Report for Metzler Ranch Filing No. 9 prepared by TST Consulting Engineers. Specifically, the landscaped area for individual sites required in the TST Filing 9 report, 8%, was exceeded. Refer to the runoff coefficient calculation in the Appendix. A lower imperviousness results in lower runoff rates which benefits downstream drainage facilities.

B. Variances

No variances are requested for this project.

C. Drainage Concept

The drainage design for the proposed development appears to have no adverse impact to the existing drainage facilities. Lot 7 complies with anticipated development in that the calculated percentage of landscaping as shown Final PD Site Plan is greater than the 8% prescribed in the TST Filing 9 Report. In fact it is much less as shown by the runoff coefficient worksheet in Appendix B.

In addition, the incorporation of the PLD will reduce the runoff from the site for smaller storms and will enhance the storm water quality for all storms further enhancing the effectiveness of the site.

VI. REFERENCES

PHASE III DRAINAGE REPORT
Lot 7, Metzler Ranch Filing No. 9
(Metzler Memory Care)
Castle Rock, Colorado
CD10-XXXX

1. Flood Insurance Rate Map #08035C0188F, Douglas County, Colorado and Incorporated Areas. Federal Emergency Management Agency. September 30, 2005.
2. Soil Survey of Castle Rock Area, Colorado, United States Department of Agriculture. November, 1974.
3. Town of Castle Rock Public Works Regulations. Castle Rock, Colorado. February 12, 1999.
4. Urban Storm Drainage Criteria Manual Volumes 1, 2 and 3, Denver Colorado. Revised April, 2008.
5. Town of Castle Rock Storm Drainage Design and Technical Criteria Manual. Latest on-line edition as of April 2010.
6. Phase III Drainage Report for Metzler Ranch Filing No. 9. by TST Inc of Denver Consulting Engineers, July 26, 2002

Appendix A
Hydrologic Computations

Weighted Runoff Coefficients - NCRS Type B Soil

Using UDFCD Equation - RO-6 and RO-7

Date: 15-Jun-10

Project: Metzler Memory Care

By: J Holley

	%
	Impervious
Roof	90%
Landscape	0%
Pavement	100%

Soil: Bresser, BrB, Hydrologic Soil Group B

PROPOSED SITE**Weighted Runoff Coeff**

Basin	Roof	Landscape	Pavement	Total	C2	C5	C10	C100	% Impervious
		Area in Acres							
A	0.08	0.17	0.05	0.30	0.24	0.30	0.36	0.50	41%
B	0.10	0.02	0.02	0.14	0.55	0.58	0.61	0.69	79%
C	0.04	0.00	0.00	0.04	0.71	0.73	0.75	0.81	90%
D	0.02	0.00	0.00	0.02	0.71	0.73	0.75	0.81	90%
E	0.05	0.09	0.21	0.35	0.48	0.52	0.56	0.64	73%
F	0.07	0.01	0.13	0.21	0.74	0.76	0.78	0.83	92%
G	0.00	0.04	0.00	0.04	0.02	0.08	0.15	0.35	0%
Subtotal:	0.36	0.33	0.41	1.10	0.42	0.46	0.51	0.60	67%
U1	0.00	0.12	0.07	0.19	0.21	0.28	0.35	0.49	37%
U2	0.00	0.07	0.00	0.07	0.02	0.08	0.15	0.35	0%

Table RO-5— Runoff Coefficients, *C*

Percentage Imperviousness	Type C and D NRCS Hydrologic Soil Groups					
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
0%	0.04	0.15	0.25	0.37	0.44	0.50
5%	0.08	0.18	0.28	0.39	0.46	0.52
10%	0.11	0.21	0.30	0.41	0.47	0.53
15%	0.14	0.24	0.32	0.43	0.49	0.54
20%	0.17	0.26	0.34	0.44	0.50	0.55
25%	0.20	0.28	0.36	0.46	0.51	0.56
30%	0.22	0.30	0.38	0.47	0.52	0.57
35%	0.25	0.33	0.40	0.48	0.53	0.57
40%	0.28	0.35	0.42	0.50	0.54	0.58
45%	0.31	0.37	0.44	0.51	0.55	0.59
50%	0.34	0.40	0.46	0.53	0.57	0.60
55%	0.37	0.43	0.48	0.55	0.58	0.62
60%	0.41	0.46	0.51	0.57	0.60	0.63
65%	0.45	0.49	0.54	0.59	0.62	0.65
70%	0.49	0.53	0.57	0.62	0.65	0.68
75%	0.54	0.58	0.62	0.66	0.68	0.71
80%	0.60	0.63	0.66	0.70	0.72	0.74
85%	0.66	0.68	0.71	0.75	0.77	0.79
90%	0.73	0.75	0.77	0.80	0.82	0.83
95%	0.80	0.82	0.84	0.87	0.88	0.89
100%	0.89	0.90	0.92	0.94	0.95	0.96
TYPE B NRCS HYDROLOGIC SOILS GROUP						
0%	0.02	0.08	0.15	0.25	0.30	0.35
5%	0.04	0.10	0.19	0.28	0.33	0.38
10%	0.06	0.14	0.22	0.31	0.36	0.40
15%	0.08	0.17	0.25	0.33	0.38	0.42
20%	0.12	0.20	0.27	0.35	0.40	0.44
25%	0.15	0.22	0.30	0.37	0.41	0.46
30%	0.18	0.25	0.32	0.39	0.43	0.47
35%	0.20	0.27	0.34	0.41	0.44	0.48
40%	0.23	0.30	0.36	0.42	0.46	0.50
45%	0.26	0.32	0.38	0.44	0.48	0.51
50%	0.29	0.35	0.40	0.46	0.49	0.52
55%	0.33	0.38	0.43	0.48	0.51	0.54
60%	0.37	0.41	0.46	0.51	0.54	0.56
65%	0.41	0.45	0.49	0.54	0.57	0.59
70%	0.45	0.49	0.53	0.58	0.60	0.62
75%	0.51	0.54	0.58	0.62	0.64	0.66
80%	0.57	0.59	0.63	0.66	0.68	0.70
85%	0.63	0.66	0.69	0.72	0.73	0.75
90%	0.71	0.73	0.75	0.78	0.80	0.81
95%	0.79	0.81	0.83	0.85	0.87	0.88
100%	0.89	0.90	0.92	0.94	0.95	0.96

SF2

Importance:

[illegible]

**STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD)**

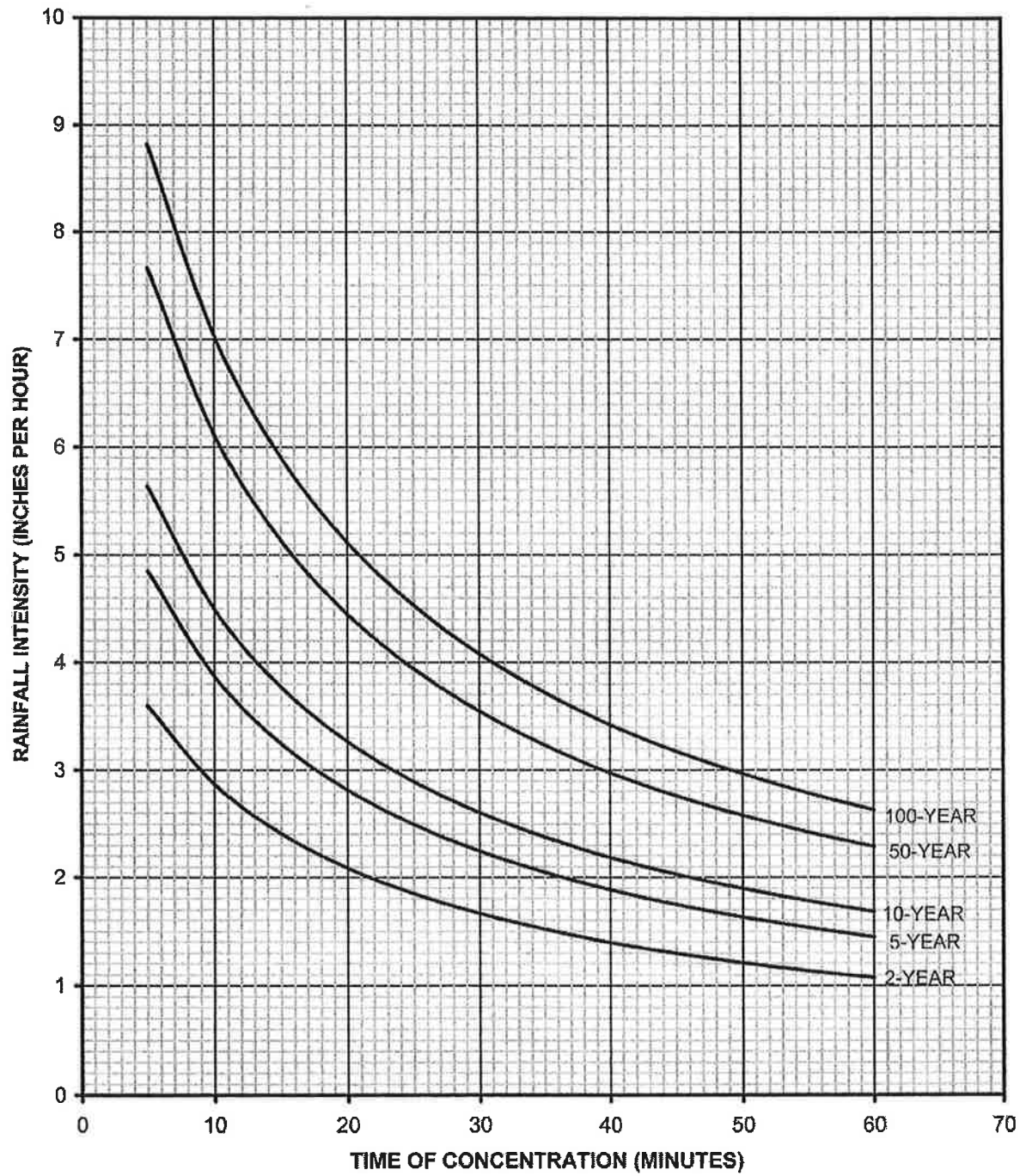
Calculated by:	J Holley	Job No:	
Date:	15-Jun-10	Project:	Metzler Memory Care
Checked by:		Design Storm:	100-yr

[illegible]

Job No:

Project: Metzler Memory Care

FIGURE 6-1
RAINFALL INTENSITY-DURATION CURVE
TOWN OF CASTLE ROCK



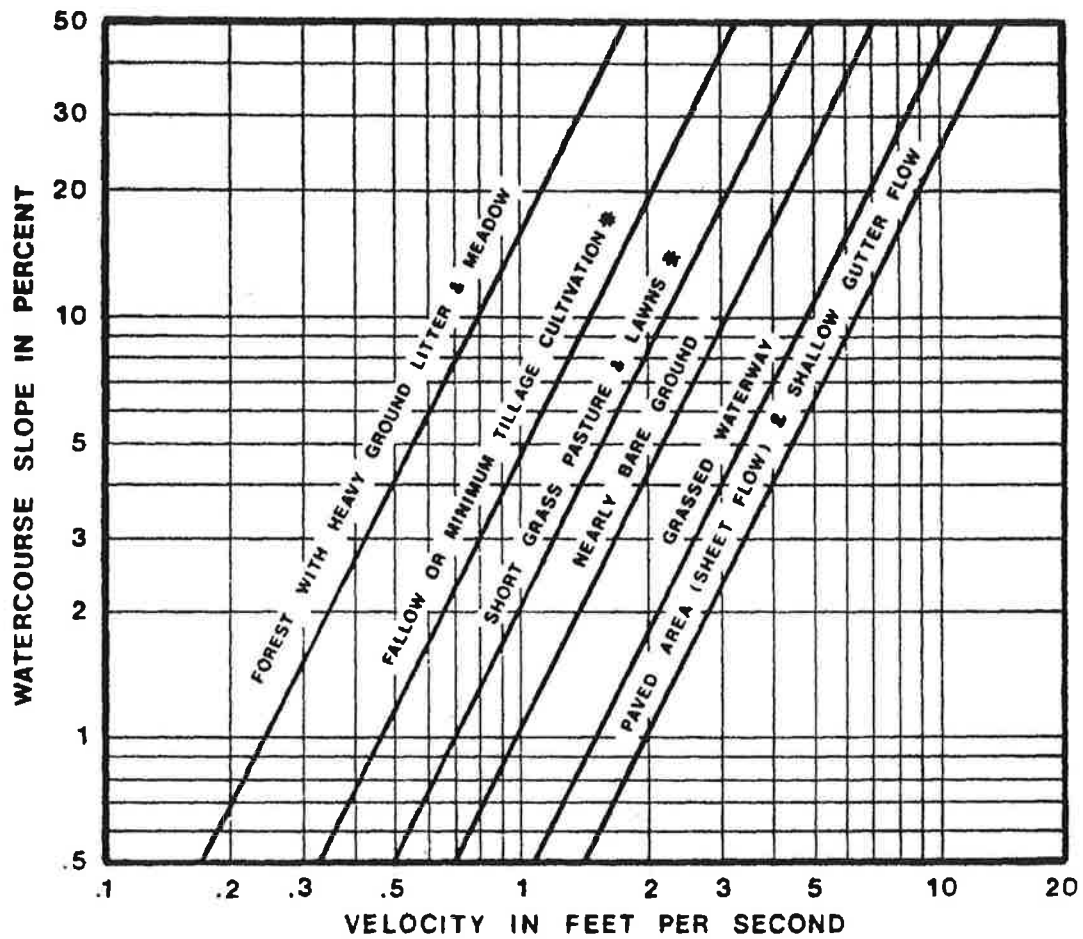


Figure RO-1—Estimate of Average Overland Flow Velocity for Use With the Rational Formula

TABLE 6-1
1-HOUR POINT RAINFALL VALUES FOR
THE TOWN OF CASTLE ROCK (INCHES)

2- YR	5-YR	10-YR	50-YR	100-YR
1.06	1.43	1.66	2.26	2.60

The one-hour rainfall depths are the basis of the Town's intensity-duration rainfall curves and are used to formulate design storm distributions.

