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e SPR-1995-009

Date 7/9/99

Present	Scanned	
		A few items are denoted with a (*) are to be scanned for permanent record on the ISYS retrieval system. In some instances, not all entries designated to be scanned, are present in the file. There are also documents specific to certain files, not found on the standard list. For this reason, a checklist has been included. Remaining items, (not selected for scanning), will be marked present on the checklist. This index can serve as a quick guide for the contents of each file. Files denoted with (**) are to be located using the ISYS Query System. Planning Clearance will need to be typed in full, as well as other entries such as Ordinances, Resolutions, Board of Appeals, and etc.
X	X	***Summary Sheet – Table of Contents**
X		Application form
		Receipts for fees paid for anything
X	X	***Submittal checklist**
X	X	***General project report**
		Reduced copy of final plans or drawings
X		Reduction of assessor's map
X	X	Evidence of title, deeds
		***Mailing list to adjacent property owners**
		Public notice cards
		Record of certified mail
		Legal description
		Appraisal of raw land
		Reduction of any maps – final copy
	X	***Final reports for drainage and soils (geotechnical reports)**
		Other bound or nonbound reports
		Traffic studies
X		Individual review comments from agencies
X	X	***Consolidated review comments list**
		***Petitioner's response to comments**
X	X	***Staff Reports**
		***Planning Commission staff report and exhibits**
		***City Council staff report and exhibits**
		***Summary sheet of final conditions**
		***Letters and correspondence dated after the date of final approval (pertaining to change in conditions or expiration date)**

DOCUMENTS SPECIFIC TO THIS DEVELOPMENT FILE:

X		Basin map			
X	X	Soils map			
X	X	Grading and Drainage Plan – stamped and signed			
X		Site Plan – not stamped or signed			
X		Landscape Plan – not stamped or signed			
X		Note from Millie Fowler – 3/7/95			
X		Assessor's map			
X		Memo Jody Kliska from Michael Drollinger – 2/22/95			
X	X	Letter to Pat Portice from Michael Drollinger – 2/24/95			
X		Letter to Marcia Rabideux from Jody Kliska – 1/16/95			
X		Planning Clearance **	X		Treasurer's Certificate of Taxes due
	X	Letter from Michael Drollinger to Pat Portice – 2/3/95	X		Pre-application
X		Letter from Michael Drollinger to Pat Portice – 12/22/95	X		Structural slab pad/wall section
X		Letter from Denny Granum to Michael Drollinger – 7/25/95			

SUBMITTAL CHECKLIST

SITE PLAN REVIEW

Location: 29 Rd & I-70 B   Project Name: Bldg Materials Sales

pl $185.00
1890
#SPR-95-9

ITEMS / DESCRIPTION	SSID REFERENCE	City Community Development ●	City Dev. Eng. ●	City Utility Eng. ●	City Property Agent ●	City Parks/Recreation ●	City Fire Department ●	City Attorney ●	City Downtown Dev. Auth. ○	County Planning ●	County Bldg. Dept. ●	Irrigation District ○	Drainage District ○	Water District ○	Sewer District ○	U.S. West ○	Public Service ○	GVRP ○	CDOT ●	Corps of Engineers ○	Walker Field ○	City Police Dept. ●	TOTAL REQ'D
● Application Fee $185	VII-1	1																					
● Submittal Checklist*	VII-3	1																					
● Review Agency Cover Sheet*	VII-3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	/	
● Planning Clearance*	VII-3	1																					
● ~~11"x17"~~ 8½x11 Reduction of Assessor's Map	VII-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	/	
● Evidence of Title	VII-2	1			1			1															
○ Appraisal of Raw Land	VII-1	1			1	1																	
○ Deeds	VII-1	1			1			1															
○ Easements	VII-2	1	1	1	1			1															
○ Avigation Easement	VII-1	1			1			1															
~~● ROW~~	~~VII-3~~	~~1~~	~~1~~	~~1~~	~~1~~			~~1~~															
○ Improvements Agreement/Guarantee	VII-2	1	1	1				1															
○ CDOT Access Permit	VII-3	1	1																				
○ Industrial Pretreatment Sign-off	VII-4	1		1																			
● General Project Report	X-7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	/	
○ Elevation Drawing	IX-13	1	1																				
● Site Plan	IX-29	2	2	1	1		/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
○ 11"x17" Reduction of Site Plan	IX-29						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	/	
● Grading and Drainage Plan	IX-16	1	2										1							1			
○ Storm Drainage Plan and Profile	IX-30	1	2										1			1	1	1					
○ Water and Sewer Plan and Profile	IX-34	1	2	1			1							1	1	1	1	1					
○ Roadway Plan and Profile	IX-28	1	2										1										
○ Road Cross-Sections	IX-27	1	2																				
○ Detail Sheet	IX-12	1	2																				
● Landscape Plan (on site plan)	IX-20	2	1	1																			
○ Geotechnical Report	X-8	1	1								1												
○ Final Drainage Report	X-5,6	1	2										1										
○ Stormwater Management Plan	X-14	1	2										1							1			
○ Phase I and II Environmental Report	X-10,11	1	1																				
○ Traffic Impact Study	X-15	1	2																1				

NOTES:
1) An asterisk in the item description column indicates that a form is supplied by the City.
2) Required submittal items and distribution are indicated by filled in circles, some of which may be filled in during the pre-application conference. Additional items or copies may be subsequently requested in the review process.
3) Each submitted item must be labeled, named, or otherwise identified as described above in the description column.

DRAWING STANDARDS CHECKLIST

LANDSCAPE PLAN

ITEM	GRAPHIC STANDARDS	OK	NA
SECTION VIII A	Scale: 1" = 10' or 20'		
B	Drawing size: 24" x 36"		
C	Primary features consist only of landscape features		
D	Notation: All non-construction text, and also construction notation for all primary features		
E	Line weights of existing and proposed (secondary and primary) features per City standards		
H	Vertical control: Benchmarks on U.S.G.S. datum if public facilities other than SW are proposed		
I	Orientation and north arrow		
K	Title block with names, titles, preparation and revision dates		
M	Legend of symbols used		
N	List of abbreviations used		
P	Multiple sheets provided with overall graphical key and match lines		
Q	Contouring interval and extent		
R	Neatness and legibility		

ITEM	FEATURES	OK	NA
→ 1	Use the Site Plan as a base map.		
2	Identify areas to be covered with specific landscaping materials.		
3	Boulders, mounds, swales, water courses, rock outcroppings.		
4	Planting Material Legend includes common and botanical names, quantities, minimum purchase sizes, mature height, groundcover/perennial spacing, types of soil, and other remarks.		
5	Specification of soil type and preparation.		
6	Landscape irrigation layout, design, materials, and details (if requested by City staff).		
7	Planting/staking and other details as required.		
8	Required note on Plan: "An underground, pressurized irrigation system will be provided."		
9	Space for approval signature by Community Development with date and title.		

COMMENTS

1 This drawing may be eliminated if information may be put on the Site Plan. See Note (2) on the Site Plan Checklist.

DRAWING STANDARDS CHECKLIST

LANDSCAPE PLAN

ITEM		GRAPHIC STANDARDS	OK	NA
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	Q	Contouring interval and extent		
	R	Neatness and legibility		

ITEM		FEATURES	OK	NA
→	1	Use the Site Plan as a base map.		
	2	Identify areas to be covered with specific landscaping materials. - grassed areas?		
	3	Boulders, mounds, swales, water courses, rock outcroppings.		
	4	Planting Material Legend includes common and botanical names, quantities, minimum purchase sizes, mature height, groundcover/perennial spacing, types of soil, and other remarks.		
	5	Specification of soil type and preparation.		
	6	Landscape irrigation layout, design, materials, and details (if requested by City staff).		
	7	Planting/staking and other details as required.		
	8	Required note on Plan: "An underground, pressurized irrigation system will be provided."		
	9	Space for approval signature by Community Development with date and title.		

COMMENTS

1 This drawing may be eliminated if information may be put on the Site Plan. See Note (2) on the Site Plan Checklist.

REVIEW COMMENTS

FILE #SPR-95-9 **TITLE HEADING:** Site Plan Review - Building Materials Sales

LOCATION: 2898 I-70 Business Loop

PETITIONER: Monument Homes

PETITIONER'S ADDRESS/TELEPHONE: 759 Horizon Drive, Suite A
Grand Junction, CO 81506
243-4890

PETITIONER'S REPRESENTATIVE: Pat Portice

STAFF REPRESENTATIVE: Michael Drollinger

NOTE: WRITTEN RESPONSE (4 COPIES) BY THE PETITIONER TO THE REVIEW COMMENTS IS REQUIRED. A PLANNING CLEARANCE WILL NOT BE ISSUED UNTIL ALL ISSUES HAVE BEEN RESOLVED.

GRAND JUNCTION POLICE DEPARTMENT **1/5/95**
J. Hall **244-3577**

It does not appear that this project will cause any impact on the Police Department.

GRAND JUNCTION FIRE DEPARTMENT **1/6/95**
Hank Masterson **244-1414**

A fire flow survey is required - submit complete building plans to the Fire Department. A complete utility composite should also be submitted showing water line sizes and locations of hydrants. Requirements for additional hydrants will depend on fire flow requirements.

Interior heights of building that permit storage over 12' high and 2,500 square feet in area will require a fire sprinkler system or smoke detection system.

