PRELIMINARY SURFACE WATER RUNOFF REPORT

LANE MEADOWS SUBDIVISION
Blaine County, Idaho

March 2014

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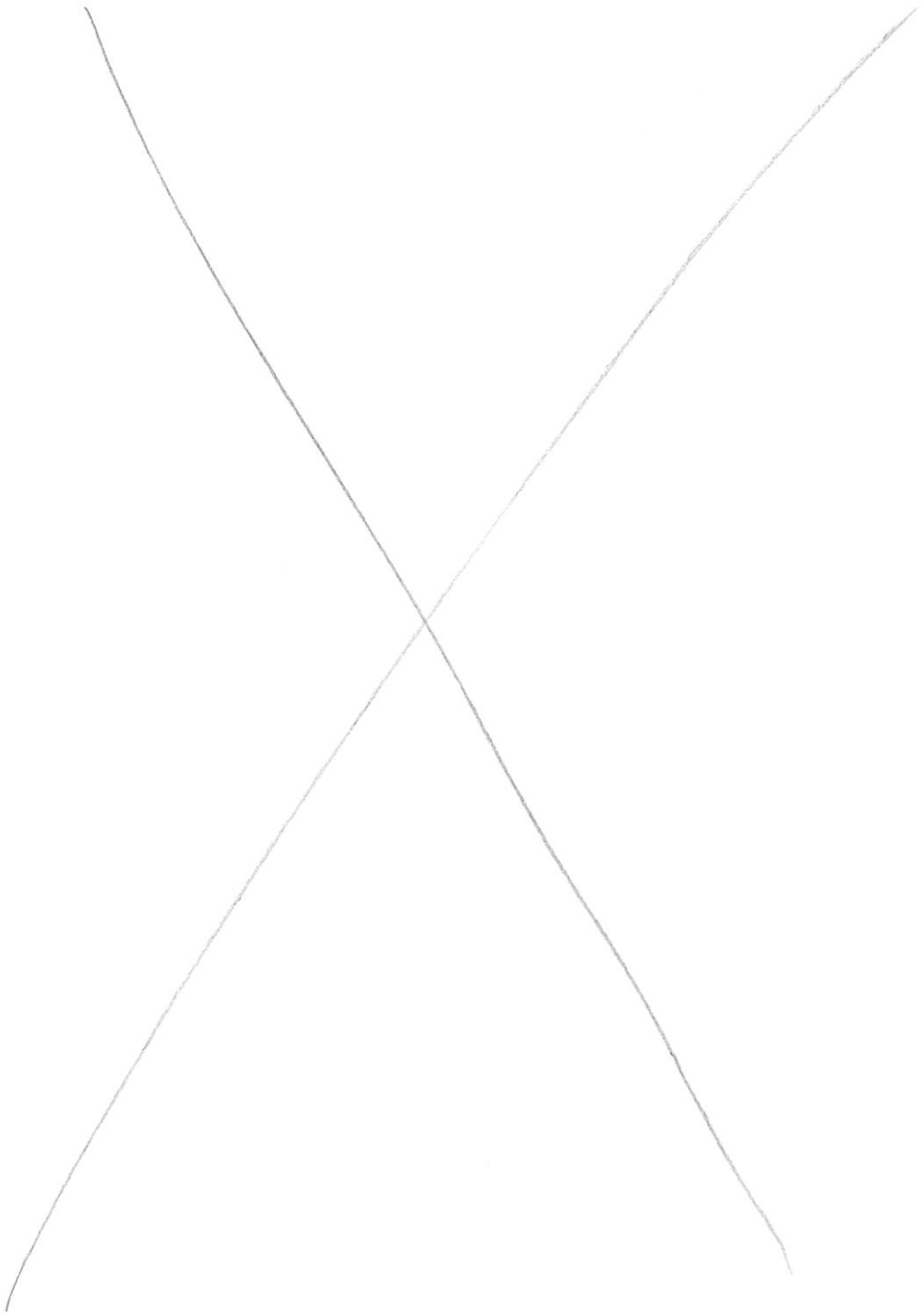
Prepared For:

Scott Thomson
Strider Group LLC
P.O. Box 14001-363
Ketchum, Idaho 83340

Prepared By:

Benchmark Associates, P.A.
100 Bell Drive
Ketchum, Idaho 83340
Ph: (208) 726-9512
Fax: (208) 726-9514

Contact:
Steve Butler, P.E.



