FINAL STORM DRAINAGE CALCULATIONS
For

Layla Lot 1 Subdivision

A Residential Property

Job # 21-028

ATLAS
ENGINEERING

Elk Ridge, Utah
February 2024

Drainage Plan

Introduction:

Layla Lot 1 Subdivision is a 1.11-acre site plan with a single family lot to be completed at the north end of Sunset Avenue in Elk Ridge, Utah. The project will consist of road and utility improvements for the lot. Storm water will flow along the curb and gutter and into a catch basin at the low point in the road, where it will then enter an underground detention system designed to accommodate a 100-yr storm.

Storm Drainage:

The site is a single basin with enough storage to provide the required volume of a 100-yr storm and allowing an outflow equal to the percolation rate. 0.50 acres was used as the acreage because this is the roadway area on Sunset Avenue that will flow into the storm drain system. Storm water on the lot area will be graded to remain on the lot. The weighted "C" of 0.55 was calculated using 0.25 acres as the planter area and 0.25 acres as the impervious road area. The Premier Point Subdivision just north of the project had a percolation test completed by CMT Engineering with a rate of 3 min/inch. As a factor of safety for Layla Lot 1 it was determined to use a 10 min/inch percolation rate in the calculations. The required 100-yr volume for the site is 1,157 ft^3 of storage. 21 Cultec 360 HD chambers will provide 1,170 ft^3 of storage.

In the case of an event larger than the 100-yr storm, a drainage ditch will be constructed that conveys overflow from the catch basin and down to Goosenest Drive. This drainage ditch is 1' deep with 3:1 side slopes and is designed to convey the 100-yr peak flow rate at a depth of 4" within the ditch.

Conclusion:

The Storm Drain design meets or exceeds all Elk Ridge City design requirements. Storm drainage will be handled through catch basins, piping, and underground Cultec storage chambers. Values given for runoff flows are derived from calculations included in the appendix. The pipe inlets will be covered and appropriately protected.

The residential building will have a finished floor elevation that provides for positive drainage away from the building. In the event that any of the drainage structures should become damaged or clogged with debris, the water will overflow off the project through the drainage ditch to Goosenest Drive before flooding the structures.

Appendix

WEIGHTED "C" VALUE

Layla Lot 1 Subdivision

Total Acrage: 0.50

Description	Area (Acres)	Runoff Coefficient	Percentage of Area	Weighted C Value
Landscaping	0.25	0.15	50.00	7.50
Impervious Area	0.25	0.95	50.00	47.50
			Total	**55**

PROJECT TITLE: **Layla Lot 1 Subdivision**
BASIN: **1**

Detention Volume Determination

Basin Size, acres (A):	0.5	
Runoff Coefficient (C):	0.55	
Design Frequency:	100 yr	
Percolation rate	10	min/in
Area for perc	1,052	sf
Allowable Outflow (Q):	0.146111	

Storm Duration (min.)	Rainfall intensity (in/hr)	Runoff volume (cu.ft.)	perc outflow (cu.ft.)	Storage volume (cu.ft.)
(T)	(I)	CIAT	QT	CIAT-QT
5	6.47	534	44	490
10	4.92	812	88	724
15	4.07	1007	132	876
30	2.74	1356	263	1093
60	1.70	1683	526	1157
120	0.95	1883	1052	831
180	0.66	1948	1578	370
360	0.36	2121	3156	-1035
720	0.21	2459	6312	-3853
1440	0.12	2899	12624	-9725