MESA COUNTY PLANNING **1/6/95**
Mike Joyce **244-1642**

The site plan indicates limited landscaping. More would seem to be appropriate. No landscaping is indicated for the retention pond. Is the pond a "retention" or "detention" facility? What type of grass, if any, is proposed for the "yard"? Does the trash container need to be screened? Need to more clearly define the location of the sign. Two driveway locations would seem to be appropriate.

CITY UTILITY ENGINEER **1/12/95**
Bill Cheney **244-1590**

No comment.

CITY DEVELOPMENT ENGINEER **1/16/95**
Jody Kliska **244-1591**

1. 29 Road is a principal arterial and requires 110' of total right-of-way. Dedication of sufficient right-of-way is required so that there will be 55' of half right-of-way. Submitted drawings show less than 30' of existing half right-of-way.
2. The Transportation Capacity Payment is $1,756.80.
3. A drainage report detailing the size of the retention area is required. the City Stormwater manual requires a percolation test stamped by an engineer for retention areas. Drainage reports must be prepared by a registered engineer. A more detailed grading plan is required as per the attached checklist.
4. Parking spaces need to be dimensioned and must meet the Zoning and Development Code requirements. One handicap space is required and must be signed, marked and meet dimensions in City Standards. A ramp to the sidewalk to enter the building is required and must meet ADA requirements.
5. The trash container placement needs to be reviewed by the Sanitation Department. A pavement detail is required which shows the pavement is designed so trash trucks do not damage the pavement when loading.
6. A CDOT access permit will be required for the driveway onto the frontage road.
7. Red-lined drawing and information is attached.

COMMUNITY DEVELOPMENT DEPARTMENT **1/16/95**
Michael Drollinger **244-1439**

See attached.

Grand Junction Community Development Department
Planning • Zoning • Code Enforcement
250 North Fifth Street
Grand Junction, Colorado 81501-2668
(303) 244-1430 FAX (303) 244-1599

February 3, 1995

Attn: Pat Portice
Monument Homes
759 Horizon Drive, Suite A
Grand Junction, CO 81506

Re: Our File #SPR-95-9

Dear Mr. Portice,

We have reviewed your revised submittal and have identified the remaining outstanding items below including the City Development Engineer's comments.

OUTSTANDING ITEMS

Community Development

1. Section 5-5-1 F(1) of the Zoning and Development Code requires that at least five percent of the parking lot area shall be used for landscaping. Our calculations indicate that about 375 square feet is provided whereas 820 square feet of landscaping is required. The amount of required landscaping would be reduced if the minimum parking as per Code would be provided.

2. The frontage landscaping is sufficient in size, however,much of it appears to be in the ROW of 29 Road. We would recommend that the parking along the building on the 29 Road frontage be eliminated (since it is not required by Code) or converted to parallel parking spaces and the driveway width narrowed which would allow for the frontage landscaping to be located on the property (a maximum of 15% of the frontage landscaping may be located in the ROW as per Code). Also indicate groundcover to be used along frontage between the landscaping and the street.

3. Landscape Plan is incomplete, see attached checklist for remaining items (minor).

4. All landscaped areas should be protected by concrete curbing; please identify curbing provided on the plan.

Development Engineer

1. An additional five (5) feet of right-of-way dedication will be required. From the latest drawing it appears a substantial amount of the landscaping and drainage is in the ROW.

2. The Stormwater Management Manual (SWMM) requires a percolation test performed and certified by a licensed engineer be submitted for retention ponds. Calculations for the drainage need

to be submitted to ensure that the area provided for retention is adequate. Approximately 47% of the proposed retention area is in the ROW and the drainage fee would be charged proportional to that. A preliminary calculation of the proportionate drainage fee (in lieu of providing on-site detention) is $1185.57.

3. The handicapped spaces must be dimensioned, marked and signed as shown in the City Standard Drawings.

4. The frontage road driveway requires a CDOT access permit. The CDOT process takes from 30-45 days; thus the applicant needs to begin that process as soon as possible.

5. The Transportation Capacity Payment is calculated at $1,756.80.

6. A construction detail of the loading dock ramp is required showing the placement of reinforcing steel, thickness of concrete, dimensions including the maximum height of ramp.

Revised plans will be required.

If you have any questions please feel free to contact me at 244-1439.

Sincerely yours,

Michael T. Drollinger
Senior Planner

cc: Jody Kliska, City Development Engineer (w/enclosure)
File #SPR95-9

Enclosures

95-092.wpd

COMMUNITY DEVELOPMENT DEPARTMENT
CITY OF GRAND JUNCTION

PROJECT INSPECTION REPORT

SPR-

FILE #: 95-9

PROJECT NAME: BUILDING MATERIALS SALES (E&E WINDOW & DOOR)

INSPECTION DATE: 7/24/95

PROJECT PLANNER: MICHAEL T. DROLLINGER

☐ **Project completed as per approved plans**

☒ **Project incomplete as noted below:**

- Drainage facilities not completed as per plans
- Fence to adjoining residence not completed (north prop. line)

SIGNATURE: _____ *DATE:* 7/24/95

h:\mdforms\projinsp.wpd

Grand Junction Community Development Department
Planning • Zoning • Code Enforcement
250 North Fifth Street
Grand Junction, Colorado 81501-2668
(303) 244-1430 FAX (303) 244-1599

February 24, 1995

Attn: Pat Portice
Monument Homes
759 Horizon Drive, Suite A
Grand Junction, CO 81506

Re: Our File #SPR-95-9

Dear Mr. Portice,

We have reviewed your revised submittals (received February 22nd) and have identified the remaining outstanding items below including the City Development Engineer's comments.

OUTSTANDING ITEMS

Community Development

We did not receive any plans which addressed the items identified in the February 9th letter so they are repeated here for your information:

1. Section 5-5-1 F(1) of the Zoning and Development Code requires that at least five percent of the parking lot area shall be used for landscaping. Our calculations indicate that about 375 square feet is provided whereas 820 square feet of landscaping is required. The amount of required landscaping would be reduced if the minimum parking as per Code would be provided.

2. The frontage landscaping is sufficient in size, however,much of it appears to be in the ROW of 29 Road. We would recommend that the parking along the building on the 29 Road frontage be eliminated (since it is not required by Code) or converted to parallel parking spaces and the driveway width narrowed which would allow for the frontage landscaping to be located on the property (a maximum of 15% of the frontage landscaping may be located in the ROW as per Code). Also indicate groundcover to be used along frontage between the landscaping and the street.

3. Landscape Plan is incomplete, see attached checklist for remaining items (minor).

4. All landscaped areas should be protected by concrete curbing; please identify curbing provided on the plan.

Development Engineer

The drainage report which was submitted is acceptable. The remaining items must still be

addressed:

1. An additional five (5) feet of right-of-way dedication will be required.

2. The Transportation Capacity Payment is calculated at $1,756.80.

3. A construction detail of the loading dock ramp is required showing the placement of reinforcing steel, thickness of concrete, dimensions including the maximum height of ramp.

Revised plans will be required.

If you have any questions please feel free to contact me at 244-1439.

Sincerely yours,

Michael T. Drollinger
Senior Planner

cc: Jody Kliska, City Development Engineer (w/enclosure)
File #SPR95-9

Enclosures

95-092.wpd

GENERAL PROJECT REPORT

A. Project Description
   1. Location: Southwest corner of 29 Road and Frontage Road of U.S. Hwy 6 and 24.
   2. Acreage: .70 acres.
   3. Proposed use: Sales and warehousing of certain building materials. Such materials include windows, doors, garage doors and other related items.

B. Public Benefit

   Vacant, unattended property will be the location of a new commercial structure, complete with appropriate colors, lighting, landscaping, and fencing.

   Business products and services of the occupying company will be easily accessible to its customers.

C. Project Compliance, Compatibility, and impact
   1. Adopted plans and/or policies: plans and policies for this project comply with zoning of the area.
   2. Land use in surrounding area: east and west properties on the Frontage Road are commercial and/or light industrial in nature. Property to the north is composed of some residential, some non-residential. Property to the south is railroad.
   3. Site access and traffic patterns: Site access on the north will be from a driveway near the north property line on 29 Road. Site access on the south will be from a driveway near the southwest corner of the property on to the frontage road if a second access is deemed necessary. Driveways are planned to keep traffic away from the intersection when entering or exiting the site.
   4. Availability of utilities: Water, sewer, gas, and phone are adjacent to the property. There is a city fire hydrant in the approximate center of the property on the 29 Road side.
   5. Special or unusual demands upon utilities: None.
   6. Effects on public facilities: None.
   7. Site soils and geology: Site soils are a coarse alluvial deposit composed of stratification of silts and clays.
   8. Impact of project on site geology: None.
   9. Hours of operation: Normal hours of operation will be from approximately 8:00AM to approximately 6:00PM.
   10. Signage Plans: One free-standing sign is planned for the southeast area of the property, and probable flush mounted building signs will be installed.

11. Development schedule and phasing: Project will proceed immediately upon approvals, and consists of one phase.

DRAINAGE REPORT FOR:

E & E DOOR AND WINDOW

February, 1995

Prepared For:

Denny Granum
Monument Realty
759 Horizon Drive, Suite A
Grand Junction, Colorado 81506

Prepared By:

LANDesign LTD.
200 North 6th Street, Grand Junction, Colorado 81501
(303) 245-4099

Prepared By: _____
Monty D. Stroup

"I hereby certify that this report for the drainage design of the E & E Door and Window was prepared under my direct supervision."

