SUN / SHADOW STUDY

2030 CAROLINE

Proposed Mixed-Use Development

2030 Caroline Street

City of Burlington

Prepared for:

Inaria Burlington Inc.
c/o Carriage Gate Homes

Prepared by:

Ralph Bouwmeester, P. Eng.

RBA File: S23028

June 21, 2024

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

1. This shadow study is based on the requirements of the City of Burlington's *Shadow Study Guidelines and Terms of Reference* dated June 2020.

2. Site latitude and longitude used in this study are as follows:

   Latitude: 43° 19' 41" N (43.3281º N)
   Longitude: 79° 48' 00" W (79.8000º W)

3. **Time Zone:** Eastern

4. Standard Time: UT – 5 hours - applies on December 21
   Daylight Time: UT – 4 hours - applies on March 21, June 21 and September 21

5. Test times are hourly from 9:00 AM to 6:00 PM on Mar 21 and Sep 21, 8:00 AM to 7:00 PM on Jun 21, and 11:00 AM to 3:00 PM on Dec 21 all as per the Guidelines.

6. **Site Orientation:** Shadow directions in this study are referenced to True (Astronomic) North. The conversion between astronomic bearings and the grid bearings used in the City's mapping (which is referenced to UTM Zone 17, NAD83) is shown on the north arrow in the diagrams.

   The site boundary was derived from surveys dated May 31, 2016, and 2023 by A.T. McLaren Limited Legal and Engineering Surveys.

7. Existing park mapping and existing 3D building context mapping were obtained from the City's Open Data portal. Property line data maps were purchased from First Base Solutions.

   This study is based on a 3D model of the proposal as provided by Chamberlain Architect Services Limited.

   Roof heights (m), above fixed grade at the subject site, are shown on Drawing RH-1. The proposed shadows account for and include parapets, balcony slabs, railings, and roof-top features, as indicated.

   We note that railings are assumed solid, therefore, actual shadows may be less than shown.

8. This shadow analysis is based on an assumed flat ground plane.

9. **Shadow Criteria:**

   Criterion 4.2 - Key Civic and Cultural Spaces - Mar 21 and Sep 21

   No net new shadows are permitted on Key Civic and Cultural Spaces between 10:00 and 16:00 hours on Mar 21 and Sep 21.

   Criterion 4.3 - Private Outdoor Amenity Spaces - Mar 21

   Shadows from proposed developments should not exceed 2 hours in duration, between 09:00 and 18:00 on Mar 21.

   Net new shadows resulting from proposed buildings should allow a minimum amount of sunlight to reach nearby private residential outdoor amenity areas, including common outdoor amenity areas, such that a Sun Access Factor of at least 0.22 is provided in such areas between the hours of 09:00 and 18:00 on Mar 21.

   Criterion 4.4 - Parks and Open Spaces – Mar 21, Sep 21 and Dec 21

   To ensure adequate access to sunlight at all times of the year, a Sun Access Factor of at least 0.50 is required on each of the three test dates.

   Criterion 4.5 - Places Where Children Play – Mar 21, Sep 21 and Dec 21

   Shadows cast by all existing buildings and proposed developments onto places where children play including but not limited to schoolyards, playgrounds, and park features such as wading pools or other outdoor shadow-sensitive activity areas must ensure a Sun Access Factor of at least 0.50 on each of the three test dates.

   Criterion 4.6 - Public Realm and Sidewalks - Mar 21

   Shadows cast by all existing buildings and proposed developments onto the full extent of the boulevard and sidewalk on the opposite side of the adjacent right-of-way must ensure a Sun Access Factor of at least 0.50 on Mar 21.

10. **Review of Shadow Drawings vs. Shadow Criteria:**

    Criterion 4.2 – We have identified no key civic or cultural spaces within the shadow reach of the proposal; therefore, this criterion is not applicable.

    Criterion 4.3 – Proposed new shadows reach a number of private residential outdoor amenity areas (rooftop patios) at the townhomes in the block directly east of the site.

    Our analysis of the above amenity areas is included in Drawings 4.3-1 to 4.3-5 and summarized in Tables 2 to 5 following. The Sun Access Factors for the individual amenity areas meet and exceed the minimum required 0.22 in all cases.

    In addition to adjacent private residential outdoor amenity areas, the City has indicated that Criterion 4.3 applies to on-site common outdoor amenity spaces. Rooftop outdoor amenity space is proposed on the roof of the podium (at the 7th-floor level). Our analysis of this area is included in Drawings 4.3-1 to 4.3-5 and summarized in Table 1 following. The Sun Access Factor for this amenity area meets and exceeds the minimum required 0.22.

    We are satisfied that this guideline criterion has been met.

Criterion 4.4 – Proposed shadows reach Lions Park at 6:00 PM only on Mar 21 and Sep 21.

We are satisfied that this guideline criterion has been met.

Criterion 4.5 – We have identified no places where children play (as defined in the Guidelines) within the shadow reach of the proposal; therefore, this criterion is not applicable.

Criterion 4.6 – New shadows reach the sidewalks opposite the subject site on Caroline Street, John Street and Elizabeth Street. The sidewalk locations were derived from hi-res geo-referenced aerial photos obtained from the City. See Drawings 4.6-1 to 4.6-5 and Tables 6A, 6B and 6C following for Sun Access Factor calculations.

Only the Elizabeth Street sidewalk does not meet the criterion (see Table 7C). There is very little if any, new shadow on this sidewalk. The 'existing' shadow shown is from the previously approved building on the subject site.

Based on the above, we are satisfied that the purpose and intent of this guideline criterion have been met.

11. **Description of Locations Not Meeting the Shadow Impact Criteria:**

Criterion 4.2 – None

Criterion 4.3 – None

Criterion 4.4 – None

Criterion 4.5 – None

Criterion 4.6 – The east sidewalk along Elizabeth Street opposite the subject site does not meet the criterion. The deficiency is due to the previously approved building on the subject site. There is very little if any, new shadow on this sidewalk.

On this basis, we are satisfied that the purpose and intent of this guideline criterion have been met.

12. **Conclusion**:

This proposal meets the Shadow Impact Criteria of the City of Burlington as set out in its ***Shadow Study Guidelines and Terms of Reference*** **dated June 2020** with the minor exception of Criterion 4.6 as it relates to the east sidewalk along Elizabeth Street opposite the subject site. The exception is due to the previously approved building on the subject site as there is very little, if any, new shadow on this sidewalk from the current proposal.

It is our opinion that the proposal meets the intent of the City's shadow requirements.

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TABLE 1

June 2024

R. Bouwmeester & Associates

Sun Access Factor Analysis - Proposed Rooftop Amenity Space

Criteria 4.3 - Private Outdoor Amenity Spaces

Proposed Rooftop Amenity Space Areas (sm)

7th Flr 337

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	21	
10:00	3	12
11:00	0	2
12:00	11	6
13:00	109	60
14:00	248	179
15:00	291	270
16:00	272	282
17:00	156	214
18:00	68	112
	Total Area	1,135
	Average Area	126
	Amenity Area	337

Sun Access Factor (SAF) = 0.37

> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

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TABLE 2

June 2024
R. Bouwmeester & Associates

Sun Access Factor Analysis - Existing Rooftop Amenity Space
Criteria 4.3 - Private Outdoor Amenity Spaces

Existing Townhouses Roof Amenity Space Areas (sm)

Bldg A Unit 1 — 45

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	11	
10:00	19	15
11:00	23	21
12:00	16	20
13:00	13	15
14:00	10	12
15:00	2	6
16:00	0	1
17:00	0	0
18:00	3	2
	Total Area	90
	Average Area	10
	Amenity Area	45

Sun Access Factor (SAF) = 0.22
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg A Unit 2 — 47

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	5	
10:00	22	14
11:00	24	23
12:00	17	21
13:00	14	16
14:00	13	14
15:00	13	13
16:00	0	7
17:00	0	0
18:00	0	0
	Total Area	106
	Average Area	12
	Amenity Area	47

Sun Access Factor (SAF) = 0.25
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg A Unit 3 — 48

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	5	
10:00	24	15
11:00	25	25
12:00	17	21
13:00	13	15
14:00	10	12
15:00	12	11
16:00	1	7
17:00	0	1
18:00	0	0
	Total Area	105
	Average Area	12
	Amenity Area	48

Sun Access Factor (SAF) = 0.24
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg A Unit 4 — 48

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	5	
10:00	24	15
11:00	25	25
12:00	17	21
13:00	14	16
14:00	12	13
15:00	13	13
16:00	10	12
17:00	0	5
18:00	0	0
	Total Area	118
	Average Area	13
	Amenity Area	48

Sun Access Factor (SAF) = 0.27
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg A Unit 5 — 46

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	4	
10:00	23	14
11:00	22	23
12:00	14	18
13:00	12	13
14:00	9	11
15:00	12	11
16:00	10	11
17:00	0	5
18:00	0	0
	Total Area	104
	Average Area	12
	Amenity Area	46

Sun Access Factor (SAF) = 0.25
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg A Unit 6 — 46

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	5	
10:00	28	17
11:00	28	28
12:00	25	27
13:00	22	24
14:00	15	19
15:00	9	12
16:00	10	10
17:00	0	5
18:00	0	0
	Total Area	140
	Average Area	16
	Amenity Area	46

Sun Access Factor (SAF) = 0.34
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

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TABLE 3

June 2024
R. Bouwmeester & Associates

Sun Access Factor Analysis - Existing Rooftop Amenity Space
Criteria 4.3 - Private Outdoor Amenity Spaces

Existing Townhouses Roof Amenity Space Areas (sm)

Bldg B Unit 1 — 25

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	0	
10:00	4	2
11:00	14	9
12:00	13	14
13:00	12	13
14:00	12	12
15:00	11	12
16:00	0	6
17:00	6	3
18:00	4	5
	Total Area	74
	Average Area	8
	Amenity Area	25

Sun Access Factor (SAF) = 0.33
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg B Unit 2 — 26

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	2	
10:00	4	3
11:00	11	8
12:00	12	12
13:00	12	12
14:00	10	11
15:00	12	11
16:00	0	6
17:00	0	0
18:00	5	3
	Total Area	65
	Average Area	7
	Amenity Area	26

Sun Access Factor (SAF) = 0.28
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg B Unit 3 — 26

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	3	
10:00	4	4
11:00	12	8
12:00	13	13
13:00	13	13
14:00	12	13
15:00	16	14
16:00	0	8
17:00	0	0
18:00	5	3
	Total Area	74
	Average Area	8
	Amenity Area	26

Sun Access Factor (SAF) = 0.32
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg B Unit 4 — 41

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	2	
10:00	9	6
11:00	19	14
12:00	19	19
13:00	19	19
14:00	21	20
15:00	25	23
16:00	20	23
17:00	0	10
18:00	5	3
	Total Area	136
	Average Area	15
	Amenity Area	41

Sun Access Factor (SAF) = 0.37
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg B Unit 5 — 43

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	1	
10:00	10	6
11:00	21	16
12:00	23	22
13:00	22	23
14:00	25	24
15:00	27	26
16:00	27	27
17:00	0	14
18:00	0	0
	Total Area	156
	Average Area	17
	Amenity Area	43

Sun Access Factor (SAF) = 0.40
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg B Unit 6 — 39

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	0	
10:00	10	5
11:00	20	15
12:00	21	21
13:00	22	22
14:00	23	23
15:00	26	25
16:00	20	23
17:00	0	10
18:00	0	0
	Total Area	142
	Average Area	16
	Amenity Area	39

Sun Access Factor (SAF) = 0.40
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg B Unit 7 — 30

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	0	
10:00	3	2
11:00	15	9
12:00	16	16
13:00	16	16
14:00	16	16
15:00	16	16
16:00	14	15
17:00	0	7
18:00	0	0
	Total Area	96
	Average Area	11
	Amenity Area	30

Sun Access Factor (SAF) = 0.36
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg B Unit 8 — 41

Time of Day	Area in Sun (sm)	
	81 Test Time Area (As) *	Interval Ave Area (Aa)
9:00	0	
10:00	17	9
11:00	26	22
12:00	26	26
13:00	26	26
14:00	25	26
15:00	21	23
16:00	21	21
17:00	12	17
18:00	0	6
	Total Area	174
	Average Area	19
	Amenity Area	41

Sun Access Factor (SAF) = 0.47
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

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TABLE 4

June 2024
R. Bouwmeester & Associates

Sun Access Factor Analysis - Existing Rooftop Amenity Space
Criteria 4.3 - Private Outdoor Amenity Spaces

Existing Townhouses Roof Amenity Space Areas (sm)

Bldg C Unit 1 — 79

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	42	
10:00	67	55
11:00	77	72
12:00	61	69
13:00	56	59
14:00	52	54
15:00	47	50
16:00	39	43
17:00	0	20
18:00	13	7
	Total Area	427
	Average Area	47
	Amenity Area	79

Sun Access Factor (SAF) = 0.60
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg C Unit 2 — 92

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	40	
10:00	59	50
11:00	76	68
12:00	64	70
13:00	60	62
14:00	61	61
15:00	63	62
16:00	65	64
17:00	0	33
18:00	44	22
	Total Area	490
	Average Area	54
	Amenity Area	92

Sun Access Factor (SAF) = 0.59
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg C Unit 3 — 78

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	34	
10:00	60	47
11:00	74	67
12:00	60	67
13:00	55	58
14:00	50	53
15:00	45	48
16:00	36	41
17:00	0	18
18:00	5	3
	Total Area	400
	Average Area	44
	Amenity Area	78

Sun Access Factor (SAF) = 0.57
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg C Unit 4 — 80

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	32	
10:00	17	25
11:00	66	42
12:00	49	58
13:00	45	47
14:00	43	44
15:00	43	43
16:00	40	42
17:00	0	20
18:00	0	0
	Total Area	319
	Average Area	35
	Amenity Area	80

Sun Access Factor (SAF) = 0.44
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg C Unit 5 — 79

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	42	
10:00	0	21
11:00	75	38
12:00	60	68
13:00	54	57
14:00	51	53
15:00	48	50
16:00	39	44
17:00	23	31
18:00	0	12
	Total Area	371
	Average Area	41
	Amenity Area	79