21 Cultec 360 HD chambers provides 1,170 cf

NOAA Atlas 14, Volume 1, Version 5
Location name: Elk Ridge, Utah, USA*
Latitude: 40.019°, Longitude: -111.6721°
Elevation: 5193.29 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.55 (1.34-1.84)	1.98 (1.72-2.35)	2.75 (2.35-3.25)	3.41 (2.90-4.06)	4.45 (3.70-5.32)	5.39 (4.37-6.46)	6.47 (5.12-7.80)	7.72 (5.92-9.42)	9.71 (7.10-12.1)	11.5 (8.10-14.5)
10-min	1.18 (1.02-1.40)	1.51 (1.31-1.79)	2.09 (1.79-2.47)	2.59 (2.20-3.08)	3.38 (2.81-4.04)	4.10 (3.32-4.91)	4.92 (3.89-5.93)	5.87 (4.51-7.16)	7.39 (5.41-9.17)	8.74 (6.16-11.1)
15-min	0.976 (0.844-1.16)	1.25 (1.08-1.48)	1.72 (1.48-2.04)	2.14 (1.82-2.55)	2.80 (2.32-3.34)	3.39 (2.75-4.06)	4.07 (3.22-4.91)	4.86 (3.72-5.92)	6.10 (4.47-7.58)	7.22 (5.09-9.14)
30-min	0.656 (0.568-0.778)	0.840 (0.728-0.996)	1.16 (0.996-1.37)	1.44 (1.23-1.72)	1.88 (1.56-2.25)	2.28 (1.85-2.73)	2.74 (2.17-3.30)	3.27 (2.51-3.99)	4.11 (3.01-5.11)	4.86 (3.43-6.15)
60-min	0.406 (0.351-0.481)	0.519 (0.450-0.616)	0.718 (0.616-0.850)	0.893 (0.759-1.06)	1.17 (0.966-1.39)	1.41 (1.15-1.69)	1.70 (1.34-2.04)	2.02 (1.55-2.47)	2.54 (1.86-3.16)	3.01 (2.12-3.81)
2-hr	0.256 (0.226-0.298)	0.323 (0.284-0.374)	0.426 (0.372-0.496)	0.519 (0.449-0.604)	0.666 (0.564-0.780)	0.798 (0.662-0.939)	0.951 (0.768-1.13)	1.13 (0.883-1.36)	1.41 (1.05-1.73)	1.66 (1.20-2.08)
