Preliminary Storm Report

Trillium Subdivision

West Linn, Oregon

DRAINAGE REPORT

December 2018

EXPIRES: 06/30/2019

SIGNATURE DATE: 1/3/19

Prepared By:

Bruce D. Goldson, PE

Theta, llc

PO Box 1345, Lake Oswego, Oregon 97035

2014-129T

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NARRATIVE ASSUMPTIONS

Existing Conditions:

The subject property is currently vacant with a culvert conveying a drainage basin through the center of the property. Infiltration tests were conducted @ 3797, 3787, & 3777Mapleton Drive for the three new parcels this year. This property is adjacent to the subject property with similar soils. There is no indication of a high water table and the USDA finds the soil to be 1B Aloha silt loam with a hydrological soil group C/D. The soils on the adjacent property were found to be a light brown stiff clay silt/loam with no with rocks. The infiltration rates were found be between 1-2 inches per hour.

Developed Conditions:

Six residential lots accessed by a private drive is proposed. The existing culvert would be removed and the drainage way reestablished except for a culvert crossing for the new access drive. Storm water from the access drive would be collected at the low point in cartage catch basins for water quality and collected in an oversized pipe for detention and discharged in the drainage corridor. The individual lot would have individual infiltration facilities for the impervious areas.

Summary of storm water flow

	2-YEAR	5-YEAR	10-YEAR	25-YEAR
PRE-DEVELOP	0.07CFS	0.09 CFS	0.10 CFS	0.13 CFS
POST-DEVELOP	0.14 CFS	0.16 CFS	0.19 CFS	0.21CFS

REGULATORY DESIGN CRITERIA

The storm water quantity management requirements of the City of West Linn.

References

1. King County Department of Public Works, Surface Water Management Division, Hydrographic Programs, Version 4.21B

Water Quality Facility

Design Parameters

The design storm is a 24 hour standard SCS Type 1A

- 2-year.....2.5 inches
- 5-year.....3.0 inches
- 10-year.....3.4 inches
- 25-year..... 3.9 inches
- 100-year.....4.5 inches

SOIL TYPES

Willamette Silt Loam – type C soil

FOR PRIVATE DRIVE

Time of Concentration

$$T = (0.42)[(nL)^{.8}/(p_2)^{.5}(s_0)^{.4}$$

Pre-development: $T = (0.42)[(0.24)(140)]^{.8}/(2.5)^{.5}(.11)^{.4} = 10.0$ min (pre)

Assume 5-minutes developed

HYDROGRAPH RESULTS

KING COUNTY DEPARTMENT OF PUBLIC WORKS
Surface Water Management Division
HYDROGRAPH PROGRAMS
Version 4.21B
1 - INFO ON THIS PROGRAM
2 - SBUHYD
3 - MODIFIELD SBUHYD
4 - ROUTE
5 - ROUTE2
6 - ADDHYD
7 - BASEFLOW
8 - PLOTHYD
9 - DTATA
10 - REFAC
11 - RETURN TO DOS

ENTER OPTION:
2
SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH
STORM OPTIONS:
1 - S.C.S. TYPE-1A

2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE
SPECIFY STORM OPTION:
1
S.C.S. TYPE - 1A RAINFALL DISTRIBUTION
ENTER; FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
2,24,2.6
Xxxxxxxxxxxxxxxxxxxxx S.C.S.TYPE-1A DISTRIBUTION xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
XXXXXXXXXXXX 2-YEAR 24-HOUR STORM xxxx 2.50 "TOTAL PRECIP Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx/

ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1
0.21,86,0.0,98,10.0
DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
.2	.2	86	.0	98	10.0
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
.07	7.83		1009		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:t2P
SPECIFY: C - CONTINUE, N - NEWSTORM, P -PRINT, S - STOP
C

ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1
0.00,86,0.21,98,5

DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
.2	.0	86	.2	98	5.0
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
.14	7.67		1806		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:T2D
SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S – STOP
n
STORM OPTIONS:
1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE
SPECIFY STORM OPTION:
1
ENTER; FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
5,24,3.0

Xxxxxxxxxxxxxxxxxxxxx S.C.S.TYPE-1A DISTRIBUTION xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
XXXXXXXXXXXX 5-YEAR 24-HOUR STORM xxxx 3.00" TOTAL PRECIP Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

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ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1

