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EXHIBIT 13
PAGE 1 OF 12

Illumination Supporting Calculations

Woodinville Church Subdivision

14163

October 27, 2014

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CITY OF WOODINVILLE
DEVELOPMENT SERVICES

Transpo Group 11730 118th Avenue N.E., Suite 600 Kirkland, WA 98034 425-821-3665 Fax: 425-825-8434

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WOODINVILLE CHURCH SUBDIVISION ILLUMINATION
14163
By: MMG
Date: 10/27/2014

Target Light Levels

NE 205th ST & 136th Ave NE
Road Class: Local-Intermediate / Local-Intermediate
Avg: 0.65fc
Avg/Min: 6:1

Onsite & 136th Ave NE
Road Class: Local-Residential / Local-Intermediate
Avg: 0.65 fc
Avg/Min: 6:1

NE 205th ST
Road Class: Local-Intermediate
Avg: 0.65fc
Avg/Min: 6:1

136th Ave NE
Road Class: Local-Intermediate
Avg: 0.65fc
Avg/Min: 6:1

Onsite
Road Class: Local-Residential
Avg: 0.4fc
Avg/Min: 6:1

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Luminaire Definition(s)

LXD10SXX22
LXD10SXX22

Filename	LXD10SXX22.ies
Lumens Per Lamp	9500
Number of Lamps	1
Total Lamp Lumens	9500
Arrangement Lamp Lumens	9500
Arrangement Luminaire Lumens	5723
Luminaire Lumens	5723
Luminaire Efficiency (%)	60
Total Light Loss Factor	0.760
Luminaire Watts	100
Arrangement Watts	100
Arrangement	SINGLE
Arm Length	0
Offset	0
Road Classification	Type III, Medium, Semi-Cutoff (deprecated)
Upward Waste Light Ratio	0.03

Luminaire Classification System (LCS)	Lumens	% Lamp	% Luminaire
LCS-FL	305.9	3.2	5.3
LCS-FM	1703.2	17.9	29.8
LCS-FH	1590.8	16.7	27.8
LCS-FVH	108.8	1.1	1.9
LCS-BL	270.9	2.9	4.7
LCS-BM	1010.4	10.6	17.7
LCS-BH	512.0	5.4	8.9
LCS-BVH	53.2	0.6	0.9
LCS-UL	90.3	1.0	1.6
LCS-UH	77.4	0.8	1.4
Total	5722.9	60.2	100.0

	B2-U2-G2
Indoor Classification	Direct
LER	57

GE454893
ERS1_BXDX540

Filename	GE454893.IES
Lumens Per Lamp	N.A.
Number of Lamps	1
Total Lamp Lumens	N.A.
Arrangement Lamp Lumens	N.A.
Arrangement Luminaire Lumens	4300
Luminaire Lumens	4300
Luminaire Efficiency (%)	N.A.
Total Light Loss Factor	0.770
Luminaire Watts	54
Arrangement Watts	54

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Luminaire Definition(s) - Cont.

Arrangement	SINGLE
Arm Length	7.4
Offset	0
Pole Mounted	
Road Classification	Type III, Very Short, Semi-Cutoff (deprecated)
Upward Waste Light Ratio	0.00

Luminaire Classification System (LCS)	Lumens	% Lamp	% Luminaire
LCS-FL	492.9	N.A.	11.5
LCS-FM	1938.3	N.A.	45.1
LCS-FH	942.4	N.A.	21.9
LCS-FVH	16.7	N.A.	0.4
LCS-BL	335.0	N.A.	7.8
LCS-BM	445.1	N.A.	10.4
LCS-BH	127.3	N.A.	3.0
LCS-BVH	2.4	N.A.	0.1
LCS-UL	0.0	N.A.	0.0
LCS-UH	0.0	N.A.	0.0
Total	4300.1	N.A.	100.0
BUG Rating	B1-U1-G1		
Indoor Classification	Direct		
LER	80		