Reviewed By: _____
Philip M. Hart, P.E.
State of Colorado, #19346

I. General Location and Description

A. Site and Major Basin Location:

E & E Door and Window contains approximately 0.68 acres and is located within the City of Grand Junction. The property is located in part of the SE 1/4 of the NE 1/4 of Section 18, Township One South, Range One East, of the Ute Meridian.

Streets in the vicinity include 29 Road which defines the east boundary of the site and the Frontage Road for I-70B which defines the south boundary.

Development in the vicinity is of mixed use in nature. To the north lies a single family residential home. To the west is the commercial woodworking shop. South lies I-70B with the D.R.G&W. Railroad beyond. To the west is Lucas Diesel Service a truck service facility.

B. Site and Major Basin Description:

The project site contains approximately 0.68 acres. The site is vacant of structures and is in a fallow state. Agricultural production has never occurred on the property.

Based on the "Soil Survey, Mesa County Area" (Reference 5, Exhibit 3.0) onsite soils are defined as (Bc), Billings silty clay loam, 0 to 2 percent slopes, hydrological soil group "C".

II. Existing Drainage Conditions

A. Major Basin:

Onsite and offsite lands drain generally from the northeast to the southwest towards I-70B where it is conveyed westerly along the Frontage Road.

There are no wetlands on the site. The site is void of Ground cover.

The subject site is within Zone X as determined by the FIRM Flood Insurance Rate Map.

B. Site:

Approximately 70 percent of the onsite historic basin drains from the northeast to the southwest in a sheetflow fashion towards the Frontage Road of I-70B. The remaining 30 percent of the site drains in a sheetflow fashion towards the southeast corner of the site where it is intercepted by an existing irrigation and drainage ditch owned and maintained by the Fruitvale Lateral and Waste Ditch Association. The flow within this ditch is conveyed south under I-70B via a 24-inch Diameter CMP towards the Colorado River.

The site is not affected by offsite runoff as it is bounded to the north by an existing ditch which directs flow east away from the site to the existing irrigation and drainage ditch adjacent to 29 Road. Topography of the property is flat in nature and slopes from the northeast to the southwest at approximately 0.6 percent.

III. Proposed Drainage Conditions

A. Changes in Drainage Patterns:

Historic offsite drainage patterns will be altered to direct flow away from the southwest corner of the site towards the existing irrigation and drain ditch adjacent to 29 Road.

The site is planned for a 7200 square foot building structure and associated parking lot.

There are no offsite tributary sub-basins which affect the subject property. Offsite drainage is directed towards the existing irrigation and drainage ditch.

All of the future drainage will be redirected by lot grading and swales to the southeast corner of the site where it is to be collected and conveyed by the existing 24-inch diameter CMP under I-70B. The proposed site plan divides the site into 3 sub-basins labeled A1(0.11 Ac.), B1(0.05 Ac.) and C1(0.52 Ac.). Sub-basins A1 and B1 are to be gravel landscaped and graded as shown on Exhibit 1.0 to direct runoff directly to the existing irrigation and drainage ditch adjacent to 29 Road. Sub-basin C1 is made up of the site building and parking lot improvements. For purposes of this study and due to site constraints the runoff from sub-basin C1 will be detained and released at historic rates. Runoff from sub-basins A1 and B1 will be allowed to pass unabated to the existing ditch along 29 Road. Detained runoff from sub-basin C1 will conveyed under I-70B via the 24" CMP. Fruitvale Lateral and Waste Ditch Association has agreed to accept runoff from the site for a yearly fee to be paid by the owner of the project.

B. Maintenance Issues:

Access to and through the site shall be by private driveway.

Ownership and responsibility for maintenance of the proposed onsite curb and gutter improvements shall be that of the property owner.

IV. Design Criteria & Approach

A. Hydrology:

The "Stormwater Management Manual, City of Grand Junction, Colorado" (Reference 1) and the "Mesa County Storm Drainage Criteria Manual" (Reference 2) were used as the basis for analysis and facility design.

As the project is a commercial development containing approximately 0.68 acres the "Rational Method" was used to calculate historic and developed flow rates. The minor storm is the 2 year frequency rainfall event and the major storm is the 100 year frequency rainfall event. Detention requirements are based on both the minor and major storm events. Allowable release rates are based on historic or pre-developed conditions. The "Modified Rational Method" was used to calculate required detention storage volumes for the 2 year and 100 year rainfall events as defined in Section N of Reference 1.

Runoff Coefficients to be used in the computations are based on the most recent City of Grand Junction criteria as defined in Reference 1 and shown on Exhibit 4.0 . The Soil Conservation Service defines site soils as being (Bc) Billings silty clay loam, 0 to 2 percent slopes (Reference 5, Exhibit 3.0). This soils falls within the Hydrologic Soil Group C .

The Intensity Duration Frequency Curves (IDFC) tabulated and shown on Exhibits 5.0 and 6.0 were used for design and analysis.

Times of Concentration were calculated based on the Average Velocities For Overland Flow and the Overland Flow Curves as provided in Reference 1 and shown on Exhibits 7.0 and 8.0. The results of the Tc calculations are shown on Exhibit 11.0 and 12.0.

Because offsite flows are directed away from the project site, compliance with offsite drainage considerations are mitigated.

B. Hydraulics:

All site facilities and conveyance elements are designed in accordance with the City of Grand Junction guidelines as provided in Reference 1.

Detention pond stage-storage-discharge analysis was completed using the conic method as employed by the computer program "HYDROLOGY, Watershed Modeling, Volume I, Version 6.0".

The outlet works for the detention pond is a compound weir sized to discharge the 2 year and 100 year storm events respectively. The weir calculations are shown on Exhibit 15.

V. Conclusions

The construction of the parking lot and driveways will require the import of fill material sufficient to build up the site to the minimum grades and lines as shown on the Grading and Drainage Plan.

Because the development of this project will result in the disturbance of less than five acres of land a "Construction Stormwater Discharge Permit" is not required.

This Drainage Report has been prepared to address site-specific drainage concerns in accordance with the requirements of the City of Grand Junction, Colorado. The Appendix of this report includes criteria, exhibits, tables and calculations used in the design and analysis.

VI. References

1. Stormwater Management Manual (SWMM), City of Grand Junction, Colorado, Department of Public Works, June 1994.

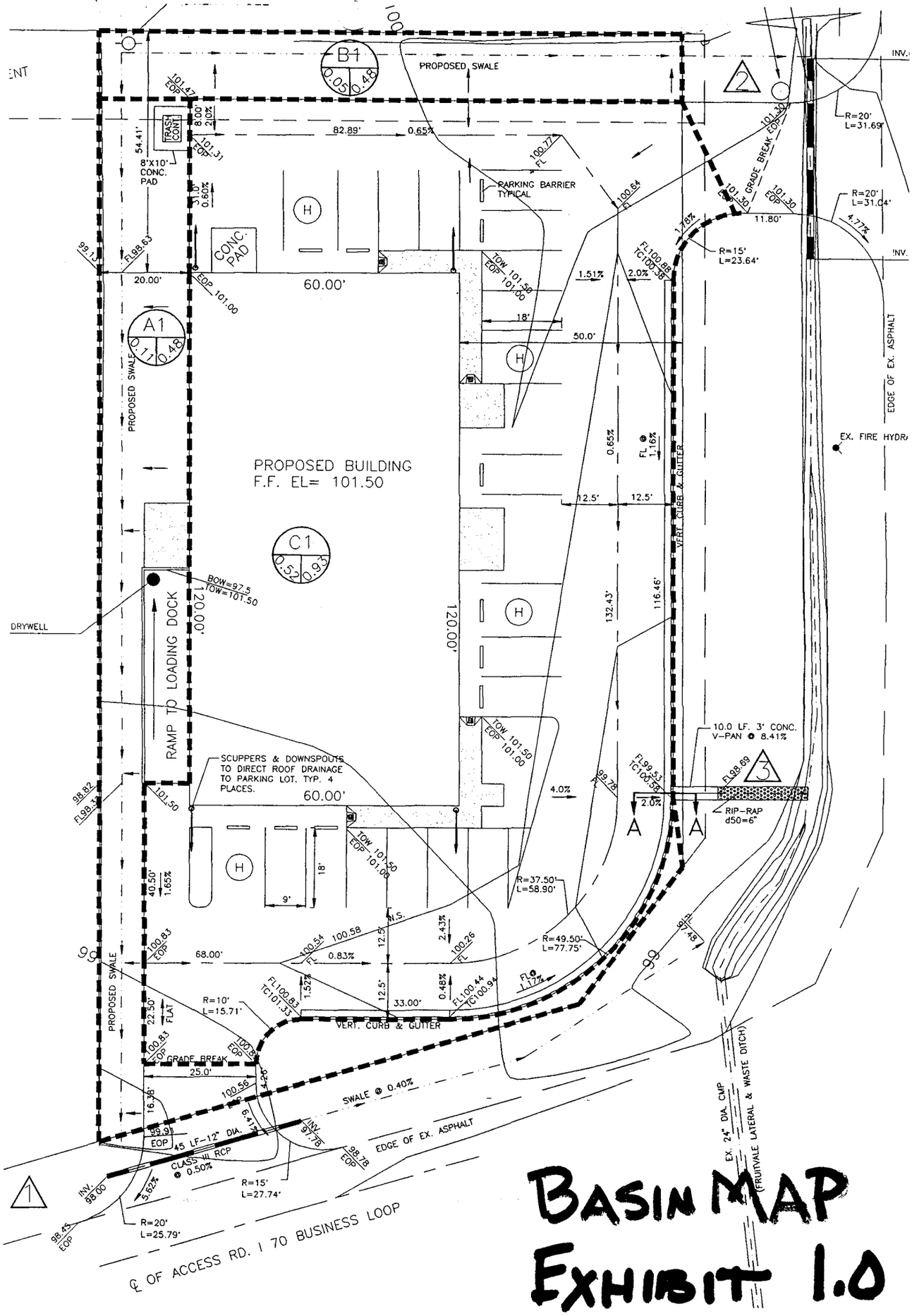
2. Mesa County Storm Drainage Criteria Manual, Final Draft, Mesa County, Colorado, March, 1992.