- 6.1.2 Intensity-Duration Curves.** Rainfall intensity based on storm duration for a variety of storm return periods can be found on Figure 6-1 at the end of this chapter. These curves were developed using distribution factors provided in the NOAA Atlas and also provided in Table RA-4 of the *UDFCD Manual*. These Intensity-Duration curves are based on Equation RA-3 in the Rainfall Section of the *UDFCD Manual*.
- 6.1.3 Six-hour Rainfall.** In order to use the Colorado Urban Hydrograph Procedure (CUHP), 2-, 3- or 6-hour rainfall distributions are required, depending on watershed area. Table RA-1 in the *UDFCD Manual* summarizes storm durations, area adjustments, and incremental rainfall depths to be used in CUHP based on watershed area. The UD-Raincurve Spreadsheet included in the *UDFCD Manual* shall be used to generate the rainfall distribution curves necessary for a CUHP model. In order to generate these distribution curves, the 1-hour and 6-hour rainfall depths for the design return periods are necessary. Since the Town of Castle Rock is not located within UDFCD boundaries, the rainfall depth-duration-frequency curves provided in the *UDFCD Manual* do not provide rainfall values for the entire Town. Therefore these values are provided in these *Criteria*. The 1-hour point values can be found in Table 6-1 of this chapter. The 6-hour point values are as follows:

TABLE 6-2
6-HOUR POINT RAINFALL VALUES FOR
THE TOWN OF CASTLE ROCK (INCHES)

2- YR	5-YR	10-YR	50-YR	100-YR
1.5	2.0	2.2	3.0	3.4

The UD-Raincurve spreadsheet shall be used for all portions of the Town. Once the rainfall distribution curves are generated using the UDFCD UD-Raincurve Spreadsheet, the CUHP model is to be set up following the procedures provided in the Runoff chapter in Volume 1 of the *UDFCD Manual*.

6.2 Selecting a Method to Estimate Runoff

Two primary methods for estimating storm runoff, peak flow rates and total volumes are used in the Town.

- Rational Method

Perception Design Group, Inc.

6732 West Coal Mine Ave., Suite 419

Littleton, Colorado 80123

(303) 232-8088 Fax (303) 232-5255

DATE 15-Jun-10

JOB # 2010-003

Project: Metzler Memory Care

STORM SEWER DESIGN -- MANNING'S EQUATION

100-YEAR STORM

Pipe	Pipe Location	Q req'd (cfs)	Slope (%)	n	Diam (in)	Area sf	Hyd Rad	Q calc (cfs)	V (Full Flow) (fps)	Friction Slope (%)
18"RCP	IN1-MH1	1.31	0.53	0.013	18	1.77	0.3750	7.67	0.74	0.02
18"RCP	MH1-MH2	2.39	0.52	0.013	18	1.77	0.3750	7.60	1.35	0.05
18"RCP	MH2-PLD	2.47	0.91	0.013	18	1.77	0.3750	10.05	1.40	0.06
18"RCP	IN3-IN4	1.94	1.00	0.013	18	1.77	0.3750	10.53	1.10	0.03
18"RCP	IN4-PLD	3.36	3.13	0.013	18	1.77	0.3750	18.63	1.90	0.10

All flow is non-pressure

HGL = normal depth

Appendix B

Hydraulic Computations

Inlet Sizing Summary

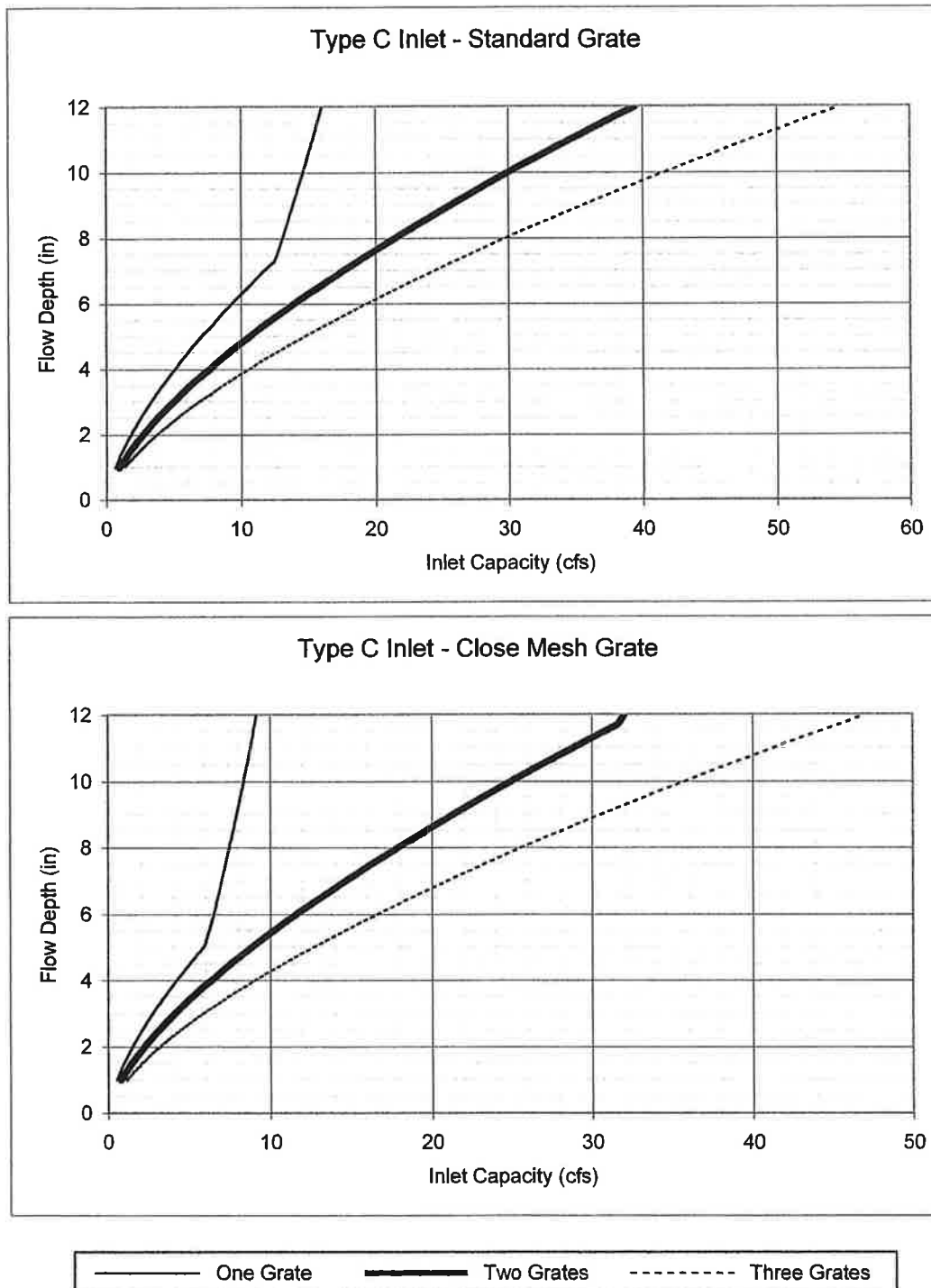
Date: 16-Jun-10
Project: Metzler Memory Care
By: J Holley

Design Point	Inlet Designation	Condition	Local Runoff (cfs)	Inlet type and size	Design Capacity (cfs)	Check?
1	Stm -In 1	Sump, 0.50' Ponding	1.31	Type C w/Close Mesh Grate	6.2	Yes
3	Stm -In 2	Sump, 0.50' Ponding	0.85	Type C w/Close Mesh Grate	5.2	Yes
5	Stm -In 3	Sump, 0.50' Ponding	1.94	3-foot Type 16 Combo	5.2	Yes
6	Stm -In 4	Sump, 0.50' Ponding	1.55	3-foot Type 16 Combo	5.2	Yes
8	Outlet Structure	Sump, 0.50' Ponding	5.90	Type C w/Close Mesh Grate	6.2	Yes

Capacities were taken from Chapter 8 of the Town of Castle Rock Storm Drainage Design Criteria.

Chapter 8. Inlets

**FIGURE 8-9, INLET CAPACITY CHART SUMP CONDITIONS
AREA (TYPE C) INLET**

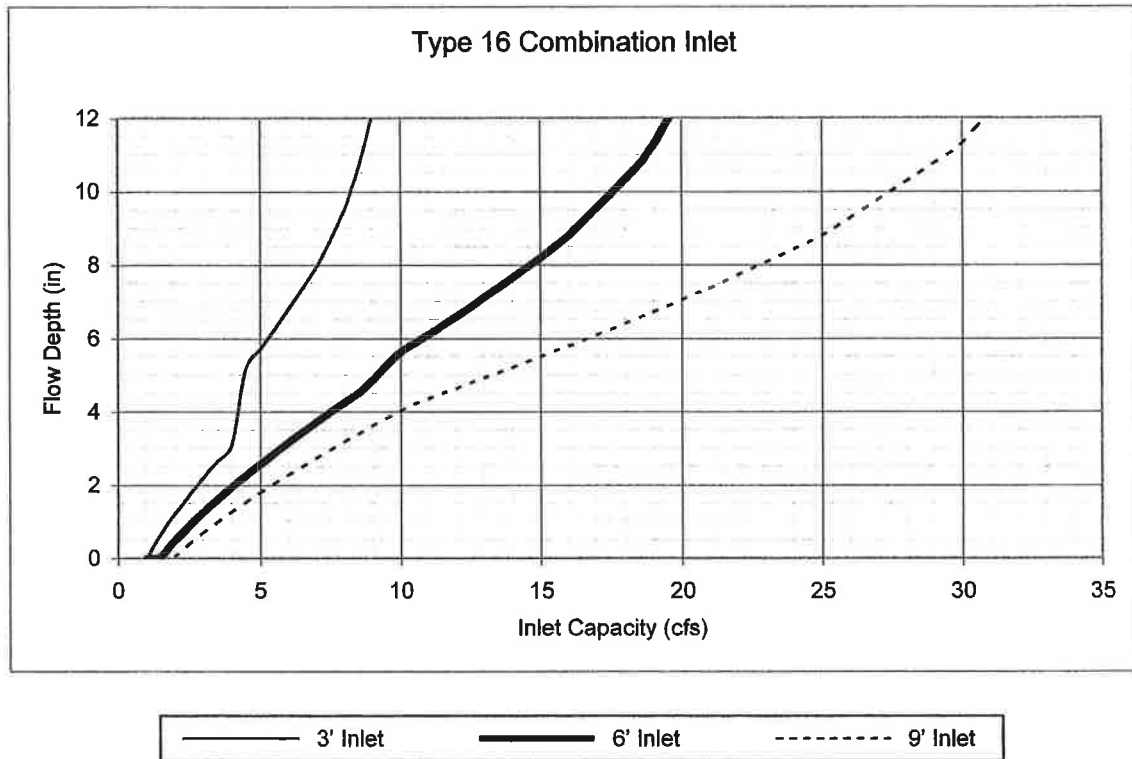


Notes:

1. The Town of Castle Rock standard inlet parameters must apply to use these charts.

Chapter 8. Inlets

**FIGURE 8-11, INLET CAPACITY CHART SUMP CONDITIONS
COMBINATION (TYPE 16) INLET**



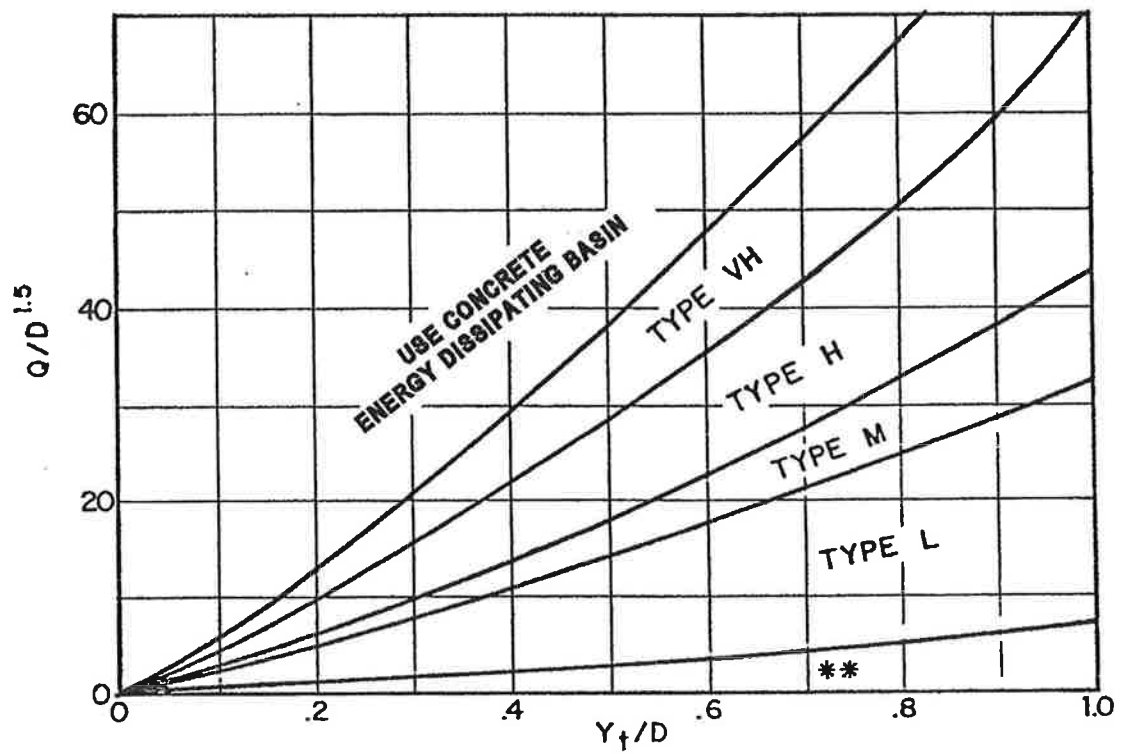
Notes:

1. The Town of Castle Rock standard inlet parameters must apply to use this chart.

Rip-Rap Outfall Design

Date: 2-Apr-10
Proj: Metzler Memory Care

Designation	Pipe Diameter (in)	Peak (1) Discharge (cfs)	Yt	Allowable Channel							At (Q/V)	Min L (3D)	Calc Length xp*(A/Vt-V (10D)	Max L (10D)	Length Used	Width	Depth	Remarks	
				Yt / D	Q / D1.5	Type (2)	d50 (3) (in)	Q/D2.5	Expansion Factor (4)	Channel Velocity (fps)									
DP-4	18	1	3.10	0.5	0.3333	1.7	L	9	1.1	6.7	5	0.6	4.5	-1.7	15.0	4.5	4.5	1.5	
DP-7	18	1	2.89	0.63	0.42	1.6	L	9	1.1	6.7	5	0.6	4.5	-3.9	15.0	4.5	4.5	1.5	



Use D_0 instead of D whenever flow is supercritical in the barrel.
 ** Use Type L for a distance of $3D$ downstream.