GE454909
ERS2_EXDX540

Filename	GE454909.IES
Lumens Per Lamp	N.A.
Number of Lamps	1
Total Lamp Lumens	N.A.
Arrangement Lamp Lumens	N.A.
Arrangement Luminaire Lumens	7300
Luminaire Lumens	7300
Luminaire Efficiency (%)	N.A.
Total Light Loss Factor	0.770
Luminaire Watts	94
Arrangement Watts	94
Arrangement	SINGLE
Arm Length	7.6
Offset	0
Pole Mounted	
Road Classification	Type III, Very Short, Semi-Cutoff (deprecated)
Upward Waste Light Ratio	0.00

Luminaire Classification System (LCS)	Lumens	% Lamp	% Luminaire
LCS-FL	836.9	N.A.	11.5
LCS-FM	3290.6	N.A.	45.1
LCS-FH	1599.8	N.A.	21.9
LCS-FVH	28.3	N.A.	0.4
LCS-BL	568.7	N.A.	7.8
LCS-BM	755.7	N.A.	10.4

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Luminaire Definition(s) - Cont.

LCS-BH	216.1	N.A.	3.0
LCS-BVH	4.1	N.A.	0.1
LCS-UL	0.0	N.A.	0.0
LCS-UH	0.0	N.A.	0.0
Total	7300.2	N.A.	100.0
BUG Rating	B2-U1-G1		
Indoor Classification	Direct		
LER	78		

GE451006
MCL40SFMC3

Filename	GE451006.IES
Lumens Per Lamp	9500
Number of Lamps	1
Total Lamp Lumens	9500
Arrangement Lamp Lumens	9500
Arrangement Luminaire Lumens	7261
Luminaire Lumens	7261
Luminaire Efficiency (%)	76
Total Light Loss Factor	0.760
Luminaire Watts	100
Arrangement Watts	100
Arrangement	SINGLE
Arm Length	11.5
Offset	0
Pole Mounted	
Road Classification	Type III, Medium, Full Cutoff (deprecated)
Upward Waste Light Ratio	0.00

Luminaire Classification System (LCS)	Lumens	% Lamp	% Luminaire
LCS-FL	650.4	6.8	9.0
LCS-FM	2152.8	22.7	29.6
LCS-FH	1374.1	14.5	18.9
LCS-FVH	4.7	0.0	0.1
LCS-BL	647.0	6.8	8.9
LCS-BM	1699.6	17.9	23.4
LCS-BH	723.4	7.6	10.0
LCS-BVH	8.8	0.1	0.1
LCS-UL	0.0	0.0	0.0
LCS-UH	0.0	0.0	0.0
Total	7260.8	76.4	100.0
BUG Rating	B2-U0-G2		
Indoor Classification	Direct		
LER	73		

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Calculation Summary

INT - 136TH AVE & ONSITE

Project: Project_1
Polygon
Coordinates in Feet

Point Spacing L-R	5
Point Spacing T-B	5
Grid Orient	0
Grid Tilt	0
Meter Type	Horizontal

Illuminance (Fc)	
Average	0.76
Maximum	2.4
Minimum	0.2
Avg/Min	3.80
Max/Min	12.00

INT - NE 205TH & 136TH AVE

Project: Project_1
Polygon
Coordinates in Feet

Point Spacing L-R	5
Point Spacing T-B	5
Grid Orient	0
Grid Tilt	0
Meter Type	Horizontal

Illuminance (Fc)	
Average	0.68
Maximum	2.3
Minimum	0.2
Avg/Min	3.40
Max/Min	11.50

RD - 136TH AVE - N

Project: Project_1
Polygon
Coordinates in Feet

Point Spacing L-R	5
Point Spacing T-B	5
Grid Orient	0
Grid Tilt	0
Meter Type	Horizontal

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Calculation Summary - Cont.