0.21,86,0.00,98,10.0
DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
.2	.2	86	.0	98	10.0
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
.09	7.83		1266		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:t5p
SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S – STOP
c
0.0,86,0.21,98,5
DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
.2	.0	86	.2	98	5.0
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
.16	7.67		2110		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:t5D
SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S – STOP
n
STORM OPTIONS:
1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE
SPECIFY STORM OPTION:
1
ENTER; FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
10,24,3.4
Xxxxxxxxxxxxxxxxxxxxxx S.C.S.TYPE-1A DISTRIBUTION xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
XXXXXXXXXXX 10-YEAR 24-HOUR STORM xxxx 3.40" TOTAL PRECIP Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

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ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1
0.28,86,06,98,7.0
DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
.2	.2	86	.0	98	10.0
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
.10	7.83		1531		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:t10P
SPECIFY: C - CONTINUE, N - NEWSTORM, P - DATA PRINT OUT:
C
ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1
0.00,86,0.21,98,5

AREA(ACRES)	PERVIOUS	IMPERVIOUS	TC(MINUTES)

```
                    A       CN          A       CN
   .2               .0      86          .2      98          5.0
PEAK-Q(CFS)         T-PEAK(HRS)         VOL(CU-FT)
   .19                 7.67                2414
ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:t10D
SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S – STOP
n
STORM OPTIONS:
1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE
SPECIFY STORM OPTION:
1
ENTER; FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
25,24,3.9
Xxxxxxxxxxxxxxxxxxxxxx S.C.S.TYPE-1A DISTRIBUTION xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
XXXXXXXXXXXX  25-YEAR  24-HOUR STORM  xxxx  3.90" TOTAL PRECIP  Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1
0.21,86,00,98,10.0
DATA PRINT OUT:
AREA(ACRES)         PERVIOUS            IMPERVIOUS          TC(MINUTES)
                    A       CN          A       CN
   .2               .2      86          .0      98          10.0
PEAK-Q(CFS)         T-PEAK(HRS)         VOL(CU-FT)
   .13                 7.83                1870
ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:t25P
SPECIFY: C - CONTINUE, N - NEWSTORM, P - DATA PRINT OUT:
C
ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1
0.00,86,0.21,98,5
AREA(ACRES)         PERVIOUS            IMPERVIOUS          TC(MINUTES)
                    A       CN          A       CN
   .2               .0      86          .2      98          5.0
PEAK-Q(CFS)         T-PEAK(HRS)         VOL(CU-FT)
   .21                 7.67                2794
ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:t25D


j
DETENTION SIZING
ENTER OPTION
10
R/D FACILITY DESIGN ROUTINE
SPEFICY TYPE OF R/D FACILTY
```

1 - POND 4 - INFILTRATION POND
2 - TANK 5 - INFILTRATION TANK
3 -VAULT 6 - GRAVEL TRENCH/BED
4
ENTER: POND SIDE SLOPE (HORIZ. COMPONENT)
3
ENTER: EFFECTIVE STORAGE DEPTH(ft) BEFORE OVERFLOW
2.0
ENTER: VERT-PERM(min/in)< PERM-SURFACE (O = SIDES ONLY, 1 = SIDES AND BOTTOM)
60,1
ENTER [d:][path]filename[.ext] OF PRIMARY DESIGN INFLOW HYDROGRAPH:
C:t25D
PRIMARY DESIGN INFLOW PEAK = .21 CFS

ENTER PRIMARY DESIGN RELEASE RATE(cfs):
0.13
ENTER NUMBER OF INFLOW HYDROGRAPHS TO BE TESTED FOR PERFORMANCE (5 MAXIMUM)
3
ENTER [d:][path]filename[.ext] OF HYDROGRAPH 1:
C:T10D
ENTER TARGET RELEASE RATE (cfs)
0.10
ENTER [d:][path]filename[.ext] OF HYDROGRAPH 2:
C:T5D
ENTER TARGET RELEASE RATE (cfs)
0.09
0. ENTER [d:][path]filename[.ext] OF HYDROGRAPH 3:
C:T2D
ENTER TARGET RELEASE RATE (cfs)
0.07
ENTER: NUMBER OF ORIFICES, RISER-HEAD (ft), RISER-DIAMETER(in)
2.4.10
RISER OVERFLOW DEPTH FOR PRIMARY PEAK INFLOW= 0.09FT
SPECIFY ITERATION DISPLAY: Y -YES, N - NO
N
SPECIFY: R - REVIEW/REVISE INPUT, C - CONTINUE
C
INITIAL STORAGE VALUE FOR ITERATION PURPOSES: 1170 CU-FT
BOTTOM ORIFICE: ENTER Q-MAX(cfs)
0.075
DIA. = 1.40 INCHES
TOP ORIFICE: ENTER HEIGHT(ft)
1.84
DIA. = 2.25 INCHES