FIGURE MD-21

Riprap Erosion Protection at Circular Conduit Outlet Valid for $Q/D^{2.5} \leq 6.0$

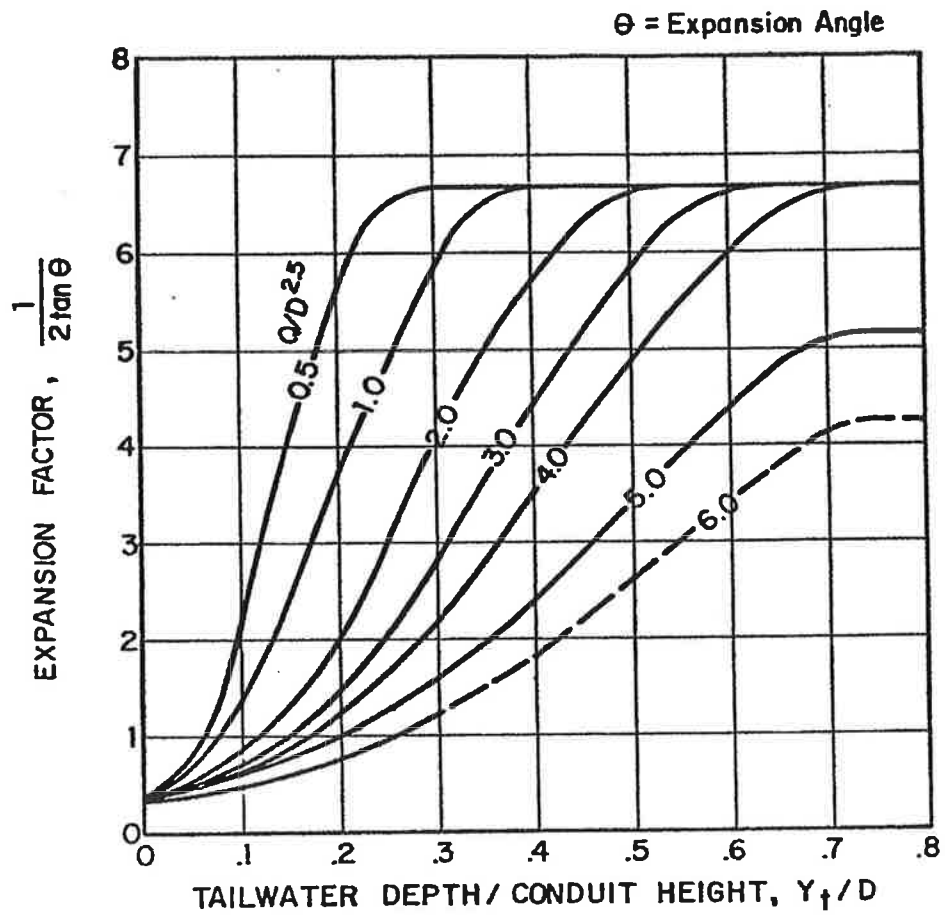


FIGURE MD-23
Expansion Factor for Circular Conduits

Appendix C

Water Quality Enhancement BMP's

Design Procedure Form: Porous Landscape Detention (PLD)

Designer: Jeffrey Holley, PE

Company: Sterling Design Associates, llc

Date: April 2, 2010

Project: Metzler Memory Care

Location: Castle Rock, Colorado

1. Basin Storage Volume

($I_a = 100\%$ if all paved and roofed areas u/s of PLD)

A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)

B) Contributing Watershed Area Including the PLD (Area)

C) Water Quality Capture Volume (WQCV)

($WQCV = 0.8 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I)$)

D) Design Volume: $Vol_{PLD} = (WQCV / 12) * Area$

$I_a = \underline{67.00} \%$

$i = \underline{0.67}$

Area = 49,660 square feet

WQCV = 0.21 watershed inches

Vol = 868 cubic feet

2. PLD Surface Area (A_{PLD}) and Average Depth (d_{av})

(from 867.74 square feet to 1735.47 square feet)

($d_{av} = (Vol / A_{PLD})$, Min=0.5', Max=1.0')

$A_{PLD} = \underline{1,314}$ square feet

$d_{av} = \underline{0.66}$ feet

3. Draining of PLD (Check A, or B, or C, answer D)

Based on answers to 3A through 3D, check the appropriate method

A) Check box if subgrade is heavy or expansive clay

B) Check box if subgrade is silty or clayey sand

C) Check box if subgrade is well-draining soil

D) Check box if underdrains are not desirable or if underdrains are not feasible at this site.

E) Does tributary catchment contain land uses that may have petroleum products, greases, or other chemicals present, such as gas station, hardware store, restaurant, etc.?

yes no
☐ ☒

☒ Infiltration to Subgrade with Permeable Membrane: 3(C) checked and 3(E) = no

☐ Underdrain with Impermeable Liner: 3(A) checked or 3(E) = yes

☐ Underdrain with Woven Geotextile Fabric (See note 1): 3(B) checked and 3(E) = no

☐ 16-Mil. Impermeable Membrane with No Underdrain: 3(D) checked - Evapotranspiration only

Other: _____

4. Sand/Peat Mix and Gravel Subbase (See Figure PLD-1)

A) Heavy or Expansive Clay (NRCS Group D Soils) Present; Perforated HDPE Underdrain Used.

B) Silty or Clayey Sand (NRCS Group C Soils) Present; Perforated HDPE Underdrain Used.

C) No Potential For Contamination And Well-Draining (NRCS Group A or B Soils) Are Present; Underdrains Eliminated.

D) Underdrains Are Not Desirable Or Are Not Feasible At This Site.

E) Other: _____

☐ 18" Minimum Depth Sand-Peat Mix with 8" Gravel Layer. 16-Mil. Impermeable Liner and a 3" to 4" Perforated HDPE Underdrain.

☐ 18" Minimum Depth Sand-Peat Mix with 8" Gravel Layer and a 3" to 4" Perforated HDPE Underdrain w/ Non-Woven Pemeable Membrane.

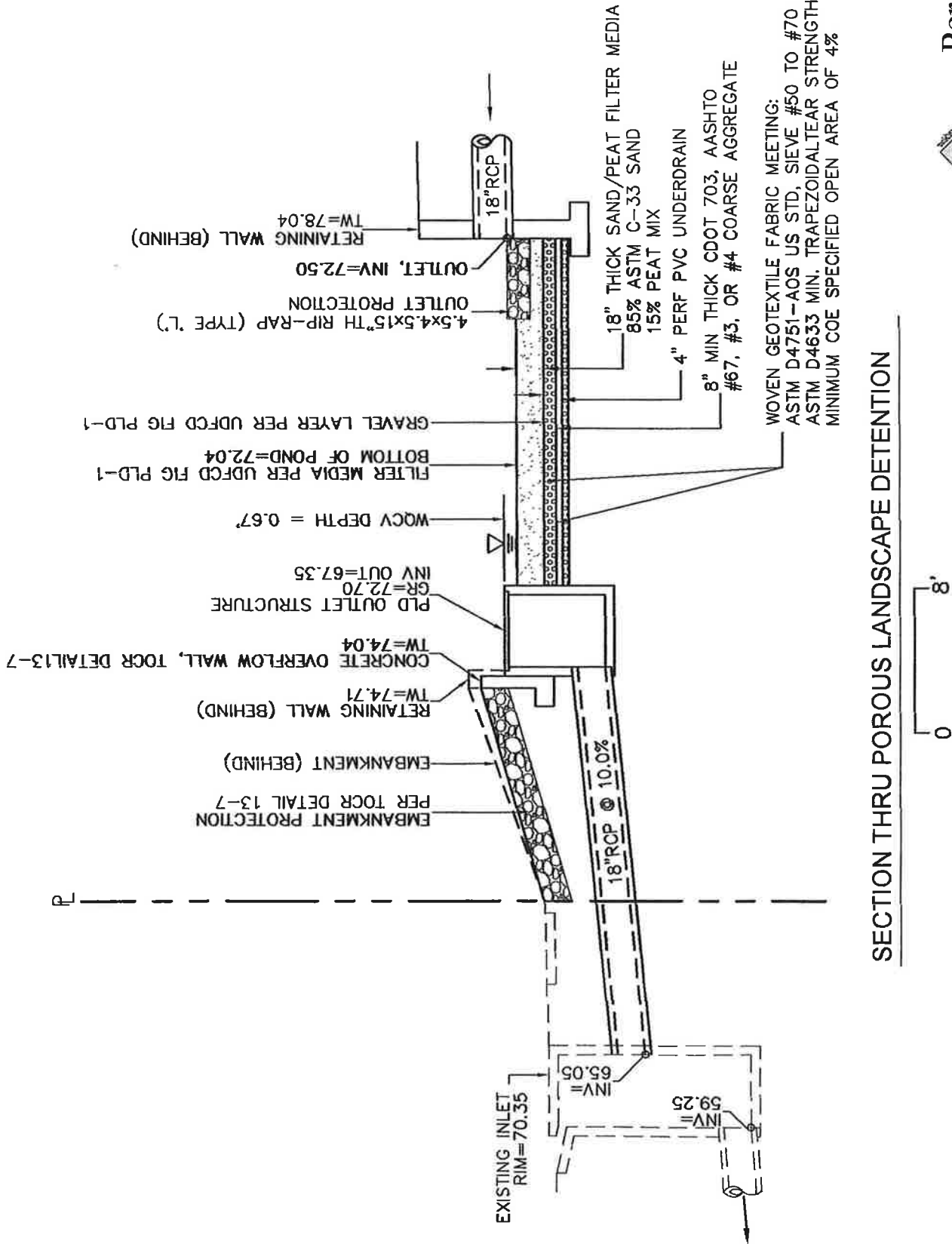
☒ 18" Minimum Depth Sand-Peat Mix with Non-Woven Pemeable Membrane and No Underdrain (Direct Infiltration).

☐ 18" Minimum Depth Sand-Peat Mix with An Additional 18" Minimum Layer Sand-Peat Mix or Sand-Class 'A' Compost Bottom Layer (Total Sand-Peat Depth of 36"). 16-Mil. Impermeable Liner Used.

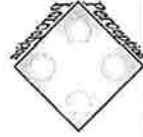
Other: _____

Notes: 1) Woven geotextile fabric shall meet ASTM D4751 - AOS U.S. Std. Sieve #50 to #70, ASTM D4633 min. trapezoidal tear strength 100 x 60 lbs, min. COE specified open area of 4%.

2) It is critical that vegetation planting be in accordance with USDCM V3 guidelines for PLD's



SECTION THRU POROUS LANDSCAPE DETENTION



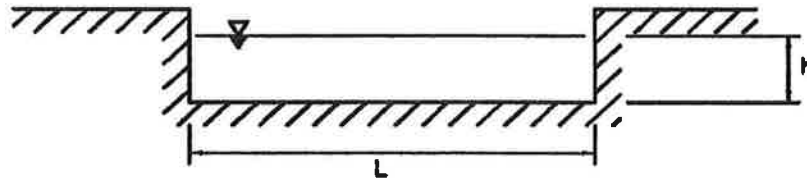
Perception
Design Group, Inc.
Consulting Civil Engineers

6732 West Coal Mine Ave., Suite 419
Littleton, Colorado 80123
Office: 303-232-8088
Fax: 303-232-5255

EMERGENCY OVERFLOW SIZING

Broad Crested Weir

Date: 3-Apr-10
Project: Metzler Memory Care
By: J Holley

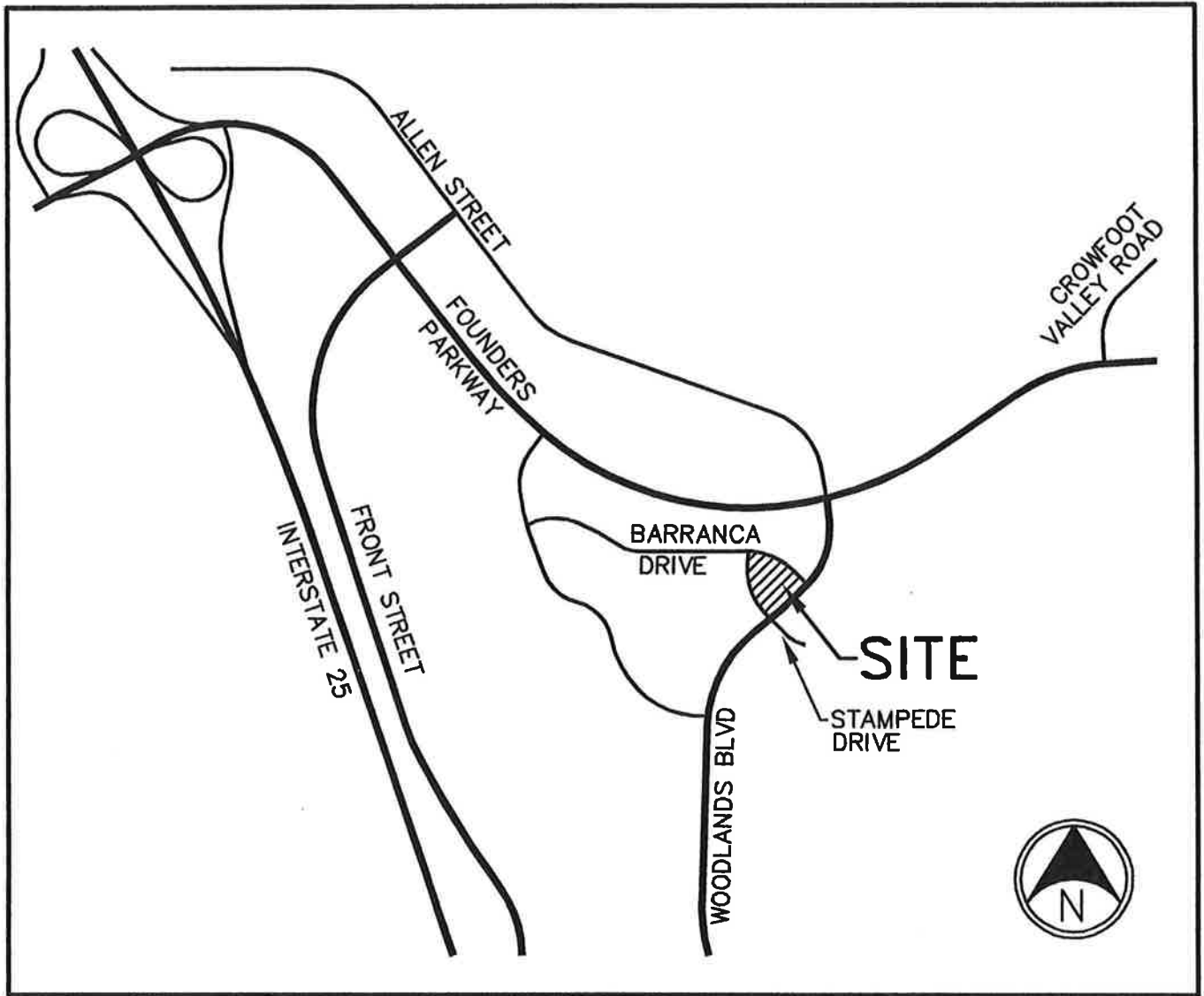


$$Q = CLh^{\frac{3}{2}}$$

Q = Discharge (cfs)
 C = Weir coefficient (from table 1401)
 L = Horizontal length (feet)
 h = Total energy head (feet)

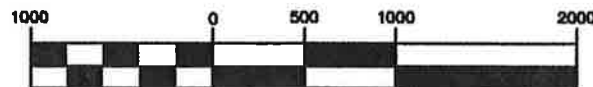
Design Point	$Q(100)$ cfs	$2 \cdot Q(100)$ cfs	C	L	h	Available h	Check?
8	6.06	12.1	3.33	20	0.32	0.67	Yes

Appendix D
Referenced Information



VICINITY MAP

SCALE: 1" = 1,000'



LEGAL DESCRIPTION:

LOT 7, METZLER RANCH FILING NO. 9, COUNTY OF DOUGLAS, STATE OF COLORADO.