3. Flood Hazard Information, Colorado River and Tributaries, Grand Junction, Colorado, prepared for the City of Grand Junction and Mesa County, by The Department Of The Army, Sacramento District, Corps Of Engineers, Sacramento, California, November, 1976.

4. Flood Insurance Rate Map, City Of Grand Junction, Colorado, Mesa County, Community Panel Number 080117 0001 0009, Federal Emergency Management Agency, Map Revised July 15th, 1992.

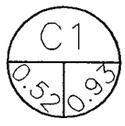
5. Soil Survey, Mesa County Area, Colorado, , U.S. Department of Agriculture, issued November, 1955.

APPENDIX



BASIN MAP
EXHIBIT 1.0

LEGEND



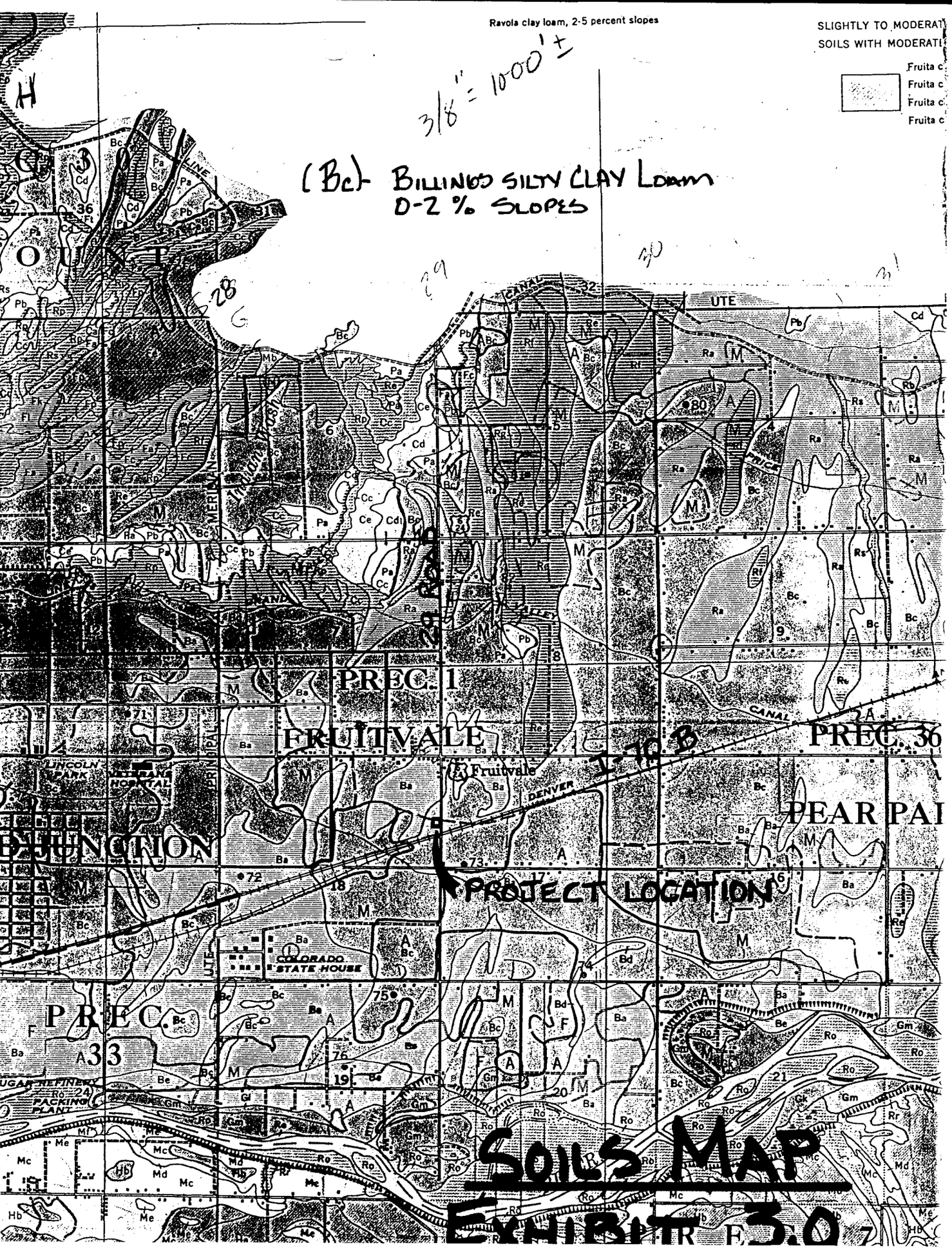
SUB–BASIN I.D.

SUB–BASIN AREA AC.	2 YEAR RUNOFF COEFFICIENT

SUB–BASIN BOUNDARY

DESIGN POINT

EXHIBIT 2.0


Ravola clay loam, 2-5 percent slopes
SLIGHTLY TO MODERAT
SOILS WITH MODERATI
Fruita c
Fruita c
Fruita c
Fruita c
3/8" = 1000' ±
(Bc)- BILLINGS SILTY CLAY LOAM
0-2 % SLOPES
PREC. 1
FRUITVALE
PREC. 36
PEAR PA
PROJECT LOCATION
Fruitvale
DENVER
CANAL
UTE
PRINCIPAL
COLORADO STATE HOUSE
SUGAR REFINERY
PACKING PLANT
SOILS MAP
EXHIBIT E 3.0

LAND USE OR SURFACE CHARACTERISTICS	SCS HYDROLOGIC SOIL GROUP (SEE APPENDIX "C" FOR DESCRIPTIONS)											
	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
UNDEVELOPED AREAS Bare ground	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .40 - .48	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Cultivated/Agricultural	.08 - .18 .14 - .24	.13 - .23 .18 - .28	.16 - .26 .22 - .32	.11 - .19 .16 - .24	.15 - .23 .21 - .29	.21 - .29 .28 - .36	.14 - .22 .20 - .28	.19 - .27 .25 - .33	.26 - .34 .34 - .42	.18 - .26 .24 - .32	.23 - .31 .29 - .37	.31 - .39 .41 - .49
Pasture	.12 - .22 .15 - .25	.20 - .30 .25 - .35	.30 - .40 .37 - .47	.18 - .26 .23 - .31	.28 - .36 .34 - .42	.37 - .45 .45 - .53	.24 - .32 .30 - .38	.34 - .42 .42 - .50	.44 - .52 .52 - .60	.30 - .38 .37 - .45	.40 - .48 .50 - .58	.50 - .58 .62 - .70
Meadow	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .44 - .52	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Forest	.05 - .15 .08 - .18	.08 - .18 .11 - .21	.11 - .21 .14 - .24	.08 - .16 .10 - .18	.11 - .19 .14 - .22	.14 - .22 .18 - .26	.10 - .18 .12 - .20	.13 - .21 .16 - .24	.16 - .24 .20 - .28	.12 - .20 .15 - .23	.16 - .24 .20 - .28	.20 - .28 .25 - .33
RESIDENTIAL AREAS 1/8 acre per unit	.40 - .50 .48 - .58	.43 - .53 .52 - .62	.46 - .56 .55 - .65	.42 - .50 .50 - .58	.45 - .53 .54 - .62	.50 - .58 .59 - .67	.45 - .53 .53 - .61	.48 - .56 .57 - .65	.53 - .61 .64 - .72	.48 - .56 .56 - .64	.51 - .59 .60 - .68	.57 - .65 .69 - .77
1/4 acre per unit	.27 - .37 .35 - .45	.31 - .41 .39 - .49	.34 - .44 .42 - .52	.29 - .37 .38 - .46	.34 - .42 .42 - .50	.38 - .46 .47 - .55	.32 - .40 .41 - .49	.36 - .44 .45 - .53	.41 - .49 .52 - .60	.35 - .43 .43 - .51	.39 - .47 .47 - .55	.45 - .53 .57 - .65
1/3 acre per unit	.22 - .32 .31 - .41	.26 - .36 .35 - .45	.29 - .39 .38 - .48	.25 - .33 .33 - .41	.29 - .37 .38 - .46	.33 - .41 .42 - .50	.28 - .36 .36 - .44	.32 - .40 .41 - .49	.37 - .45 .48 - .56	.31 - .39 .39 - .47	.35 - .43 .43 - .51	.42 - .50 .53 - .61
1/2 acre per unit	.16 - .26 .25 - .35	.20 - .30 .29 - .39	.24 - .34 .32 - .42	.19 - .27 .28 - .36	.23 - .31 .32 - .40	.28 - .36 .36 - .44	.22 - .30 .31 - .39	.27 - .35 .35 - .43	.32 - .40 .42 - .50	.26 - .34 .34 - .42	.30 - .38 .38 - .46	.37 - .45 .48 - .56
1 acre per unit	.14 - .24 .22 - .32	.19 - .29 .26 - .36	.22 - .32 .29 - .39	.17 - .25 .24 - .32	.21 - .29 .28 - .36	.26 - .34 .34 - .42	.20 - .28 .28 - .36	.25 - .33 .32 - .40	.31 - .39 .40 - .48	.24 - .32 .31 - .39	.29 - .37 .35 - .43	.35 - .43 .46 - .54
MISC. SURFACES Pavement and roofs	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97
Traffic areas (soil and gravel)	.55 - .65 .65 - .70	.60 - .70 .70 - .75	.64 - .74 .74 - .79	.60 - .68 .68 - .76	.64 - .72 .72 - .80	.67 - .75 .75 - .83	.64 - .72 .72 - .80	.67 - .75 .75 - .83	.69 - .77 .77 - .85	.72 - .80 .79 - .87	.75 - .83 .82 - .90	.77 - .85 .84 - .92
Green landscaping (lawns, parks)	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .42 - .52	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Non-green and gravel landscaping	.30 - .40 .34 - .44	.36 - .46 .42 - .52	.45 - .55 .50 - .60	.45 - .55 .50 - .60	.42 - .50 .48 - .56	.50 - .58 .57 - .65	.40 - .48 .46 - .54	.48 - .56 .55 - .63	.56 - .64 .64 - .72	.44 - .52 .50 - .58	.50 - .58 .60 - .68	.60 - .68 .70 - .78
Cemeteries, playgrounds	.20 - .30 .24 - .34	.26 - .36 .32 - .42	.35 - .45 .40 - .50	.35 - .45 .40 - .50	.32 - .40 .38 - .46	.40 - .48 .47 - .55	.30 - .38 .36 - .44	.38 - .44 .45 - .53	.46 - .54 .54 - .62	.34 - .42 .40 - .48	.40 - .48 .50 - .58	.50 - .58 .60 - .68

