Addendum for rear lot at Mapleleaf Court

REGISTERED PROFESSIONAL ENGINEER
19244PE
OREGON
MIA C MAHEDY-SEXTON
EXPIRES: 12-31-2018

RSS was hired by Ottbone Investments and Sean Foushee to reevaluate slope stability based on concerns from the previous hearing with the Development Review Commission regarding the placement of storm water on to the project site and impacts to stability.

Slope stability analysis is performed to assess the design of human-made or natural slopes (e.g., embankments, road cuts, open-pit mining, excavations, landfills, etc.) and the equilibrium conditions.[1][2] Slope stability is the resistance of inclined surfaces to sliding or collapsing.[3] The main objectives of slope stability analysis are finding endangered areas, investigation of potential failure mechanisms, determination of the slope sensitivity to different triggering mechanisms, designing of optimal slopes with regard to safety, understanding reliability and economics, and designing possible remedial measures, such as barriers and stabilization.[1][2]

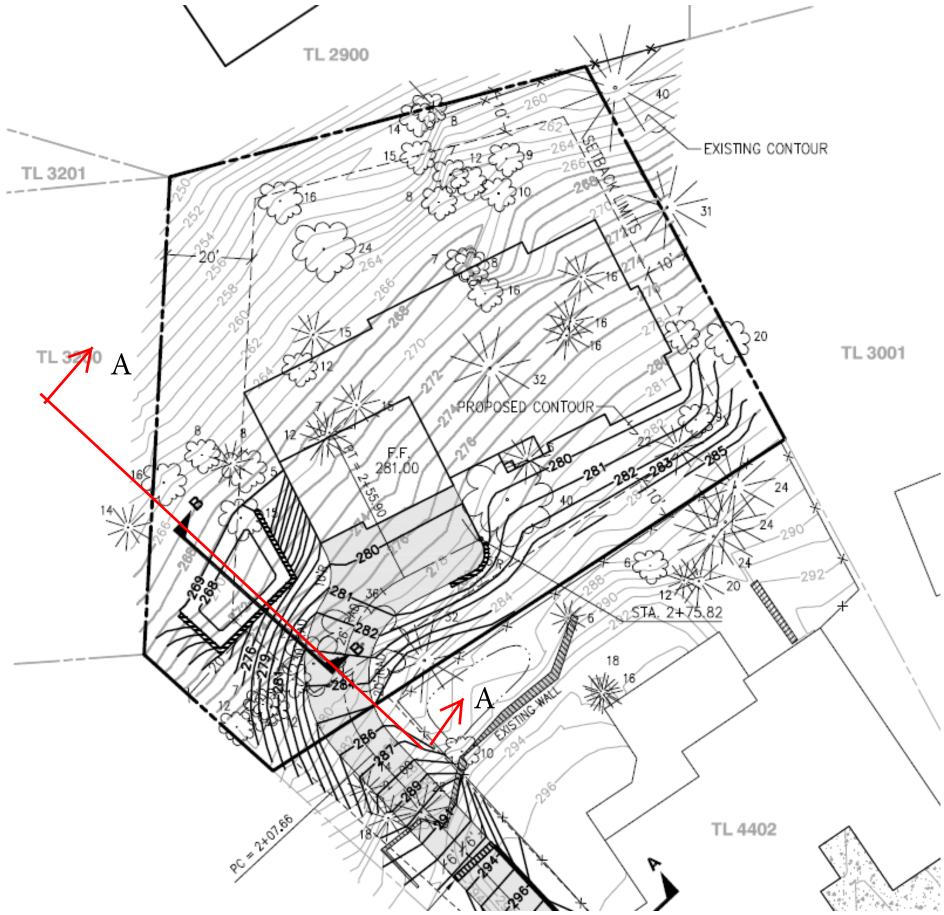
To further evaluate those concerns, RSS performed a slope stability analysis across the site of the rain garden and redundant drywell system. RSS used XSTABL, which uses the Simplified Bishop Method, by creating a series of slices through the soil mass for determining a factor of safety of the slope.