3-hr	0.198 (0.177-0.226)	0.247 (0.220-0.282)	0.315 (0.280-0.361)	0.377 (0.332-0.432)	0.473 (0.410-0.545)	0.556 (0.472-0.645)	0.656 (0.544-0.768)	0.773 (0.625-0.915)	0.961 (0.747-1.16)	1.13 (0.849-1.40)
6-hr	0.129 (0.117-0.145)	0.159 (0.144-0.178)	0.195 (0.176-0.219)	0.226 (0.204-0.254)	0.271 (0.241-0.306)	0.311 (0.272-0.352)	0.357 (0.306-0.408)	0.410 (0.346-0.474)	0.501 (0.411-0.592)	0.583 (0.468-0.704)
12-hr	0.083 (0.076-0.091)	0.102 (0.093-0.112)	0.123 (0.112-0.136)	0.141 (0.127-0.156)	0.166 (0.149-0.185)	0.186 (0.165-0.209)	0.207 (0.182-0.234)	0.233 (0.201-0.266)	0.274 (0.231-0.318)	0.310 (0.257-0.365)
24-hr	0.051 (0.047-0.055)	0.063 (0.058-0.068)	0.076 (0.070-0.082)	0.086 (0.080-0.093)	0.100 (0.092-0.108)	0.111 (0.102-0.120)	0.122 (0.111-0.132)	0.133 (0.121-0.144)	0.147 (0.133-0.161)	0.158 (0.142-0.185)
2-day	0.029 (0.027-0.031)	0.036 (0.033-0.039)	0.043 (0.040-0.047)	0.050 (0.046-0.054)	0.058 (0.054-0.063)	0.065 (0.059-0.070)	0.072 (0.066-0.078)	0.079 (0.072-0.086)	0.089 (0.080-0.097)	0.097 (0.086-0.106)
3-day	0.022 (0.020-0.023)	0.027 (0.025-0.029)	0.032 (0.030-0.035)	0.037 (0.034-0.040)	0.044 (0.040-0.048)	0.049 (0.045-0.054)	0.055 (0.050-0.060)	0.061 (0.055-0.066)	0.069 (0.061-0.075)	0.075 (0.066-0.083)
4-day	0.018 (0.016-0.019)	0.022 (0.020-0.024)	0.027 (0.025-0.029)	0.031 (0.028-0.034)	0.037 (0.034-0.040)	0.041 (0.038-0.045)	0.046 (0.042-0.051)	0.051 (0.046-0.056)	0.058 (0.052-0.064)	0.064 (0.056-0.071)