Illuminance (Fc)	
Average	0.73
Maximum	1.5
Minimum	0.2
Avg/Min	3.65
Max/Min	7.50

RD - 136TH AVE - S

Project: Project_1
Polygon
Coordinates in Feet

Point Spacing L-R	5
Point Spacing T-B	5
Grid Orient	0
Grid Tilt	0
Meter Type	Horizontal

Illuminance (Fc)	
Average	0.98
Maximum	3.5
Minimum	0.2
Avg/Min	4.90
Max/Min	17.50

RD - NE 205TH

Project: Project_1
Polygon
Coordinates in Feet

Point Spacing L-R	5
Point Spacing T-B	5
Grid Orient	0
Grid Tilt	0
Meter Type	Horizontal

Illuminance (Fc)	
Average	0.64
Maximum	1.5
Minimum	0.2
Avg/Min	3.20
Max/Min	7.50

RD - ONSITE

Project: Project_1
Polygon

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Calculation Summary - Cont.

Coordinates in Feet

Point Spacing L-R	5
Point Spacing T-B	5
Grid Orient	0
Grid Tilt	0
Meter Type	Horizontal

Illuminance (Fc)	
Average	0.45
Maximum	2.4
Minimum	0.1
Avg/Min	4.50
Max/Min	24.00

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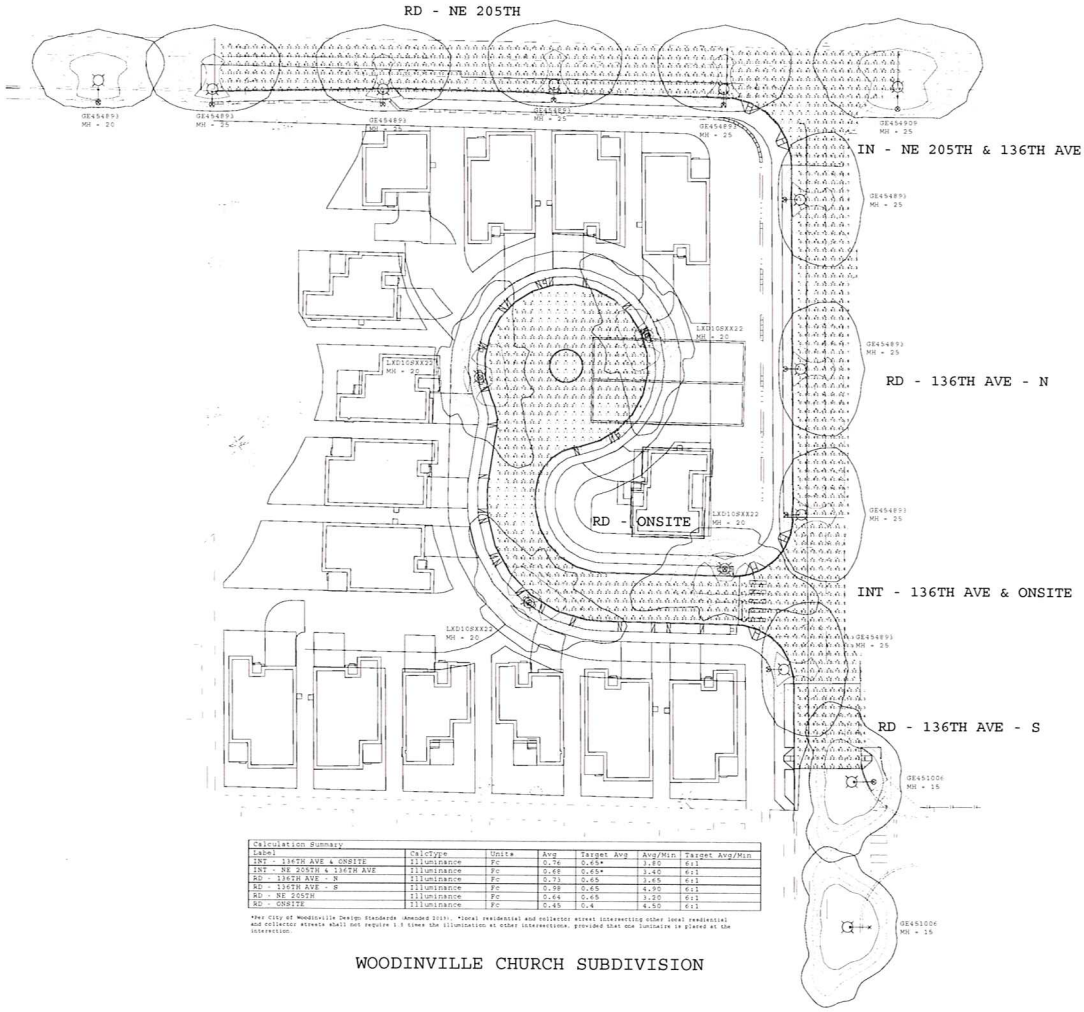

