

Reviewed 12/27/06

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**Storm Water Management/Drainage Report
For
River Rock Subdivision**

*Impact Fee calculation
shown on last page
of report.*

Date: November 1, 2006

Prepared by: Robert W. Jones II, P.E.
Vortex Engineering, Inc.
255 Vista Valley Drive
Fruita, CO 81521
970-245-9051
VEI # F05-035

Submitted To: City of Fruita
Division of Engineering
325 E. Aspen Avenue
Fruita, Colorado 81521

Type of Design: New Residential Subdivision

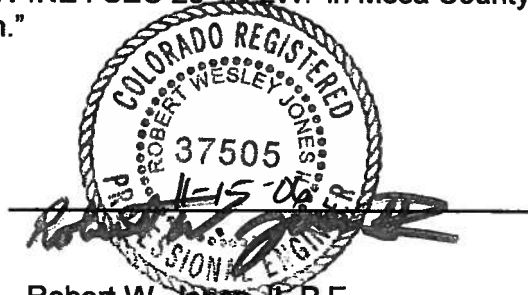
Developer/Owner: Karl R. Clemons
2557 Maureen Court
Grand Junction, CO 81506

Property Address: 972 17.5 Road
Fruita, CO 81521

Tax Schedule No.: 2697-201-00-024

Property Location: East of Maple Street (17 1/2 Road) and South of Kaley Street (Fruita, Colorado)

"I hereby certify that this report for the preliminary drainage report for the River Rock Subdivision. By legal description, the property is described as N2NW4SW4NE4 SEC 20 1N 2W. in Mesa County, Colorado, and was prepared by me or under my direct supervision."



Robert W. Jones, II, P.E.
Registered Professional Engineer,
State of Colorado No. 37505

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Exhibits and Appendices

Exhibit 'A' – Pre-Development Drainage Area Map

Exhibit 'B' – Post-Development Drainage Area Map

Appendix I - USDA – Natural Resources Conservation Service (NRCS) Soils Information

Appendix II - TR-55 Summary for Existing Hydrologic Conditions

Appendix III - TR-55 Summary for Proposed/Developed Hydrologic Conditions

Appendix IV – Storm Drain Capacity Calculations, SWMM Figures to Size Inlets, Inlet / Street Flow Quantities, Proposed Storm Drain Plan and Profile, Calculation of Drainage Impact Fee

I. Introduction/Site History

A. Property Location

The site is located east Maple Street (17 ½ Road) and south of Kaley Street which is part of the Stone Mountain Subdivision in the City of Fruita, Colorado. The property is approximately 5.0 acres in size, which includes the adjacent street area to the centerline of the right of way.

B. Description of Property

As stated above, the property is approximately 5.0 acres in size. The site is currently undeveloped except an older house and out buildings in the northwest section of the parcel.

The site slopes from the northeast to the southwest, with slopes averaging slightly less than 1 percent. Elevations vary from 4497 to 4502 feet.

According to the Natural Resource Conservation Service (NRCS), the soils across the site consist of RC-Fruitland Sandy Clay Loam on the western portion of the property and TR-Turley Clay Loam on the eastern portion. Both soils are Hydrologic Soils Group "B". A copy of the NRCS soils report is included in Appendix I.

D.H. Survey of Grand Junction, CO completed a boundary and topographic survey for the planned development. G.E.G. of Grand Junction completed a soils investigation for the planned development.

C. Purpose of Drainage Report

The 5.0-acre parcel is planned to be developed in one phase. The purpose of this Drainage Report is to evaluate the impact or change to the existing drainage patterns and peak runoff from developing this 5.0 acre parcel.

II. Existing Drainage Conditions

A. Major Basin Characteristics

This area of Fruita consists of a mixed residential, and agricultural land uses.

The general area dips to the south and west. The watershed for this site is identified as No. 118 consisting of 244 acres and has no known studies.

Based on the existing contours and a field visit, drainage from the site apparently goes to 17.5 Road where it flows south toward the Colorado River. Eventually the drainage is collected in roadside ditches and conveyed to a drain known as the Arcuby Drainage System. This drain is a 36-inch storm drain in front of this proposed development. The Arcuby Drainage System was recently constructed, apparently based on recommendations by the Fruita Storm Water Master Plan (SWMMP).

According the Mesa County GIS website, this property is located approximately 1,500 feet from the 500 year flood plain of the Colorado River.