RSS saturated the soils for the worst case scenario in the analysis. The below site plan shows the cross section A-A drawn through the rain garden. RSS performed the results for both a static and also during a seismic event. The required factors of safety are 1.5 in static and 1.1 in seismic. **The results yielded 4.3 in static and 2.2 in seismic.** In my professional opinion our plan to drain the storm water into the ground will not cause any increase in slope instability to the site.

After a careful and detailed analysis of the proposed site and its proposed rain garden and secondary system, It is my professional opinion as a licensed geotechnical engineer in the State of Oregon that this site is more than adequate to accommodate the designed and analyzed storm water by Theta Engineering. As shown in the analysis, the slope stability is not and should not be a concern for the adjoining neighbors or the committee of Development Review Commission. As a licensed Geotechnical Engineer, we are bound by certain codes and must use those codes to analyze stability in the State of Oregon. Under those parameters, the proposed site clearly meets all of those requirements for slope stability and storm detention as shown in the detailed analysis.

EXHIBIT
F-12

LU 17-0065



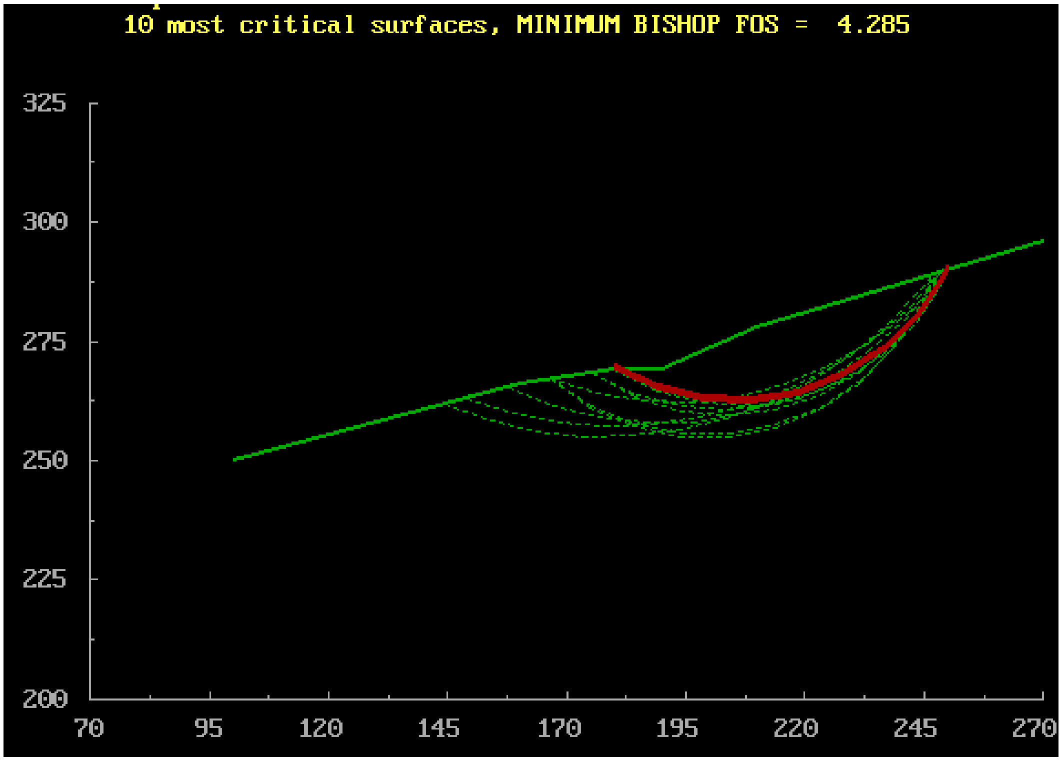
The key concern is the stability of the soil at the site and each proposed infiltration system designed by Theta Engineering. It was brought up in the last Development Review Commission hearing that the secondary emergency redundant system was favored by some of the committee and not by the others. It is my professional opinion, that a secondary system is a more prudent option, but is not required, due to the fact the proposed rain garden has the capacity and capability of accommodating the proposed storm water on the site. The location of the secondary system was chosen after a complete site reconnaissance. Placement is on a naturally occurring bench (or flat spot) on the site.