Calculation Summary						
Label	CalcType	Unit*	Avg	Target Avg	Avg/Min	Target Avg/Min
INT - 136TH AVE & ONSITE	Illuminance	Fc	0.76	0.65*	3.80	6:1
INT - NE 205TH & 136TH AVE	Illuminance	Fc	0.68	0.65*	3.40	6:1
RD - 136TH AVE - N	Illuminance	Fc	0.73	0.65	3.65	6:1
RD - 136TH AVE - S	Illuminance	Fc	0.98	0.65	4.90	6:1
RD - NE 205TH	Illuminance	Fc	0.64	0.65	3.20	6:1
RD - ONSITE	Illuminance	Fc	0.45	0.4	4.50	6:1

*Per City of Woodinville Design Standards (Amended 2010). *Local residential and collector street intersecting other local residential and collector streets shall not require 1.5 times the illumination at other intersections, provided that one luminaire is placed at the intersection.

WOODINVILLE CHURCH SUBDIVISION

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BREAKER SIZING
PROJECT NAME: Woodinville Church Subdivision
JOB NUMBER: 14182
PREPARED BY: MMG 10/27/2014 (QC by RP)

Main Breaker Check - Proposed Electrical Service A

LLF = 140%
100W lums= 4
54W lums= 8

$$\frac{100(4)+54(8)}{240V} \times 1.4 = \mathbf{4.85333333\ A}$$

4.85A is less than 100A (standard).
100A main breaker ok.

Breaker Sizing - Circuit 1

LLF = 140%
100W lums= 4
54W lums= 8

$$\frac{100(4)+54(8)}{240V} \times 1.4 = \mathbf{4.85333333\ A}$$

4.85A is less than 15A.
Use 15A Breaker.
Use 30A Contactor .

EXHIBIT 13
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LINE LOSS CALCUATIONS - Eletrical Service A, Circuit 1
PROJECT NAME: Woodinville Church Subdivision
JOB NUMBER: 14163
PREPARED BY: MMG 10/27/2014 (QC by SIB)