B. Site Characteristics

As stated above, the property is approximately 5.0 acres in size. The site is currently undeveloped except for a single-family residence located in the northwest corner of the property. The property is utilized

as horse property. The site slopes from the northeast to the southwest, with slopes averaging slightly less than 1 percent. Elevations vary from 4502 to 4498 feet.

The existing drainage patterns of the property, includes a combination of sheet flow, shallow concentrated flow, and channel flow. The cover type for the site is currently pasture. Please refer to Exhibit 'A'- Pre-Development Drainage Area Map. In general, drainage flows from the northeast to the southwest corner of the property. From the corner it sheet flows onto 17.5 Road and flows south toward the Colorado River and into the Arcuby Drainage System.

III. Proposed Drainage Conditions

A. Changes in Drainage Patterns

As expected in most developments, conversion and development of this property from rural residential and pasture to a subdivision will increase the storm water runoff, both in peak rates and volumes. We propose to pipe drain flows directly into the Arcuby Drainage System and eliminate the flow onto 17 ½ Road. Consequently, a Drainage Impact Fee is proposed. The Drainage Impact fee is calculated to be \$ 12,851.49. Calculations are included in Appendix IV.

Please reference Exhibit 'B'- Post Development Drainage Area Map for an accurate depiction of proposed drainage areas. The building's roofs will drain via gutters and down spouts discharging in the landscape areas and green areas, then sheet flow to the streets. From the streets the flow will be shallow concentrated and concentrated flows along the gutters to inlets located at the west end of the development. From the inlets, the storm water will be conveyed to storm drains and ultimately the Arcuby Drainage System in Maple Street.

A back yard swale is planned to capture a small portion of drainage along the southerly border of the property. Discharge will be in the southwesterly corner of the project to Maple Street.

B. Maintenance Issues

The streets and storm drainage facilities will be dedicated to the City of Fruita who will be responsible for the maintenance. The 36-inch drain in 17.5 Road is owned by Grand Junction Drainage District (GJDD), they will maintain this line. Based on the drainage concept of the development, no maintenance to the facilities is anticipated beyond normal situations.

IV. Design Criteria and Approach

A. General Considerations

There are no known drainage constraints imposed on this site.

B. Hydrology

The hydrologic analysis presented in this drainage report used procedures per the Mesa County Storm Water Management Manual (SWMM) guidelines. The SWMM guidelines allow the use of WinTR-55 developed by the United States Department of Agriculture for use in modeling watersheds.

WinTR-55 was used to calculate the weighted runoff curve numbers and times of concentrations for both the pre-development flows and the post development flows. Analysis for this development includes peak discharges for the 2-year and 100-year intensity precipitation events and the 24-hour duration event. WinTR-55 was used to calculate the pre-development flows and the post-development bypass flows.

V. Results and Conclusions

A. Runoff Rates for the 2-Year and the 100-Year Storm

Please reference the attached WinTR-55 in the Appendices for a complete breakdown of the rates and input values utilized. The summary of estimated flows is as follows:

Condition	2 year runoff (cfs)	100 year runoff (cfs)
Pre-Development	Minor	0.52
Total Post-Development	Minor	2.06
Increase in Flow		1.54

*doesn't agree with
spread sheet in Appendix*

*4/28/09
Δ*

Miscellaneous

Two (2) single inlets, two storm drain manholes, approximately 75 feet of 18-inch diameter pipe, and 30 feet of 15-inch diameter pipe are planned for this development. Calculations for storm drain quantities/capacities are included in Appendix IV. Inlets were sized based on the Mesa County SWMM; Figures are included in Appendix IV. Please reference the Structure and Pipe Schedules in Appendix IV for a detailed description.

B. Street/Drive Aisle Flow

Runoff from the street/drive aisles will sheet flow across and drain into inlets. The inlets will direct the storm flow to a network of piping that will discharge into the Arcuby Drainage System. Please reference the proposed storm drain plan and profile in Appendix IV, for a plan of the proposed storm drain network.

C. Finish Floor Elevations of Structures

The finished floor elevations for the permanent structures are a minimum of 1.0 foot above the adjacent roadway.

D. Overall Compliance

The drainage plan for the proposed development will improve the existing drainage conditions by limiting the storm drain discharge to that currently flows onto 17 ½ Road. Adherence to this drainage report will not cause any negative impacts to this site. The 36-inch drain has a capacity of approximately 14 cfs at the point of discharge. Piping the increased post development flow of 1.54 cfs will use approximately 11 percent of the capacity.