Sun Access Factor (SAF) = 0.52
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg C Unit 6 — 92

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	41	
10:00	0	21
11:00	61	31
12:00	66	64
13:00	61	64
14:00	61	61
15:00	62	62
16:00	62	62
17:00	60	61
18:00	0	30
	Total Area	454
	Average Area	50
	Amenity Area	92

Sun Access Factor (SAF) = 0.55
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg C Unit 7 — 75

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	15	
10:00	0	8
11:00	39	20
12:00	45	42
13:00	40	43
14:00	37	39
15:00	36	37
16:00	30	33
17:00	14	22
18:00	0	7
	Total Area	249
	Average Area	28
	Amenity Area	75

Sun Access Factor (SAF) = 0.37
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

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TABLE 5

June 2024
R. Bouwmeester & Associates

Sun Access Factor Analysis - Existing Rooftop Amenity Space
Criteria 4.3 - Private Outdoor Amenity Spaces

Existing Townhouses Roof Amenity Space Areas (sm)

Bldg D Unit 1 — 83

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	47	
10:00	64	56
11:00	77	71
12:00	75	76
13:00	72	74
14:00	70	71
15:00	67	69
16:00	57	62
17:00	47	52
18:00	33	40
	Total Area	569
	Average Area	63
	Amenity Area	83

Sun Access Factor (SAF) = 0.76
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg D Unit 2 — 84

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	22	
10:00	40	31
11:00	61	51
12:00	65	63
13:00	63	64
14:00	63	63
15:00	63	63
16:00	59	61
17:00	53	56
18:00	42	48
	Total Area	499
	Average Area	55
	Amenity Area	84

Sun Access Factor (SAF) = 0.66
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg D Unit 3 — 70

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	34	
10:00	50	42
11:00	55	53
12:00	56	56
13:00	55	56
14:00	52	54
15:00	49	51
16:00	42	46
17:00	8	25
18:00	21	15
	Total Area	395
	Average Area	44
	Amenity Area	70

Sun Access Factor (SAF) = 0.63
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg D Unit 4 — 93

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	34	
10:00	50	42
11:00	72	61
12:00	74	73
13:00	71	73
14:00	70	71
15:00	71	71
16:00	68	70
17:00	0	34
18:00	45	23
	Total Area	516
	Average Area	57
	Amenity Area	93

Sun Access Factor (SAF) = 0.62
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg D Unit 5 — 82

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	15	
10:00	34	25
11:00	48	41
12:00	55	52
13:00	56	56
14:00	55	56
15:00	53	54
16:00	47	50
17:00	0	24
18:00	32	16
	Total Area	372
	Average Area	41
	Amenity Area	82

Sun Access Factor (SAF) = 0.50
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg D Unit 6 — 93

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	33	
10:00	48	41
11:00	70	59
12:00	71	71
13:00	73	72
14:00	73	73
15:00	73	73
16:00	67	70
17:00	0	34
18:00	36	18
	Total Area	510
	Average Area	57
	Amenity Area	93

Sun Access Factor (SAF) = 0.61
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg D Unit 7 — 82

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	16	
10:00	32	24
11:00	51	42
12:00	56	54
13:00	53	55
14:00	51	52
15:00	49	50
16:00	57	53
17:00	0	29
18:00	7	4
	Total Area	361
	Average Area	40
	Amenity Area	82

Sun Access Factor (SAF) = 0.49
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg D Unit 8 — 93

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	33	
10:00	50	42
11:00	60	55
12:00	72	66
13:00	73	73
14:00	74	74
15:00	74	74
16:00	65	70
17:00	16	41
18:00	0	8
	Total Area	501
	Average Area	56
	Amenity Area	93

Sun Access Factor (SAF) = 0.60
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Bldg D Unit 9 — 76

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	17	
10:00	34	26
11:00	30	32
12:00	49	40
13:00	49	49
14:00	47	48
15:00	45	46
16:00	44	45
17:00	38	41
18:00	0	19
	Total Area	345
	Average Area	38
	Amenity Area	76

Sun Access Factor (SAF) = 0.50
> 0.22; therefore, meets criteria

* Note: See Drawings 4.3-1 to 4.3-5

Sun Access Factor Analysis - Caroline Street Sidewalk
Criteria 4.6 - Public Realm and Sidewalks

Area (sm) of Opposite Boulevard and Sidewalk = 89

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	29	
10:00	17	23
11:00	4	11
12:00	18	11
13:00	43	31
14:00	89	66
15:00	89	89
16:00	89	89
17:00	78	84
18:00	50	64
	Total Area	467

Overall Average Interval Area 52
Boulevard & Sidewalk Area 89

Sun Access Factor (SAF) = 0.58
> 0.50; therefore, meets criteria

* Note: See Drawings 4.6-1 to 4.6-5

Sun Access Factor Analysis - John Street Sidewalk
Criteria 4.6 - Public Realm and Sidewalks

Area (sm) of Opposite Boulevard and Sidewalk = 202

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	-	
10:00	97	49
11:00	202	150
12:00	202	202
13:00	202	202
14:00	202	202
15:00	202	202
16:00	202	202
17:00	165	184
18:00	104	135
	Total Area	1,526

Overall Average Interval Area	170
Boulevard & Sidewalk Area	202

Sun Access Factor (SAF) =	**0.84**
> 0.50; therefore, meets criteria	

* Note: See Drawings 4.6-1 to 4.6-5

Sun Access Factor Analysis - Elizabeth Street Sidewalk
Criteria 4.6 - Public Realm and Sidewalks

Area (sm) of Opposite Boulevard and Sidewalk = 270

Time of Day	Area in Sun (sm)	
21-Mar	Test Time Area (As) *	Interval Ave Area (Aa)
9:00	2	
10:00	88	45
11:00	270	179
12:00	270	270
13:00	84	177
14:00	44	64
15:00	-	22
16:00	23	12
17:00	41	32
18:00	64	53
	Total Area	853

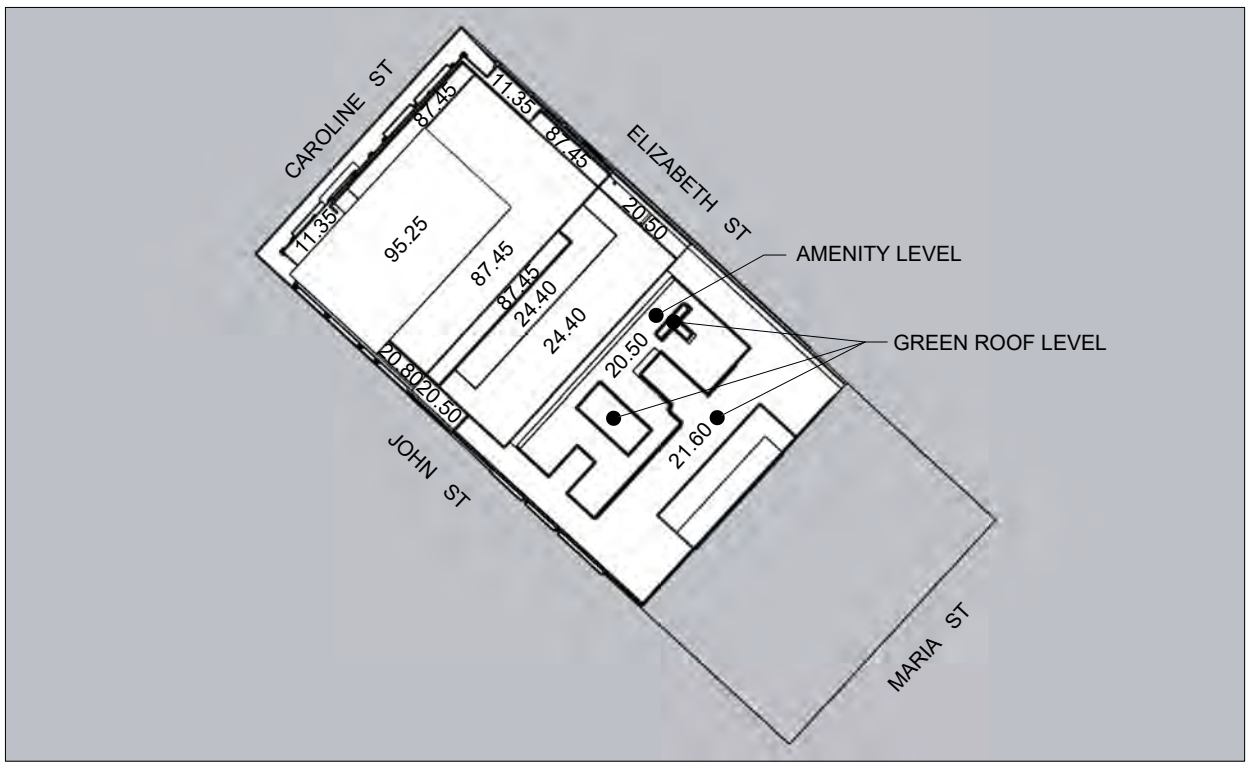
Overall Average Interval Area 95
Boulevard & Sidewalk Area 270

Sun Access Factor (SAF) = 0.35
< 0.50; therefore, does not meet criteria

* Note: See Drawings 4.6-1 to 4.6-5

NOTES:

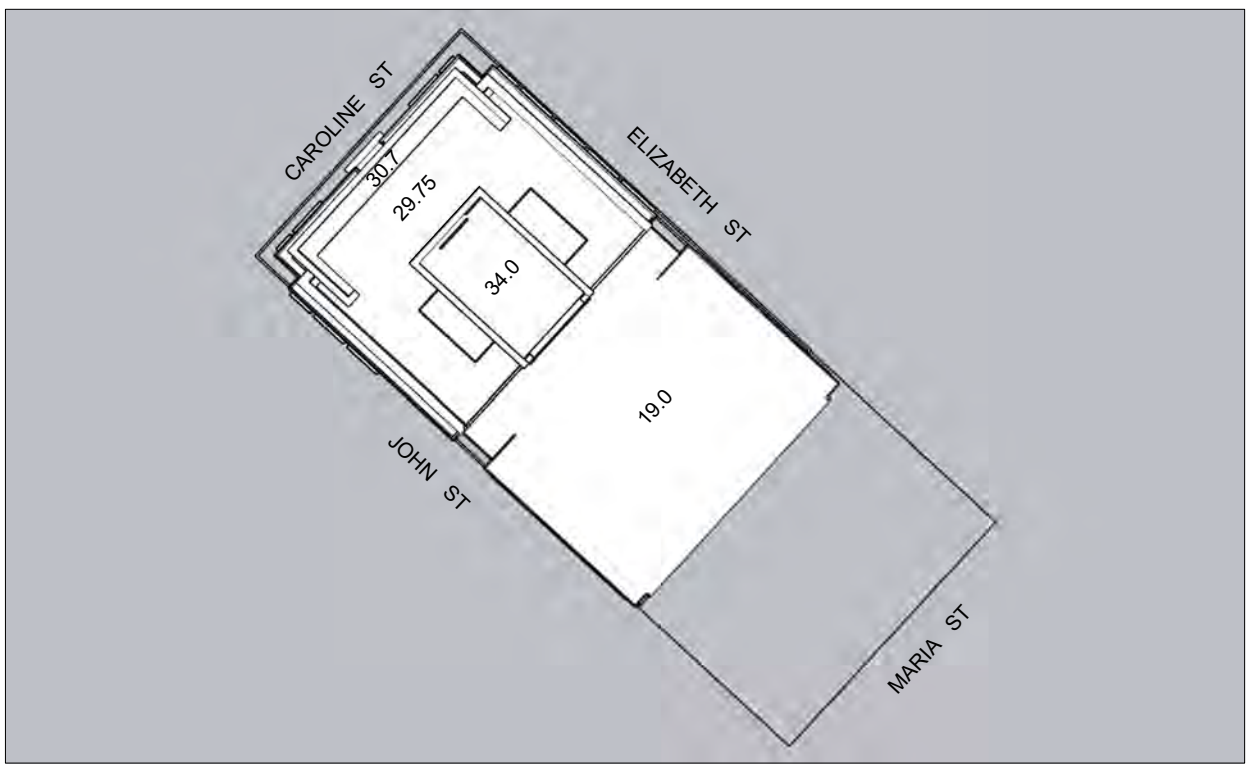
1. ROOF HEIGHTS ARE TO TOP OF SLAB AND DO NOT INCLUDE PARAPETS AND RAILINGS.
2. ROOF HEIGHTS ARE SHOWN IN METRES ABOVE FINISHED GRADE AT SUBJECT SITE. (FFE IS ASSUMED TO BE 0.20m ABOVE FINISHED GRADE).
3. SHADOWS ARE SHOWN ON ASSUMED FLAT GROUND PLANE.
4. SHADOWS INCLUDE PARAPETS AND RAILINGS.
5. ROOF HEIGHTS DERIVED FROM 3D MODELS AND ARCHITECTURAL PLANS DATED JUNE 21, 2024, BY CHAMBERLAIN ARCHITECT SERVICES LIMITED.



GEOGRAPHIC SITE LOCATION:
LATITUDE: 43° 19' 41" N
LONGITUDE: 79° 48' 00" W

TIME ZONE:
EASTERN
- STANDARD TIME (EST) (UT - 5 hrs)
- DAYLIGHT TIME (EDT) (UT - 4 hrs)

PROPOSED



APPROVED UNBUILT
(SHADOW INCLUDED IN EXISTING CONTEXT)

KEY ROOF HEIGHTS
SUN / SHADOW STUDY
Proposed Mixed-Use Development

2030 Caroline

Inaria Burlington Inc.

City of Burlington

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: RH-1
Drawn by:	RB	Scale:	1 : 1000	
Checked by:	RB	Date:	JUN 21/24	



MAR 21

9:00 AM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



MAR 21

Approved Unbuilt 535 Brant St

10:00 AM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

Inaria Burlington Inc.

City of Burlington

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-01
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



MAR 21

11:00 AM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



MAR 21

Approved Unbuilt 535 Brant St

12:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

Inaria Burlington Inc.

City of Burlington

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Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-02
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



MAR 21

1:00 PM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



MAR 21

Approved Unbuilt 535 Brant St

2:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

Inaria Burlington Inc.

