

Mr. Eric Mende
City Engineer
City of Fruita
325 E. Aspen Ave
Fruita, CO 81521

August 5, 2005

Re: 5 lot subdivision
Apple Street & E. Carolina St.
Fruita, Colorado

Dear Mr. Mende:

This project is approximately 0.99 acres, currently consisting of 8 narrow lots. It is to be replatted into five lots and developed. The parcel number is 2697-174-04-012 and the parcel address is 621 E CAROLINA AVE.

The soils type for this area is Bc – Sagers silty clay loam, 0 to 2 percent slopes. This is defined as "Runoff Class: Medium" and so a Hydrologic Group "C" was used

This project is located near the top of Drainage Basin 120 according to the Mesa County Drainage maps on their Internet site. According to this web site there have been no studies on this basin. The closest storm sewer inlet appears to be a block and a half away from the site to the southwest. The streets appear to have been improved, with rolled curb and sidewalk, in the relatively recent past.

There is a small increase in runoff from the development of this parcel. This is shown on the following pages. The increase for the two year storm is from 0.19 cfs to 0.37 cfs and for the hundred year storm from 0.97 cfs to 1.65 cfs.

It is our recommendation that no detention be required for this project. The neighborhood is largely developed, it does not appear that there are existing drainage problems that will be added to by this development, and the increase in runoff is minimal.

If you have any questions please give me a call at the number above.

Sincerely,


William S. Merrell



Revised 11/1/05

**Apple Street
Job Number 205055**

October 19, 2005

2 Year Storm

**100 Year
Storm**

	Apple Street				
	Acres	"C"	Acres x C	"C"	Acres x C
Impervious Surface	0.021	0.93	0.0192	0.95	0.0196
Traffic Areas	0.039	0.68	0.0265	0.76	0.0297
Bare Ground / grass	0.931	0.24	0.2233	0.3	0.2792
	<hr/>		<hr/>		<hr/>
	0.990		0.2691		0.3285
			0.2717		0.3317
Composite C Prior to Development			0.27		0.33

	Apple Street				
	Acres	"C"	Acres x C	"C"	Acres x C
Impervious Surface	0.327	0.93	0.3042	0.95	0.3108
Grass Lawn	0.663	0.22	0.1459	0.28	0.1857
	<hr/>		<hr/>		<hr/>
	0.990		0.4501		0.4965
			0.4545		0.5013
Composite C After Development			0.45		0.5

Rational "C" values taken from TABLE "B-1" of "Stormwater Management Manual" City of Grand Junction
Soil Type Bc - Sagers Silty clay Loam, 0-2% slope (drainage class C)

This assumes five 1,800 sq. ft. homes, five driveways and garages (two car) and five 12'x20' sheds.

Acceptable by Engineering
 $Impact\ Fee = 14,000(0.50 - 0.33) 0.99^{c-1} = \$ 2,363.31$

JOB NAME: Apple Street Homes
JOB NUMBER: 205055.00
DATE: 8/2/2005

*Revised from 8/5/05
Drainage Report*

BASIN DESIGNATION: Historic Conditions

Flowing to: Apple Street and East Carolina St.

OVERLAND FLOW:	2-Year	100-Year
Surface Description:	Vegetation - short grass	Vegetation - short grass
Rational Coefficient:	0.29	0.35
Flow Length, L (total < 300 ft.)	100 ft.	100 ft.
Land Slope, S	0.0085 ft/ft	0.0085 ft/ft

To<2> (Figure E-2):

15.39 min.

To<100> (Figure E-2):

14.25 min.

SHALLOW CONCENTRATED FLOW

Surface

Bare

Description:

Gr/Gravel/asphalt

Bare Gr/Gravel/asphalt

Flow Length, L

200 ft.

200 ft.

Flow Slope, S

0.0085 ft/ft

0.0085 ft/ft

Flow Velocity: (Figure E-3)

1.45 ft/sec

1.45 ft/sec

Travel Time =

L/(60V)

2.30 min.

2.30 min.

CHANNEL FLOW

Cross-Sectional Flow Area, a

2.37 ft²

Wetted Perimeter, Pw

6.38 ft.

Hydraulic Radius, $r = a/Pw$

0.37 ft.

Channel Slope, S

0.018 ft./ft.