E. Construction Phasing

There is only one phase of construction planned for this project. The storm drains will be constructed during this phase of construction.

VI. Limitations/Restrictions

This report is a site-specific design for Storm Water Management and is applicable only for the client for whom our work was performed. Use of this report under other circumstances is not an appropriate application of this document. This report is a product of Vortex Engineering Incorporated and is to be taken in its entirety. Excerpts from this report may be taken out of context and may not convey the true intent of the report. It is the owner's and owner's agents responsibility to read this report and become familiar with recommendations and design guidelines contained herein.

The recommendations and design guidelines outlined in this report are based on: 1) the proposed site development and plot plan prepared by Vortex Engineering Incorporated, 2) the site conditions disclosed at the specific time of the site investigation of reference, and 3) the boundary and topographic survey prepared by DH Surveying of Grand Junction, CO. Vortex Engineering, Inc. assumes no liability for the accuracy or completeness of information furnished by the client. Site conditions are subject to external environmental effects and may change over time. Use of this plan under different site conditions is inappropriate. If it becomes apparent that current site conditions vary from those anticipated, the design engineer should be contacted to develop any required design modifications. Vortex Engineering, Inc. is not responsible and accepts no liability for any variation in assumed design parameters.

Vortex Engineering, Inc. represents this report has been prepared within the limits prescribed by the owner and in accordance with the current accepted practice of the civil engineering profession in the area. No warranty or representation either expressed or implied is included or intended in this report or in any of our contracts.

VII. References

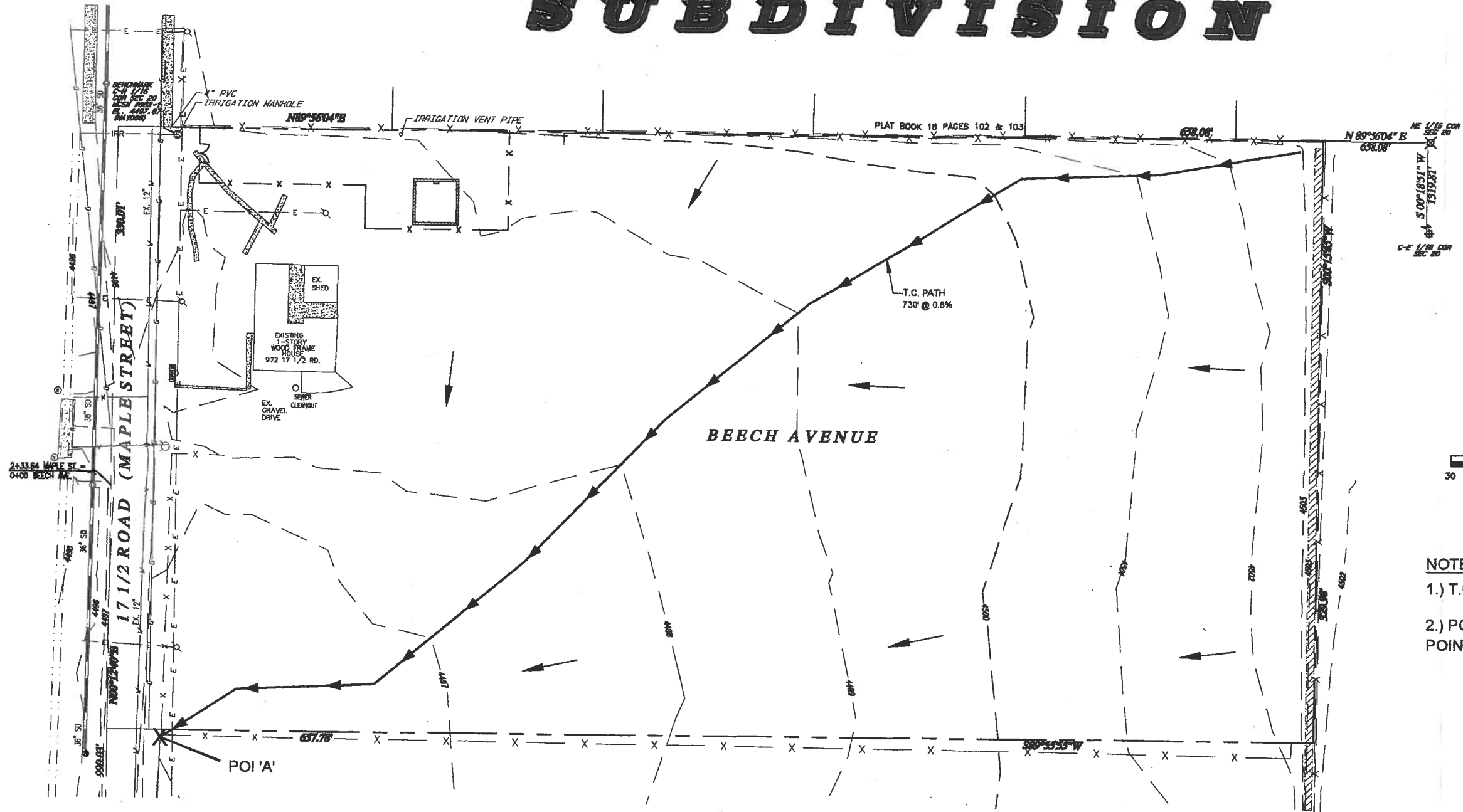
The following manuals and computer programs were used for this drainage report:

- * Storm Water Management Manual, City of Grand Junction and Mesa County, May 1996,
- The NRCS method Technical Release 55 entitled "Urban Hydrology for Small Watersheds" was used to calculate runoff curve numbers and time of concentrations.
- Storm Water Management Master Plan (SWMMP) for the City of Fruita, June 1998.

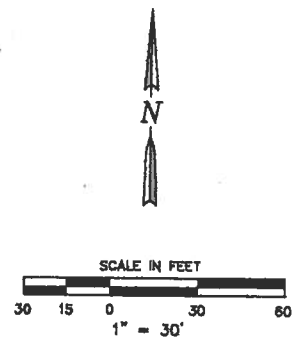
** Use revised publication dated March 2006.*

EXHIBIT 'A'
PRE-DEVELOPMENT DRAINAGE AREA MAP

RIVER ROCK SUBDIVISION



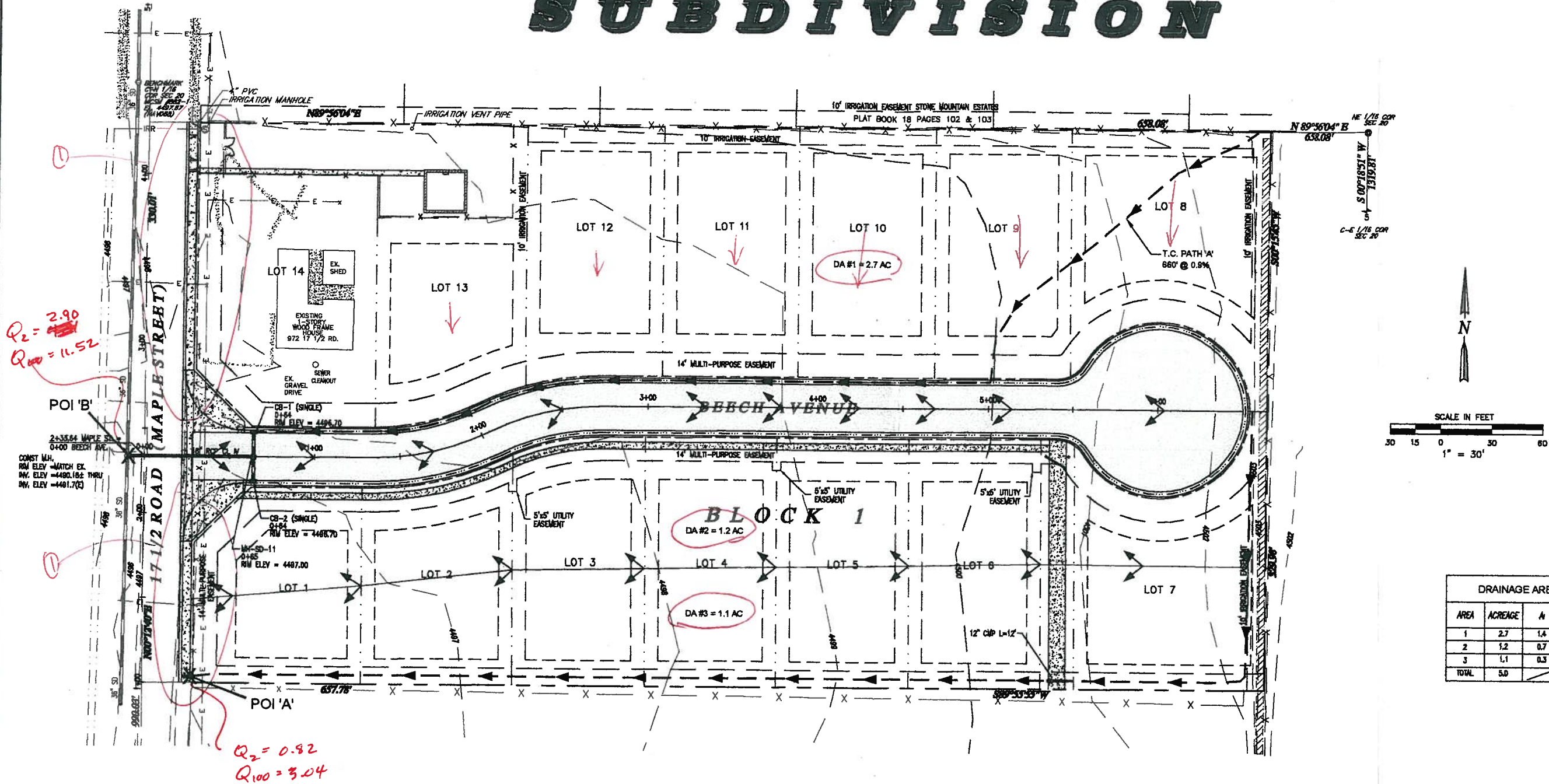
NE 1/4 COR SEC 20
S 00°18'51" W
185.61'
C-E 1/4 COR SEC 20