City of Burlington

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-03
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



MAR 21

3:00 PM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



MAR 21

Approved Unbuilt 535 Brant St

4:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

Inaria Burlington Inc.

City of Burlington

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Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-04
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



MAR 21

5:00 PM

Site Boundary

Net New Shadows cast on roof surfaces

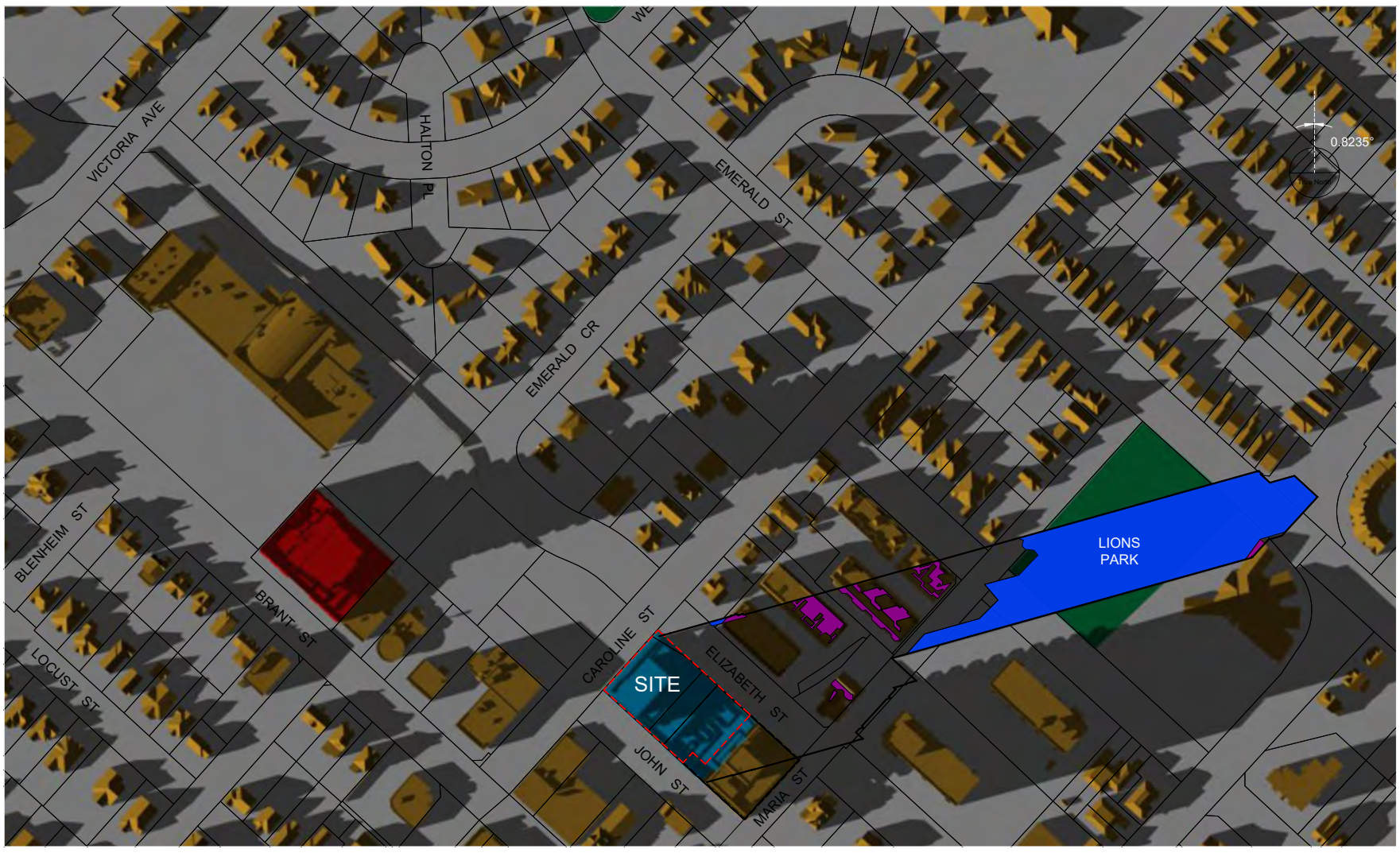
Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



MAR 21

Approved Unbuilt 535 Brant St

6:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

Inaria Burlington Inc.

City of Burlington

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Sun & Shadow Position Specialists
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Calculated by:	RB	Project:	S23028	Drawing No.: SS-05
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



JUN 21

8:00 AM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



JUN 21

Approved Unbuilt 535 Brant St

9:00 AM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

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City of Burlington

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Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-06
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



JUN 21

10:00 AM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



JUN 21

Approved Unbuilt 535 Brant St

11:00 AM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

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City of Burlington

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-07
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



JUN 21

12:00 PM

Site Boundary

Net New Shadows cast on roof surfaces

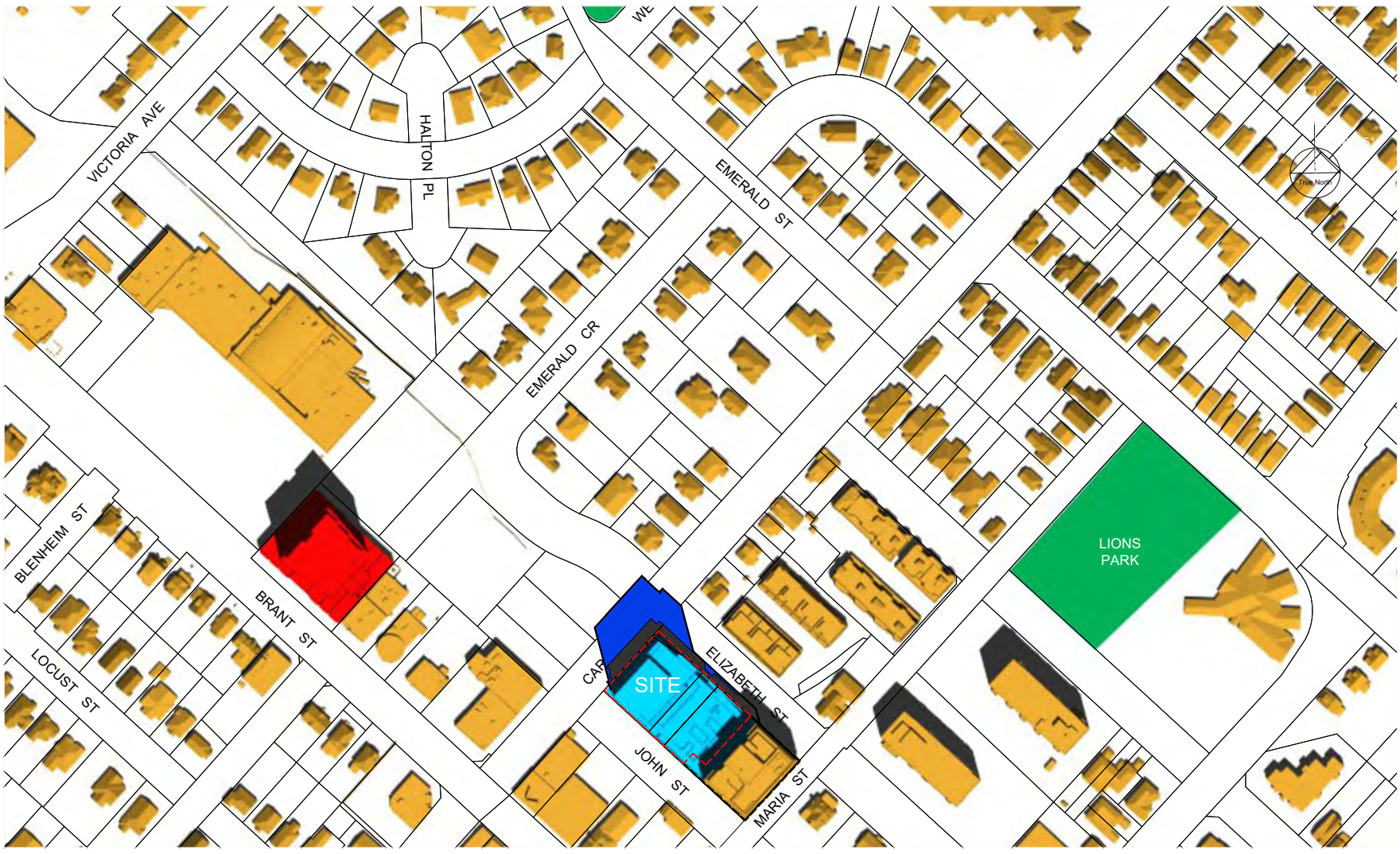
Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



JUN 21

Approved Unbuilt 535 Brant St

1:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

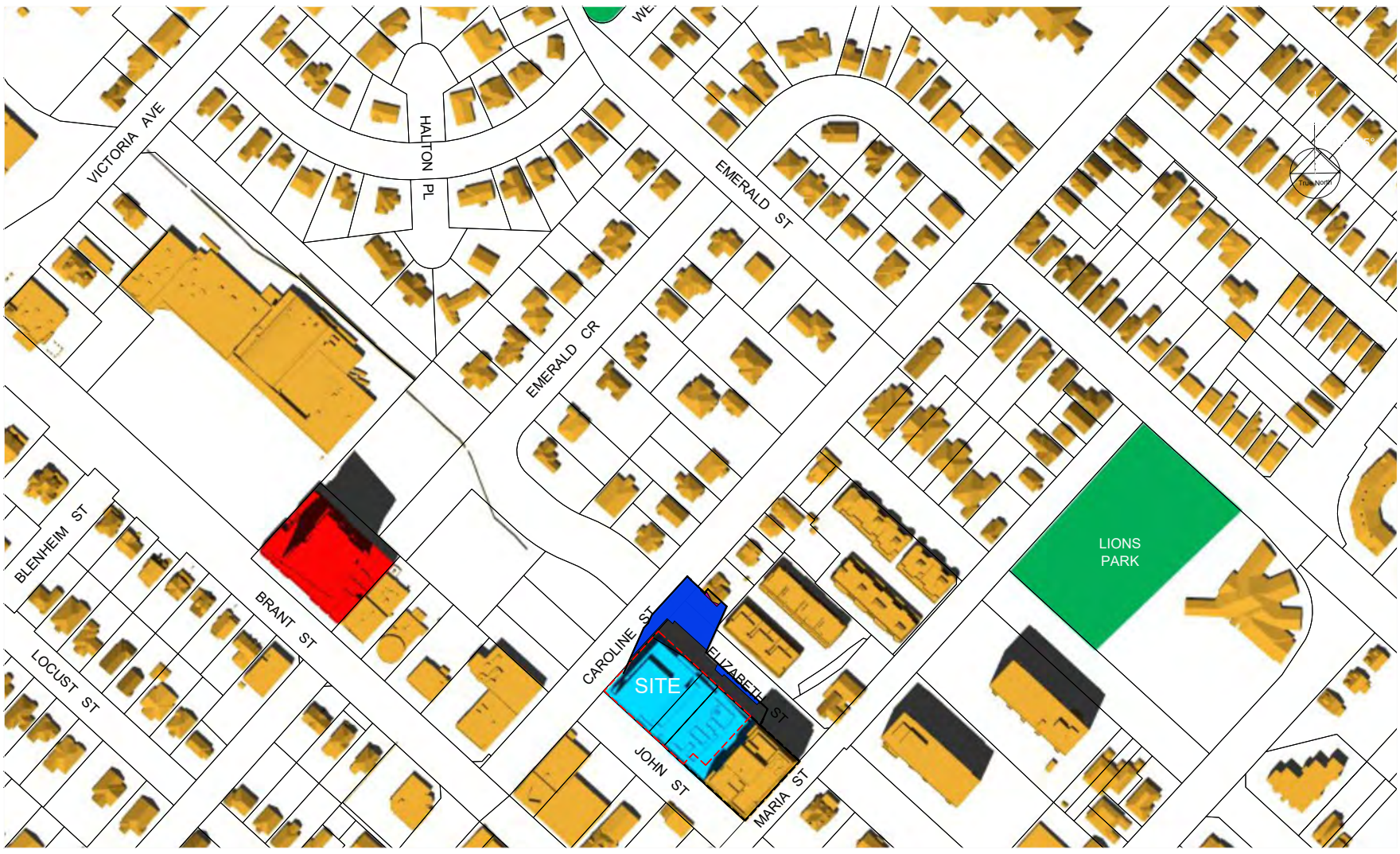
2030 Caroline

Inaria Burlington Inc.