7-day	0.012 (0.011-0.013)	0.015 (0.014-0.016)	0.018 (0.017-0.020)	0.021 (0.019-0.023)	0.024 (0.022-0.027)	0.027 (0.025-0.030)	0.030 (0.028-0.033)	0.033 (0.030-0.036)	0.038 (0.034-0.041)	0.041 (0.036-0.045)
10-day	0.010 (0.009-0.010)	0.012 (0.011-0.013)	0.014 (0.013-0.015)	0.016 (0.015-0.018)	0.019 (0.018-0.021)	0.021 (0.019-0.023)	0.023 (0.021-0.025)	0.025 (0.023-0.028)	0.028 (0.025-0.031)	0.030 (0.027-0.033)
20-day	0.006 (0.006-0.007)	0.008 (0.007-0.009)	0.010 (0.009-0.010)	0.011 (0.010-0.012)	0.012 (0.012-0.013)	0.014 (0.013-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.018 (0.016-0.019)	0.019 (0.017-0.020)
30-day	0.005 (0.005-0.006)	0.006 (0.006-0.007)	0.008 (0.007-0.008)	0.009 (0.008-0.009)	0.010 (0.009-0.011)	0.011 (0.010-0.012)	0.012 (0.011-0.013)	0.013 (0.012-0.014)	0.015 (0.013-0.016)	0.016 (0.014-0.017)
45-day	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.012)	0.012 (0.011-0.013)	0.012 (0.011-0.013)
60-day	0.004 (0.004-0.004)	0.005 (0.005-0.005)	0.006 (0.005-0.006)	0.007 (0.006-0.007)	0.007 (0.007-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.009)	0.009 (0.009-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.012)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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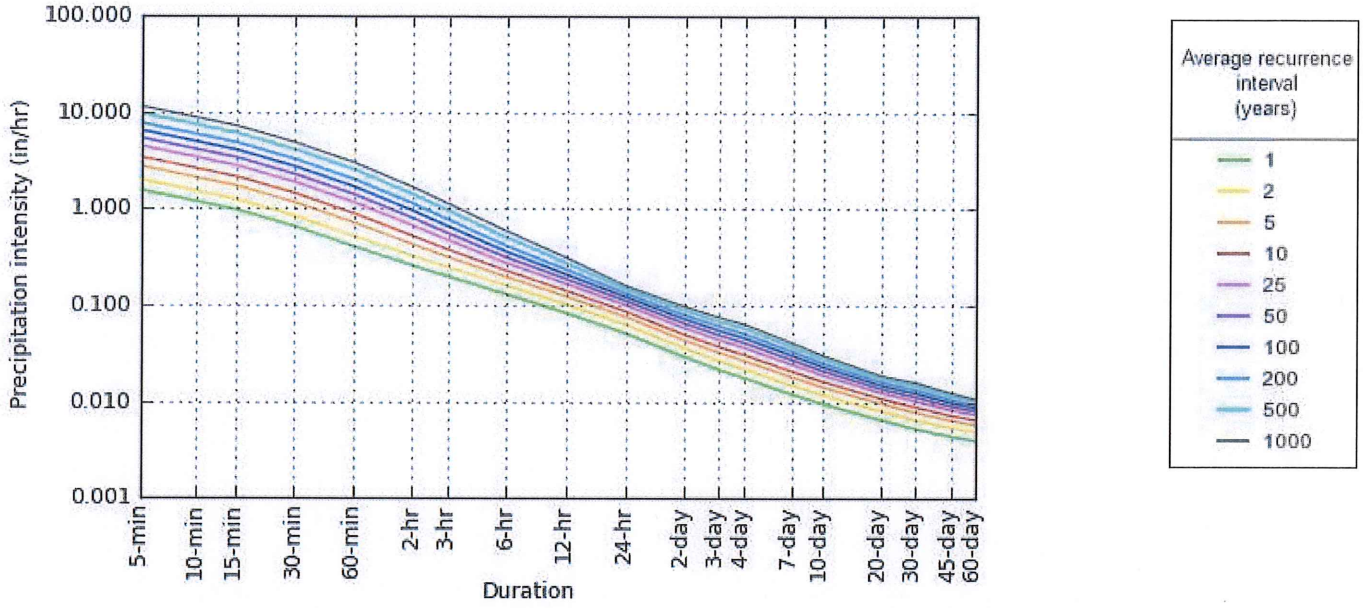
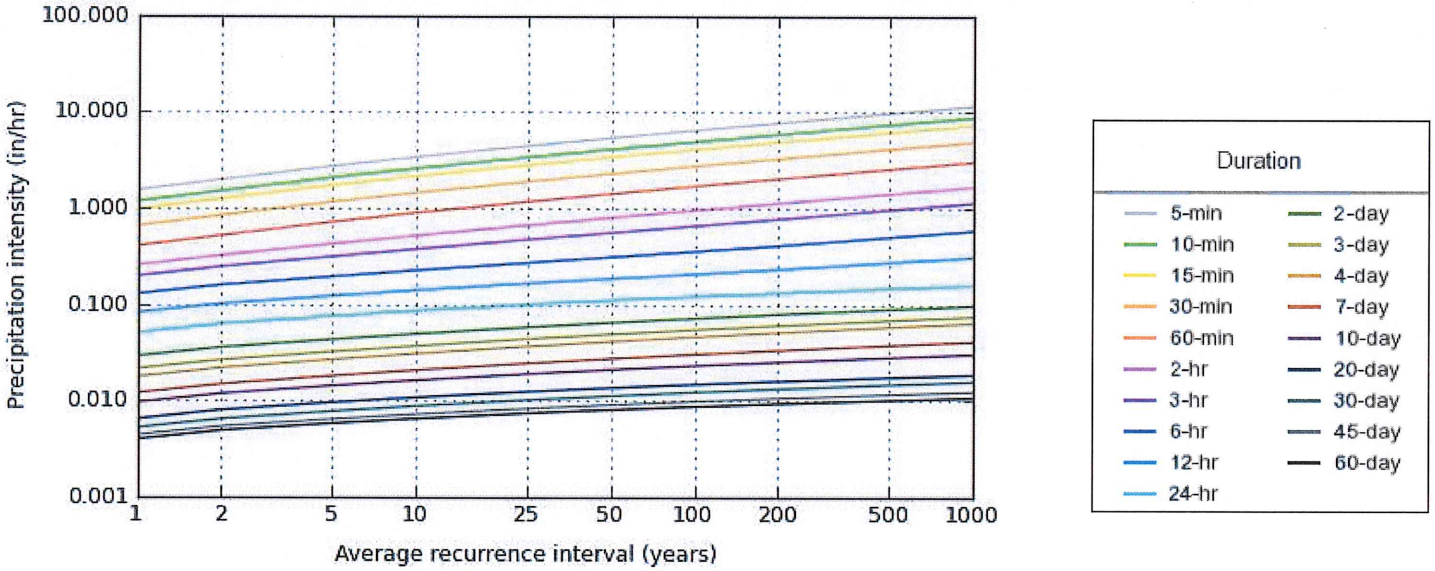
PF graphical