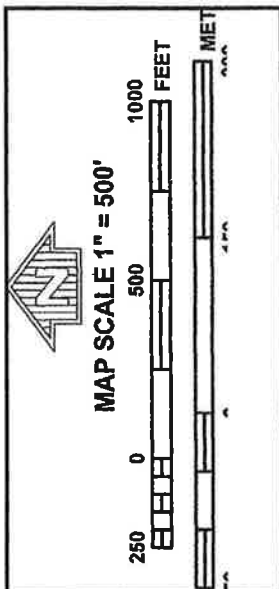
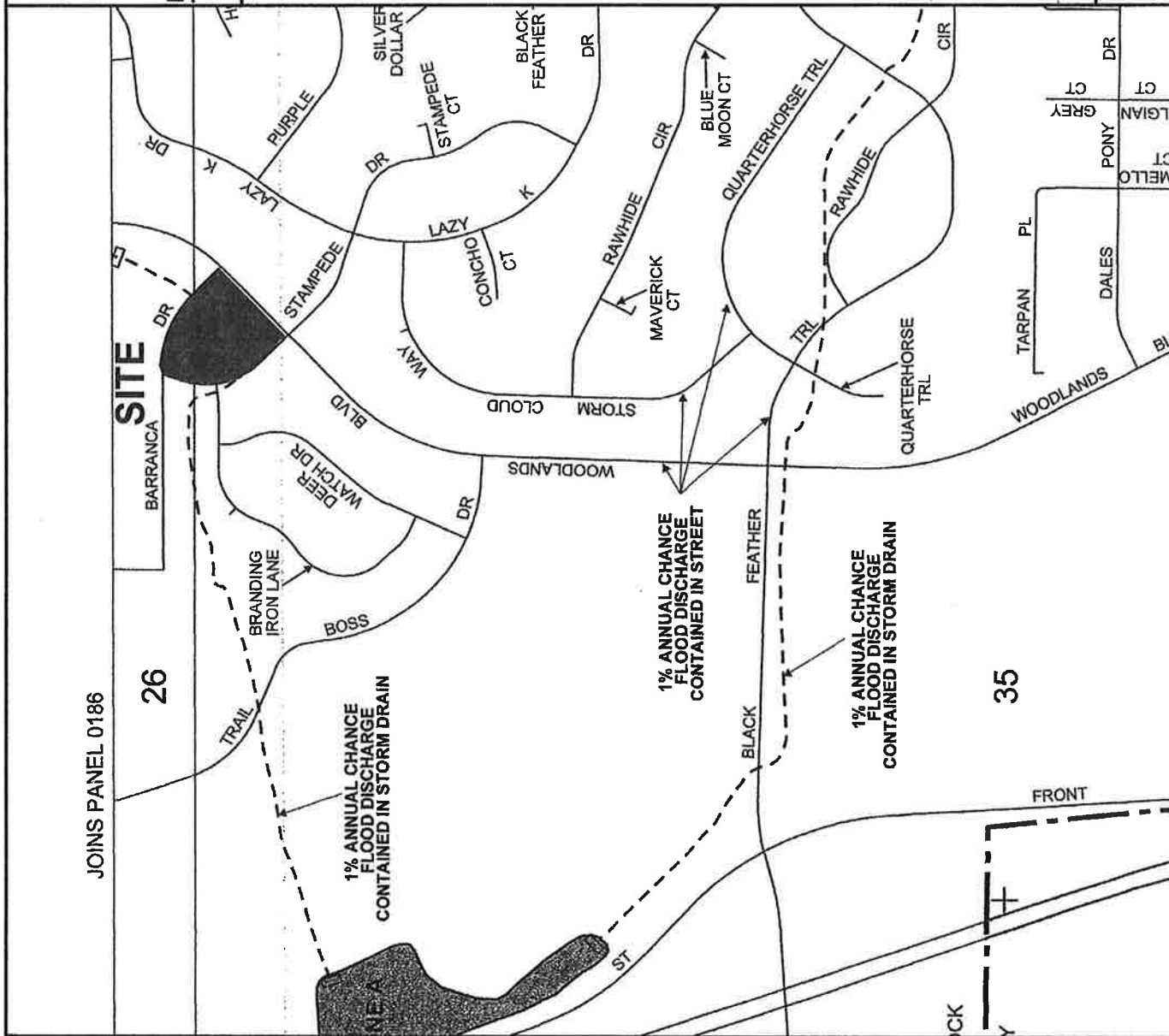


**Perception
Design Group, Inc.**

Consulting Civil Engineers

6732 West Coal Mine Ave., Suite 419 ♦ Littleton, Colorado 80123
Office: 303-232-8088 ♦ Fax: 303-232-5255

APRIL 05, 2010



NFIP

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO

AND INCORPORATED AREAS

PANEL 188 OF 495

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

PANEL 0188F

CONTAINS	COMMUNITY	NUMBER	PANEL	SUFFIX
	CASTLE ROCK, TOWN OF	08050	0188	F
	DOUGLAS COUNTY	080049	0188	F

MAP NUMBER
08035C0188F

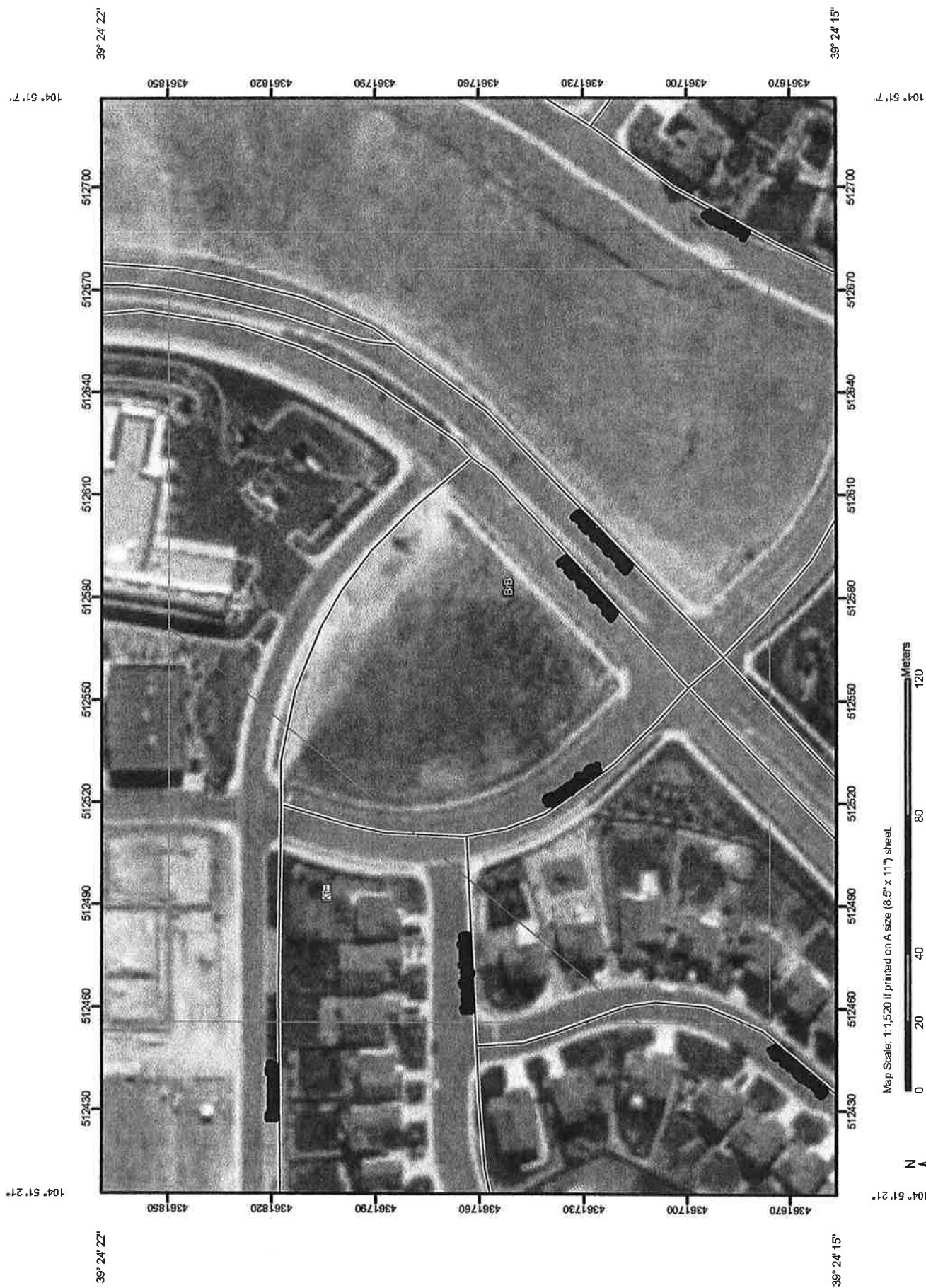
EFFECTIVE DATE:
SEPTEMBER 30, 2005

Federal Emergency Management Agency

Notes to Users: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Soil Map—Castle Rock Area, Colorado



MAP LEGEND

	Area of Interest (AOI)		Very Stony Spot
	Soils		Wet Spot
	Soil Map Units		Other
	Special Point Features		Special Line Features
	Blowout		Gully
	Borrow Pit		Short Steep Slope
	Clay Spot		Other
	Closed Depression		Political Features
	Gravel Pit		Cities
	Gravelly Spot		Water Features
	Landfill		Oceans
	Lava Flow		Streams and Canals
	Marsh or swamp		Transportation
	Mine or Quarry		Rails
	Miscellaneous Water		Interstate Highways
	Perennial Water		US Routes
	Rock Outcrop		Major Roads
	Saline Spot		Local Roads
	Sandy Spot		
	Severely Eroded Spot		
	Sinkhole		
	Slide or Slip		
	Sodic Spot		
	Spoil Area		
	Stony Spot		

MAP INFORMATION

Map Scale: 1:1,520 if printed on A size (8.5" x 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000. Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: UTM Zone 13N NAD83

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

Soil Survey Area: Castle Rock Area, Colorado
 Survey Area Data: Version 6, May 4, 2009

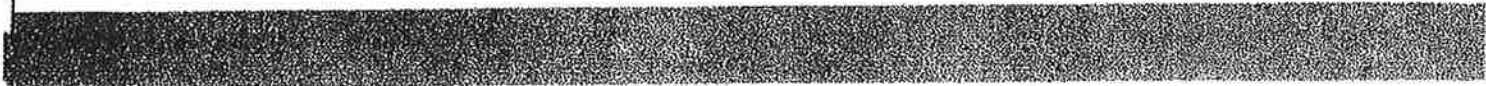
Date(s) aerial images were photographed: 7/30/2005

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

Map Unit Legend

Castle Rock Area, Colorado (C0622)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BrB	Bresser sandy loam, 1 to 3 percent slopes	7.5	79.5%
KtE	Kutch sandy loam, 5 to 20 percent slopes	1.9	20.5%
Totals for Area of Interest		9.5	100.0%

Excerpts from Phase III Drainage Report, Metzler Ranch Filing No. 9



PHASE III DRAINAGE REPORT

METZLER RANCH FILING No. 9

**AS PART OF METZLER RANCH
TOWN OF CASTLE ROCK, COLORADO**

**PREPARED FOR
VISTA VILLAGE LLC.**

**JULY 26, 2002
REVISED MARCH 27, 2003**

**BY
TST INC. OF DENVER, CONSULTING ENGINEERS
9222 TEDDY LANE
LONE TREE, CO 80124
303-792-0557**

PROJECT NO. 088-002

TST

Date: March 27, 2003
Project Name: Metzler Ranch Filing No. 9
Project No. 088-002

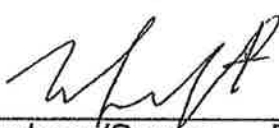
ENGINEER'S STATEMENT:

The enclosed drainage report and exhibits were prepared by me or under my direct supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared in accordance with applicable Town of Castle Rock criteria and is in conformance with the master plan of drainage for the effected area. I accept responsibility for any liability caused by negligent acts, errors, or omissions on my part in preparing this report.


Ward L. Mahanke
Colorado P.E. #26753


DEVELOPER'S STATEMENT:

As Developer/Owner of lands identified within this report; I agree to proceed, implement, and comply with all recommendations and requirements outlined herein.