Manning's Coefficient, n

0.030

Velocity, $V = 1.49r^{.67}s^{.5/n}$

3.41 ft./sec.

Flow Length, L

0.00 ft.

Travel Time =

L/(60V)

0.00 min.

CHANNEL FLOW

Cross-Sectional Flow Area, a

1.69 ft²

Wetted Perimeter, Pw

5.46 ft.

Hydraulic Radius, $r = a/Pw$

0.31 ft.

Channel Slope, S

0.082 ft./ft.

Manning's Coefficient, n

0.030

Velocity, $V = 1.49r^{.67}s^{.5/n}$

6.51 ft./sec.

Flow Length, L

0.00 ft.

Travel Time =

L/(60V)

0.00 min.

TIME OF CONCENTRATION

Tc<2> 17.69 min.

Tc<100> 16.55 min.

RUNOFF CALCULATION WORKSHEET RATIONAL METHOD

JOB

NAME: Apple Street Homes

JOB NUMBER: 205055.00

DATE: 8/2/2005

BASIN DESIGNATION:

Historic Conditions

FLOWING TO: Apple Street Homes

1. Basin Area (Includes offsite areas OS 1 & OS 2)		<u>0.99</u>	acres
2. Time of Concentration			
	2-Year	<u>17.69</u>	min.
	100-Year	<u>16.55</u>	min.
3. Storm Intensity (for use in the Grand Valley) per Table "A-1a"			
	2-year	<u>26.71</u>	
		Tc +	
		19.01	
		<u>0.73</u>	in/hr
	100-Year	<u>104.94</u>	
		Tc +	
		18.8	
		<u>2.97</u>	in/hr
4. Composite Runoff Coefficients			
	2-Year	<u>0.27</u>	
	100-Year	<u>0.33</u>	
5. Q = CIA			

$$Q(2) = 0.27 \times 0.73 \times 0.990 = 0.19 \text{ cfs}$$

$$Q(100) = 0.33 \times 2.97 \times 0.990 = 0.97 \text{ cfs}$$

TIME OF CONCENTRATION CALCULATION WORKSHEET

JOB NAME: Apple Street Homes
JOB NUMBER: 205055.00
DATE: 11/2/2005

BASIN DESIGNATION: Developed
Conditions

Flowing to: Apple Street Homes - sw corner of parcel

OVERLAND FLOW:	2-Year	100-Year
Surface Description:	Vegetation - short grass	Vegetation - short grass
Rational Coefficient:	0.45	0.50
Flow Length, L (total < 300 ft.)	75 ft.	75 ft.
Land Slope, S	0.0085 ft/ft	0.0085 ft/ft
To<2> (Figure E-2):	10.70 min.	
To<100> (Figure E-2):		9.87 min.

SHALLOW CONCENTRATED FLOW

Surface Description: Bare Gr/Gravel/asphalt Bare Gr/Gravel/asphalt

Flow Length, L	250	ft.	250	ft.
Flow Slope, S	0.0085	ft/ft	0.0085	ft/ft
Flow Velocity: (Figure E-3)	1.45	ft/sec	1.45	ft/sec
Travel Time = L/(60V)	2.87	min.	2.87	min.

CHANNEL FLOW

Cross-Sectional Flow Area, a	2.37	
Wetted Perimeter, Pw	6.38	ft.
Hydraulic Radius, r = a/Pw	0.37	ft.
Channel Slope, S	0.018	ft./ft.
Manning's Coefficient, n	0.030	
Velocity, V=1.49r ^{0.67} s ^{0.5} /n	3.44	ft./sec.
Flow Length, L	0.00	ft.
Travel Time = L/(60V)	0.00	min.

PIPE FLOW

Pipe Size	18.00	in.
Flow Length	0.00	ft.
Flow Velocity	15.50	ft/sec
Travel Time = L/(60V)	0.00	min.

TIME OF CONCENTRATION

Tc<2>	13.57	min.
Tc<100>	12.75	min.