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Lane Meadows
Preliminary Surface Water Runoff Report

I. Project Description

The proposed project is located 1.7 miles south of Ketchum, Idaho along Highway 75 and lies within the existing Lane Ranch Subdivision. The existing property is approximately 7.2 acres in size and is currently developed with one house and an existing paved driveway. The development is proposing to cut and fill the site but grades will stay within three to four feet of the existing grades. The proposed construction includes 12 single family lots, paved roadway, concrete sidewalk and landscaping.

II. Existing Drainage System and Conditions

General Description

The site generally drains southwesterly and has an average fall of approximately 1 to 2 percent. The existing soil type will be confirmed by Butler Associates Geotechnical Report, spring 2014. The soil type assumed for this report is several feet of native silty clay overlying a free draining native alluvial sand and gravel with a percolation rate of 2.5"/min which is common to the area.

The pervious nature of the subsurface soils will allow the use of dry wells to discharge water into the ground.

Surface water generally sheet flows southwesterly across the site. A portion of the drainage is intercepted by the existing driveway and flows towards Highway 75 into an existing ditch via an existing 12-inch culvert as shown in Figure 1: Lane Meadows Existing Drainage Map.

Area A Existing Runoff

The rational method was used to calculate the existing runoff rate from this area during a twenty-five year and 100 year, 1-hour design storm as shown:

Q_{25}=CIA
Q_{25}= (0.40) x (0.89) x (4.83) = 1.72 cfs (from pervious surface)
Q_{25}= (0.90) x (0.89) x (0.37) = 0.30 cfs (from impervious surface)
2.02 cfs Existing, 1-hour, 25-year flow from area A

Q_{100}=CIA
Q_{100}= (0.40) x (1.10) x (4.83) = 2.13 cfs (from pervious surface)
Q_{100}= (0.90) x (1.10) x (0.37) = 0.37 cfs (from impervious surface)
2.50 cfs Existing, 1-hour, 25-year flow from area A

Area B Existing Runoff

The rational method was used to calculate the existing runoff rate from this area during a twenty-five year and 100 year, 1-hour design storm as shown:

Q_{25}=CIA
Q_{25}= (0.40) x (0.89) x (1.78) = 0.63 cfs (from pervious surface)
Q_{25}= (0.90) x (0.89) x (0.22) = 0.18 cfs (from impervious surface)
0.81 cfs Existing, 1-hour, 25-year flow from area B

Q_{100}=CIA
Q_{100}= (0.40) x (1.10) x (1.78) = 0.78 cfs (from pervious surface)
Q_{100}= (0.90) x (1.10) x (0.22) = 0.22 cfs (from impervious surface)
1.00 cfs Existing, 1-hour, 25-year flow from area B

III. Proposed Drainage System

General Description

The Lane Meadows Project is proposing to capture runoff from the road section in a roadside swale or curb and gutter with catch basins and then discharge the runoff via drywells into the ground. Individual drywells will be constructed on each lot to capture runoff from roofs and other impervious surfaces into the ground.

Design Approach

Our design approach was to capture any developed runoff from the proposed development using catch basins and drywells in the curb and gutter and roadside swale for the roadway drainage and individual drywells for each lot to capture runoff from roofs, driveways and other impervious surfaces that may be constructed on the lots. Developed flows were calculated using the 25-year, 1-hour and 100-year, 1-hour storm event. This storm event approximates a thunderstorm with a high intensity of rainfall. These events are prevalent in the mountainous areas of Ketchum and Sun Valley and used to design storm drainage infrastructure.

Basin A will direct 5.2 acres of developed flow to the downstream catch basin and drywell located in the curb and gutter and roadside swale and to individual drywells on each lot.