Developer/Owner Date 3-27-03

TOWN OF CASTLE ROCK APPROVALS:

ENGINEERING DIVISION

DATE

DEVELOPMENT SERVICES DIRECTOR

DATE



INTRODUCTION

The purpose of this report is to present the Phase III Drainage Report for Metzler Ranch Filing No. 9, located within Metzler Ranch, in Castle Rock, Colorado. This report has revised calculations for the central-western portion of the overall project as described in the *Metzler Ranch Master Drainage Study*, Inter-Mountain Engineering Ltd., revised on January 20, 1997.

LOCATION

Metzler Ranch Filing No. 9 is approximately nine acres located in the South half of Section 26, Township 7 South, Range 67 West of the 6th Principal Meridian, Castle Rock, Douglas County, Colorado. It is bounded by Founders Parkway the north, Woodlands Boulevard to the east, Metzler Ranch Filing No. 1 to the south and Milestone Filing No. 4 to the west (see Vicinity Map, in Appendix B).

EXISTING BASIN DESCRIPTION

As part of the approval for preliminary plat, the site was completely overlot graded. Historically, the site was divided by a drainage that flowed from northeast to southwest through the middle of the site. There was no evidence of surface water, however, there was indication of intermittent flows, substantiated by the characteristic arroyos found in many areas in the Front Range. The site had naturally occurring slopes up to 12 percent and was covered with indigenous grasses, yucca, and gamble oak. Soil conservation service maps identify the soils as Kutch Sandy Loam (KtE), a D hydrologic soil group having medium-to-severe runoff and moderate erosion hazard, and Bresser Sandy Loam (BrB), a B hydrologic soil group having slow runoff and slight to moderate erosion hazard. A copy of the local SCS map is included in Appendix B. The historic drainage exited the site at the southwest corner, with the single family house in Lot 9 of Metzler Filing No. 1 (at this corner) having experienced periodic local flooding and erosion at the corner of their property fence. The flow then travels south along the easement in a non-defined pattern.

This parcel has been subject to a previous drainage study. The *Metzler Ranch Master Drainage Study*, Inter-Mountain Engineering Ltd., updated January 20, 1997, is the master study of the entire Metzler Ranch development. This parcel is a portion of the sub-basins referred to as Sub-Basin B. Per this report, all flows are to be passed undetained through the site and subsequent existing storm sewer piping to the existing regional detention pond built as part of Metzler Ranch Filing No. 1. As part of this basin, there is no requirement for on-site detention. All existing storm sewer is in platted easements through the Filing No. 1 development. The Final Drainage Report for *Metzler Ranch Filing No. 1*, Rocky Mountain Consultants, revised February 1998, did not include this parcel in any calculations for the development of the subdivision.

PROPOSED DEVELOPMENT

Metzler Ranch Filing No. 9 is a proposed commercial development. The private road layout has been developed with the existing grades of Founders Parkway in mind and

is graded to best serve the development's vertical relationship with Founders Parkway. The proposed contours shown on the drainage exhibit represent the previously-mentioned addition of up to an additional 10 feet of fill to improve the existing conditions of the property and are the general basis of the basin boundaries, with additional boundaries being formed by the proposed roads.

The project will be platted as one filing, with each of the lots individually sited and taken through the Final PD Site Plan process separately. The overall rough grading was completed as a master development phase. The private roads and utility mains are to be constructed after Final Plat approval. Additional drainage facilities may be required for the siting of each lot development, but are not contemplated at this time.

Storm sewer proposed for this development include two new inlets that tie into existing storm sewer, relocating an existing inlet on Woodlands Boulevard (to eliminate conflict with a new intersection), and extending flows from Lot 7 into the back of an existing inlet.

STORM-DRAINAGE CRITERIA

This drainage study is based upon information from the 1998 version of the *Town of Castle Rock Public Works Regulations* (henceforth referred to as the Manual).

The Rational Method was used to calculate the 5-year and 100-year frequency storm runoffs. The Rational Method is defined as follows:

$$Q = cia$$

- Q = maximum rate of runoff in cubic feet per second
- c = a runoff coefficient as a ratio between the maximum rate of runoff and the average rate of rainfall intensity over a duration equal to the time of concentration
- i = average intensity of rainfall in inches per hour for a duration equal to the time of concentration
- a = area of basin or sub-basin in acres

The time of concentration is defined as the time required for water to flow from the most remote point of the area to the point being investigated. Each basin on the exhibit includes a depiction of the path used for these calculations. For this study, the runoff coefficients for the 5-year (Minor Storm) and 100-year (Major Storm) frequency storms have been calculated using a "weighted" coefficient based on the overall land usage of the parcel for Basins A and C, the actual land usage for Basin B, and the recommended runoff coefficient (see Appendix B) for a paved street for Basins F1 and W1. The weighted coefficient calculations are included in Appendix A. The coefficients used on calculating the initial time of concentration for were for the 5-year event. The rainfall time/intensity/frequency curve for Town of Castle Rock Zone I (Appendix B) was taken from the Manual.

For each basin, the initial time of concentration for overland flows for developed conditions to the streets has been calculated, per Urban Drainage runoff guidelines. The time of flow along the roads and existing channels was based on velocities determined by the Urban Drainage equations, and added to the initial time of concentration. This is considered the time of concentration (t_c). The land surface descriptions used were paved area for all gutter flow, and nearly bare ground for the overland flows.

Flow capacities along the proposed streets have been calculated based on the individual conditions of the roadway. The capacity of the roads is limited by the spill-over of the curb. For practicality, the inlets and storm sewer are designed for the major storm. Storm sewer is designed to take the major flows captured by inlets and discharging into the existing storm sewer piping along the west side of the site.

DISCUSSION

The following portion of this report addresses the results of the study and overall drainage plan. Please refer to the calculation sheets and exhibits for actual sizes and flows.

Flows

The flows for the 5-year and 100-year events have been calculated at the design points as shown on the exhibit. As stated above, each design point has an inlet that will accept the major flows. Calculations for the following are included in Appendix A. The design points include two existing inlets in Woodlands Boulevard and two inlets at the west end of the site on Barranca Drive.

Storm Sewer

The storm sewer shown on the exhibit has been sized according to the calculated major flows based on the resultant time of concentration for each design point.

Design Point Nos. 1 and 2

The two new inlets on Barranca Drive have been sized to work in tandem during the 100-year event. The capacity of the street prior to breaching the crown of the road is 16.3 cfs (8.17 cfs per side). The total capacity of the road section from back of walk is 60.2 cfs. Based on this performance, the 34.7 cfs during the 100-year flow will split, with each side using the inlet capacity to capture half (17.35 cfs) of the flow. The north side will be in sump, and will work as a 15' type R inlet. The south side, projecting through at 2% grade, will need to be a 25' type R inlet. These inlets will be tied into the existing storm sewer at the existing manhole from the Filing No. 3 construction. The capacity of Barranca Drive will keep the developed flows of Filing No. 9 from spilling into the Filing No. 1 residences, an improvement of the existing conditions. The pipe analysis shows that the 5-year flows do not exceed the full condition of the pipe as well.

Design Point No. 3

The existing 5-foot Type "R" inlet at the intersection of Woodlands Boulevard and Stampede Drive successfully captures the 5-year flows for entire basin, but does not have capacity to capture the 100-year flows. However, the existing piping does have the capacity for the 100-year flow, so the final site plan for Lot 7 will need to include a storm sewer system that can be tied to the back of the existing inlet. The existing inlet is shown to have a 3.6 cfs bypass, but this would only occur if there is not an on-site storm system for Lot 7 to tie into the back of that exiting inlet. The existing pipe configuration was confirmed to have full flow capacity for the 100-year event. In the event that this inlet becomes completely clogged, all flows will continue south on Woodlands Boulevard, then west on Trail Boss Drive to RMC Design Point 3. At this sump inlet, the RMC report describes the low flows to enter the inlet, and any overflow will top the curb and gutter, and go south across the ball fields and into the regional detention facility.

Design Point No. 4

The flows along Founders Parkway (Basin F1) includes the area from flowline to centerline of Founders Parkway. This basin flows to the northwest, and since the road is in super-elevation, to the center median of Founders Parkway.

Design Point No. 5

The existing 10-foot Type "R" inlet along Woodlands Boulevard had to be moved to the north of the Barranca Drive intersection. It is sized to capture the 100-year flows, with the existing pipe configuration confirming capacity for the 100-year event. In the event of overflow, a concrete pan has been placed across Barranca Drive.

The outfall for the overall site (as completed by Inter-Mountain) can be compared for capacity with the findings of the Filing No. 3, Lot 3 report and for Filing No. 9. Based on the results of the latest reports, the total flow experienced at the 66-inch storm sewer on the west end of the property will be 401 cfs. The IME report includes a capacity check showing that the pipe has a capacity of 538 cfs (with a design of 573 cfs). Thus, the existing storm sewer has adequate capacity to take on flows that were previously accounted for in the design. In the event that the inlets become plugged, the flow will continue to the west to Trail Boss, and then south to the regional detention pond.

Another consideration in the design of this development was the transitional drainage along the retaining walls on the south end. Because the houses to the south have fences along the property line, it was determined that the best transition will be to create a four (4) foot strip within the Filing No. 9 property that will be graded to match the existing fence line, and over-excavated with river rock covering a private perforated drain pipe that drains each lot in front of the base of the lower wall. This drain was tapped into the 66-inch storm sewer at the west end of the property.

Detention

The detention requirements for the parcel, as stated above, have been included in the regional detention pond as designed for Filing No. 1 and, therefore, on-site detention is not required. From the existing approved reports, there is no clear delineation of volumes attributed to each parcel, only to the overall performance of the regional system. The IME report does show Filing No. 9 as part of Basin 1-G, which has an interpolated imperviousness of 82% (see memo from the Town in Appendix A). In order to safely assume adequate detention capacity, Filing No. 9 needs to meet this maximum. The calculations in Appendix A for overall site imperviousness show that after taking out the open space in Tract A and the area between the sidewalk and Founders Parkway, and using the maximum FAR of 25%, each site must have a minimum of 8% landscaping. Based on this requirement, each final site plan will need to demonstrate the following:

EACH FINAL PD SITE PLAN SUBMITTAL WILL BE REQUIRED TO DEMONSTRATE A MINIMUM OF 8% ON-SITE LANDSCAPING IN ADDITION TO THE LANDSCAPE STRIP BETWEEN THE SIDEWALK AND FOUNDERS PARKWAY.

It is not known, after several re-constructions of the pond by the Town, if there is adequate or additional water quality volume included in the regional pond for Filing No. 9 or any other parcel. However, the relative small size of Filing No. 9 has a small magnitude effect on the total dynamic limits of this regional pond and was included in the initial design.

The existing detention pond discharges into a box culvert that crosses under Interstate 25. It then discharges into a channel that was improved in conjunction with the Douglas County Justice Center. This channel crosses under Highway 85 and into East Plum Creek.

ENVIRONMENTAL PROTECTION

As previously described, the development is to be constructed on a site that has naturally occurring slopes of up to 12 percent. Soil conservation service maps identify the soils as having medium-to-severe runoff and slight-to-moderate runoff. Erosion control for the project will occur in three phases: Construction, Stormwater, and Long Term Maintenance.

Construction Activity

There has been complete overlot grading of the site prior to the infrastructure construction. Construction materials will be brought on site on an as-needed basis. There will be at least one planned areas for stockpiling materials, fuel storage, or mechanical staging areas.

The following erosion-control measures are to be implemented during the construction phase of the project:

Provided Downstream Capacity of Storm Sewer with
Metzler Ranch Filing No. 9

As discussed in the Metzler Ranch Filing No. 9 Drainage Study
the Storm sewer will have capacity for both the 5 year storm and
100 yr Storm, those flow were shown on the attached Drainage Map
(Refer to sheet 34 for Discussion and Sheet 36 for Drainage Map in Appendix E)

Provided Flow Rate	Q_5	6.6 cfs	Q_{100}	14.4 cfs
Calculated Flow Rate	Q_5	6.54 cfs	Q_{100}	14.22 cfs