PERFORMANCE: INFLOW TARGET-OUTFLOW ACTUAL-OUTFLOW PK-STAGE STORAGE

DESIGN HYD:	.21	.13	.13	2.00	251
TEST HYD 1:	.19	.10	.09	3.25	220
TEST HYD 2:	.16	.09	.07	2.76	180
TEST HYD 3:	.14	.07	.07	2.14	130

SPECIFY: D - DOCUMENT, R -REVISE, A - ADJUST ORIF, E -ENLARGE, S –STOP

251 CF required, and 275.5 CF provided per the current layout

For the individual lots:

Roof = 5072 SF = 0.116acres

PROPOSED:

2- StormTech SC-740-infiltration units - & 15 LF 48" drywell.

Footprint = (17.56 X 6) + (10 X 8) = 185.4 Square feet

Xxxxxxxxxxxxxxxxxxxxxx S.C.S.TYPE-1A DISTRIBUTION xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
XXXXXXXXXXXX 10-YEAR 24-HOUR STORM xxxx 3.20" TOTAL PRECIP. Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

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ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1
0.0,86,0.116,98,5
DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
.1	.0	86.0	.1	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
.10	7.67	1249

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:1maple
SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S – STOP
S

ENTER OPTION
RESERVOIR ROUTING INFLOW/OUTFLOW ROUTINE
SPECIFY [d:][path]filename[.ext] OF ROUTINE DATA)
C:m1data
DISPLAY ROUTING DATA (Y or N)
Y
ROUTING DATA:

STAGE (FT)	DISCHARGE (CFS)	STORAGE (CU-FT)	PERN-AREA(SQ-FT)
.00	.00	.0	.0
11.50	.00	520.7	276.0
12.00	.00	575.8	276.0
12.50	.00	662.2	276.0
13.00	.00	746.1	276.0
13.50	.00	826.2	276.0

14.00	.00	900.2	276.0
14.50	.00	962.4	276.0
15.00	.00	1017.6	276.0

AVERAGE PERM-RATE: 56.4 MINUTES/INCH
SATURATED PERM-RATE: 56.4 MINUTES/INCH
GROUND STORAGE BEFORE SATURATION: .00 CU-FT/SQ-FT
ENTER [d:][path]filename[.ext] OF COMPUTED HYDROGRAPH:
C:maple
INFLOW/OUTFLOW ANALYSIS:

PEAK-INFLOW(CFS)	PEAK-OUTFLOW(CFS)	OUTFLOW-VOL (CU-FT)
.10	.00	0
INITIAL-STAGE (FT)	TIME-OF-PEAK(HRS)	PEAK-STAGE-ELEV(FT)
.00	23.83	13.58

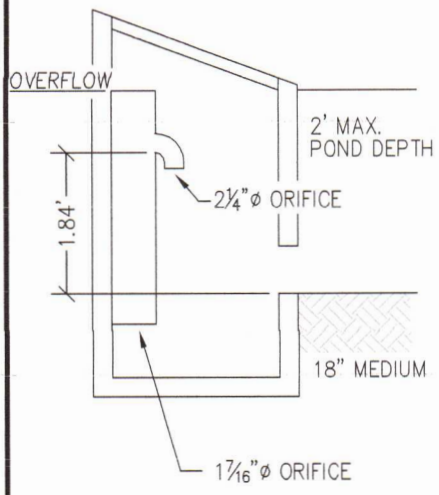
PEAK STORAGE: 830 CU-FT
INFILTRATED VOLUME: 889 CU-FT
ENTER [d] [path] filename [.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

DESIGN SUMMARY:

For the preliminary design a water quality/detention facility will receive the storm flow from the impervious private driveway and meter it out at the pre-developed rates. The Pond will be 2' deep and have a volume of 275 CF. with the required volume of 251CF thus meeting the storage requirements. Two orifices are proposed to discharge at the pre-developed rate for the 2, 5 10 & 25 year events. Water quality for the drive would be provided with the 18-inches of medium in the pond.