NOTES:
1. Values above and below pertain to the 2-year and 100-year storms, respectively.
2. The range of values provided allows for engineering judgement of site conditions such as basic shape, homogeneity of surface type, surface depression storage, and storm duration. In general, during shorter duration storms (Tc ≤ 10 minutes), infiltration capacity is higher, allowing use of a "C" value in the low range. Conversely, for longer duration storms (Tc) 30 minutes), use a ""C value in the higher range.
3. For residential development at less than 1/8 acre per unit or greater than 1 acre per unit, and also for commercial and industrial areas, use values under MISC SURFACES to estimate "C" value ranges for use.

RATIONAL METHOD RUNOFF COEFFICIENTS
(Modified from Table 4, UC-Davis, which appears to be a modification of work done by Rawls)

TABLE "B-1"

EXHIBIT 4.0

TABLE "A-1" INTENSITY-DURATION-FREQUENCY (IDF) TABLE					
Time (min)	2-Year Intensity (in/hr)	100-Year Intensity (in/hr)	Time (min)	2-Year Intensity (in/hr)	100-Year Intensity (in/hr)
5	1.95	4.95	33	0.83	2.15
6	1.83	4.65	34	0.82	2.12
7	1.74	4.40	35	0.81	2.09
8	1.66	4.19	36	0.80	2.06
9	1.59	3.99	37	0.79	2.03
10	1.52	3.80	38	0.78	2.00
11	1.46	3.66	39	0.77	1.97
12	1.41	3.54	40	0.76	1.94
13	1.36	3.43	41	0.75	1.91
14	1.32	3.33	42	0.74	1.88
15	1.28	3.24	43	0.73	1.85
16	1.24	3.15	44	0.72	1.82
17	1.21	3.07	45	0.71	1.79
18	1.17	2.99	46	0.70	1.76
19	1.14	2.91	47	0.69	1.73
20	1.11	2.84	48	0.68	1.70
21	1.08	2.77	49	0.67	1.67
22	1.05	2.70	50	0.66	1.64
23	1.02	2.63	51	0.65	1.61
24	1.00	2.57	52	0.64	1.59
25	0.98	2.51	53	0.63	1.57
26	0.96	2.46	54	0.62	1.55
27	0.94	2.41	55	0.61	1.53
28	0.92	2.36	56	0.60	1.51
29	0.90	2.31	57	0.59	1.49
30	0.88	2.27	58	0.58	1.47
31	0.86	2.23	59	0.57	1.45
32	0.84	2.19	60	0.56	1.43
Source: Mesa County 1991					

EXHIBIT 5.0

MESA COUNTY
STORM DRAINAGE CRITERIAL MANUAL | FIGURE 401a

INTENSITY DURATION FREQUENCY CURVES
MESA COUNTY, COLORADO

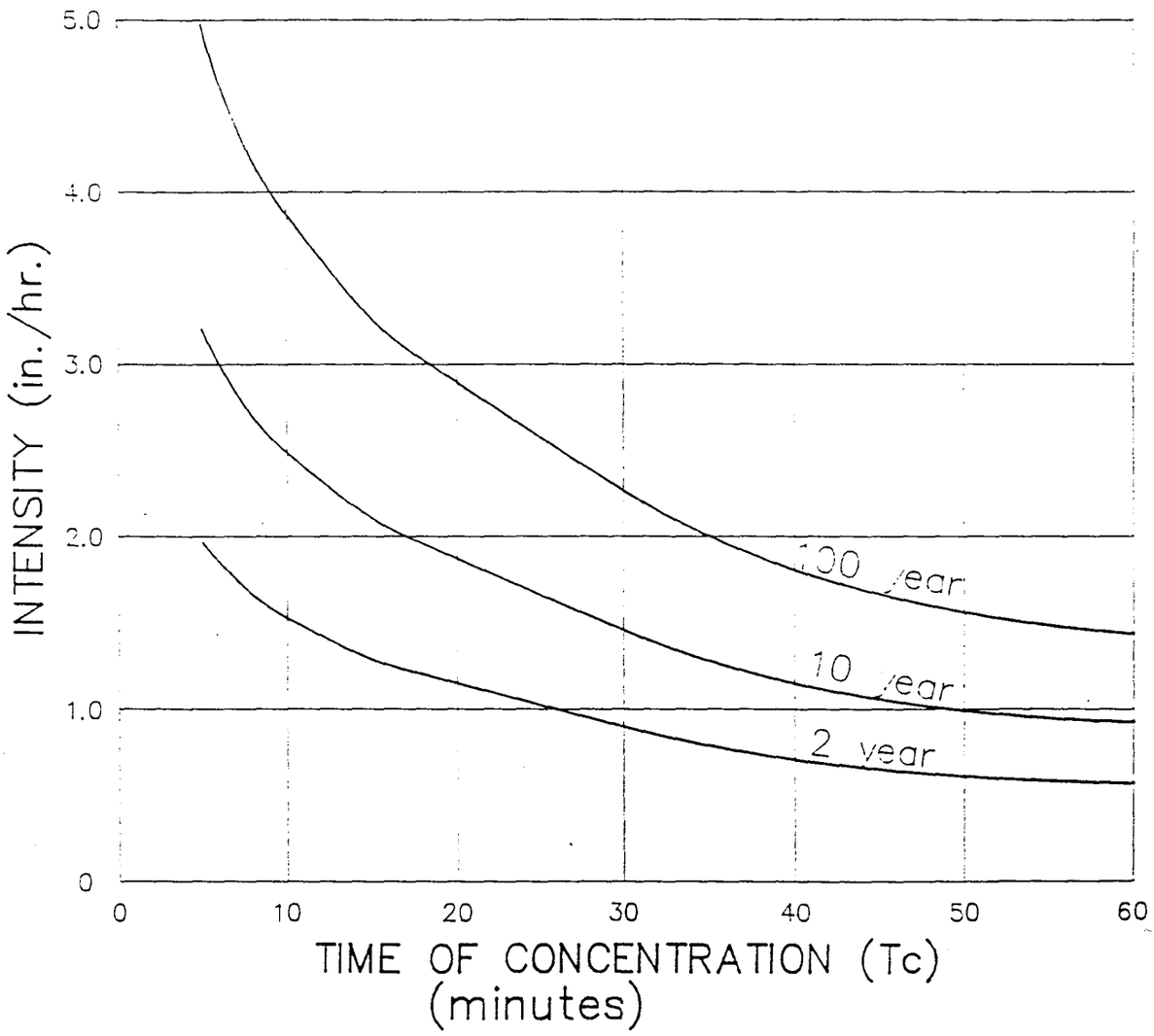
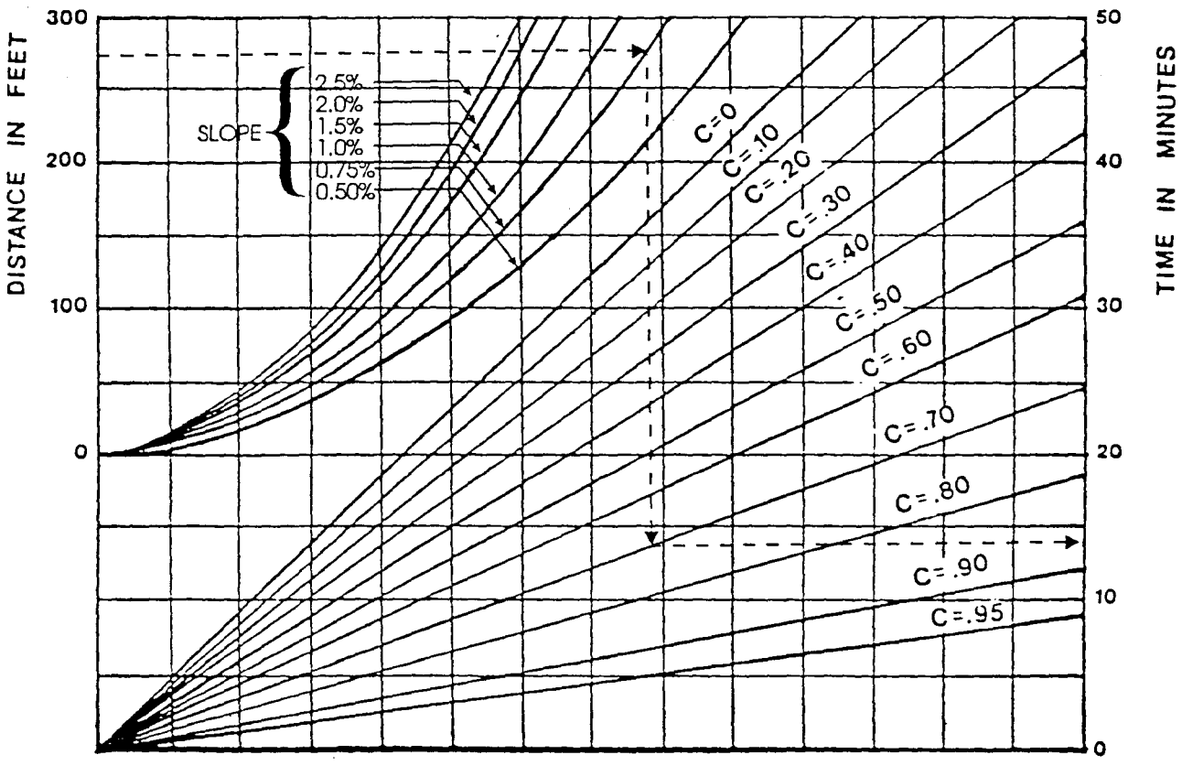