**STORM FLOW CALCULATIONS
METZLER RANCH FILING NO. 9**

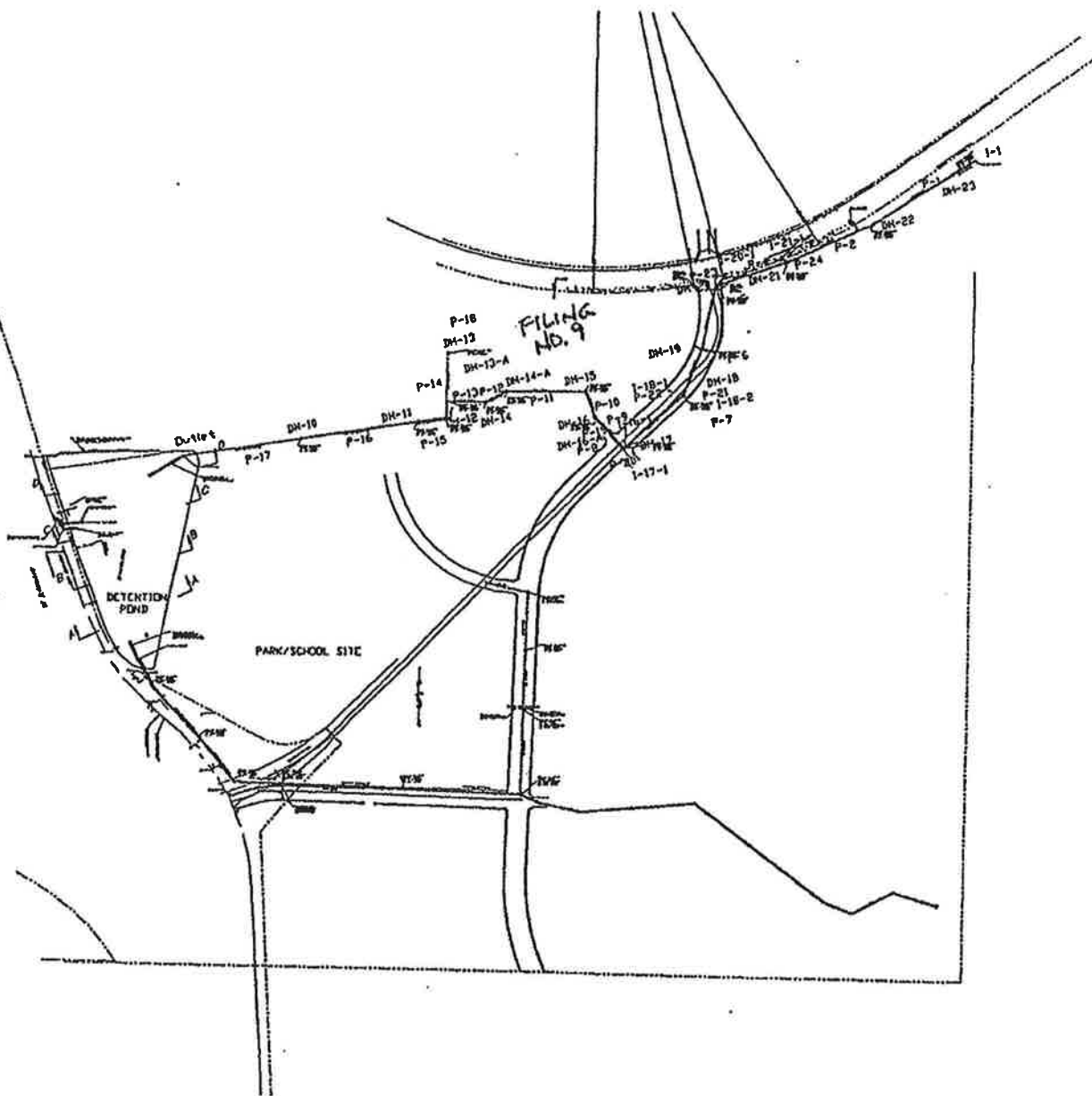
Design Point	Basin Desig.	Area (ac)	tc (min)	Runoff Coeff.	C*A (ac)	i (in/hr)	Q5 (cfs)	Q100 (cfs)
1	A	6.30	11.1	0.64	4.0	3.7	14.8	32.6
		6.30	11.1	0.76	4.8	6.8		
2	B	0.49	12.1	0.31	0.2	3.5	0.7	2.0
		0.49	12.1	0.57	0.3	6.5		
1,2	A, B	6.79	11.1	0.62	4.2	3.7	15.5	34.7
		6.79	11.1	0.75	5.1	6.8		
3	C	2.54	8.3	0.64	1.6	4.1	6.6	14.4
		2.54	8.3	0.76	1.9	7.6		
4	F1	1.47	9.9	0.88	1.3	3.8	4.9	10.1
		1.47	9.9	0.93	1.4	7.2		
5	W1	0.99	5.3	0.88	0.9	4.9	4.4	8.1
		0.99	5.3	0.93	0.9	9.0		

**STORM SEWER INLET SIZING
METZLER RANCH FILING NO. 9**

Design Point No.	Inlet No.	FLOW		Slope (%)	Type	INLET				Comments
		Q5 (cfs)	Q100 (cfs)			Length (ft)	Capture (cfs)	Depth (ft)	Overflow (cfs)	
1	1		17.4	Sump	R	15	17.4	0.55	-	1 North Side
2	2		17.3	2.0	R	25	17.3	0.50	-	1 South Side
3	3		14.4	Sump	R	5	10.8	0.90	3.6	2 Existing
5	5		8.1	3.0	R	10	8.1	0.50	-	Relocated

Notes:

- 1 Private street to contain total 100-year flow. Flow is split evenly between inlets.
- 2 100-year over-flow to continue south on Woodlands Blvd.



Project Title: METZLER RANCH PIPED SYSTEM

c:\haestad\stmc\969043c.stm

06/17/97 11:10:59 AM

© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

INTERMOUNTAIN

Project Engineer: INTER-MOUNTAIN ENGINEERING

StormCAD v1.0

Page 1 of 1

Pipe Report

Pipe	Up Node	Dn Node	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	I (in/hr)	Q (cfs)	Length (ft)	S (%)	Size	Roughness	Cap (cfs)	Up Invert (ft)	Dn Invert (ft)
P-18	DM-13-A	DM-13	0.00	0.00	0.00	0.00	5.73	387.00	206.00	2.82	60 inch	0.013	436.99	243.50	237.70
P-19	I-16-1	DM-16-A	0.00	0.00	0.00	0.00	5.73	25.00	23.00	2.00	36 inch	0.013	94.32	261.50	261.04
P-20	I-17-1	DM-17	0.00	0.00	0.00	0.00	5.73	50.00	73.00	2.00	36 inch	0.013	94.32	261.50	260.04
P-22	I-18-1	DM-18	0.00	0.00	0.00	0.00	5.73	10.00	35.00	2.00	24 inch	0.013	31.99	271.50	270.80
P-21	I-18-2	DM-18	0.00	0.00	0.00	0.00	5.73	10.00	37.00	1.89	24 inch	0.013	31.11	271.50	270.80
P-23	I-20-1	DM-20	0.00	0.00	0.00	0.00	5.73	5.00	50.00	12.60	24 inch	0.013	80.30	288.00	281.70
P-24	I-21-1	DM-21	0.00	0.00	0.00	0.00	5.73	15.00	15.00	3.33	24 inch	0.011	48.81	288.00	287.50
P-1	I-1	DM-23	0.00	0.00	0.00	0.00	5.73	71.00	279.00	4.36	36 inch	0.013	139.29	333.17	321.00
P-2	DM-23	DM-22	N/A	N/A	N/A	0.00	5.67	71.00	350.00	5.00	36 inch	0.013	149.13	320.80	303.30
P-3	DM-22	DM-21	N/A	N/A	N/A	0.00	5.59	71.00	350.00	5.00	36 inch	0.013	149.13	303.10	285.60
P-4	DM-21	DM-20	N/A	N/A	N/A	0.00	5.52	86.00	250.00	4.16	36 inch	0.013	136.03	285.40	275.00
P-5	DM-20	DM-19	N/A	N/A	N/A	0.00	5.46	91.00	276.00	2.39	42 inch	0.013	155.57	274.80	268.20
P-6	DM-19	DM-18	N/A	N/A	N/A	0.00	5.39	91.00	202.00	2.38	42 inch	0.013	155.08	268.00	263.20
P-7	DM-18	DM-17	N/A	N/A	N/A	0.00	5.33	111.00	334.00	3.49	42 inch	0.013	187.89	263.00	251.35
P-8	DM-17	DM-16-A	N/A	N/A	N/A	0.00	5.23	161.00	79.00	1.25	48 inch	0.013	160.79	251.35	250.36
P-9	DM-16-A	DM-16	N/A	N/A	N/A	0.00	5.21	186.00	90.00	0.18	48 inch	0.013	60.56	250.16	250.00
P-10	DM-16	DM-15	N/A	N/A	N/A	0.00	5.19	186.00	114.00	0.53	48 inch	0.013	104.20	249.80	249.20
P-11	DM-15	DM-14-A	N/A	N/A	N/A	0.00	5.16	186.00	340.00	0.53	48 inch	0.013	104.51	249.00	247.20
P-12	DM-14-A	DM-14	N/A	N/A	N/A	0.00	5.08	186.00	100.00	0.60	48 inch	0.013	111.26	247.00	246.40
P-13	DM-14	DM-13	N/A	N/A	N/A	0.00	5.06	186.00	167.00	5.09	48 inch	0.013	324.05	246.20	237.70
P-14	DM-13	DM-12	N/A	N/A	N/A	0.00	5.02	573.00	70.00	2.57	66 inch	0.013	538.46	237.50	235.70
P-15	DM-12	DM-11	N/A	N/A	N/A	0.00	5.01	573.00	124.00	2.26	66 inch	0.013	504.59	235.50	232.70
P-16	DM-11	DM-10	N/A	N/A	N/A	0.00	4.99	573.00	500.00	4.36	66 inch	0.013	701.15	232.50	210.70
P-17	DM-10	Outlet	N/A	N/A	N/A	0.00	4.93	573.00	500.00	4.10	66 inch	0.013	679.92	210.50	190.00

Node Report

Node	Inlet Area (acres)	Weighted Roughness Coefficient	Inlet CA (acres)	External CA (acres)	Total CA (acres)	Inlet TC (min)	External TC (min)	Upstream Flow Time (min)	System Flow Time (min)	System Intensity (in/hr)	Total Watershed (CIA) (cfs)	Additional Flow (cfs)	Carryover (cfs)
DM-13-A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.73	0.00	387.00	0.00
I-16-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.73	0.00	25.00	0.00
I-17-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.73	0.00	50.00	0.00
I-18-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.73	0.00	10.00	0.00
I-18-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.73	0.00	10.00	0.00
I-20-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.73	0.00	5.00	0.00
I-21-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.73	0.00	15.00	0.00
I-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.73	0.00	0.00	0.00
DM-23	N/A	N/A	N/A	N/A	0.00	N/A	0.00	0.31	0.31	5.67	0.00	N/A	N/A
DM-22	N/A	N/A	N/A	N/A	0.00	N/A	0.00	0.68	0.68	5.59	0.00	N/A	N/A
DM-21	N/A	N/A	N/A	N/A	0.00	N/A	0.00	1.05	1.05	5.52	0.00	N/A	N/A
DM-20	N/A	N/A	N/A	N/A	0.00	N/A	0.00	1.30	1.30	5.46	0.00	N/A	N/A
DM-19	N/A	N/A	N/A	N/A	0.00	N/A	0.00	1.64	1.64	5.39	0.00	N/A	N/A
DM-18	N/A	N/A	N/A	N/A	0.00	N/A	0.00	1.96	1.96	5.33	0.00	N/A	N/A
DM-17	N/A	N/A	N/A	N/A	0.00	N/A	0.00	2.43	2.43	5.23	0.00	N/A	N/A
DM-16-A	N/A	N/A	N/A	N/A	0.00	N/A	0.00	2.54	2.54	5.21	0.00	N/A	N/A
DM-16	N/A	N/A	N/A	N/A	0.00	N/A	0.00	2.64	2.64	5.19	0.00	N/A	N/A
DM-15	N/A	N/A	N/A	N/A	0.00	N/A	0.00	2.77	2.77	5.16	0.00	N/A	N/A
DM-14-A	N/A	N/A	N/A	N/A	0.00	N/A	0.00	3.15	3.15	5.08	0.00	N/A	N/A
DM-14	N/A	N/A	N/A	N/A	0.00	N/A	0.00	3.26	3.26	5.06	0.00	N/A	N/A
DM-13	N/A	N/A	N/A	N/A	0.00	N/A	0.00	3.45	3.45	5.02	0.00	N/A	N/A
DM-12	N/A	N/A	N/A	N/A	0.00	N/A	0.00	3.50	3.50	5.01	0.00	N/A	N/A
DM-11	N/A	N/A	N/A	N/A	0.00	N/A	0.00	3.58	3.58	4.99	0.00	N/A	N/A
DM-10	N/A	N/A	N/A	N/A	0.00	N/A	0.00	3.88	3.88	4.93	0.00	N/A	N/A
Outlet	N/A	N/A	N/A	N/A	0.00	N/A	0.00	4.22	4.22	4.86	0.00	N/A	N/A

DOT Report

Pipe	-Node- Upstream Downstream	Inlet Area (acres)	Inlet CA (acres)	Total CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (%)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-18	DM-13-A DM-13	0.00	0.00	0.00	251.50 247.50	248.37 243.82	2.25 2.82	387.00 436.89	Circular 60 inch	206.00	19.78	
P-19	I-16-1 DM-16-A	0.00	0.00	0.00	266.70 267.29	263.11 262.28	0.86 2.00	25.00 94.32	Circular 36 inch	23.00	7.78	
P-20	I-17-1 DM-17	0.00	0.00	0.00	266.70 267.00	263.80 261.72	1.22 2.00	50.00 94.32	Circular 36 inch	73.00	10.43	
P-22	I-18-1 DM-18	0.00	0.00	0.00	279.50 287.60	272.63 271.62	1.20 2.00	10.00 31.99	Circular 24 inch	35.00	6.84	
P-21	I-18-2 DM-18	0.00	0.00	0.00	279.50 287.60	272.63 271.63	1.18 1.89	10.00 31.11	Circular 24 inch	37.00	6.80	
P-23	I-20-1 DM-20	0.00	0.00	0.00	288.25 286.50	288.79 282.04	7.80 12.60	5.00 80.30	Circular 24 inch	50.00	9.28	
P-24	I-21-1 DM-21	0.00	0.00	0.00	293.00 296.65	289.40 288.51	0.91 3.33	15.00 48.81	Circular 24 inch	15.00	7.93	
P-1	I-1 DM-23	0.00	0.00	0.00	333.17 331.30	335.84 322.52	3.23 4.36	71.00 139.29	Circular 36 inch	279.00	15.24	
P-2	DM-23 DM-22	N/A	N/A	0.00	331.30 312.75	323.47 304.76	3.92 5.00	71.00 149.13	Circular 36 inch	350.00	15.76	
P-3	DM-22 DM-21	N/A	N/A	0.00	312.75 296.65	305.77 287.06	3.92 5.00	71.00 149.13	Circular 36 inch	350.00	15.76	
P-4	DM-21 DM-20	N/A	N/A	0.00	296.65 286.50	288.22 276.75	3.06 4.16	86.00 136.03	Circular 36 inch	250.00	16.26	
P-5	DM-20 DM-19	N/A	N/A	0.00	286.50 283.50	277.76 270.14	1.82 2.39	91.00 155.57	Circular 42 inch	276.00	13.56	
P-6	DM-19 DM-18	N/A	N/A	0.00	283.50 287.60	270.96 266.18	2.38 2.38	91.00 155.08	Circular 42 inch	202.00	10.46	
P-7	DM-18 DM-17	N/A	N/A	0.00	287.60 267.00	266.18 262.11	1.28 3.49	111.00 187.89	Circular 42 inch	334.00	11.81	
P-8	DM-17 DM-16-A	N/A	N/A	0.00	267.00 267.29	262.11 261.12	1.26 1.25	161.00 160.79	Circular 48 inch	79.00	12.81	
P-9	DM-16-A DM-16	N/A	N/A	0.00	267.29 267.85	261.12 259.61	1.68 0.18	186.00 60.56	Circular 48 inch	90.00	14.80	
P-10	DM-16 DM-15	N/A	N/A	0.00	267.85 270.20	259.61 257.70	1.68 0.53	186.00 104.20	Circular 48 inch	114.00	14.80	
P-11	DM-15 DM-14-A	N/A	N/A	0.00	270.20 260.00	257.70 252.00	1.68 0.53	186.00 104.51	Circular 48 inch	340.00	14.80	
P-12	DM-14-A DM-14	N/A	N/A	0.00	260.00 259.50	252.00 250.20	1.67 0.60	186.00 111.26	Circular 48 inch	100.00	14.94	
P-13	DM-14 DM-13	N/A	N/A	0.00	259.50 247.50	250.00 243.82	3.78 5.09	186.00 324.05	Circular 48 inch	167.00	14.94	
P-14	DM-13 DM-12	N/A	N/A	0.00	247.50 245.00	243.82 241.78	2.91 2.57	573.00 538.46	Circular 66 inch	70.00	24.12	
P-15	DM-12 DM-11	N/A	N/A	0.00	245.00 241.50	241.78 238.12	2.91 2.28	573.00 504.59	Circular 66 inch	124.00	24.15	
P-16	DM-11 DM-10	N/A	N/A	0.00	241.50 224.25	237.92 214.81	3.36 4.36	573.00 701.15	Circular 66 inch	500.00	27.95	
P-17	DM-10 Outlet	N/A	N/A	0.00	224.25 195.00	215.92 195.50	4.09 4.10	573.00 679.92	Circular 66 inch	500.00	24.15	