City of Burlington

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-08
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



JUN 21

2:00 PM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



JUN 21

Approved Unbuilt 535 Brant St

3:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

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City of Burlington

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.:
Drawn by:	RB	Scale:	1 : 3000	SS-09
Checked by:	RB	Date:	JUN 21/24	



JUN 21

4:00 PM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



JUN 21

Approved Unbuilt 535 Brant St

5:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

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City of Burlington

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-10
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



JUN 21

6:00 PM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



JUN 21

Approved Unbuilt 535 Brant St

7:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

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City of Burlington

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Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-11
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



SEP 21

9:00 AM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



SEP 21

Approved Unbuilt 535 Brant St

10:00 AM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

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City of Burlington

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Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-12
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



SEP 21

11:00 AM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



SEP 21

Approved Unbuilt 535 Brant St

12:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

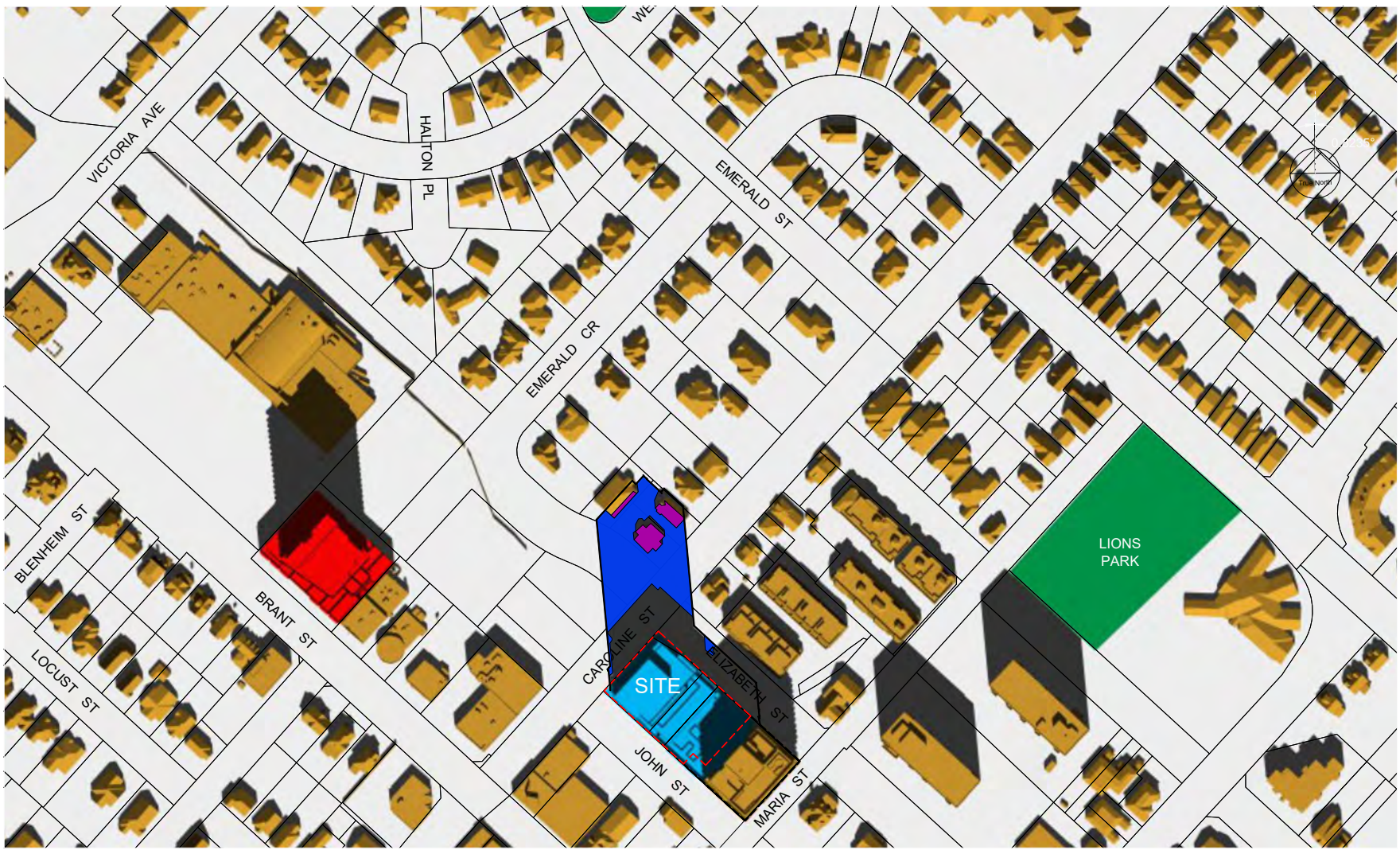
2030 Caroline

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City of Burlington

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-13
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



SEP 21

1:00 PM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



SEP 21

Approved Unbuilt 535 Brant St

2:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

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R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
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Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-14
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



SEP 21

3:00 PM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



SEP 21

Approved Unbuilt 535 Brant St

4:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

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City of Burlington

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Sun & Shadow Position Specialists
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Calculated by:	RB	Project:	S23028	Drawing No.: SS-15
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



SEP 21

5:00 PM

Site Boundary

Net New Shadows cast on roof surfaces

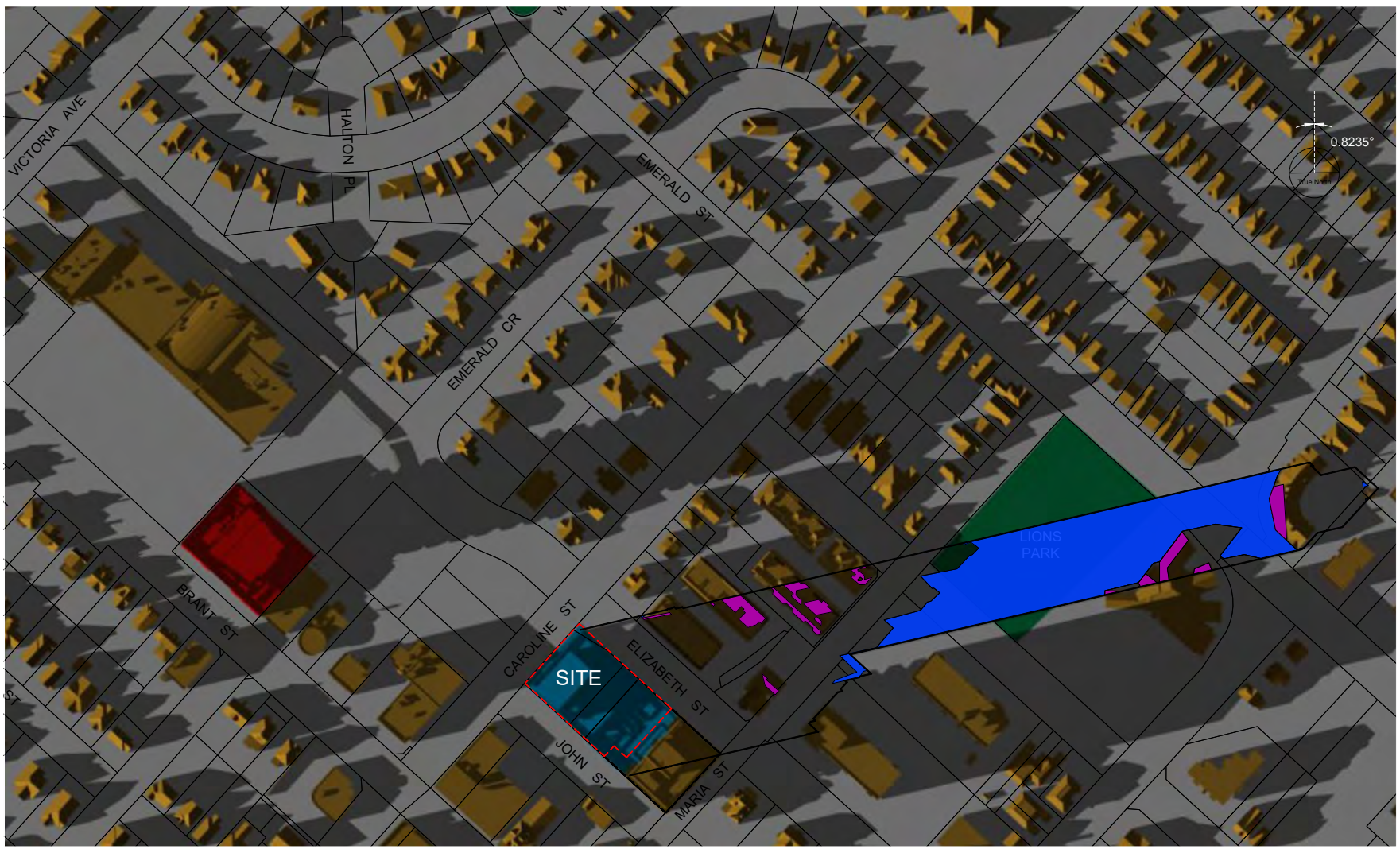
Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EDT

0 20 100 200

SCALE 1 : 3000



SEP 21

Approved Unbuilt 535 Brant St

6:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

Inaria Burlington Inc.

City of Burlington

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Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-16
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



DEC 21

11:00 AM

Site Boundary

Net New Shadows cast on roof surfaces

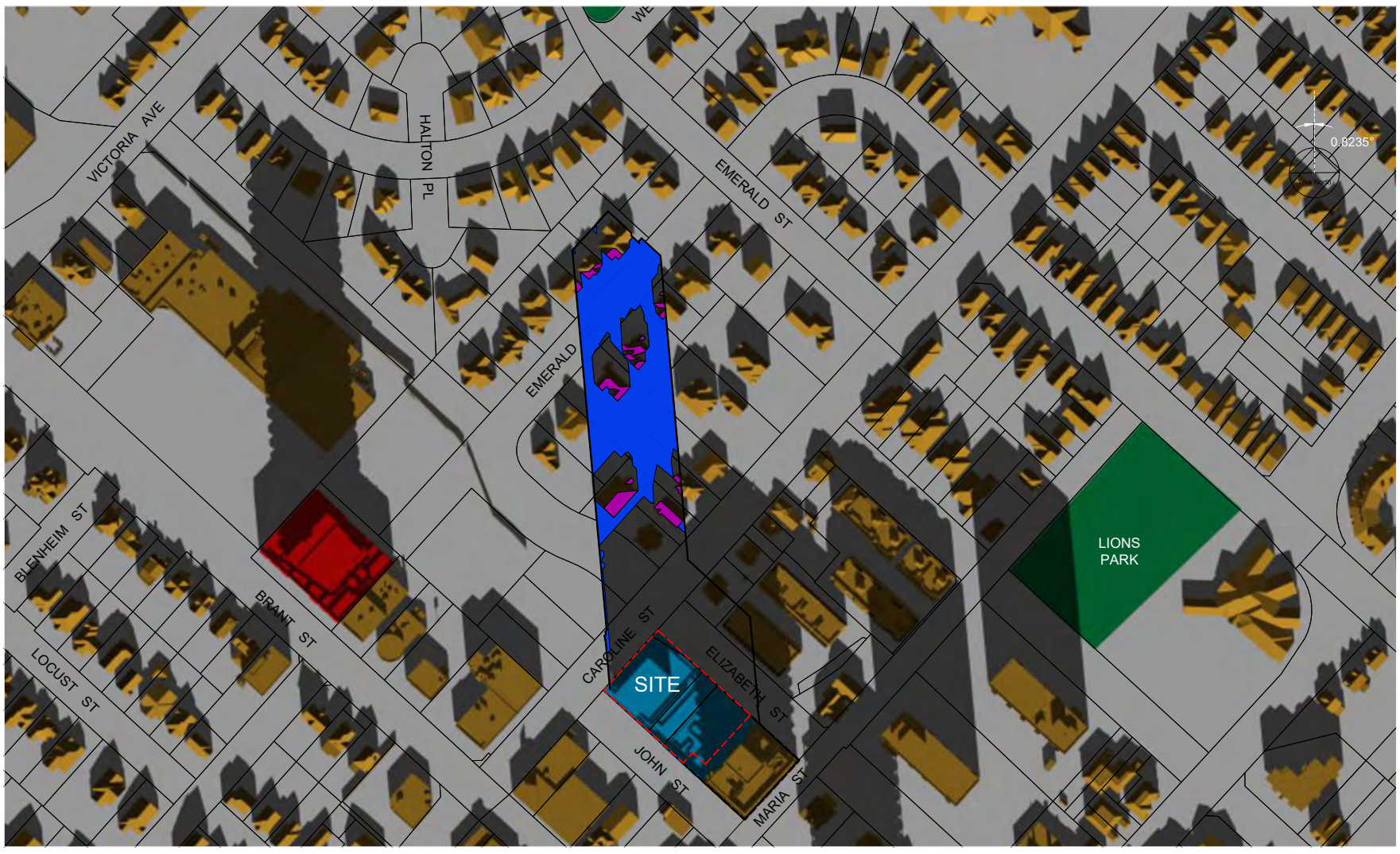
Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EST

0 20 100 200

SCALE 1 : 3000



DEC 21

Approved Unbuilt 535 Brant St

12:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

Inaria Burlington Inc.

City of Burlington

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Sun & Shadow Position Specialists
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Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-17
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



DEC 21

1:00 PM

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

ALL TIMES IN EST

0 20 100 200

SCALE 1 : 3000



DEC 21

Approved Unbuilt 535 Brant St

2:00 PM

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

Inaria Burlington Inc.

City of Burlington

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Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-18
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



DEC 21

3:00 PM

ALL TIMES IN EST

Approved Unbuilt 535 Brant St

Site Boundary

Net New Shadows cast on roof surfaces

Net New Shadows cast on ground surfaces

Existing Shadows cast on ground surfaces

0 20 100 200

SCALE 1 : 3000

SUN / SHADOW STUDY

Proposed Mixed-Use Development

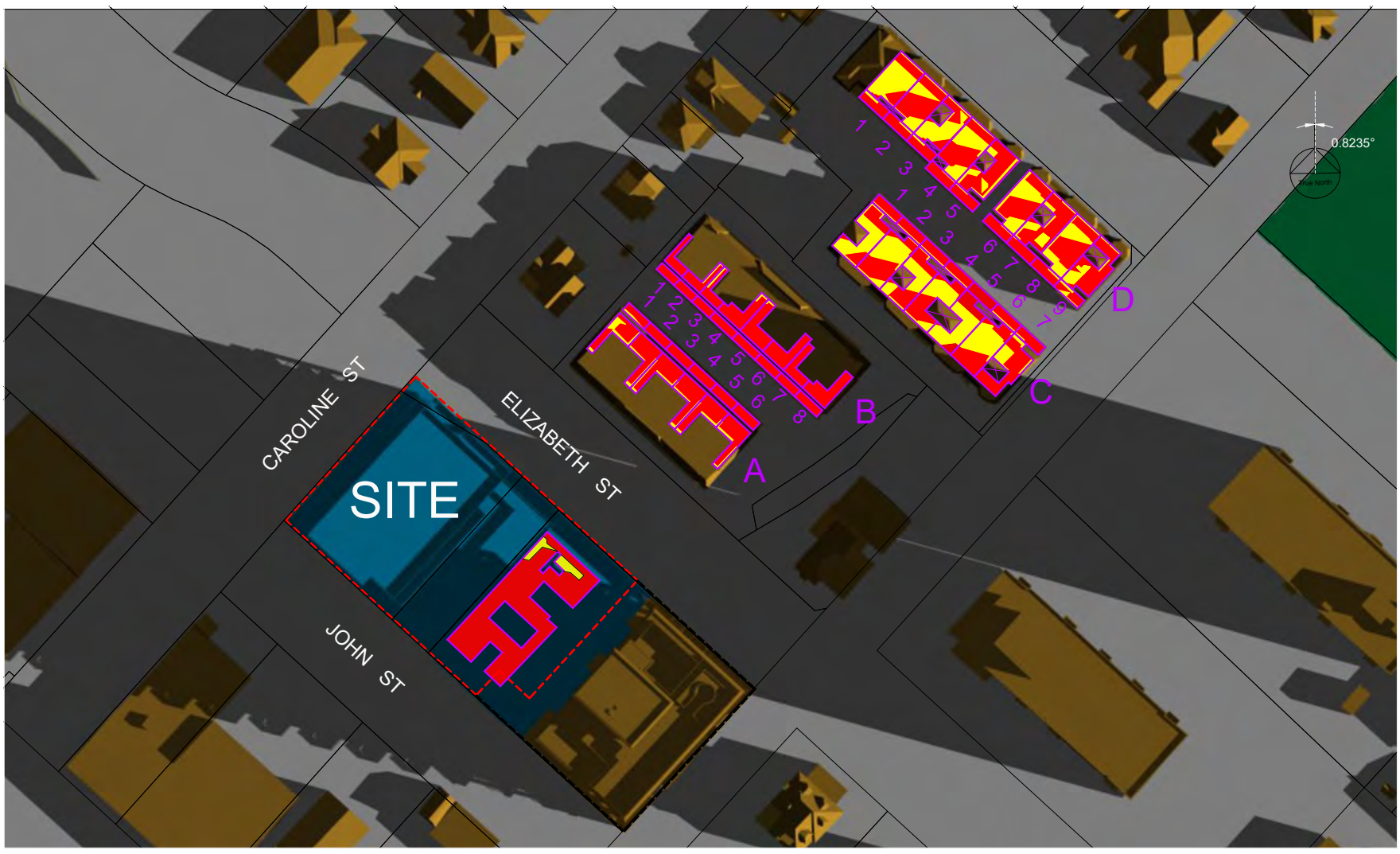
2030 Caroline

Inaria Burlington Inc.