Basin B will direct 2.0 acres of developed flow to the downstream catch basin and drywell located in the roadside swales and to individual drywells on each lot. (See Figure 2). Flow calculations are shown below:

Area A Developed Runoff

Q_{25}=CIA
Q_{25}= (0.40) x (0.89) x (4.49) = 1.60 cfs (from pervious surface)
Q_{25}= (0.90) x (0.89) x (0.71) = 0.57 cfs (from impervious surface)
2.17 cfs Developed 1-hour, 25-year flow from area A

Q_{100}=CIA
Q_{100}= (0.40) x (1.10) x (4.49) = 1.98 cfs (from pervious surface)
Q_{100}= (0.90) x (1.10) x (0.71) = 0.70 cfs (from impervious surface)
2.68 cfs Developed 1-hour, 25-year flow from area A

Area B Developed Runoff

Q_{25}=CIA
Q_{25}= (0.40) x (0.89) x (1.75) = 0.62 cfs (from pervious surface)
Q_{25}= (0.90) x (0.89) x (0.25) = 0.20 cfs (from impervious surface)
0.82 cfs Developed 1-hour, 25-year flow from area B

Q_{100}=CIA
Q_{100}= (0.40) x (1.10) x (1.75) = 0.77 cfs (from pervious surface)
Q_{100}= (0.90) x (1.10) x (0.25) = 0.25 cfs (from impervious surface)
1.02 cfs Developed 1-hour, 25-year flow from area B

IV. Discussion of Results

Basin A

Table 1, Comparison of Existing Flows With Developed Flows, shows that the developed conditions will increase runoff to drainage basin A by approximately 0.15 cfs during a 25 year event. The increase is due primarily to the increased impervious areas from the development. The runoff from the roadway impervious surfaces will be captured by three separate drywells and catch basins located in the curb and gutter or roadway swale. Each roadside drywell will have a minimum capacity of 900 cf.

Developed flow for each lot was calculated from Lot 3. The building zone on lot 3 was considered as an impervious surface and covers most of the lot. This will give a conservative estimate for runoff of each lot in the proposed subdivision and a conservative estimate on the size of a drywell for individual lots. Each lot will have a separate drywell with a minimum capacity of 750 cf to capture the runoff from the roofs and other impervious surfaces.

Basin B

The proposed development will increase the flow to drainage basin B by approximately 0.04 cfs during a 25 year event. This minor increase is due to the improvements to the existing roadway in Basin B. The post developed runoff will be captured by a drywell and catch basins located in the curb and gutter and roadside swale. Each lot will have a separate drywell as in Basin A.

Combined Basin A & B

The total developed flow increased by approximately 0.19 cfs during the 25-year event. The reason for the flow increase is due to the increased impervious surfaces of the development.

Table 1: Comparison of Existing Flows with Developed Flows

Area	1 Hr, 25 Yr Existing Runoff	1 Hr, 25 Yr Developed Runoff	1 Hr, 25 Yr Flow Increase or (Decrease)
A	2.02 cfs	2.17 cfs	0.15 cfs
B	0.78 cfs	0.82 cfs	0.04 cfs
A + B	2.80 cfs	2.99 cfs	0.19 cfs

Area	1 Hr, 100 Yr Existing Runoff	1 Hr, 100 Yr Developed Runoff	1 Hr, 100 Yr Flow Increase or (Decrease)
A	2.50 cfs	2.68 cfs	0.18 cfs
B	1.00 cfs	1.02 cfs	0.02 cfs
A+B	3.50 cfs	3.7 cfs	0.20 cfs

V. Conclusions

Basin A shows a 0.15 cfs increase in the 1 Hr, 25 year peak flows because of the increased impervious surfaces proposed by the development.

Basin B shows a 0.04 cfs increase in the 1 Hr, 25 year peak flow. This minor increase is due to the increased impervious surface area from the proposed improvements to the existing roadway

The post developed runoff increased by 0.19 cfs due to the impervious improvements of the development. Drainage swales, curb and gutter will capture the increased runoff into catch basins and drywells. Drywells will also be constructed on each lot where roof drainage will be captured in downspouts. The downspouts will be connected into the drywells.

VI. Drywell Capacities

Rather than analyze the tributary area for each drywell we have completed calculations to show that the worst case (areas with the most impervious surfaces) have the capacity to store, capture and discharge water into the ground as shown in Table 2. below.