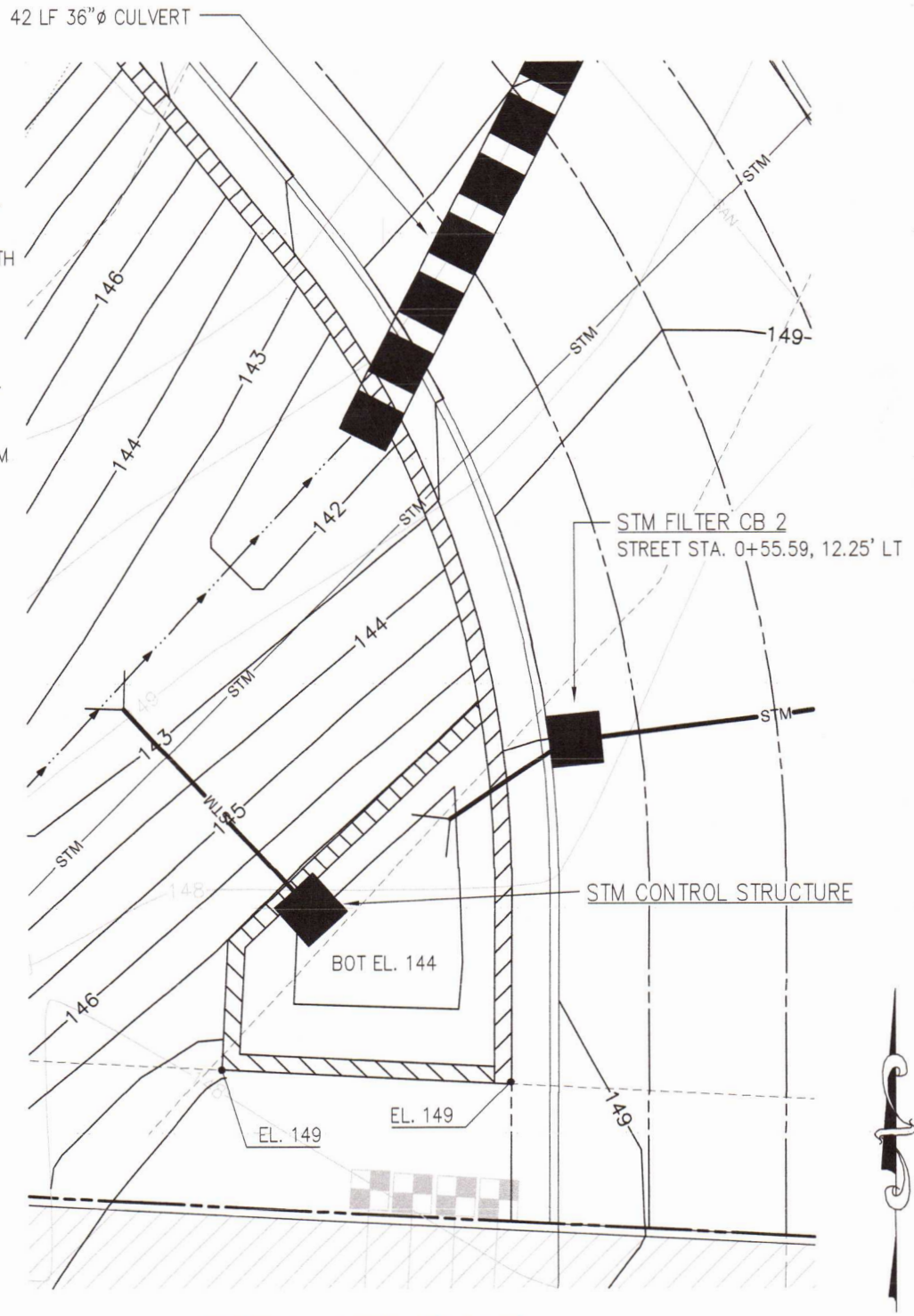
The individual lots would have infiltration facilities sized to the impervious area.

Appendix



CONTROL STRUCTURE

SCALE: NTS



STORM WATER FACILITY

SCALE: 1" = 10'

2014-129T

STORM DRAINAGE REPORT

Theta, llc
ENGINEERING - SURVEYING - PLANNING
PO Box 1345
Lake Oswego, Oregon 97035
503-481-8822
email: thetaeng@comcast.net

Trillium Creek

Field Memo

Project: Trillium Creek
Location: West Linn, OR

Date: 1/17/19
Developer: Darren Gustdorf

Rapid Soil Solutions (RSS) has reviewed out geotechnical report dated 10/2/18. If the nearby creek is rerouted then there is the potential that the proposed pond location will not have ground water in it.

If you have any questions with this field report please contact me at the below numbers.