City of Burlington

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: SS-19
Drawn by:	RB	Scale:	1 : 3000	
Checked by:	RB	Date:	JUN 21/24	



Criteria 4.3 - Private Outdoor Amenity Space

9:00 AM

ROOFTOP AMENITY SPACE

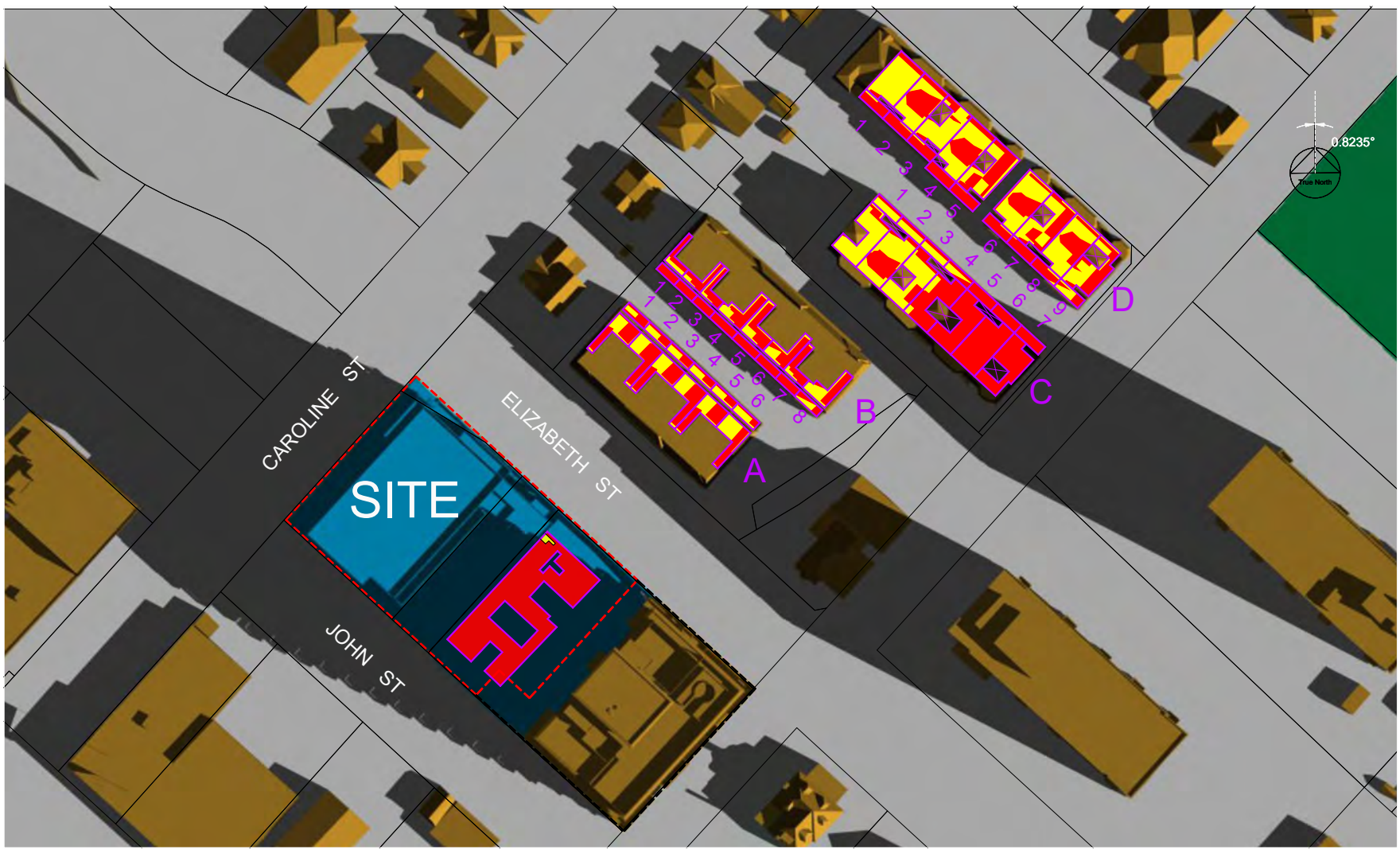
AREA EXPOSED TO SUNSHINE

AREA IN SHADOW

ALL TIMES IN EDT

0 10 50 100

SCALE 1 : 1250



Criteria 4.3 - Private Outdoor Amenity Space

10:00 AM

MAR 21

SUN / SHADOW STUDY

Proposed Mixed-Use Development

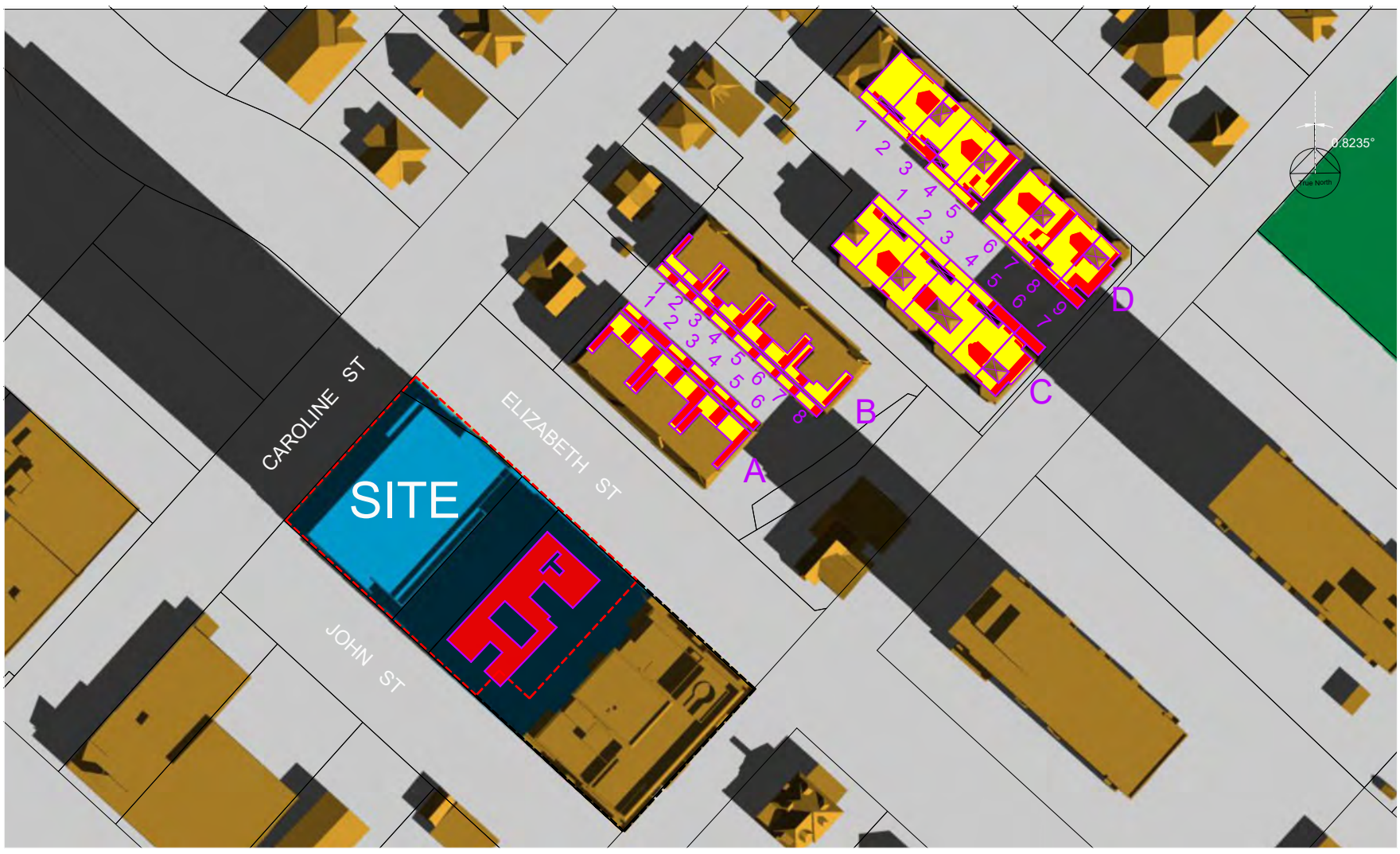
2030 Caroline

Inaria Burlington Inc.

City of Burlington

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.:
Drawn by:	RB	Scale:	1 : 1250	4.3-1
Checked by:	RB	Date:	JUN 21/24	