EXHIBIT 6.0

MODIFIED FROM FIGURE 403, MESA COUNTY



THE ABOVE CURVES ARE A SOLUTION OF THE FOLLOWING EQUATION:

$$To = \frac{1.8\ (1.1 - C)\sqrt{L}}{\sqrt[3]{S}}$$

WHERE: To = OVERLAND FLOW TIME (MIN.)
S = SLOPE OF BASIN (%)
C = RUNOFF COEFFICIENT (SEE TABLE "B-1" IN APPENDIX "B")
L = LENGTH OF BASIN (ft)

EXHIBIT 7.0

GRAPHICAL DETERMINATION OF "To:" FAA METHOD	FIGURE "E-2"

REPRODUCED FROM FIGURE 15.2, SCS 1972

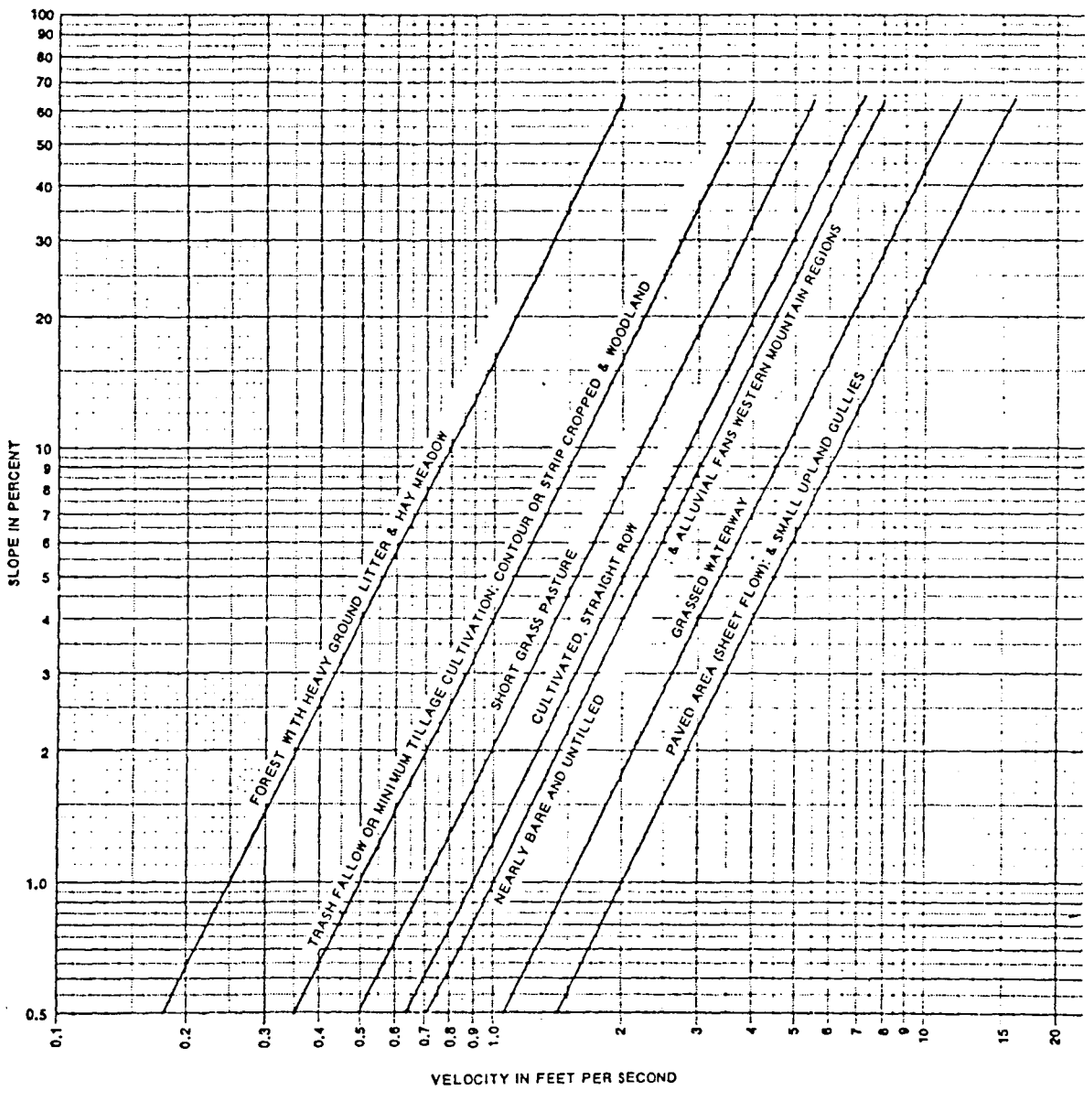


FIGURE 8.0

DETERMINATION OF "Ts"	FIGURE "E-3"

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: PARKING LOT

Comment: V-SECTION OF PARKING LOT

Solve For Discharge

Given Input Data:

Left Side Slope..	50.00:1 (H:V) — 2% X-SLOPE
Right Side Slope.	50.00:1 (H:V)
Manning's n.....	0.018 ——— ASPHALT
Channel Slope....	0.0065 ft/ft
Depth.....	0.10 ft

Computed Results:

Discharge.....	0.45 cfs
Velocity.....	0.90 fps — USE FOR TC CALCS.
Flow Area.....	0.50 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	10.00 ft
Critical Depth...	0.09 ft
Critical Slope...	0.0134 ft/ft
Froude Number....	0.71 (flow is Subcritical)

Open Channel Flow Module, Version 3.16 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

FIGURE 9.0

TIME OF CONCENTRATION CALCULATIONS

(2 YEAR STORM EVENT)
HISTORIC CONDITION - CITY OF GRAND JUNCTION, COLORADO

PROJECT: E & E DOOR AND WINDOW
JOB # 95013
LANDesign LTD.

DATE: 16-Feb-95

SUB-BASIN DATA			INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME TIME (Tt)				INITIAL	Tc CHECK (URBANIZED BASINS)		FINAL	REMARKS
BASIN	C 2	AREA AC.	LENGTH FT.	SLOPE %	Ti MIN.	LENGTH FT.	SLOPE %	VEL F.P.S.	Tt MIN.	Tc MIN.	TOTAL LENGTH FT.	Tc = (L/180)+10 MIN.	Tc MIN.	
C1	0.28	0.52	250.0	0.50	29.40									OVERLAND SHEET FLOW - SOUTH
										29.40	250.00	11.39	29.40	TOWARDS FRONTAGE ROAD I-70B
--	--	--	--	--	--	--	--	--	--	--	--	--	--	---

FORMULAS

$$Ti = \frac{1.8(1.1-C)(L)^{1/2}}{1/3} \qquad Tt = \frac{(L)}{60 \text{ SEC/MIN. } (V \text{ F.P.S.})}$$

TIME OF CONCENTRATION CALCULATIONS

(100 YEAR STORM EVENT)
HISTORIC CONDITION - CITY OF GRAND JUNCTION, COLORADO

PROJECT: E & E DOOR AND WINDOW
JOB # 95013
LANDesign LTD.