Rapid Soil Solutions INC 503-816-3689 mia@rapidsoilsolutions.com

Trillium Creek

Addendum to Storm Analysis
February 2019

Narrative:

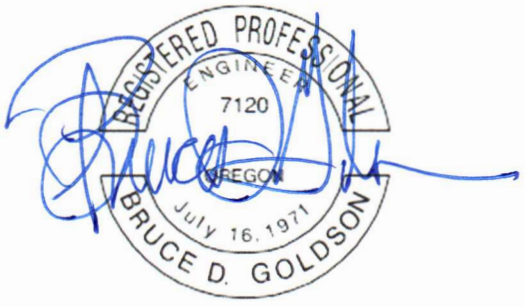
The proposed 6-lots have been reviewed for the appropriate storm water disposal by conducting two infiltration tests on the site. The two test sites were prepared on January 27th 2019 with test pits dug to 44 ½" (#1) and 47" (#2) and presoaked at that time. The soil in both was found to be damp but without seeps or standing ground water. The lower depths of both were found to be a clay/silt brown material. As previously reported the USDA finds the soil to be (1B) Aloha silt loam with a hydrological soil group C/D. The observed rates of infiltration on January 28th, 2019 were 0.56 inches/ hour for #1 and 0.27 inches/hour for # 2.

With these low observed rates it is not practical to provide total on-site storm water disposal. Water quality can be provided with an underdrain system and control orifice with discharge to the drainage way. Open bottom facilities will allow for the infiltration to the extent possible. The attached drawing illustrates conceptually how this can be accomplished for each lot. The final sizing of the individual systems will be determined when the impervious areas are known.

At this time infiltrators are proposed with an underdrain system as the best management option for the site. This will provide both water quality and quantity for the individual lots.

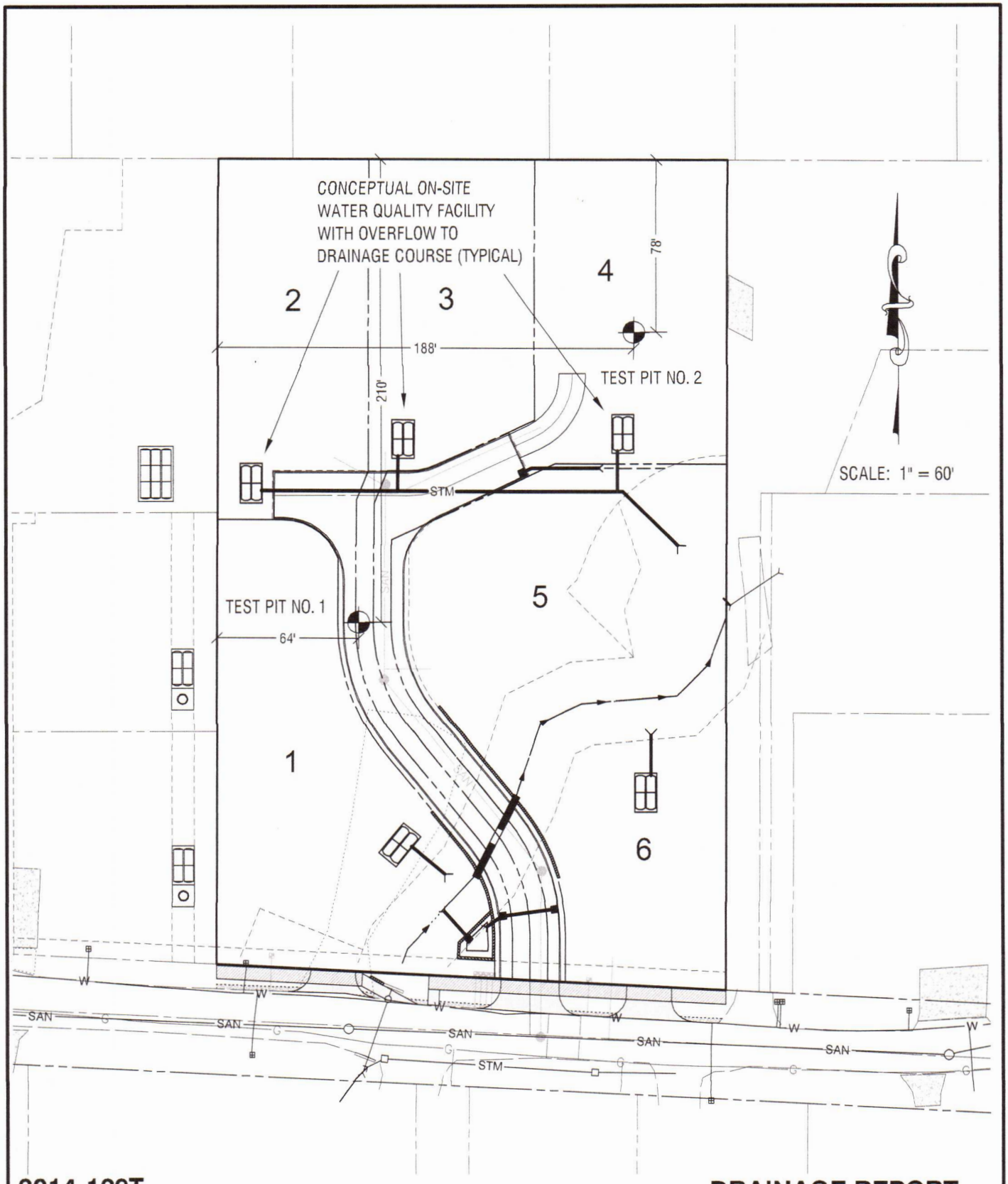
Prepared by:

Bruce D. Goldson, PE
Theta
February 5, 2019



EXPIRES: 06/30/2019
SIGNATURE DATE: 2/5/19

2014-129T



2014-129T

DRAINAGE REPORT

Theta, llc

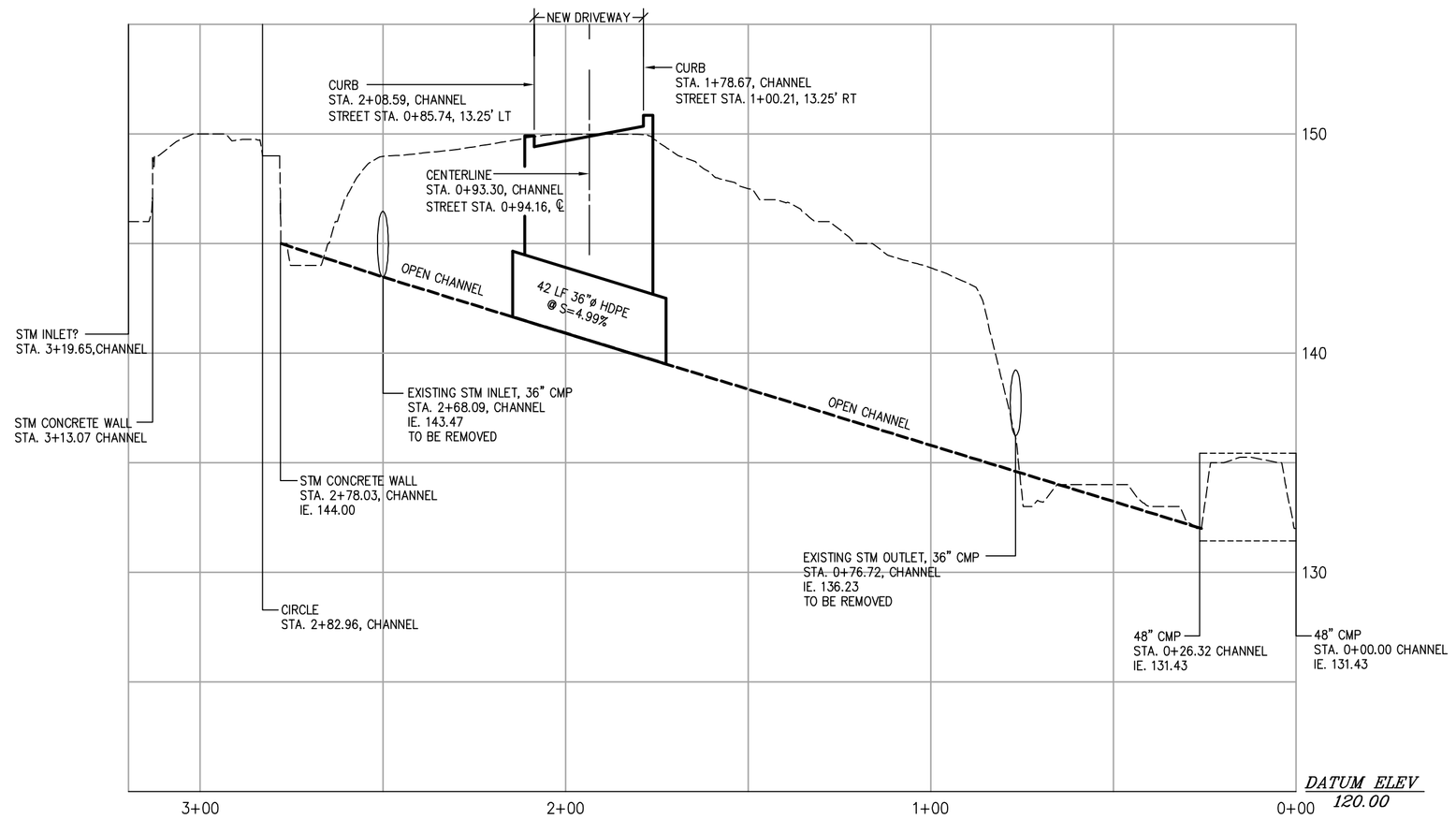
ENGINEERING - SURVEYING - PLANNING

PO Box 1345
Lake Oswego, Oregon 97035

503/481-8822
email: thetaeng@comcast.net

Trillium Creek

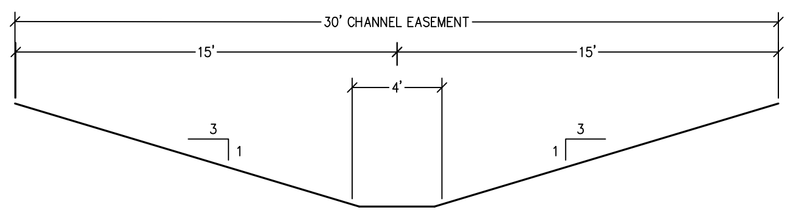
1
1



CHANNEL CENTERLINE PROFILE