Criteria 4.3 - Private Outdoor Amenity Space

11:00 AM

ALL TIMES IN EDT

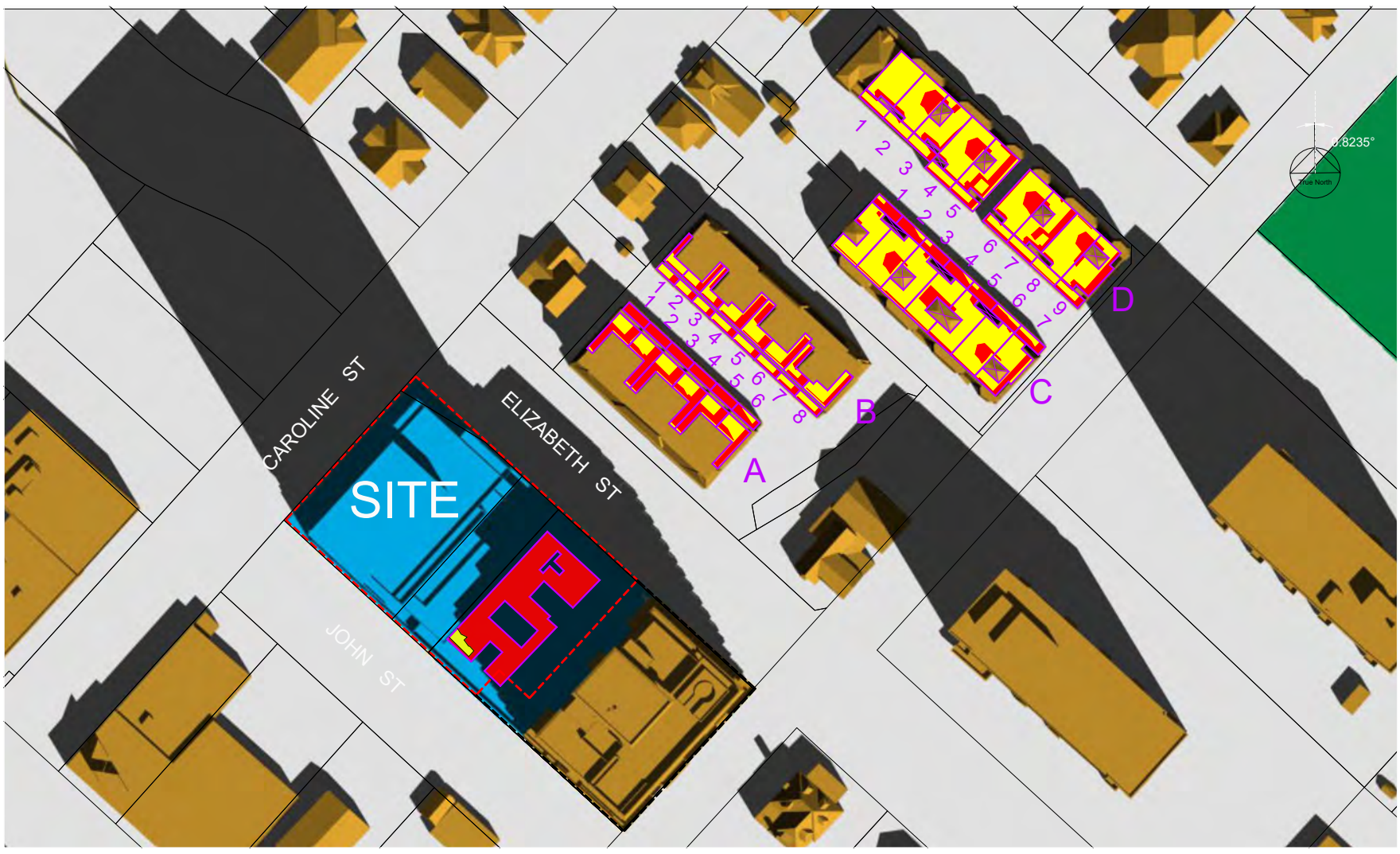
ROOFTOP AMENITY SPACE

AREA EXPOSED TO SUNSHINE

AREA IN SHADOW

0 10 50 100

SCALE 1 : 1250



Criteria 4.3 - Private Outdoor Amenity Space

12:00 PM

MAR 21

SUN / SHADOW STUDY

Proposed Mixed-Use Development

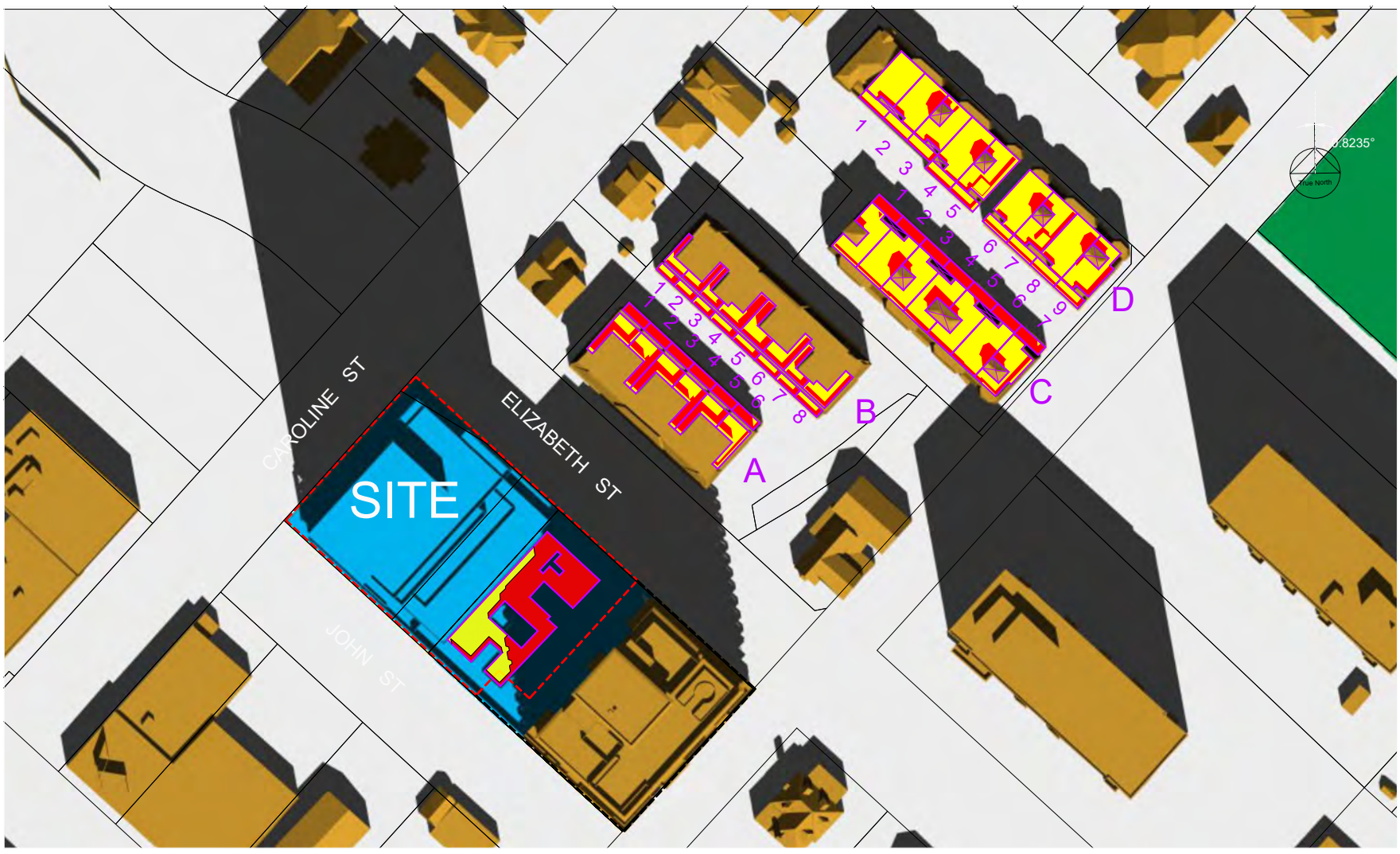
2030 Caroline

Inaria Burlington Inc.

City of Burlington

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Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
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Calculated by:	RB	Project:	S23028	Drawing No.: 4.3-2
Drawn by:	RB	Scale:	1 : 1250	
Checked by:	RB	Date:	JUN 21/24	



Criteria 4.3 - Private Outdoor Amenity Space

1:00 PM

ALL TIMES IN EDT

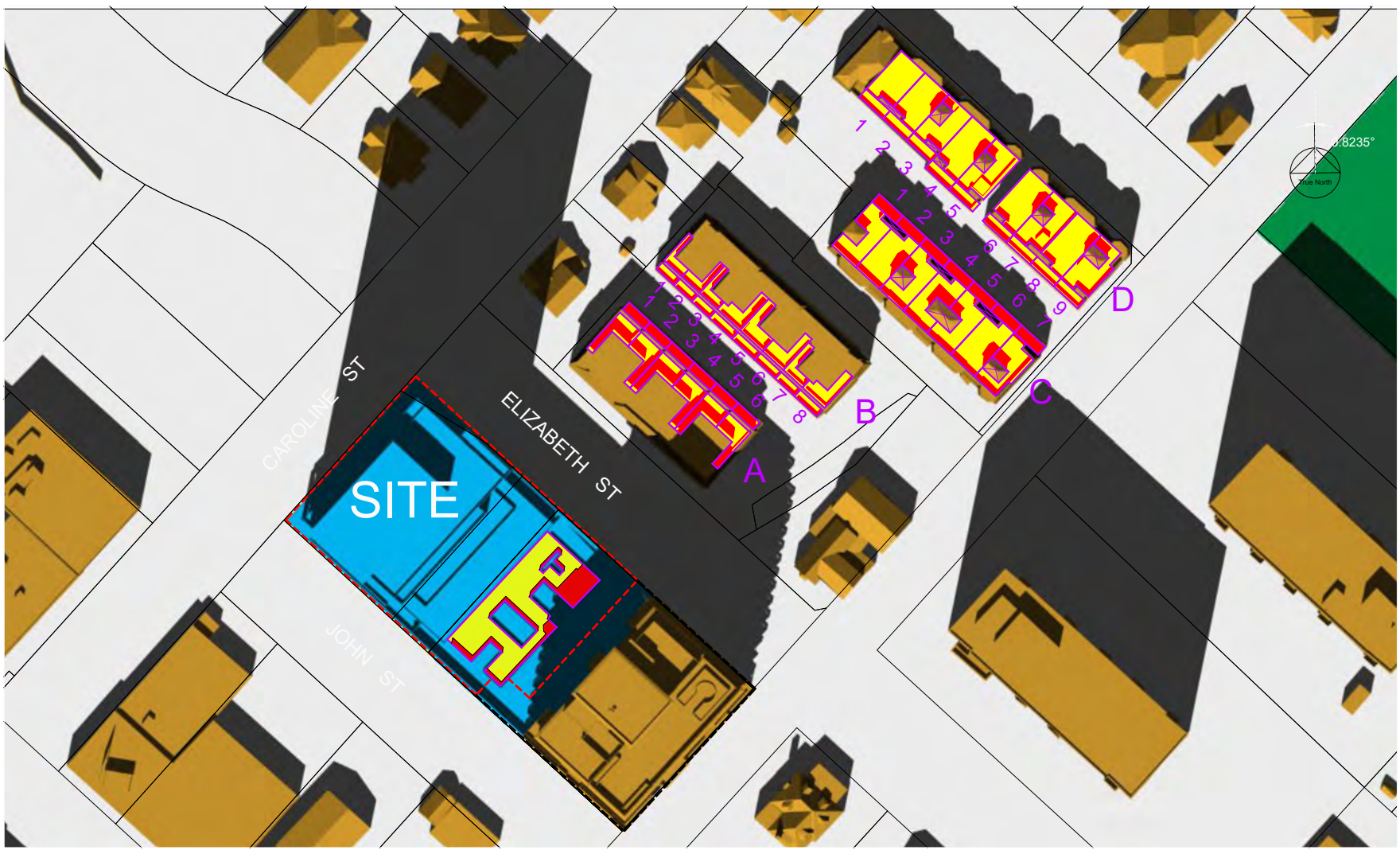
ROOFTOP AMENITY SPACE

AREA EXPOSED TO SUNSHINE

AREA IN SHADOW

0 10 50 100

SCALE 1 : 1250



Criteria 4.3 - Private Outdoor Amenity Space

2:00 PM

MAR 21

SUN / SHADOW STUDY

Proposed Mixed-Use Development

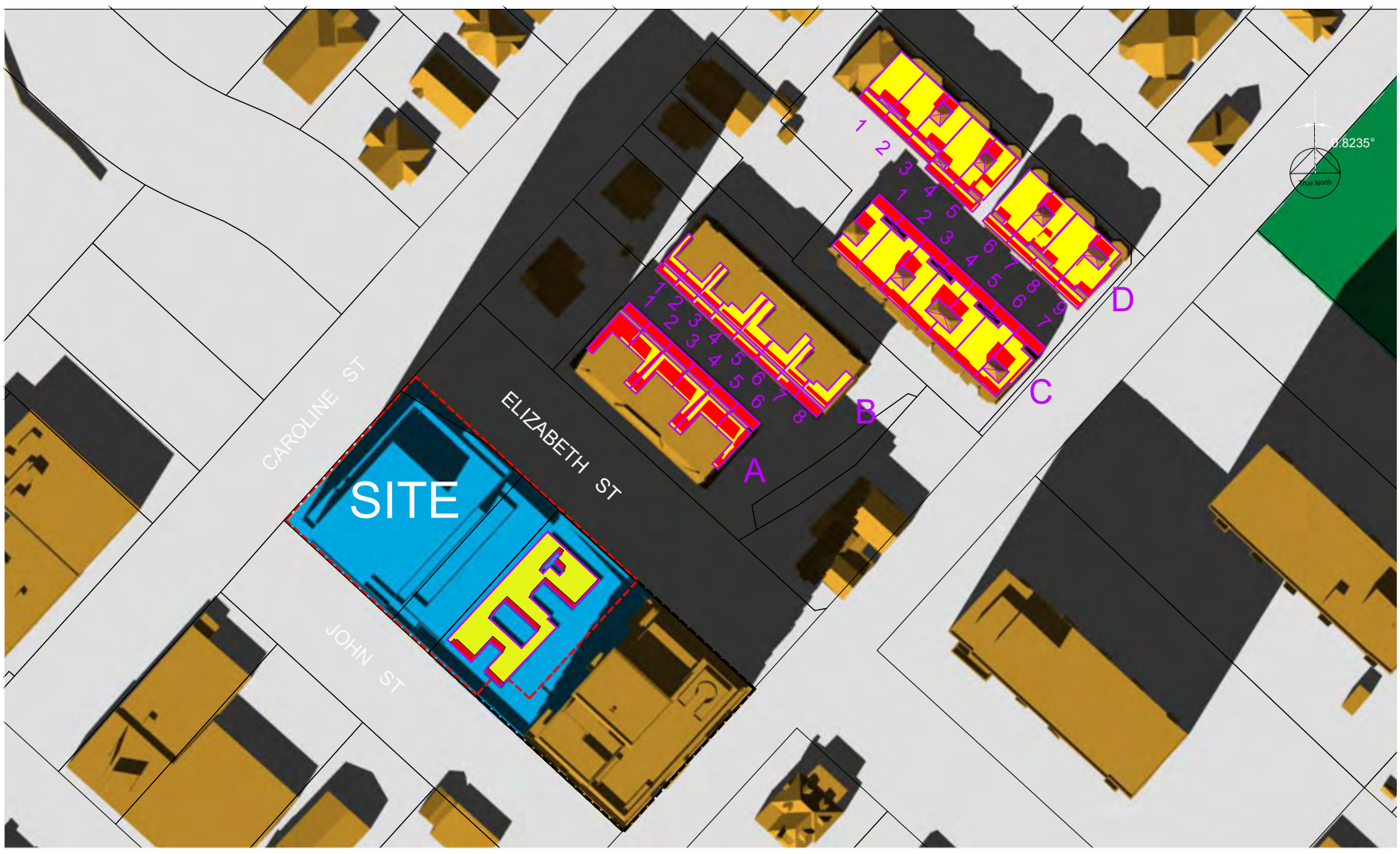
2030 Caroline

Inaria Burlington Inc.