Theta Engineering's calculations clearly state the primary rain garden can handle the 10 year storm event, only using a safety factor of two as a conservative approach. Even after the wettest February on record (2017), there was not a single rain event that equaled the 10 year storm event.

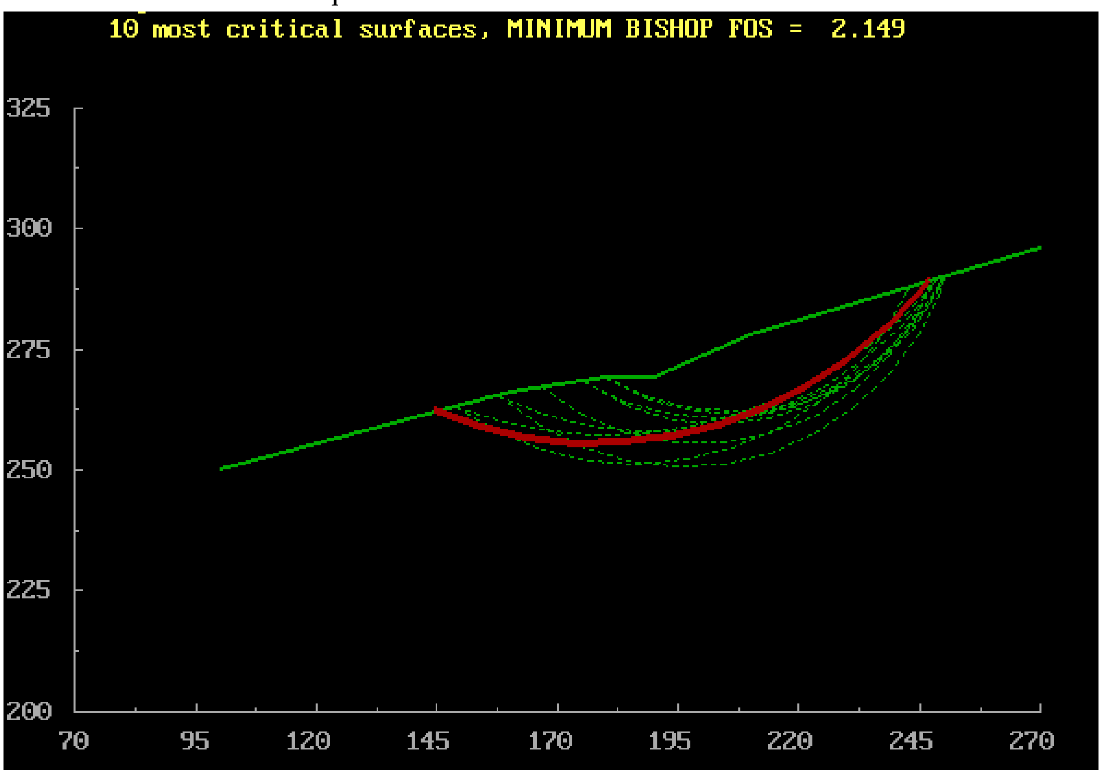
The second drywell design mitigates any potential failure of the proposed rain garden and the below-slope stability analysis shows we are well within the typical standard of care that geotechnical engineering professionals are held to in the Pacific Northwest.

RSS has completed extensive research and analysis for this site and recommends the approval of this site as it meets all the infiltration and slope stability requirements; Furthermore, the proposed rain garden and redundant drywell show it will have no impact to the stability of this site and properties adjacent to this site.