Table 2: Drywell Capacities

Basin	DW #	Diameter (pipe+gravel)	Min. Capacity	25-YR Flow
A	1A	10 ft	940 cf	0.70 cfs
	2A	10 ft	940 cf	0.70 cfs
	3A	10 ft	940 cf	0.70 cfs
B	1B	10 ft	940cf	0.25 cfs
	2B	10 ft	940cf	0.25 cfs
LOT 3		10 ft	940 cf	0.17 cfs

VII. Appendix

Figure 1: Lane Meadows Existing Drainage Map

Figure 2: Lane Meadows Proposed Drainage Map

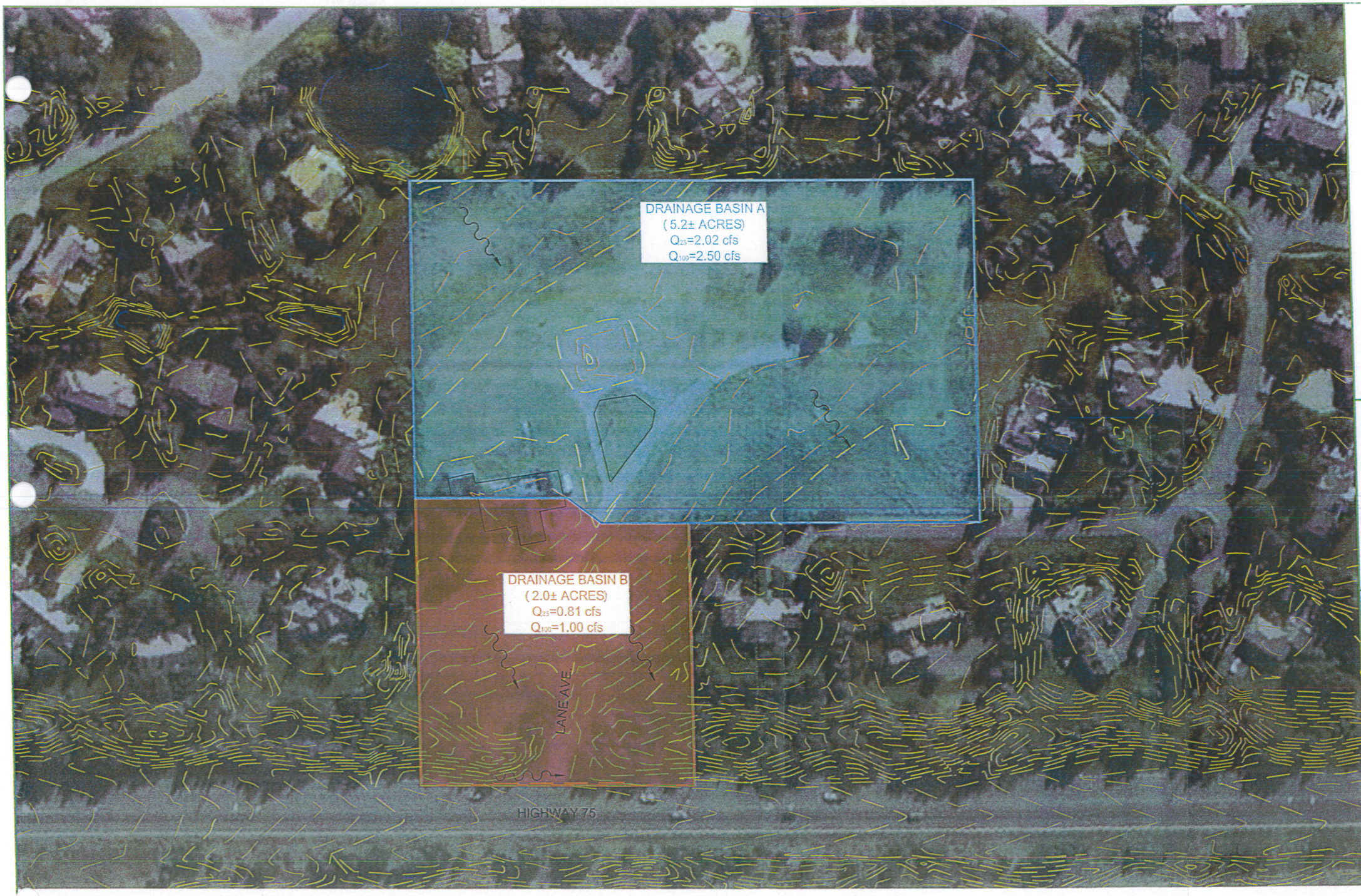
Table A-1, Rational Method Runoff Coefficients