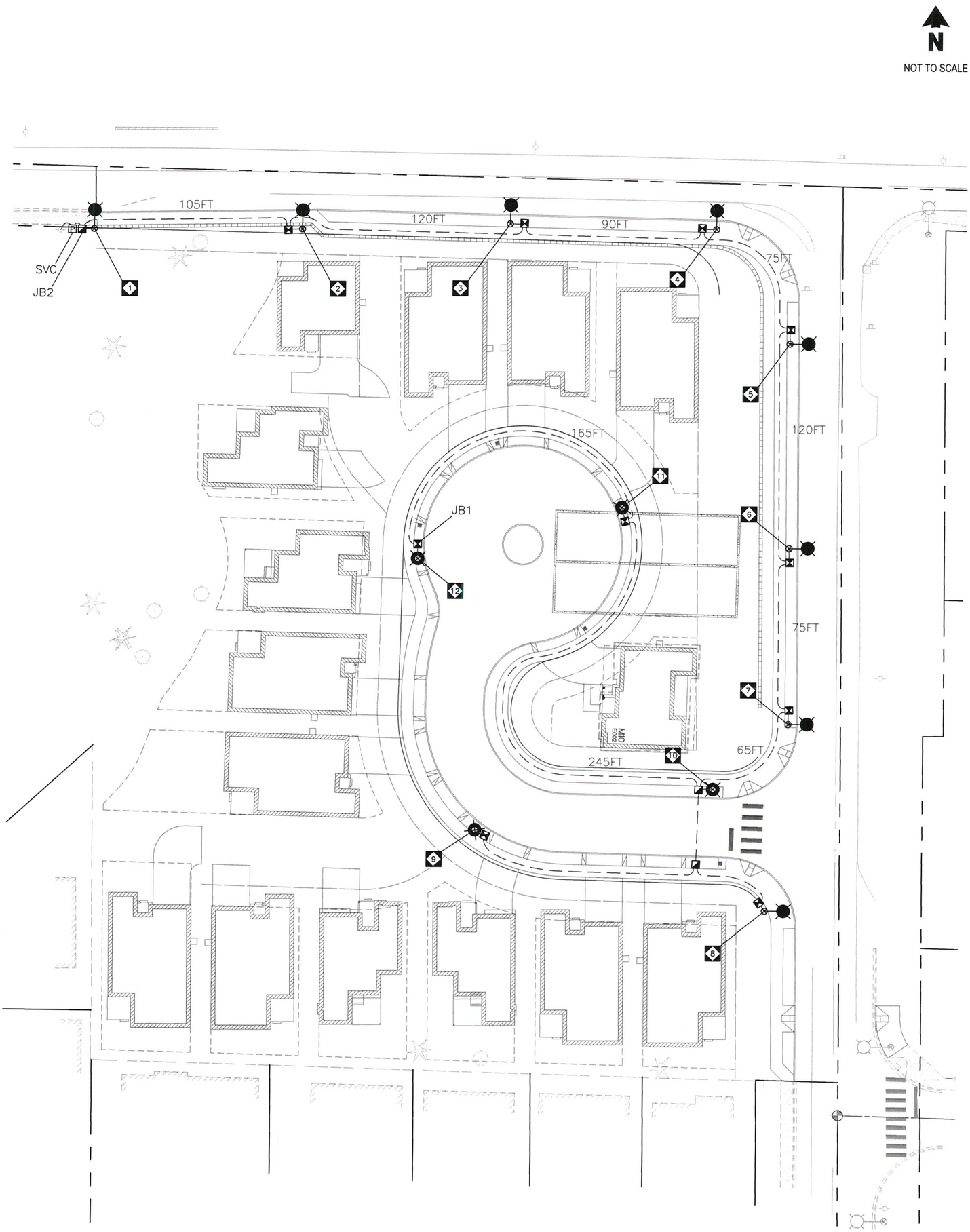
Available Power (V)	=	240 V
Allowable Vd	=	5%
	=	240(0.05)
	Vd=	**12 V**
Lum Load 1	=	54 W
Contingency Factor	=	1.2
	=	(54W/240V)x1.2
	=	**0.27 A**
Lum Load 2	=	100 W
Contingency Factor	=	1.2
	=	(100W/240V)x1.2
	=	**0.5 A**

Assume #6 Aluminum Conductor R = **0.000807** ohms/ft

Circuit No. 1 (governing branch)

RUN	Load	Sum Load	Distance	VD=2ALR	Sum VD
12 to JB1	0.5	0.5	30	0.02421	0.02421
JB1 to 11	0	0.5	175	0.141225	0.165435
11 to 10	0.5	1	255	0.41157	0.577005
10 to 7	1.27	2.27	75	0.2747835	0.8517885
7 to 6	0.27	2.54	85	0.3484626	1.2002511
6 to 5	0.27	2.81	130	0.5895942	1.7898453
5 to 4	0.27	3.08	85	0.4225452	2.2123905
4 to 3	0.27	3.35	100	0.54069	2.7530805
3 to 2	0.27	3.62	130	0.7595484	3.5126289
2 to 1	0.27	3.89	115	0.7220229	4.2346518
1 toSVC	0.27	4.16	30	0.2014272	4.436079

4.43V is less than 12V.
Use 2-#6 AWG.



Circuit 1, Service A - Line Loss

October 27, 2014

FIGURE 1

Woodinville Church Subdivision

M:\14\14163.00 – Woodinville Church Subdivision\Engineering\CAD\Xrefs\Master Illum.dwg<Line Loss>Mayra M. Garcia 10/27/2014 2:53 PM

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EXHIBIT 13
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