City of Burlington

R. BOUWMEESTER & ASSOCIATES
Sun & Shadow Position Specialists
165 Browning Trail, Barrie ON Tel/Fax (705) 726-3392
Web: www.sunposition.com Email: rba@sunposition.com

Calculated by:	RB	Project:	S23028	Drawing No.: 4.3-3
Drawn by:	RB	Scale:	1 : 1250	
Checked by:	RB	Date:	JUN 21/24	



Criteria 4.3 - Private Outdoor Amenity Space

3:00 PM

ALL TIMES IN EDT

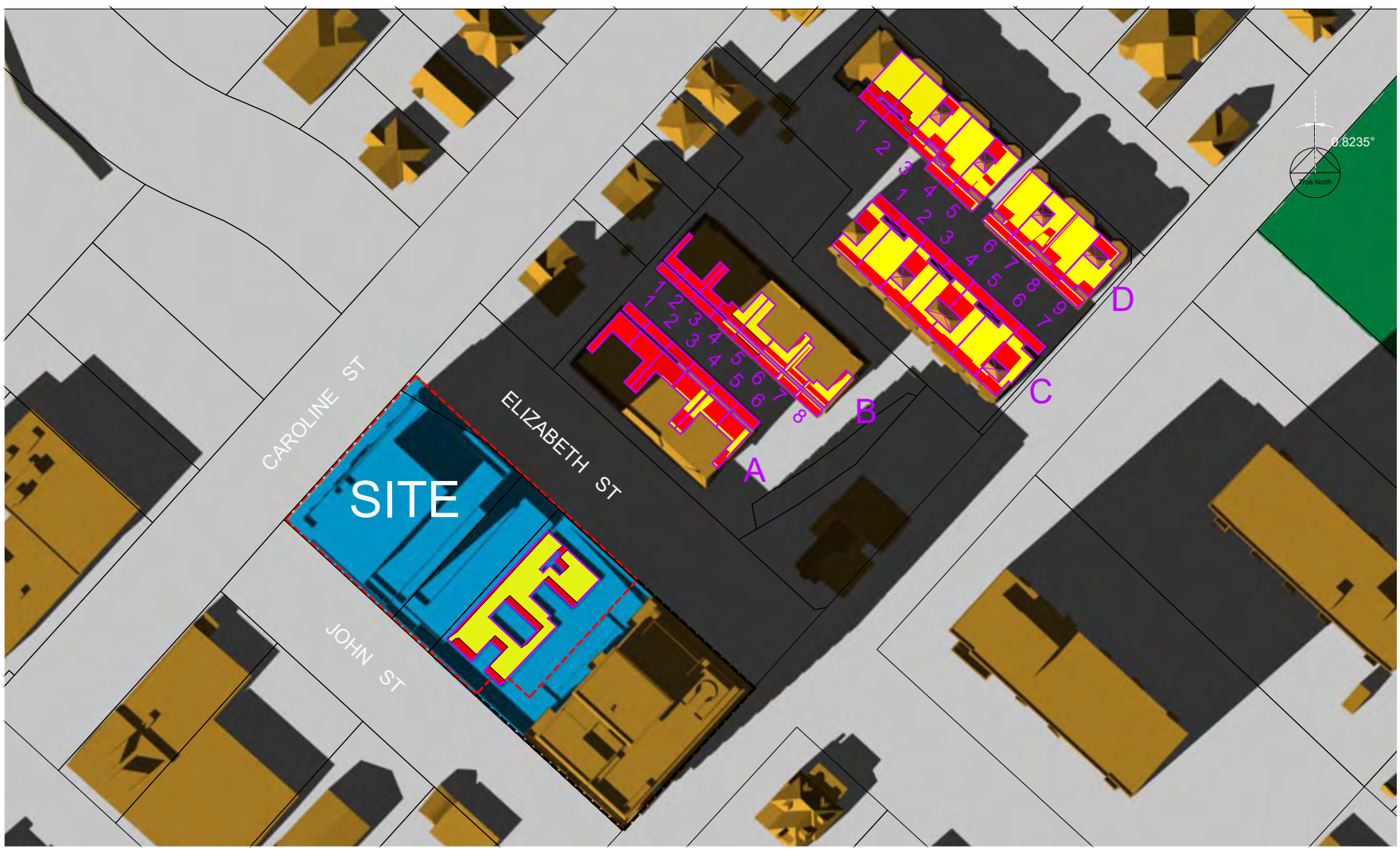
ROOFTOP AMENITY SPACE

AREA EXPOSED TO SUNSHINE

AREA IN SHADOW

0 10 50 100

SCALE 1 : 1250



Criteria 4.3 - Private Outdoor Amenity Space

4:00 PM

MAR 21

SUN / SHADOW STUDY

Proposed Mixed-Use Development

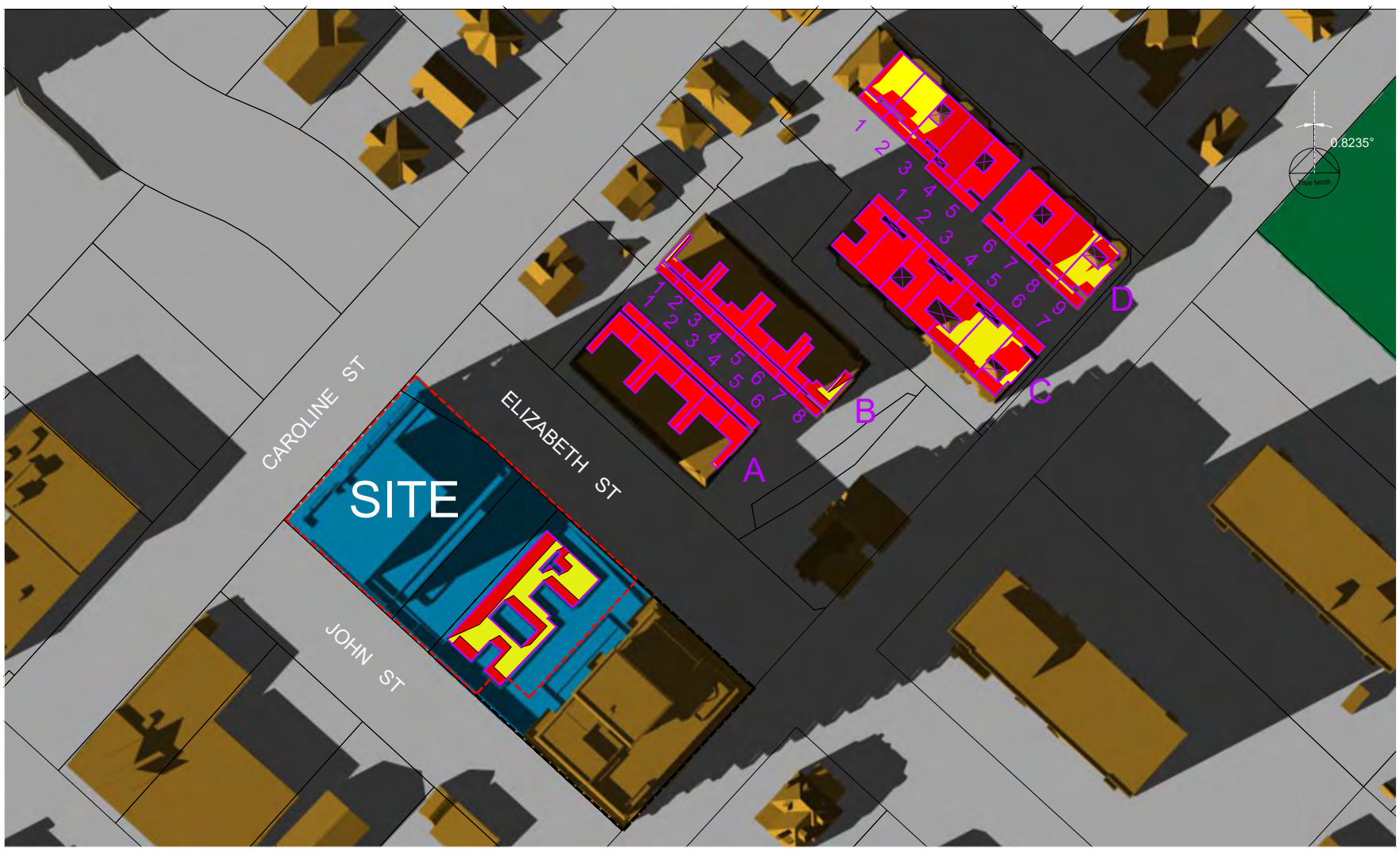
2030 Caroline

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Calculated by:	RB	Project:	S23028	Drawing No.: 4.3-4
Drawn by:	RB	Scale:	1 : 1250	
Checked by:	RB	Date:	JUN 21/24	



Criteria 4.3 - Private Outdoor Amenity Space

5:00 PM

ALL TIMES IN EDT

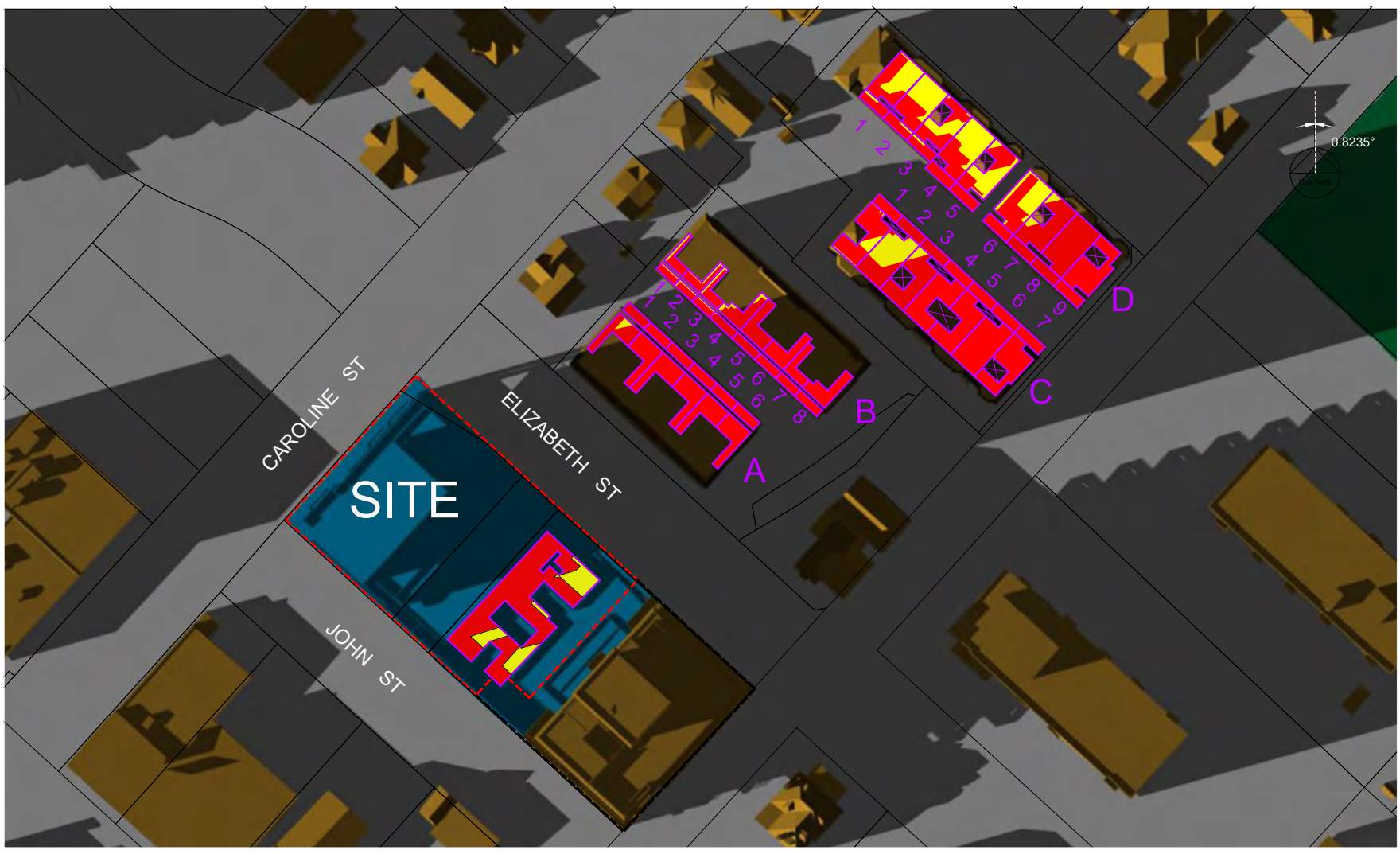
ROOFTOP AMENITY SPACE

AREA EXPOSED TO SUNSHINE

AREA IN SHADOW

0 10 50 100

SCALE 1 : 1250



Criteria 4.3 - Private Outdoor Amenity Space

6:00 PM

MAR 21

SUN / SHADOW STUDY

Proposed Mixed-Use Development

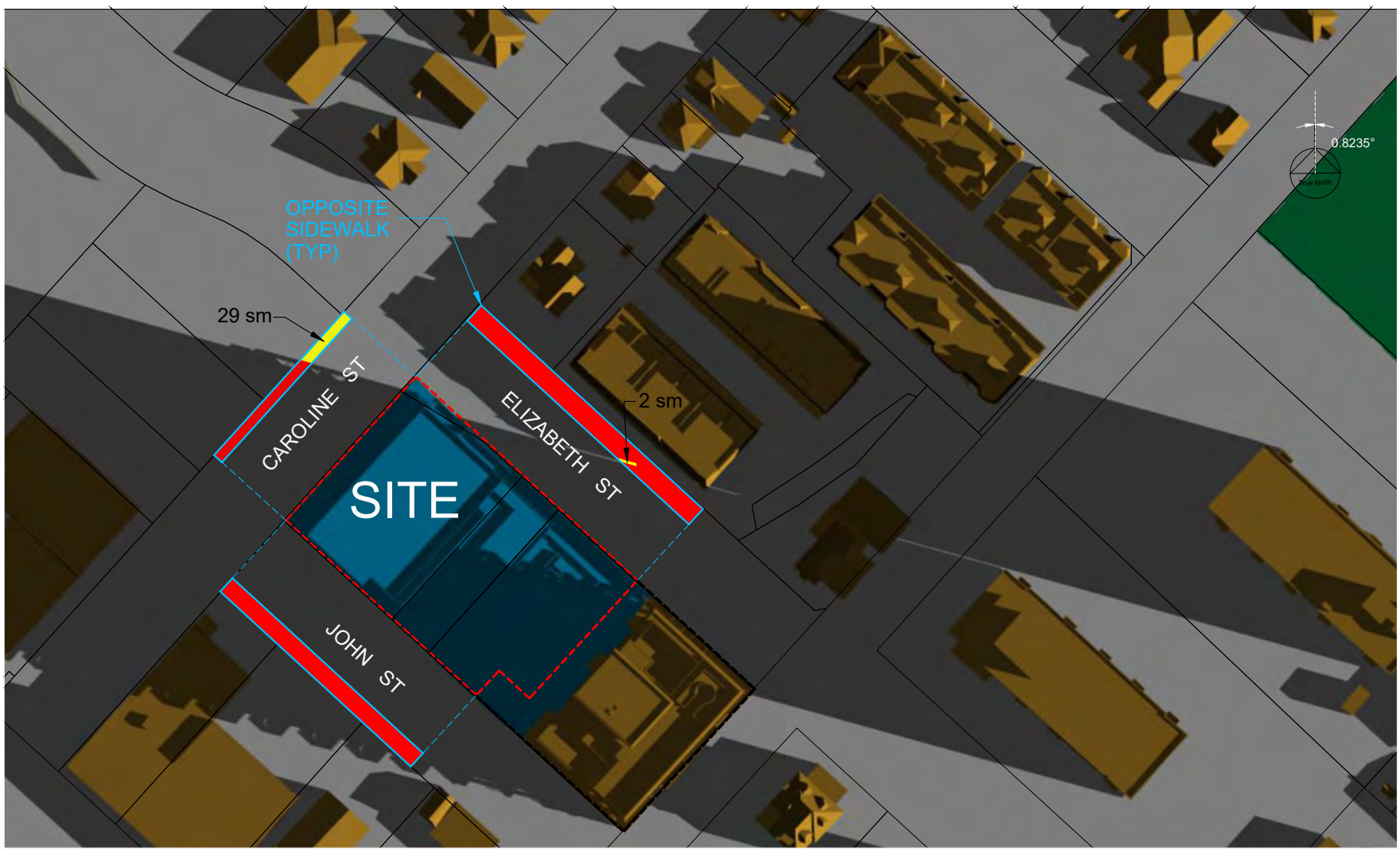
2030 Caroline

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Calculated by:	RB	Project:	S23028	Drawing No.: 4.3-5
Drawn by:	RB	Scale:	1 : 1250	
Checked by:	RB	Date:	JUN 21/24	