RUNOFF CALCULATION WORKSHEET RATIONAL METHOD

JOB NAME: Apple Street Homes
JOB NUMBER: 205055.00
DATE: 11/2/2005

BASIN DESIGNATION: Developed Conditions
FLOWING TO: Apple Street Homes - sw corner of parcel

1	Basin Area (Includes offsite areas OS 1 & OS 2)	<u>0.990</u>	acres
2	Time of Concentration		
	2-Year	<u>13.57</u>	min.
	100-Year	<u>12.75</u>	min.
3	Storm Intensity (for use in the Grand Valley)		

per Table "A-1a"

2-year	$\frac{26.71}{T_c + 19.01}$	<u>0.82</u>	in/hr
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100-Year	$\frac{104.94}{T_c + 18.8}$	<u>3.33</u>	in/hr
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4 Composite Runoff
Coefficients

2-Year	<u>0.45</u>
100-Year	<u>0.50</u>

5
Q = CIA

Q(2)=	0.45	x	0.82	x	0.990	=	0.37	cfs
Q(100)=	0.50	x	3.33	x	0.990	=	1.65	cfs

Soils Map

180 S APPLE ST

175 S ORCHARD ST

E MCCUNE AVE

610 E MCCUNE AVE

712 E MCCUNE AVE
704 E MCCUNE AVE

S APPLE ST

621 E CAROLINA AVE

Bc

Sagers Silty Clay Loam
0-2%

711 E CAROLINA AVE
703 E CAROLINA AVE



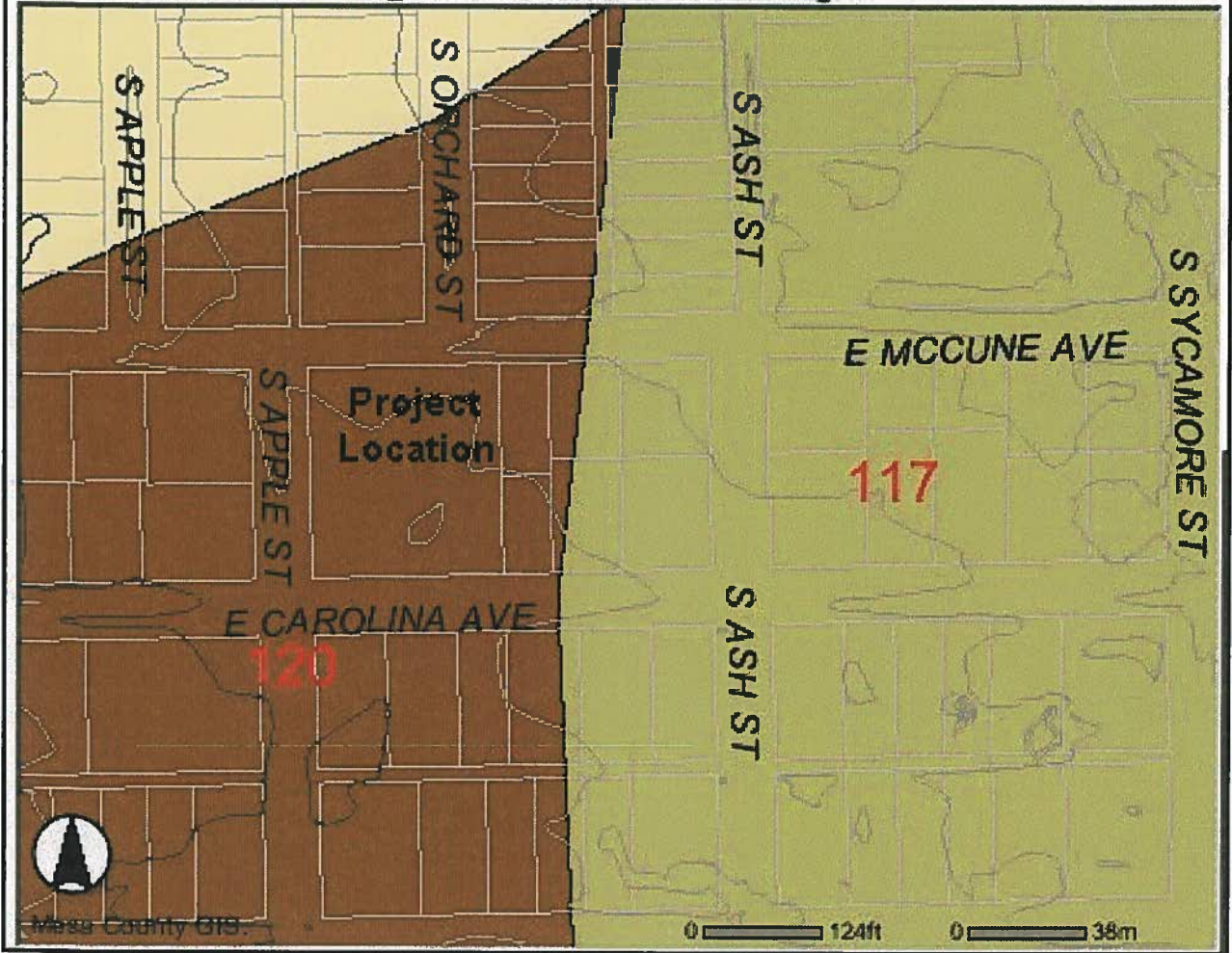
Mesa County GIS.