Table A-2, Rainfall Intensity Values

Roadside Drywell Detail

Lot Drywell Detail

APPENDIX



LANE MEADOWS EXISTING DRAINAGE MAP
SCALE: 1"=100'

100 0 100 200 300
SCALE: 1"=100'

BENCHMARK ASSOCIATES, P.A.
P.O. BOX 733 100 BELL DRIVE
KETCHUM, IDAHO 83340
(208) 726-9512
(FAX) 726-9514
WEB: WWW.BMA5B.COM
MAIL: WWW.BMA5B.COM

LANE MEADOWS
EXISTING DRAINAGE

T4N, R18E, SEC 19 & 30, B.M.,
BLAINE COUNTY, IDAHO

DRAWN BY:	JPG
DESIGNED BY:	JPG
CHECKED:	SB
DATE:	03/12/14
PROJECT NO.:	13181

SHEET NUMBER

FIG 1

LANE MEADOWS PROPOSED DRAINAGE MAP
SCALE: 1"=100'

100 0 100 200 300
SCALE: 1"=100'

REVISIONS

No.	DESCRIPTION	DATE	BY

BENCHMARK ASSOCIATES, P.A.
P.O. BOX 733 100 BELL DRIVE
KETCHUM, IDAHO 83340
(208) 726-9512
(FAX) 726-9514
WEB: WWW.BMA5B.COM
MAIL: WWW.BMA5B.COM

LANE MEADOWS
PROPOSED DRAINAGE

T4N, R18E, SEC 19 & 30, B.M.,
BLAINE COUNTY, IDAHO

DRAWN BY: JPG
DESIGNED BY: JPG
CHECKED: SB
DATE: 03/12/14
PROJECT NO.: 13181

SHEET NUMBER

FIG 2

Appendix A: Rational Method Runoff Coefficients

TABLE A–1

categorized by surface	
forested	0.059–0.2
asphalt	0.7–0.95
brick	0.7–0.85
concrete	0.8–0.95
shingle roof	0.75–0.95
lawns, well drained (sandy soil)	
up to 2% slope	0.05–0.1
2% to 7% slope	0.10–0.15
over 7% slope	0.15–0.2
lawns, poor drainage (clay soil)	
up to 2% slope	0.13–0.17
2% to 7% slope	0.18–0.22
over 7% slope	0.25–0.35
driveways, walkways	0.75–0.85
categorized by use	
farmland	0.05–0.3
pasture	0.05–0.3
unimproved	0.1–0.3
parks	0.1–0.25
cemeteries	0.1–0.25
railroad yard	0.2–0.40
playgrounds (except asphalt or concrete)	0.2–0.35
business districts	
neighborhood	0.5–0.7
city (downtown)	0.7–0.95
residential	
single family	0.3–0.5
multi-plexes, detached	0.4–0.6
multi-plexes, attached	0.6–0.75
suburban	0.25–0.4
apartments, condominiums	0.5–0.7
industrial	
light	0.5–0.8
heavy	0.6–0.9

TABLE A-2, RAINFALL INTENSITY VALUES

A worksheet to build a Depth-Duration-Frequency from NOAA Atlas 2 for Idaho

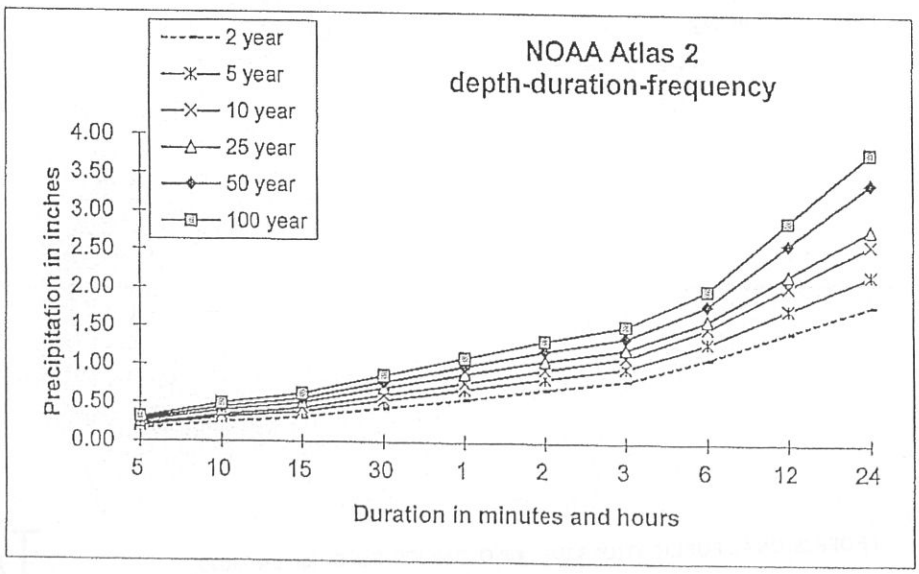
You must enter the elevation, latitude and longitude