- NOTES**
- 1.) T.C. PATH = TIME OF CONCENTRATION PATH
 - 2.) POI "A" = POINT OF INTEREST (LOW SPOT) AND POINT OF DISCHARGE

Vertex Engineering, Inc <small>CONSTRUCTION MANAGERS & SITE PLANNERS ••• PROJECT MANAGERS ••• CIVIL & CONSULTING ENGINEERS</small> 255 Vista Valley Drive Phone: (970) 245-9271 Fruita, Colorado 81521 Fax: (970) 245-7639			
PRELIMINARY			
PROJECT: River Rock Subdivision 872 17 1/2 Road Fruita, Colorado		TITLE: PRE DEVELOPMENT DRAINAGE PLAN	
SCALE: 1" = 30' DRAWN BY: RWJ CHECKED BY: RWJ	DATE: 11-01-06 PROJECT NO.: POC-036 DAD ID:	SHEET NO.: 1 OF 1	REV. NO.:
R.W. JONES II PROFESSIONAL ENGINEER <small>COLORADO LICENSE NO. 5288 WYOMING LICENSE NO. 9425 SP18</small>	C. S. PARKER PROFESSIONAL ENGINEER <small>COLORADO LICENSE NO. 5288 CALIFORNIA LICENSE NO. 5288</small>	CONSTRUCTION CHECK:	DATE:

RIVER ROCK SUBDIVISION



$Q_2 = 2.90$
 $Q_{100} = 11.52$

$Q_2 = 0.82$
 $Q_{100} = 3.04$

① Need to address these sub-basins because they affect drain inlet capacities and affect off-site impacts.

- NOTES**
- 1.) T.C. PATH = TIME OF CONCENTRATION PATH
 - 2.) POI "A" = POINT OF INTEREST (LOW SPOT) BYPASS FLOWS (SIDEWALK TROUGH)
 - 3.) POI "B" = POINT OF INTEREST CONSTRUCT MH AND DISCHARGE TO 36" "ARCUBY DRAIN"

Vertex Engineering, Inc
 CONSTRUCTION MANAGERS & SITE PLANNERS ••• PROJECT MANAGERS ••• CIVIL & CONSULTING ENGINEERS
 255 Vista Valley Drive, Fruita, Colorado 81521 Phone: (970) 245-5051 Fax: (970) 245-7639

PRELIMINARY

PROJECT: **River Rock Subdivision**
 972 1/2 Road, Fruita, Colorado

TITLE: **POST DEVELOPMENT DRAINAGE PLAN**

SCALE: 1" = 30' DATE: 11-01-06 SHEET No: 1
 DRAWN BY: DLS PROJECT NO: POS-055
 CHECKED BY: RWJII CAD D: [Signature] OF 1

PROFESSIONAL ENGINEER: **R.W. JONES II** PROFESSIONAL ENGINEER: **C. S. PARKER**
 COLORADO LICENSE NO. 2008 CALIFORNIA LICENSE NO. 21049

CONSTRUCTION CHECK: _____ DATE: _____