Project Title: metzler ranch north
g:\andy\haestad\smc\99043n.stm
12/09/97 01:43:39 PM

Intermountain Eng.
© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Project Engineer: Inter-Mountain Engineering
StormCAD v1.0
Page 1 of 1

Combined Pipe/Node Report

Pipe	Upstream Node	Downstream Node	Length (ft)	Inlet Area (acres)	Weighted Roughness Coefficient	Inlet CA (acres)	Total CA (acres)	Inlet Discharge (cfs)	Section Size	Capacity (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)
P-18	DM-13-A	DM-13	206.00	0.00	0.00	0.00	0.00	0.00	60 inch	436.99	19.78	243.50
P-19	I-16-1	DM-16-A	23.00	0.00	0.00	0.00	0.00	0.00	36 inch	94.32	7.78	261.50
P-20	I-17-1	DM-17	73.00	0.00	0.00	0.00	0.00	0.00	36 inch	94.32	10.43	261.50
P-22	I-18-1	DM-18	35.00	0.00	0.00	0.00	0.00	0.00	24 inch	31.99	6.84	271.50
P-21	I-18-2	DM-18	37.00	0.00	0.00	0.00	0.00	0.00	24 inch	31.11	6.80	271.50
P-23	I-20-1	DM-20	50.00	0.00	0.00	0.00	0.00	0.00	24 inch	80.30	9.28	288.00
P-24	I-21-1	DM-21	15.00	0.00	0.00	0.00	0.00	0.00	24 inch	48.81	7.93	288.00
P-1	I-1	DM-23	279.00	0.00	0.00	0.00	0.00	0.00	36 inch	139.29	15.24	333.17
P-2	DM-23	DM-22	350.00	N/A	N/A	N/A	0.00	N/A	36 inch	149.13	15.76	320.80
P-3	DM-22	DM-21	350.00	N/A	N/A	N/A	0.00	N/A	36 inch	149.13	15.76	303.10
P-4	DM-21	DM-20	250.00	N/A	N/A	N/A	0.00	N/A	36 inch	136.03	16.26	285.40
P-5	DM-20	DM-19	276.00	N/A	N/A	N/A	0.00	N/A	42 inch	155.57	13.56	274.80
P-6	DM-19	DM-18	202.00	N/A	N/A	N/A	0.00	N/A	42 inch	155.08	10.46	268.00
P-7	DM-18	DM-17	334.00	N/A	N/A	N/A	0.00	N/A	42 inch	187.89	11.81	263.00
P-8	DM-17	DM-16-A	79.00	N/A	N/A	N/A	0.00	N/A	48 inch	160.79	12.81	251.35
P-9	DM-16-A	DM-16	90.00	N/A	N/A	N/A	0.00	N/A	48 inch	60.56	14.80	250.16
P-10	DM-16	DM-15	114.00	N/A	N/A	N/A	0.00	N/A	48 inch	104.20	14.80	249.80
P-11	DM-15	DM-14-A	340.00	N/A	N/A	N/A	0.00	N/A	48 inch	104.51	14.80	249.00
P-12	DM-14-A	DM-14	100.00	N/A	N/A	N/A	0.00	N/A	48 inch	111.26	14.94	247.00
P-13	DM-14	DM-13	167.00	N/A	N/A	N/A	0.00	N/A	48 inch	324.05	14.94	246.20
P-14	DM-13	DM-12	70.00	N/A	N/A	N/A	0.00	N/A	66 inch	538.46	24.12	237.50
P-15	DM-12	DM-11	124.00	N/A	N/A	N/A	0.00	N/A	66 inch	504.59	24.15	235.50
P-16	DM-11	DM-10	500.00	N/A	N/A	N/A	0.00	N/A	66 inch	701.15	27.95	232.50
P-17	DM-10	Outlet	500.00	N/A	N/A	N/A	0.00	N/A	66 inch	679.92	24.15	210.50

Appendix F

Town of Castle Rock Checklist for Phase III Drainage Report

CHECKLIST FOR PHASE III DRAINAGE REPORT

Yes No N/A Report Requirements

I. COVER SHEET

☒			A. Name of Project
☒			B. Address
☒			C. Owner
☒			D. Developer
☒			E. Engineer
☒			F. Submittal date and revision dates as applicable

II. CERTIFICATION STATEMENT

☒			Include Certification Statement from a Registered Profession Engineer in the State of Colorado and the Project Developer. See Section 4.5.3 for more information.
-------------------------------------	--	--	---

III. GENERAL LOCATION AND DESCRIPTION

			A. Site Location
☒			1. Site Vicinity Map
☒			2. Township, Range, Section, and ¼ Section
☒			3. Existing and proposed Streets, Roadways, and Highways adjacent to and within the proposed development, or within the area served by the proposed drainage improvements
☒			4. Names of surrounding or adjacent developments, including land use or zoning information
			B. Description of Property
☒			1. Area in Acres
☒			2. Ground Cover, vegetation, site topography and slopes
☒			3. NRCS Soils Classification Map and discussion
☒			4. Major and minor drainageways
☒			5. Floodplains delineated by FHAD Studies or on FEMA FIRM Maps
☒			6. Existing irrigation canals or ditches
☒			7. Significant geologic feature
☒			8. Proposed land use

IV. DRAINAGE BASINS AND SUB-BASINS

			A. Major Drainage Basins
☒			1. On-site and Off-site major drainage basin characteristics and flow patterns and paths
☒			2. Existing and proposed land uses within the basins, if known
☒			3. Discussion of all drainageway planning or floodplain delineation studies that affect the major drainageways, such as FHAD Studies and Master Planning studies
☒			4. Discussion of the condition of any channel within or adjacent to the development, including existing conditions, need for improvements, and impact on the proposed development

CHECKLIST FOR PHASE III DRAINAGE REPORT

Yes	No	N/A	Report Requirements
X			5. Discussion of the impacts of the off-site flow patterns and paths, under fully developed conditions
			B. Minor Drainage Basins
X			1. On-site and Off-site minor drainage basin characteristics and flow patterns and paths under historic and developed conditions
X			2. Existing and proposed land uses within the basins
X			3. Discussion of irrigation facilities that will influence or be impacted by the site drainage
X			4. Discussion of the impacts of the off-site flow patterns and paths, under fully developed conditions

V. DRAINAGE DESIGN CRITERIA

			A. Regulations
X			1. Town criteria and optional provisions selected, when applicable
X			2. <i>UDFCD Manual</i> criteria and optional provisions selected, when applicable
			B. Drainage Studies, Master Plans, Site Constraints
X			1. Discuss previous drainage studies or master plans for the site or project that influence the stormwater facility design
X			2. Discuss drainage studies for adjacent developments and how those developments affect the stormwater facility design
X			3. Discuss Town Master Plans and how recommendations in those studies affect the design
X			4. Discuss impacts to stormwater management facility design caused by site constraints, such as streets, utilities, rapid transit, existing structures, etc.
			C. Hydrology
X			1. Runoff calculation method(s)
X			2. Design storm recurrence intervals
X			3. Design rainfall
X			4. Detention storage calculation method(s)
X			5. Detention storage release rate calculation method
			D. Hydraulics
X			1. Methods used to determine conveyance facility capacities
X			2. Hydraulic grade line calculation method and discussion of loss coefficients
X			3. Methods used to calculate water surface profiles
X			4. Detention pond routing
			E. Water Quality Enhancement
X			1. Discuss proposed BMPs
X			2. Identify design procedures

VI. STORMWATER MANAGEMENT FACILITY DESIGN

			A. Stormwater Conveyance Facilities
X			1. Discuss general conveyance concepts

CHECKLIST FOR PHASE III DRAINAGE REPORT

Yes	No	N/A	Report Requirements
X			2. Discuss proposed drainage paths and patterns
X			3. Discuss storm sewer design, including inlet and pipe locations and sizes, tributary basins and areas, peak flow rates at design points, hydraulic grade lines, etc
			4. Discuss storm sewer outfall locations and design, including method of energy dissipation
X			5. Discuss how runoff is conveyed from all outfalls to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway
		X	6. Discuss open channel and swale designs, including dimensions, alignments, tributary basins and areas, peak flow rates at design points, stabilization and grade control improvements, low flow or trickle channel capacities, water surface elevations, etc
		X	7. Discuss allowable street capacities
X			8. Discuss maintenance aspects of the design and easements and tracts that are required for stormwater conveyance purposes
X			9. Discussion of the facilities needed offsite for the conveyance of minor and major flows to the major drainageway
		X	10. Discuss lot-to-lot drainage assumptions and plan in detail as it relates to the overall grading of the site; include maximum flow conveyed between houses.
			B. Stormwater Storage Facilities
		X	1. Discussion detention pond designs, including release rates, storage volumes and water surface elevations for the EURV, 100-year, and emergency overflow conditions, outlet structure design, emergency spillway design, etc
		X	2. Discuss pond outfall locations and design, including method of energy dissipation
		X	3. Discuss how runoff is conveyed from all pond outfalls and emergency spillways to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway
		X	4. Discuss maintenance aspects of the design and easements and tracts that are required for stormwater storage purposes
			C. Water Quality Enhancement Best Management Practices
X			1. Discuss the design of all structural water quality BMPs, including tributary areas, sizing, treatment volumes, design features, etc
X			2. Discuss how runoff is conveyed from all pond outfalls to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway
X			3. Discuss the operation and maintenance aspects of the design and easements and tracts that are required for stormwater quality enhancement purposes
			D. Floodplain Modification
		X	1. Discuss why the floodplain modifications are proposed
		X	2. Discuss the source of the floodplain information and level of detail (Flood Hazard Area Delineation or FEMA Flood Insurance Rate

CHECKLIST FOR PHASE III DRAINAGE REPORT

Yes	No	N/A	Report Requirements
			Maps)
		X	3. Discuss details of floodplain modifications, including level of encroachment, velocities, depths, stabilization measures, water surface elevations, etc.
		X	4. Discuss Conditional Letter of Map Revision (CLOMR) and Letter of Map Revision (LOMR) requirements
		X	5. Discuss Town floodplain development regulations
			E. Additional Permitting Requirements
		X	1. Section 404 of the Clean Water Act
		X	2. The Endangered Species Act
		X	3. Other local, State, or Federal requirements
			F. General
			1. Discuss all tables, figures, charts, drawings, etc. that were used in design of stormwater management facilities and describe materials that are included in the appendix of the report
VII. CONCLUSIONS			
			A. Compliance with Standards
X			1. Town of Castle Rock Criteria
X			2. Master Plans
X			3. Cherry Creek Basin Control Regulation No. 72
X			4. Chatfield Reservoir Control Regulation No. 73
			B. Variances
		X	1. Identify provisions by section number for which a variance will be requested, or has been approved by the Town (final version of Drainage Report). Additional information on variances is available in Chapter 1 General Provisions.
		X	2. Provide justification for each variance request
			C. Drainage Concept
X			1. Discuss overall effectiveness of stormwater management design to properly convey, store and treat stormwater
VIII. REFERENCES			
X			Reference all criteria, master plans, reports, or other technical information used in development of the concepts discussed in the drainage report
IX. APPENDICES			
			Provide calculations for development based on zoning (density of development) and copies of all pertinent information from referenced materials
			A. Hydrologic Computations
X			1. Determination of runoff coefficients and times of concentration (Standard Form, SF-2)
X			2. Land use assumptions for off-site areas
		X	3. Colorado Urban Hydrograph Procedure input parameter

CHECKLIST FOR PHASE III DRAINAGE REPORT

Yes	No	N/A	Report Requirements
		X	determination
		X	4. SWMM Input parameter determination
X			5. Peak flow rate calculations for the minor and major storms (Standard Form, SF-3)
X			6. Rainfall Information
		X	7. CUHP/SWMM input and output
		X	8. Hydrograph data (if applicable)
		X	9. Connectivity diagram showing relationship/connectivity of basins, conveyance facilities, detention ponds, and design points
			B. Hydraulic Computations
X			B.1 On-Site Conveyance Elements
		X	1. Culvert Capacities
		X	2. Storm sewer capacities and hydraulic grade lines, including the loss coefficients
		X	3. Street capacities
X			4. Inlet capacities
X			5. Inlet summary table (5-yr and 100-yr)
		X	5. Open channel or swale capacities
		X	6. Grass-lined swales, drain pans, open channels, etc.
		X	7. Stabilization and grade control improvements
		X	8. Water surface profiles
X			9. Energy dissipation at pipe outfalls
		X	B.2 Off-Site Conveyance Elements
		X	10. Downstream/outfall capacity to the nearest major drainageway
			C. Detention/Water Quality Enhancement Best Management Practices
X			1. Design and sizing
		X	2. Low flow and trickle channels
		X	3. Stage-storage-discharge determination for detention ponds
		X	4. Detention pond routing calculations
X			5. Emergency spillway sizing calculations
			D. Referenced Information
X			1. Copies of pertinent portions of all referenced materials or drainage reports.