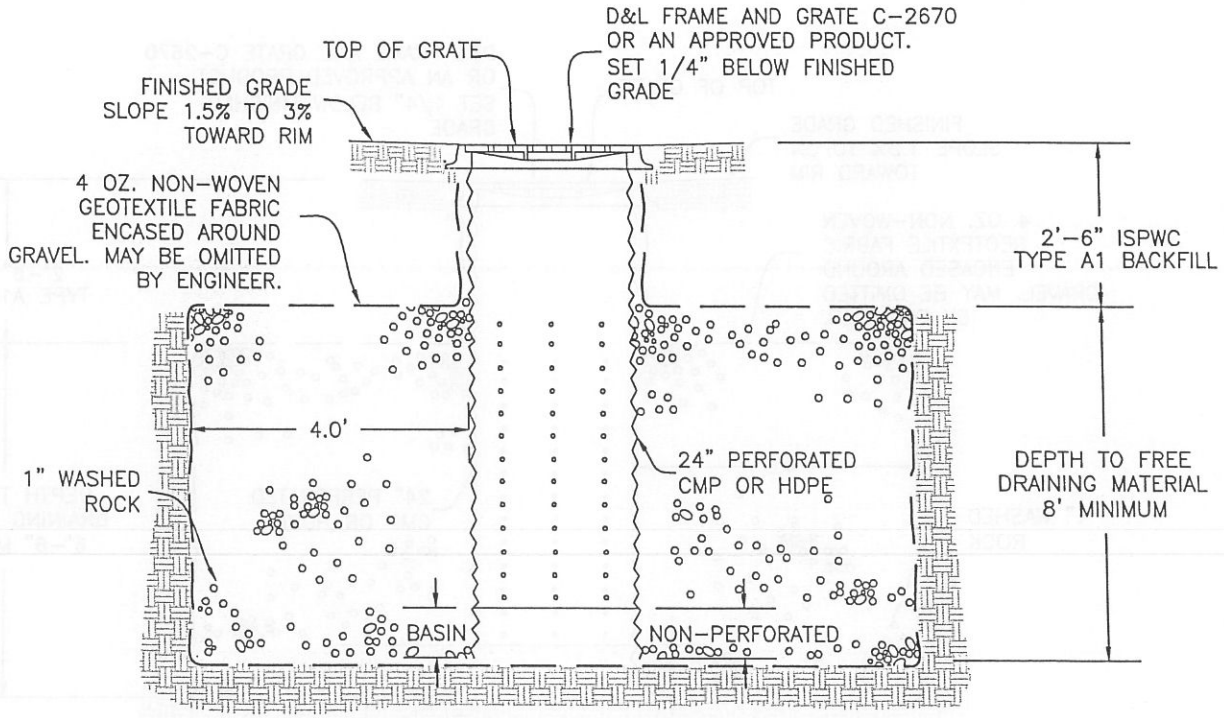
Location name:	Sun Valley, ID
Elevation (ft):	5733
Lat (Deg.min):	43.4 e.g. 48.17 is 48 degrees and 17 minutes
Long (Deg.min):	114.2
Region :	2

Fill in the 12 numbers below from the maps in NOAA Atlas 2
All other values and graphs will be automatically computed

Duration (hrs)	Frequency (years) 2	5	10	25	50	100
6	1.1	1.3	1.5	1.6	1.8	2
24	1.8	2.2	2.6	2.8	3.4	3.8