PDS-based intensity-duration-frequency (IDF) curves
Latitude: 40.0190°, Longitude: -111.6721°





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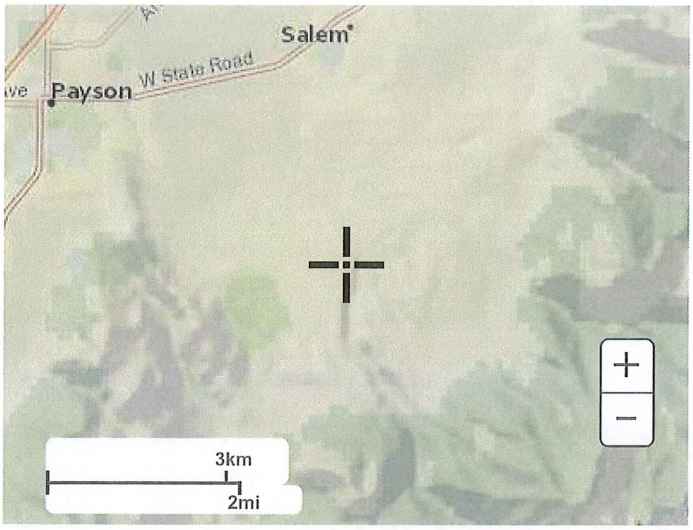
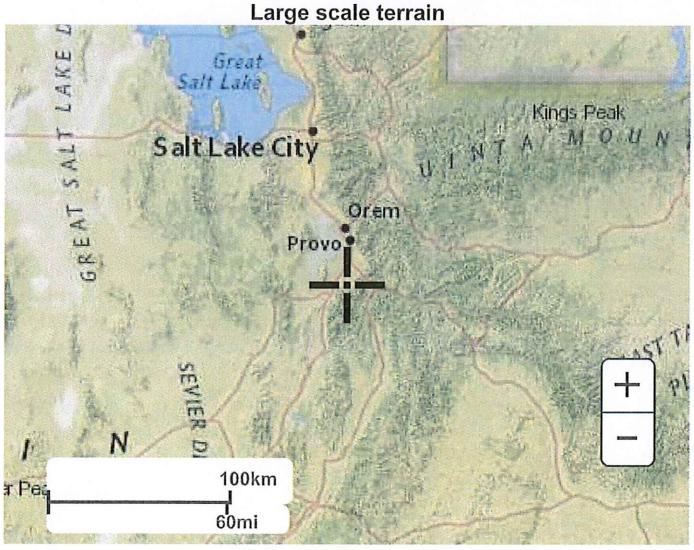
Maps & aerials

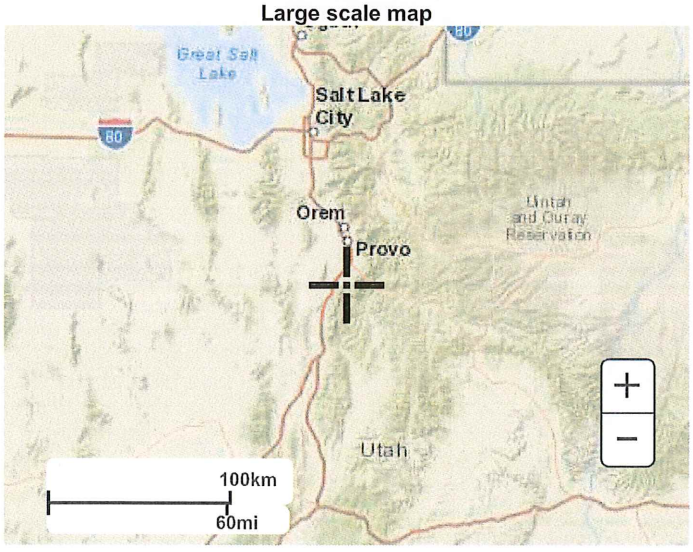
Small scale terrain



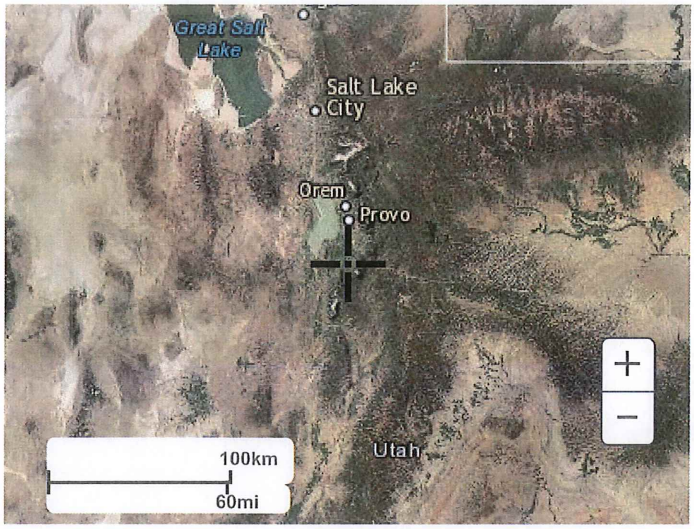
Large scale terrain



Large scale map



Large scale aerial



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