E CAROLINA AVE

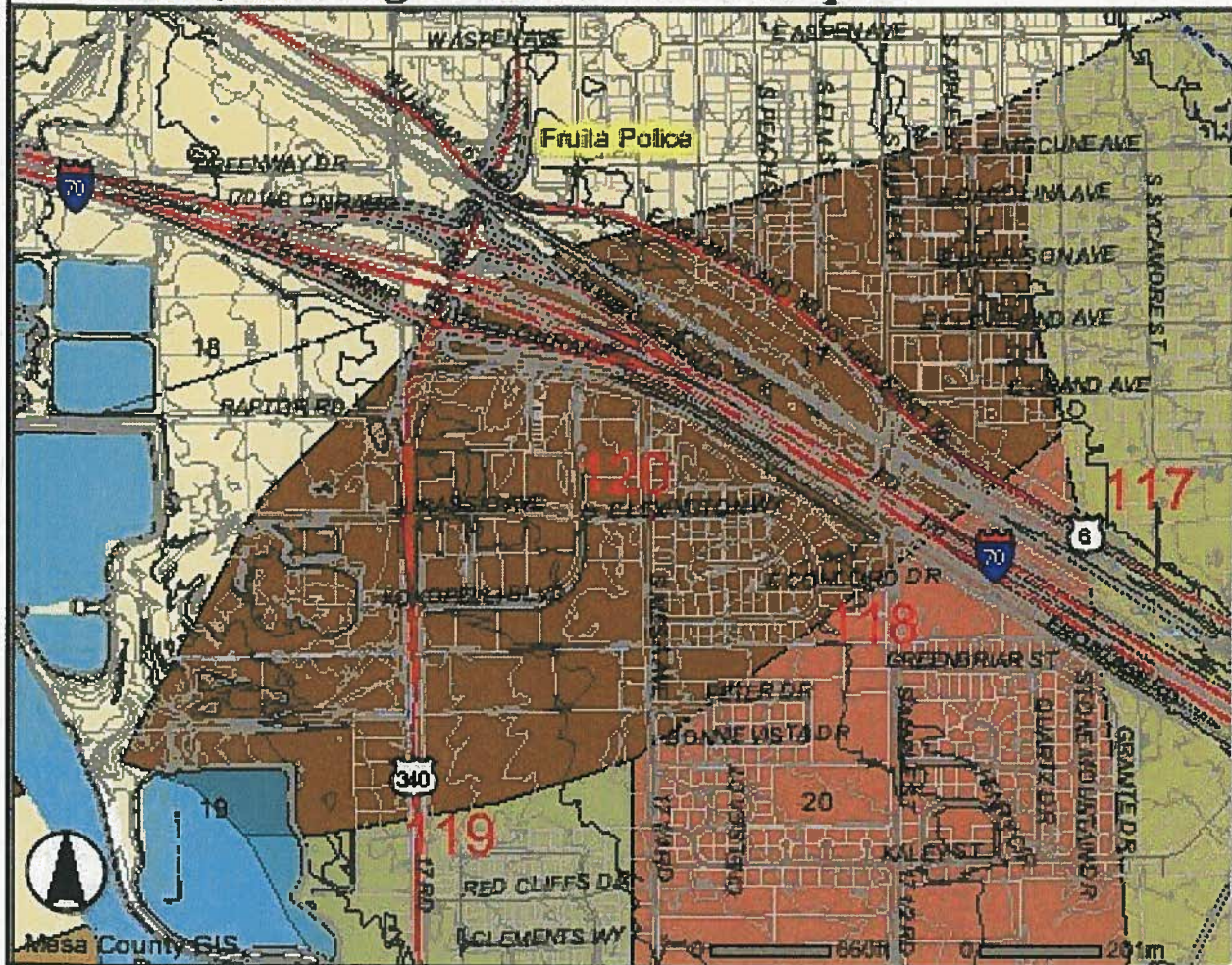
0 42ft

0 13m

Contours, Drainage Basins & Floodmaps



Contours, Drainage Basins & Floodmaps



Bc-Sagers silty clay loam, 0 to 2 percent slopes

Map Unit Setting

MLRA:

Elevation: 4,500 to 5,900 feet (1,372 to 1,798 meters)

Mean annual precipitation: 5 to 8 inches (127 to 203 millimeters)

Average annual air temperature: 50 to 54 degrees F. (10 to 12 degrees C.)

Frost-free period: 150 to 190 days

Map Unit Composition

Sagers and similar soils: 90 percent

Minor components: 10 percent

Component Descriptions

Sagers soils

Landform: Alluvial fan

Geomorphic position: Toeslope

Parent material: Alluvium derived from clayey shale

Slope: 0 to 2 percent

Surface fragments: Unspecified

Depth to restrictive feature: Unspecified

Drainage class: Well drained

Slowest permeability: About 0.20 in/hr (moderately slow)

Available water capacity: About 11.2 inches (high)

Shrink-swell potential: About 4.5 LEP (moderate)

Flooding hazard: None

Ponding hazard: Unspecified

Seasonal water table minimum depth: Greater than 6 feet

Runoff class: Medium

Calcium carbonate maximum: About 15 percent

Gypsum maximum: About 5 percent

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodicity maximum: About 5 SAR (slightly sodic)

Ecological site: Unspecified

Potential native vegetation: Unspecified

Land capability (irrigated): 2e

Land capability (non irrigated): 7c

##

Typical Profile:

Ap-0 to 12 inches; silty clay loam

Cy-12 to 60 inches; silty clay loam

##

Minor Components

Sagers, Wet and similar soils

Composition: About 5 percent

Landform: Terrace

Geomorphic Position: Unspecified

Slope: Unspecified

Depth to restrictive feature: Unspecified

Drainage class: Unspecified

Ecological site: Unspecified

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Other Soils and similar soils

Composition: About 5 percent

Landform: Unspecified

Geomorphic Position: Unspecified
Slope: Unspecified
Depth to restrictive feature: Unspecified