DATE: 16-Feb-95

SUB-BASIN DATA			INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME TIME (Tt)				INITIAL	Tc CHECK (URBANIZED BASINS)		FINAL	REMARKS
BASIN	C 10	AREA AC.	LENGTH FT.	SLOPE %	Ti MIN.	LENGTH FT.	SLOPE %	VEL F.P.S.	Tt MIN.	Tc MIN.	TOTAL LENGTH FT.	Tc = (L/180)+10 MIN.	Tc MIN.	
C1	0.34	0.52	250.0	0.50	27.25									OVERLAND SHEET FLOW - SOUTH
										27.25	250.00	11.39	27.25	TOWARDS FRONTAGE ROAD I-70B
--	--	--	--	--	--	--	--	--	--	--	--	--	--	---

FORMULAS

$$Ti = \frac{1.8(1.1-C)(L)^{1/2}}{1/3} \qquad Tt = \frac{(L)}{60 \text{ SEC/MIN. } (V \text{ F.P.S.})}$$

FILE # 10.0

STORM DRAINAGE SYSTEM DESIGN DATA

(2 YEAR STORM EVENT)
DEVELOPED CONDITION - CITY OF GRAND JUNCTION, COLORADO

PROJECT: E & E DOOR AND WINDOW
JOB # 95013
LANDesign LTD.

DATE: 15-Feb-95

													STREET		PIPE			STREET		PIPE		
LOCATION OR NODE	BASIN	LENGTH FEET	INLET TIME min.	FLOW TIME STREET	FLOW TIME PIPE	Tc min.	COEFF "C"	INTENSITY "I"	AREA "A" A	DIRECT RUNOFF C.F.S.	OTHER RUNOFF C.F.S.	SUM RUNOFF C.F.S.	SLOPE %	CAPACITY ALLOWED C.F.S.	SLOPE %	SIZE IN.	CAPACITY ALLOWED C.F.S.	DESIGN F.P.S.	VELOC F.P.S.	DESIGN F.P.S.	VELOC F.P.S.	REMARKS
1	A1					21.09	0.93	1.08	0.11	0.11		0.11										SHEET FLOW (GRAVEL) SOUTH ALONG WEST SIDE OF BUILDING TO FRONTAGE ROAD.
2	B1					15.40	0.93	1.26	0.05	0.06		0.06										SHEET FLOW (GRAVEL) EAST ALONG NORTH SIDE OF PARKING LOT TO 29 ROAD.
3	C1					5.72	0.93	1.86	0.52	0.90		0.90										FLOW IN V-SECTION OF PARKING AREA TO DETEN.

STORM DRAINAGE SYSTEM DESIGN DATA

(100 YEAR STORM EVENT)
DEVELOPED CONDITION - CITY OF GRAND JUNCTION, COLORADO

PROJECT: E & E DOOR AND WINDOW
JOB # 95013
LANDesign LTD.

DATE: 15-Feb-95

													STREET		PIPE			STREET		PIPE		
LOCATION OR NODE	BASIN	LENGTH FEET	INLET TIME min.	FLOW TIME STREET	FLOW TIME PIPE	Tc min.	COEFF "C"	INTENSITY "I"	AREA "A" A	DIRECT RUNOFF C.F.S.	OTHER RUNOFF C.F.S.	SUM RUNOFF C.F.S.	SLOPE %	CAPACITY ALLOWED C.F.S.	SLOPE %	SIZE IN.	CAPACITY ALLOWED C.F.S.	DESIGN F.P.S.	VELOC F.P.S.	DESIGN F.P.S.	VELOC F.P.S.	REMARKS
1	A1					19.05	0.95	2.88	0.11	0.30		0.30										SHEET FLOW (GRAVEL) SOUTH ALONG WEST SIDE OF BUILDING TO FRONTAGE ROAD.
2	B1					13.91	0.95	3.34	0.05	0.16		0.16										SHEET FLOW (GRAVEL) EAST ALONG NORTH SIDE OF PARKING LOT TO 29 ROAD.
3	C1					5.65	0.95	4.76	0.52	2.35		2.35										FLOW IN V-SECTION OF PARKING AREA TO DETEN.

FIGURE 13.0

(2 YEAR STORM EVENT)
HISTORIC CONDITION - CITY OF GRAND JUNCTION, COLORADO

PROJECT: E & E DOOR AND WINDOW
JOB # 95013
LANDesign LTD.

DATE: 16-Feb-95

													STREET		PIPE			STREET		PIPE		
LOCATION OR NODE	BASIN	LENGTH FEET	INLET TIME min.	FLOW TIME STREET	FLOW TIME PIPE	Tc min.	COEFF "C"	INTENSITY "I"	AREA "A" A	DIRECT RUNOFF C.F.S.	OTHER RUNOFF C.F.S.	SUM RUNOFF C.F.S.	SLOPE %	CAPACITY ALLOWED C.F.S.	SLOPE %	SIZE IN.	CAPACITY ALLOWED C.F.S.	DESIGN F.P.S.	VELOC F.P.S.	DESIGN F.P.S.	VELOC F.P.S.	REMARKS
1	C1					29.40	0.28	0.89	0.52	0.13		0.13										OVERLAND SHEET FLOW SOUTH TO I-70B

STORM DRAINAGE SYSTEM DESIGN DATA

(100 YEAR STORM EVENT)
HISTORIC CONDITION - CITY OF GRAND JUNCTION, COLORADO

PROJECT: E & E DOOR AND WINDOW
JOB # 95013
LANDesign LTD.

DATE: 16-Feb-95

													STREET		PIPE			STREET		PIPE		
LOCATION OR NODE	BASIN	LENGTH FEET	INLET TIME min.	FLOW TIME STREET	FLOW TIME PIPE	Tc min.	COEFF "C"	INTENSITY "I"	AREA "A" A	DIRECT RUNOFF C.F.S.	OTHER RUNOFF C.F.S.	SUM RUNOFF C.F.S.	SLOPE %	CAPACITY ALLOWED C.F.S.	SLOPE %	SIZE IN.	CAPACITY ALLOWED C.F.S.	DESIGN F.P.S.	VELOC F.P.S.	DESIGN F.P.S.	VELOC F.P.S.	REMARKS
1	C1					27.25	0.34	2.40	0.52	0.42		0.42										OVERLAND SHEET FLOW SOUTH TO I-70B

FIGURE 12.0

TABLE K-2
VALUES OF C IN THE BROAD CRESTED WEIR EQUATION
(Table 5-3 in *Handbook of Hydraulics*, Brater and King, 6th Edition)

Measured head in feet, H	Breadth of Crest of Weir in Feet										
	0.50	0.75	1.00	1.50	2.00	2.50	3.00	4.00	5.00	10.00	15.00
0.2	2.80	2.75	2.69	2.62	2.54	2.48	2.44	2.38	2.34	2.49	2.68
0.4	2.92	2.80	2.72	2.64	2.61	2.60	2.58	2.54	2.50	2.56	2.70
0.6	3.08	2.89	2.75	2.64	2.61	2.60	2.68	2.69	2.70	2.70	2.70
0.8	3.30	3.04	2.85	2.68	2.60	2.60	2.67	2.68	2.68	2.69	2.64
1.0	3.32	3.14	2.98	2.75	2.66	2.64	2.65	2.67	2.68	2.68	2.63
1.2	3.32	3.20	3.09	2.86	2.70	2.65	2.64	2.67	2.66	2.69	2.64
1.4	3.32	3.26	3.20	2.92	2.77	2.68	2.64	2.65	2.65	2.67	2.64
1.6	3.32	3.29	3.28	3.07	2.89	2.75	2.68	2.66	2.65	2.64	2.63
1.8	3.32	3.32	3.31	3.07	2.88	2.74	2.68	2.66	2.65	2.64	2.63
2.0	3.32	3.31	3.30	3.03	2.85	2.76	2.72	2.68	2.65	2.64	2.63
2.5	3.32	3.32	3.31	3.28	3.07	2.89	2.81	2.72	2.67	2.64	2.63
3.0	3.32	3.32	3.32	3.32	3.20	3.05	2.92	2.73	2.66	2.64	2.63
3.5	3.32	3.32	3.32	3.32	3.32	3.19	2.97	2.76	2.68	2.64	2.63
4.0	3.32	3.32	3.32	3.32	3.32	3.32	3.07	2.79	2.70	2.64	2.63
4.5	3.32	3.32	3.32	3.32	3.32	3.32	3.32	2.88	2.74	2.64	2.63
5.0	3.32	3.32	3.32	3.32	3.32	3.32	3.32	3.07	2.79	2.64	2.63
5.5	3.32	3.32	3.32	3.32	3.32	3.32	3.32	3.32	2.88	2.64	2.63

For "C" values and/or roadway overtopping conditions, reference is made to HDS-5 or Appendix "L", Section B-2.