Duration	Frequency (years) 2	5	10	25	50	100
(Minutes)						
5	0.16	0.20	0.22	0.26	0.29	0.32
10	0.25	0.31	0.35	0.40	0.45	0.50
15	0.32	0.39	0.44	0.51	0.56	0.63
30	0.44	0.54	0.61	0.70	0.78	0.87
(Hours)						
1	0.55	0.69	0.77	0.89	0.99	1.10
2	0.69	0.84	0.95	1.07	1.19	1.33
3	0.81	0.97	1.11	1.22	1.37	1.52
6	1.10	1.30	1.50	1.60	1.80	2.00
12	1.45	1.75	2.05	2.20	2.60	2.90
24	1.80	2.20	2.60	2.80	3.40	3.80



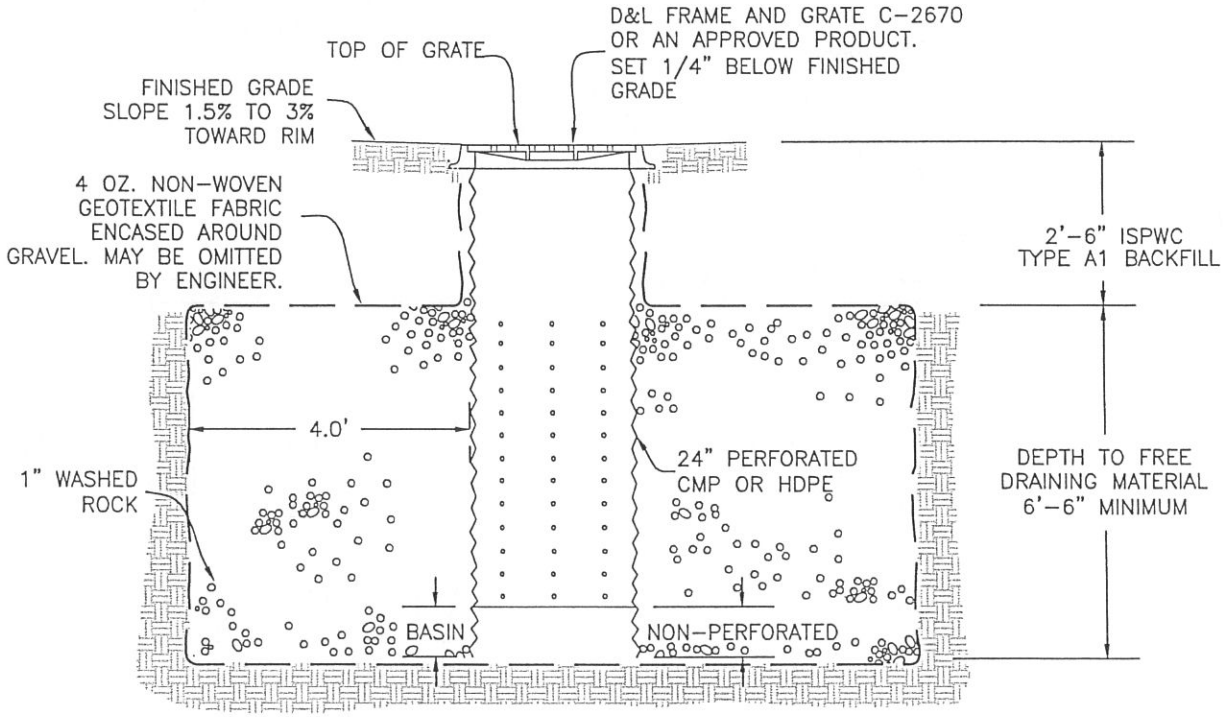


NOTES:

1. ALL PRODUCTS AS NOTED OR APPROVED SUBSTITUTION.
2. DRAINAGE GEOTEXTILE TO BE 4.5 OZ NON-WOVEN FILTER FABRIC (CONTECH C-NW45 OR EQUAL)

24-INCH DRY WELL (TYP.) - ROADSIDE

SCALE: NONE



NOTES:

1. ALL PRODUCTS AS NOTED OR APPROVED SUBSTITUTION.
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24-INCH DRY WELL (TYP.) - LOT

SCALE: NONE