SCALE: 1" = 30' HORIZONTAL
1" = 5' VERTICAL

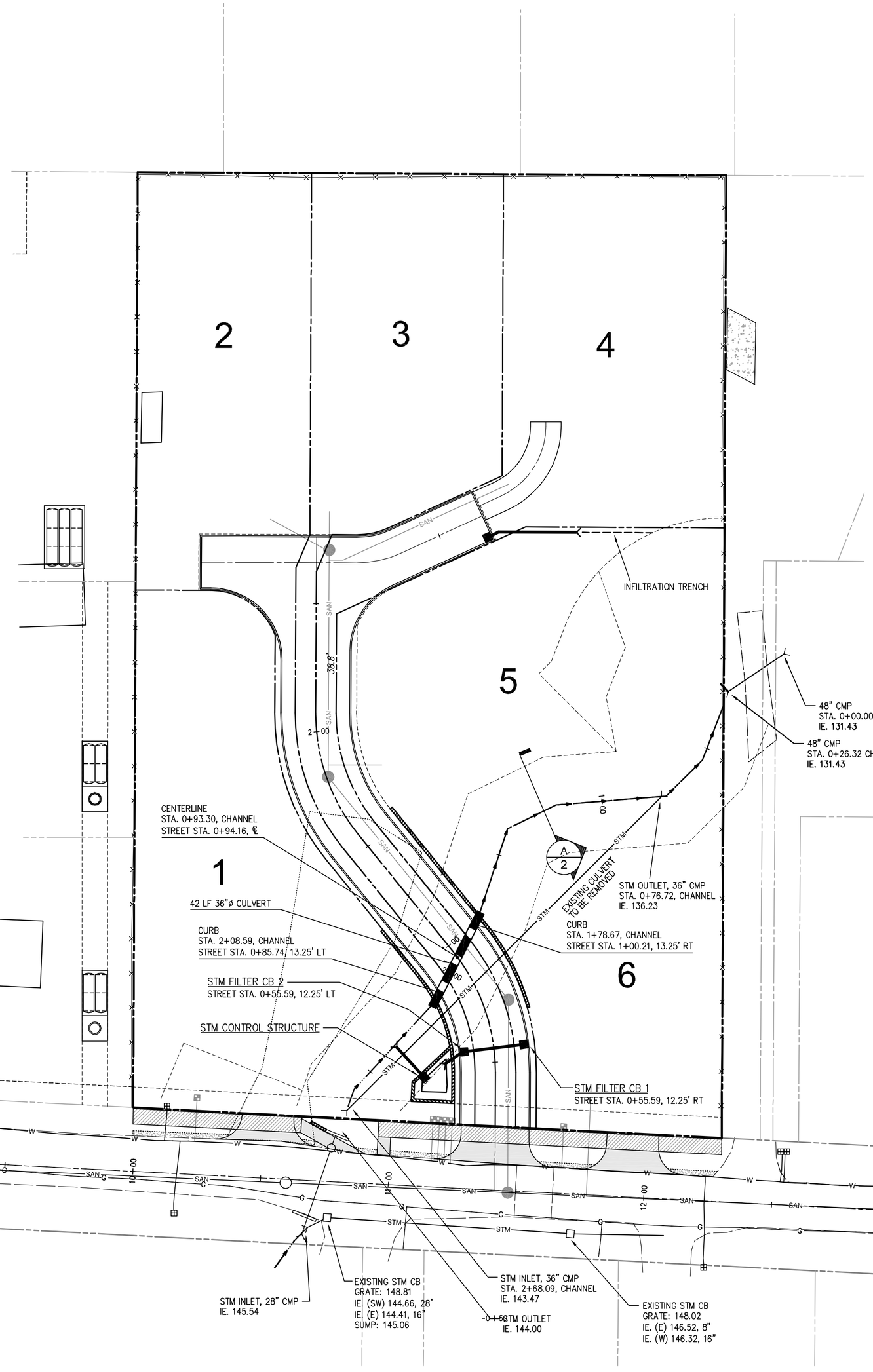
2/2

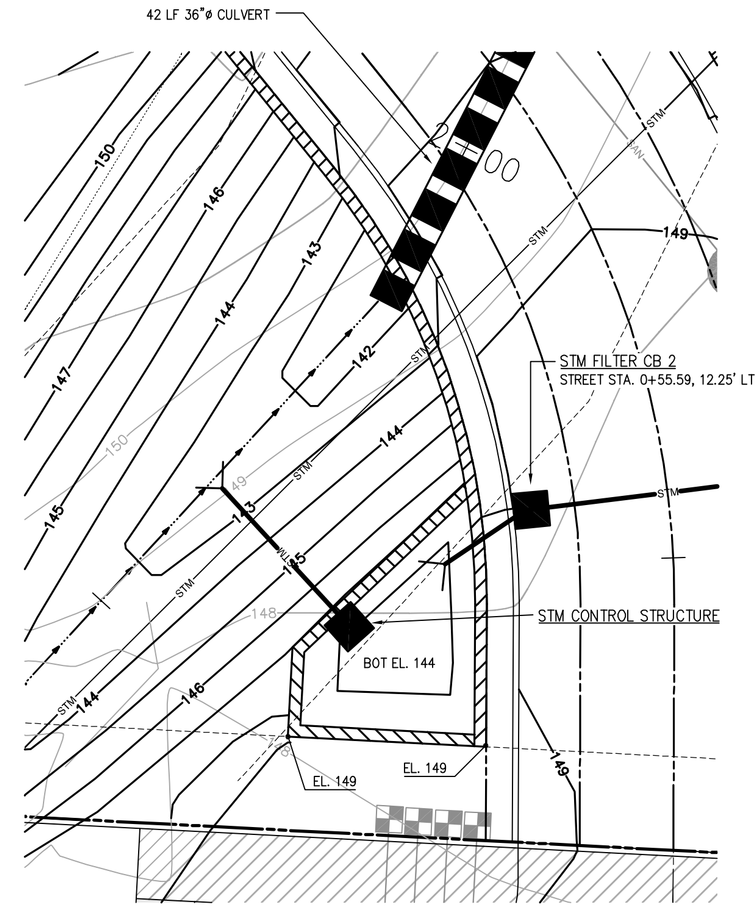


RECONSTRUCTED DRAINAGE CHANNEL

SCALE: NTS

A/2





CONTROL STRUCTURE

SCALE: 1" = 10'

B/2

REGISTERED PROFESSIONAL ENGINEER
7129
OREGON
July 16, 1971
BRUCE D GOLDSON

EXPIRES: 06/30/2019
SIGNATURE DATE: 12/27/2018

PRELIMINARY STORM DRAINAGE PLAN

2014-129T

DESIGNED:	BDG			
DRAWN:	BJS			
SCALE:	1" = 30'			
DATE:	August, 2018			
FILE:	Trillium Creek Prelim5	DATE	NO.	REVISION

Theta, llc
ENGINEERING - SURVEYING - PLANNING
PO Box 1345
Lake Oswego, Oregon 97035
503/481-8822
email: thetaeng@comcast.net

Icon Construction and Developement
1380 Willamette Falls Drive, No. 200
West Linn, Oregon 97068

Trillium Creek

SHEET: 2/4