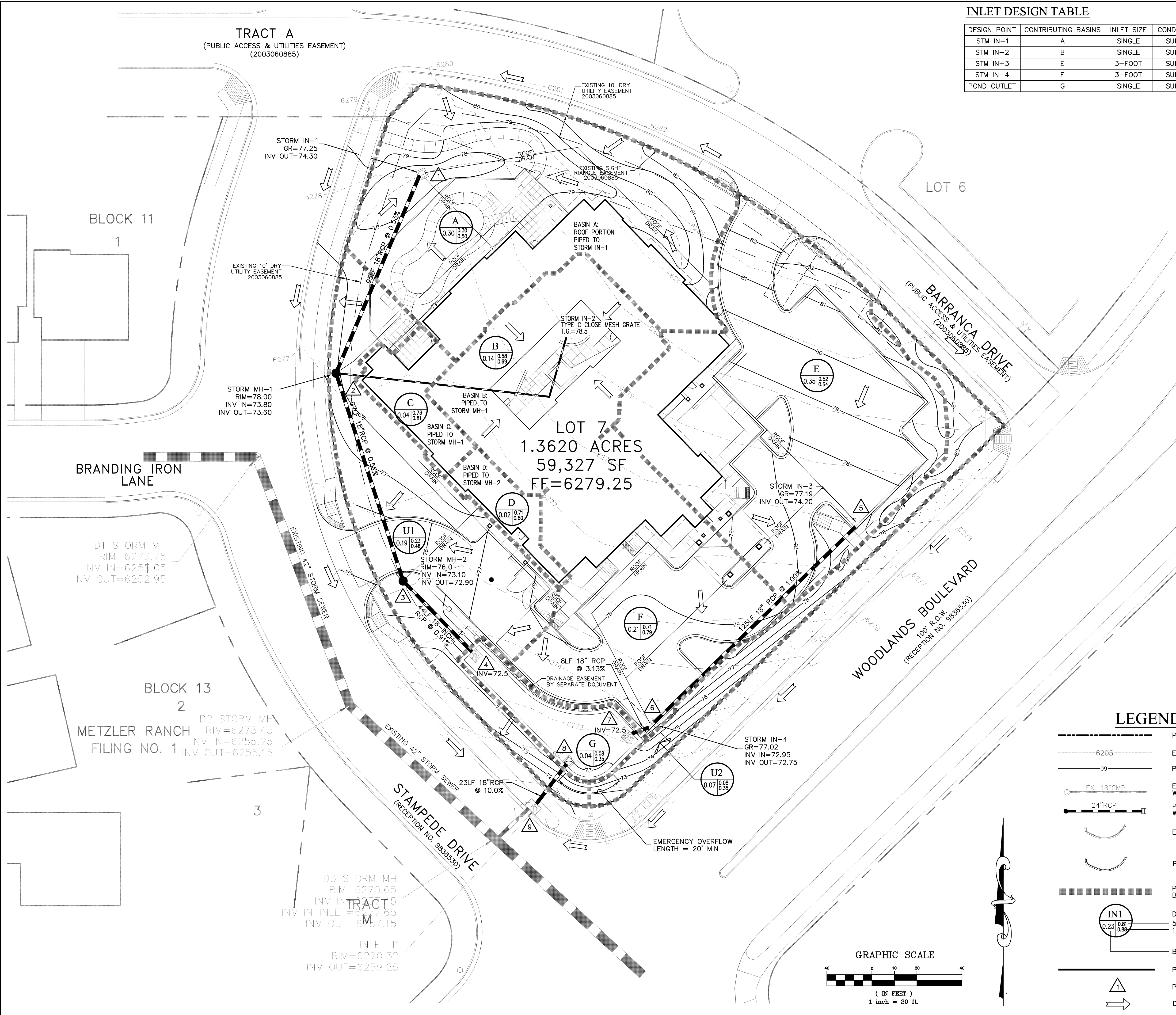
→ X
MIXED IN WHERE APPROPRIATE.

CHECKLIST FOR PHASE III DRAINAGE PLAN

Yes	No	N/A	Plan Requirements
			E. Drainage Plans
			E.I Overall Drainage Plan
X			1. 24" x 36" or 22" x 34" are acceptable sizes
X			2. Title block and legend
X			3. Show boundaries of entire development or project
X			4. Show existing or proposed streets, roadways, or highways
		X	5. Show limits of watershed with all major basins, including off-site basins where feasible
X			6. Show general drainage patterns and flow paths of the watershed, including those entering and leaving the site
X			7. Show means by which, upon leaving the site, runoff is conveyed to the nearest major drainageway (130 acres of tributary area).
X			8. Topographic information with a 5-foot maximum contour interval
X			9. Identify existing and proposed stormwater management facilities, upstream, downstream, or within the site, which will provide a stormwater management function for the site
		X	10. Provide overlay or figure showing layout of Detailed Drainage Plan sheets
			E.II Detailed Drainage Plan
X			1. 24" x 36" or 22" x 34" are acceptable sizes
X			2. Title block and legend
X			3. Basin designations, design points, flow rates, volumes and release rates
X			4. Scale 1"= 20' to 1"= 100', as required to show sufficient detail
X			5. Existing (dashed or screened) and proposed (solid) contours with a 2 foot maximum contour interval. In terrain where the slope exceeds 15%, the maximum interval is 5 feet. Contours must extend a minimum of 100 feet beyond property lines and contour elevation labels must be included.
X			6. Existing utilities and structures
X			7. All property lines and easements with type of easements noted
X			8. Adjacent developments or ownerships
X			9. Streets and roadways with ROW and flow line widths, type of curb and gutter or roadside swale, slopes, flow directions, and crosspans
X			10. Drainage basin and sub-basin limits
X			11. Existing and proposed stormwater management facilities, including irrigation ditches, roadside swales, open channels and drainageways, storm sewers, culverts, detention ponds, water quality enhancement structures or features, etc. Information must be included regarding materials, sizes, shapes, and slopes; also include detailed lot-to-lot drainage patterns with flow direction arrows
X			12. Proposed outfall points and existing or proposed facilities to convey runoff to the nearest major drainageway, without damage to downstream properties

CHECKLIST FOR PHASE III DRAINAGE PLAN

Yes	No	N/A	Plan Requirements
		X	13. Location and elevation of all existing and proposed 100-year floodplain boundaries, including the source of designation. All floodplain designations that exist for the site should be included (i.e. FEMA FIS, FHAD, and others).
X			14. Summary Runoff Table



INLET DESIGN TABLE

DESIGN POINT	CONTRIBUTING BASINS	INLET SIZE	CONDITION	PONDING (FT)	Q REQUIRED (CFS)	Q PROVIDED (CFS)	TYPE
STM IN-1	A	SINGLE	SUMP	0.50	1.31	6.2	TYPE C W/CLOSE MESH
STM IN-2	B	SINGLE	SUMP	0.50	0.85	5.2	TYPE C W/CLOSE MESH
STM IN-3	E	3-FOOT	SUMP	0.50	1.94	5.2	TYPE 16 COMBINATION
STM IN-4	F	3-FOOT	SUMP	0.50	1.55	5.2	TYPE 16 COMBINATION
POND OUTLET	G	SINGLE	SUMP	0.50	5.90	6.2	TYPE C W/CLOSE MESH

DESIGN POINT SUMMARY

DESIGN POINT	CONTRIBUTING BASIN(S)	CONTRIBUTING AREA (ACRES)	Q ₅ (CFS)	Q ₁₀₀ (CFS)
1	A	0.30	0.44	1.31
2	A, B, C	0.48	0.94	2.39
3	A, B, C, D	0.50	0.98	2.47
4	A, B, C, D	0.52	0.98	2.47
5	E	0.35	0.86	1.94
6	E, F	0.56	1.57	3.36
7	E, F	0.56	1.57	3.36
8	A, B, C, D, E, F, G	1.10	2.51	5.90
9	U1, U2	0.26	0.23	0.84

WATER QUALITY BMP SUMMARY

	VOLUME REQUIRED CUBIC FT	VOLUME PROVIDED CUBIC FT	WS ELEV (FT)	RELEASE RATE (CFS)
PLD (BASIN G)	868	868	72.70	0 (INFL)

LOCAL RUNOFF SUMMARY

BASIN	Q ₅ (CFS)	Q ₁₀₀ (CFS)
A	0.44	1.31
B	0.39	0.85
C	0.14	0.29
D	0.07	0.14
E	0.86	1.94
F	0.77	1.55
G	0.01	0.12
U1	0.21	0.67
U2	0.02	0.19

RIP-RAP OUTLET PROTECTION

DESIGN POINT	TYPE	LENGTH	WIDTH	DEPTH
4	'L'	4.5'	4.5'	15"
7	'L'	4.5'	4.5'	15"

LEGEND

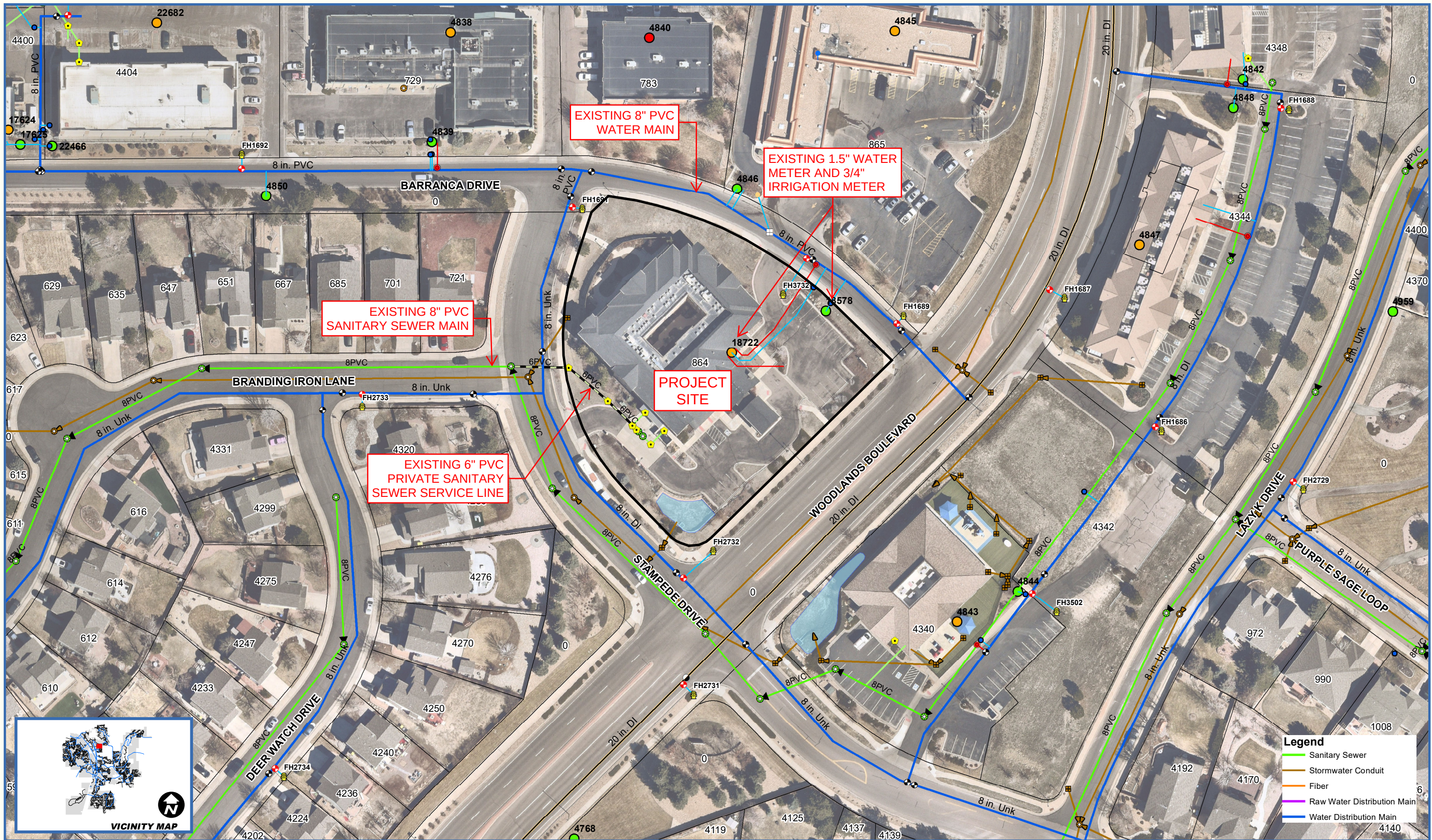
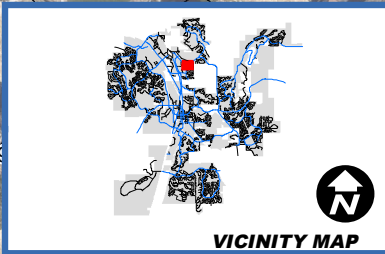
- PROPERTY LINE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- EXISTING STORM SEWER W/MANHOLE
- PROPOSED STORM SEWER W/MANHOLE AND INLET
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- PROPOSED DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN DESIGNATION
- 5-YEAR RUNOFF COEFFICIENT
- 100-YEAR RUNOFF COEFFICIENT
- BASIN AREA IN ACRES
- PROPOSED RETAINING WALL
- PROPOSED DESIGN POINT
- DRAINAGE DIRECTION

PHASE III DRAINAGE PLAN
LOT 7, METZLER RANCH FILING NO. 9
JUNE 16, 2010

Perception
Design Group, Inc.
Consulting Civil Engineers

6732 West Coal Mine Ave., Suite 419 ♦ Littleton, Colorado 80123
Office: 303-232-8088 ♦ Fax: 303-232-5255

Castle Rock GIS Utility Map



0 40 80 160 240 Feet

Date: 5/15/2023 1 inch = 80 feet



Disclaimer: The data presented has been compiled from various sources, each of which introduces varying degrees of inaccuracies or inconsistencies. Such discrepancies in data are inherent and in supplying this product the Town of Castle Rock assumes no liability for its use or accuracy. Questions or comments regarding the cartographic composition of this map including, but not limited to, errors, omissions, corrections, and/or updates, should be directed to the Utilities Department, Town of Castle Rock, (720) 733-6056. Copyright 2022, Town of Castle Rock Utilities Mapping.

- Legend**
- Sanitary Sewer
 - Stormwater Conduit
 - Fiber
 - Raw Water Distribution Main
 - Water Distribution Main

CASTLE ROCK UTILITIES MAP (INTERNAL USE ONLY)