Static SF required is 1.5 we have 4.3



Semisic conditions SF required is 1.1 and we have 2.1



Slope stability results:

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*****************************************
          *         X S T A B L          *
          *                              *
          *    Slope Stability Analysis  *
          *          using the           *
          *       Method of Slices       *
          *                              *
          *    Copyright (C) 1992 - 2007 *
          *  Interactive Software Designs, Inc.  *
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          *                              *
          *     All Rights Reserved      *
          *                              *
          *  Ver. 5.208       96 - 2036  *
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Problem Description: Mapleleaf Court

SEGMENT BOUNDARY COORDINATES

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5 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	100.0	250.0	160.0	266.0	1
2	160.0	266.0	180.0	269.0	1
3	180.0	269.0	190.0	269.0	1
4	190.0	269.0	210.0	278.0	1
5	210.0	278.0	270.0	296.0	1

ISOTROPIC Soil Parameters

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1 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	105.0	120.0	500.0	30.00	.000	.0	1

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified. 100 trial surfaces will be generated and analyzed. 10 Surfaces initiate from each of 10 points equally spaced along the ground surface between x = 140.0 ft and x = 180.0 ft Each surface terminates between x = 200.0 ft and x = 250.0 ft Unless further limitations were imposed, the minimum elevation at which a surface extends is y= .0 ft 10.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 10 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	180.00	269.00
2	189.07	264.79
3	198.80	262.48
4	208.80	262.18
5	218.65	263.88
6	227.96	267.53
7	236.35	272.97
8	243.48	279.99
9	249.05	288.29

10	249.72	289.91

**** **Simplified BISHOP FOS = 4.28**5 ****

The following is a summary of the TEN most critical surfaces

Problem Description : maple

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	4.285	205.31	311.64	49.58	180.00	249.72	4.346E+06
2.	4.286	205.95	310.12	48.62	180.00	249.98	4.420E+06
3.	4.313	203.02	312.78	52.25	175.56	249.79	5.042E+06
4.	4.402	203.39	307.41	47.98	175.56	247.53	4.729E+06
5.	4.539	189.73	328.42	70.65	157.78	248.56	8.032E+06
6.	4.555	199.32	307.15	51.75	166.67	247.75	6.398E+06
7.	4.561	192.54	335.32	73.05	166.67	249.60	6.483E+06
8.	4.632	199.49	304.65	49.95	166.67	246.78	6.291E+06
9.	4.641	178.13	341.08	86.09	144.44	246.46	1.104E+07
10.	4.660	180.27	346.45	89.12	148.89	248.94	1.045E+07

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Seismic: A horizontal earthquake loading coefficient of .290 has been assigned

Factors of safety have been calculated by the:

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 13 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	144.44	261.85
2	153.86	258.48
3	163.60	256.22

4	173.54	255.11
5	183.54	255.16
6	193.47	256.37
7	203.19	258.72
8	212.57	262.18
9	221.48	266.70
10	229.82	272.23
11	237.45	278.69
12	244.29	285.99
13	246.46	288.94

**** **Simplified BISHOP FOS = 2.149** ****

The following is a summary of the TEN most critical surfaces

Problem Description : maples

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.149	178.13	341.08	86.09	144.44	246.46	1.067E+07
2.	2.186	180.27	346.45	89.12	148.89	248.94	1.009E+07
3.	2.186	189.73	328.42	70.65	157.78	248.56	7.767E+06
4.	2.205	203.02	312.78	52.25	175.56	249.79	4.872E+06
5.	2.218	205.95	310.12	48.62	180.00	249.98	4.269E+06
6.	2.219	205.31	311.64	49.58	180.00	249.72	4.197E+06
7.	2.232	185.69	314.20	63.02	148.89	242.87	8.892E+06
8.	2.254	203.39	307.41	47.98	175.56	247.53	4.574E+06
9.	2.256	196.04	307.78	57.09	157.78	250.10	8.904E+06
10.	2.263	199.32	307.15	51.75	166.67	247.75	6.200E+06

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