Drainage class: Unspecified
Ecological site: Unspecified

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Major uses: Irrigated cropland, urban development
Major management limitations: Irrigated Cropland
Soil related factors: Salinity, piping hazard in some areas, slow permeability, moderate shrink-swell potential
Management considerations:
Suitable irrigation systems are furrow, sprinkler, and drip
If irrigation water is to be applied and removed efficiently, leveling is needed in sloping areas
All crops but legumes respond to nitrogen. Legumes respond to phosphorus
Urban Development
Soil related factors: Piping hazard in some areas, moderate shrink-swell potential, soft shale bedrock within 60 inches in some areas
Management considerations:
Heavy equipment is needed for excavation.
Because of the high content of gypsum, the soil may subside as the gypsum is dissolved and leached.
Some areas of this unit may be subject to salt heave because of the expansion of sodium sulfate salts. This action is likely to crack concrete slab floors, driveways, and sidewalks.
The deep cuts needed to level the road surface can expose soft bedrock; however, it can be easily excavated.
Cut slopes generally are stable, but slumping can occur where the bedrock is highly fractured or where rock layers are parallel to the slope.
The quality of roadbeds and road surfaces can be adversely affected by shrinking and swelling, frost action, and limited soil strength.
Local roads and streets may require a special base to prevent frost heave damage.
Septic tank absorption fields may function poorly because of limited permeability, which restricts the movement and filtration of the effluent.
Untreated effluent can move along the surface of the restrictive layer and seep in downslope areas, creating a health hazard.
Onsite investigation is needed to determine whether the area considered for a septic tank absorption field is underlain by unsuitable material. If such material is present, consider placing absorption lines beneath it.