FIGURE 14.0

PROJECT: **E & E DOOR & WINDOW**

LOCATION: **CITY OF GRAND JUNCTION, COLORADO**

SUBJECT: **REQUIRED DETENTION POND VOLUME** BASINS: **C1**

DATE: 15-Feb-95

CALC. BY: STROUP

FORMULAS PER CITY OF GRAND JUNCTION

Davg. = 0.67Dmax

2 YEAR RELEASE (WEIR ONLY)

$Qw = CL(H)^{1.5}$ = **0.1311 CFS**

C= 3.31

L= 0.6250 inches 5/8" 0.0521 feet

H= 10.0000 inches 0.8333 feet

Qr = 0.55Qmax. (Weir using Qmax. or "h") = 0.0721

100 YEAR RELEASE (COMPOND WEIR)

$Qmax = C_1 L_1 (Ht)^{1.5} + C_2 (L_2 - L_1) Ht-H^{1.5}$ = **0.4167 CFS**

C_1 = 3.32 Ht = 12.6000 inches 1.0500 feet 12 5/8"

C_2 = 2.71 H= 10.0000 inches 0.8333 feet

L_2 = 10.7500 inches 0.8958 feet 10 3/4"

Hu=Ht-H = 0.2167

$Qr = C_1 L_1 (Ht-(Hu/3))^{1.5} + C_2 (L_2 - L_1)(0.67Hu)^{1.5}$

= 0.1672 + 0.1265 = 0.2937

DETENTION FORMULAS

$Td_2 = (633.4\ Cd\ A / (Qr - (Qr\ Tcd / (81.2Cd\ A))))^{0.5} - 15.6$

$Td_{100} = (1832\ Cd\ A / (Qr - (Qr\ Tcd / (213Cd\ A))))^{0.5} - 17.2$

Id_2 = Intensity at Td = 40.6 / (Td +15.6)

Id_{100} = Intensity at Td = 106.5 / (Td +17.2)

Qd = Cd AId

K = Tch /Tcd

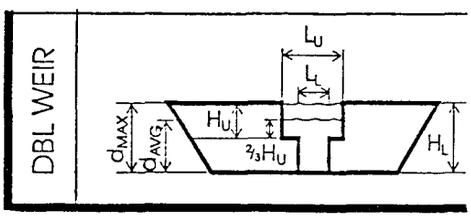
$V = 60(QdTd - QrTd - QrTcd + KQrTcd/2 + Qr\ Tcd^2/(2Qd))$

WHERE:

Td = Time of Critical Storm Duration, Minutes;
C = Weir Coefficient; OR
C = Runoff Coefficient;
A = Area in Acres;
Qo = Detention Pond Average Release Rate, CFS;
Tc = Time of Concentration, Minutes;
Id = Intensity at Td, Inches Per Hour;
Qd = Runoff Rate at Td, CFS;
K = Ratio of Pre and Post- Development Tc;
V = Storage Volume in CF;

SUBSCRIPTS:

2 = 2 - Year Storm
100 = 100 - Year Storm
h = Historic Condition
d = Developed Condition



$Q_{MAX} = Q_{W_L} + Q_{W_U} = CL_L H_L^{1.5} + C(L_U - L_L)H_U^{1.5}$

$Qr = Q_{W_L} + Q_{W_U} = CL_L(H_L - \frac{H_U}{3})^{1.5} + C(L_U - L_L)(.67H_U)^{1.5}$

REQUIRED 2 YEAR STORAGE VOLUME

Td_2	Cd	A	Qr	Tc h	Tc d	Id_2	Qd_2	K	V_2
49.93	0.93	0.52	0.0721	29.40	5.72	0.62	0.30	5.1399	**723.43**

REQUIRED 100 YEAR STORAGE VOLUME

Td_{100}	Cd	A	Qr	Tc h	Tc d	Id_{100}	Qd_{100}	K	V_{100}
38.75	0.95	0.52	0.2937	27.25	5.65	1.90	0.94	4.8230	**1825.43**

FIGURE 15.0

HYDROLOGIC REPORT

STAGE / STORAGE / DISCHARGE

RESERVOIR NUMBER = 1

RESERVOIR NAME = E&E DOOR & W
STORAGE VALUES WERE INPUT MANUALLY

DISCHARGE VALUES: CULVERT STRUCT A. Q = .6 *A*[2gh/k]^.5 * 0
CULVERT STRUCT B. Q = .6 *A*[2gh/k]^.5 * 0
WEIR STRUCT A. Q = 3 * 0 * H ^ 1.5
WEIR STRUCT B. Q = 3 * 0 * H ^ 1.5

ELEVATION	DISCHARGE (cfs)			
	CULVERT A	CULVERT B	WEIR A	WEIR B
99.53	0.00	0.00	0.00	0.00
100.00	0.00	0.00	0.00	0.00
100.53	0.00	0.00	0.00	0.00
100.58	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00

STAGE	ELEVATION	INC STOR cu ft	TOT STOR cu ft	OUTFLOW cfs
0.00	99.53	0	0	0.00
0.47	100.00	247	247	0.00
1.00	100.53	1406	1653	0.00
1.05	100.58	222	1875	0.00
0.00	0.00	0	0	0.00
0.00	0.00	0	0	0.00
0.00	0.00	0	0	0.00
0.00	0.00	0	0	0.00
0.00	0.00	0	0	0.00
0.00	0.00	0	0	0.00
0.00	0.00	0	0	0.00

FIGURE 16.0

Reservoir No. 1 STAGE / STORAGE / DISCHARGE E&E DOOR & W

Storage values were input manually
Discharge values: Culvert struct A. Q = .6 * A * [2gh/k]^.5 * 0
Culvert struct B. Q = .6 * A * [2gh/k]^.5 * 0
Weir struct A. Q = 3 * 0 * H ^ 1.5
Weir struct B. Q = 3 * 0 * H ^ 1.5

STAGE	ELEVATION	INC STOR cu ft	TOT STOR cu ft	OUTFLOW cfs
0.00	99.53	0	0	0.00
0.05	99.58	25	25	0.00
0.09	99.62	25	49	0.00
0.14	99.67	25	74	0.00
0.19	99.72	25	99	0.00
0.23	99.76	25	124	0.00
0.28	99.81	25	148	0.00
0.33	99.86	25	173	0.00
0.38	99.91	25	198	0.00
0.42	99.95	25	222	0.00
0.47	100.00	25	247	0.00

[PgDn] [Esc] to exit

Reservoir No. 1 STAGE / STORAGE / DISCHARGE E&E DOOR & W

Storage values were input manually
Discharge values: Culvert struct A. Q = .6 * A * [2gh/k]^.5 * 0
Culvert struct B. Q = .6 * A * [2gh/k]^.5 * 0
Weir struct A. Q = 3 * 0 * H ^ 1.5
Weir struct B. Q = 3 * 0 * H ^ 1.5

STAGE	ELEVATION	INC STOR cu ft	TOT STOR cu ft	OUTFLOW cfs	
0.47	100.00	25	247	0.00	
0.52	100.05	141	388	0.00	
0.58	100.11	141	528	0.00	
0.63	100.16	141	669	0.00	
0.68	100.21	141	809	0.00	
0.73	100.27	141	950	0.00	
0.79	100.32 100.36	141	1091 1,203	0.00	2YEAR
0.84	100.37	141	1231	0.00	
0.89	100.42	141	1372	0.00	
0.95	100.48	141	1512	0.00	
1.00	100.53	141	1653	0.00	

[PgDn] [Esc] to exit

2 YEAR REQUIRED VOL. = 724 CF

FIGURE 17.0

Reservoir No. 1 STAGE / STORAGE / DISCHARGE E&E DOOR & W

Storage values were input manually
Discharge values: Culvert struct A. Q = .6 * A * [2gh/k]^.5 * 0
Culvert struct B. Q = .6 * A * [2gh/k]^.5 * 0
Weir struct A. Q = 3 * 0 * H ^ 1.5
Weir struct B. Q = 3 * 0 * H ^ 1.5

STAGE	ELEVATION	INC STOR cu ft	TOT STOR cu ft	OUTFLOW cfs	
1.00	100.53	141	1653	0.00	
1.00	100.53	22	1675	0.00	
1.01	100.54	22	1697	0.00	
1.01	100.54	22	1720	0.00	
1.02	100.55	22	1742	0.00	
1.02	100.55	22	1764	0.00	
1.03	100.56	22	1786	0.00	
1.03	100.56	22	1808	0.00	
1.04	100.57	22	1831	0.00	
1.04	100.57	22	1853	0.00	
1.05	100.58	22	1875	0.00	100 YEAR

[PgDn] [Esc] to exit

100 YEAR REQUIRED VOL. = 1826 CF

FIGURE 18.0

EAST ELEV
WEST ELEV
RAMP
SOUTH ELEV
NORTH ELEV
NO SCALE
LOT 2
SUBJECT SITE
WAREHOUSE
60 X 120
OFFICE
OFFICE
RAMP TO LOADING DOC
40 RAD
29 RD. BUILDING
SCALE 200
N
SITE PLAN
0 704 ACRES
ASPHALT STRIPING
BUSINESS LOOP
REVISIONS
MONUMENT HOMES
243-4890
CHECKED
DATE
SCALE
SHOWN
JOB NO
SHEET
1 2
OF
SHEET