Criteria 4.6 - Public Realm and Sidewalks

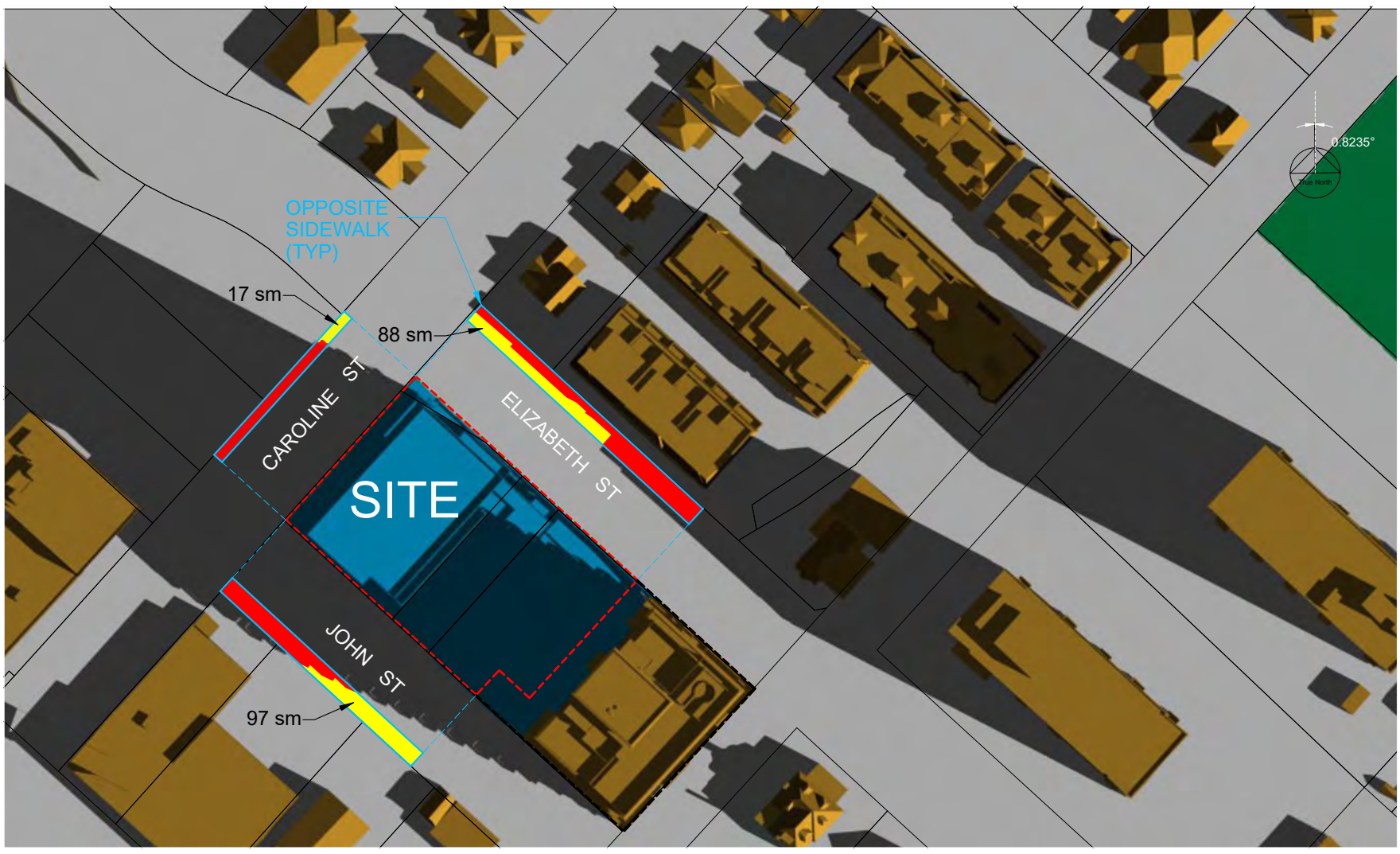
9:00 AM

Existing boulevard and sidewalk area

Area exposed to sunshine

Area in shadow (existing + proposed)

	Boulevard/Sidewalk Area (sm)
Caroline St	89
John St	202
Elizabeth St	270



Criteria 4.6 - Public Realm and Sidewalks

10:00 AM

ALL TIMES IN EDT

MAR 21

(NOTE: AREA FIGURES DENOTE TOTAL FOR THE TEST TIME)

0 10 50 100

SCALE 1 : 1250

SUN / SHADOW STUDY

Proposed Mixed-Use Development

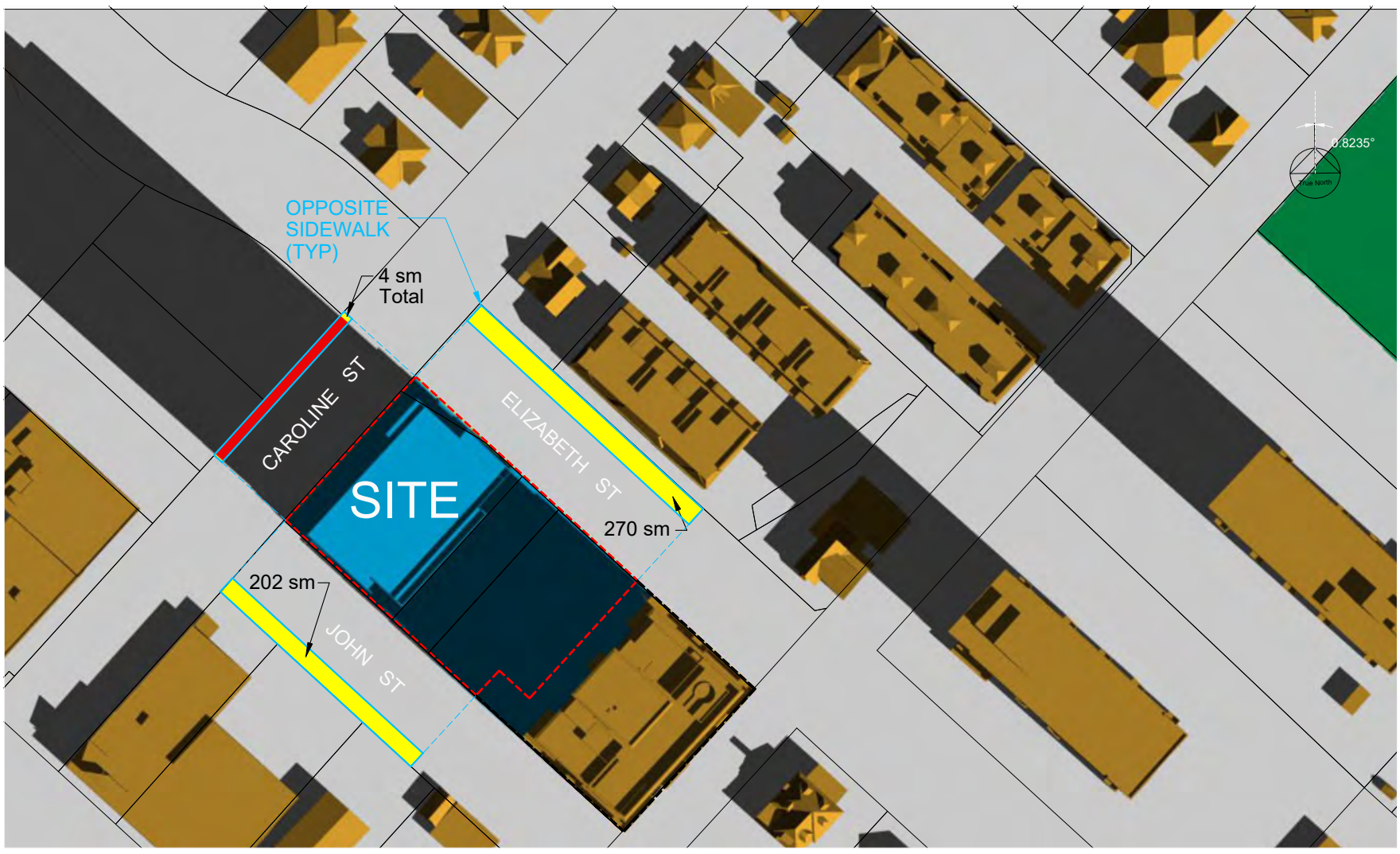
2030 Caroline

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Calculated by:	RB	Project:	S23028	Drawing No.:
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Checked by:	RB	Date:	JUN 21/24	

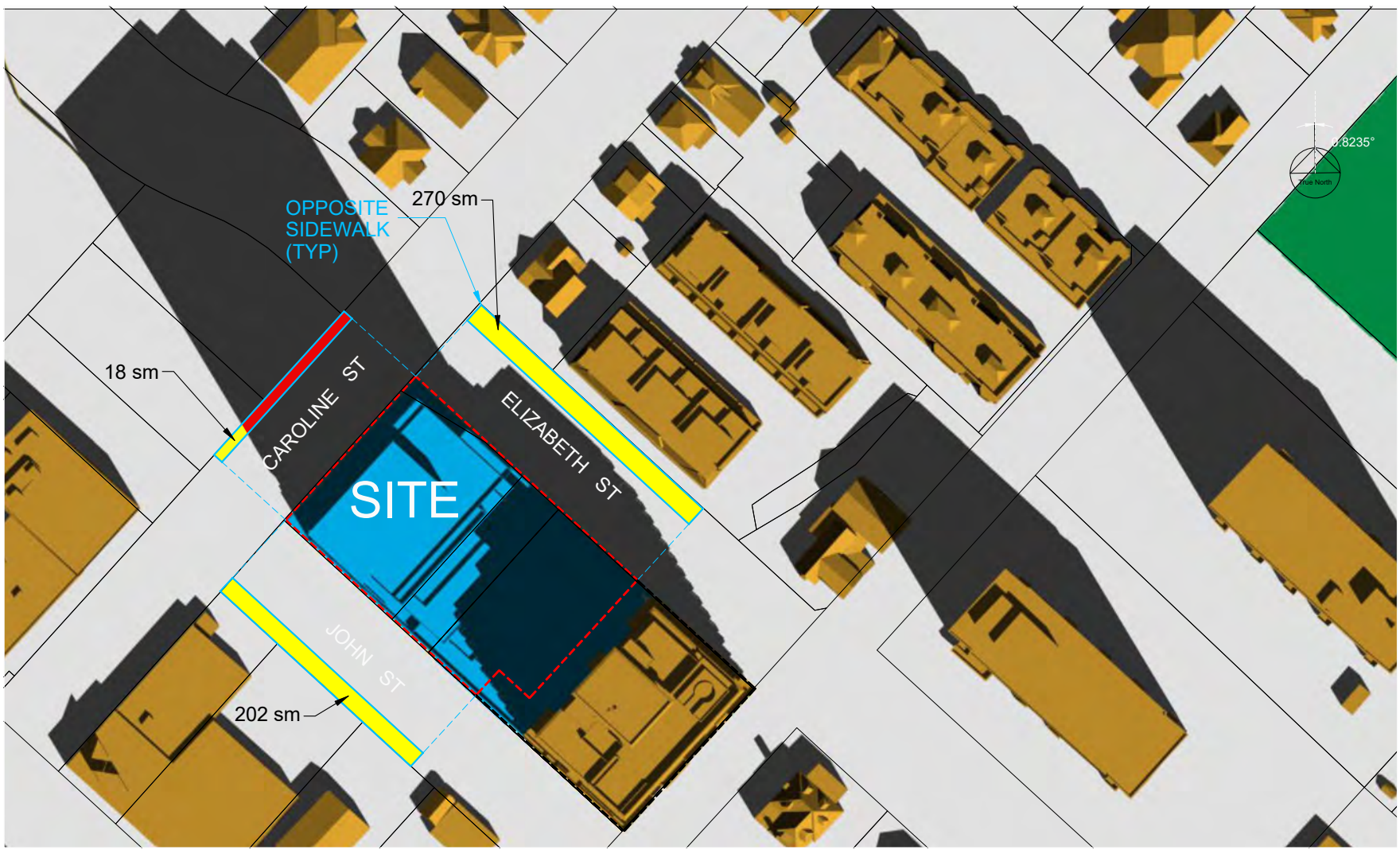


Criteria 4.6 - Public Realm and Sidewalks

11:00 AM

	Existing boulevard and sidewalk area
	Area exposed to sunshine
	Area in shadow (existing + proposed)

	Boulevard/Sidewalk Area (sm)
Caroline St	89
John St	202
Elizabeth St	270



Criteria 4.6 - Public Realm and Sidewalks

12:00 PM

ALL TIMES IN EDT

MAR 21

(NOTE: AREA FIGURES DENOTE TOTAL FOR THE TEST TIME)

0 10 50 100

SCALE 1 : 1250

SUN / SHADOW STUDY

Proposed Mixed-Use Development

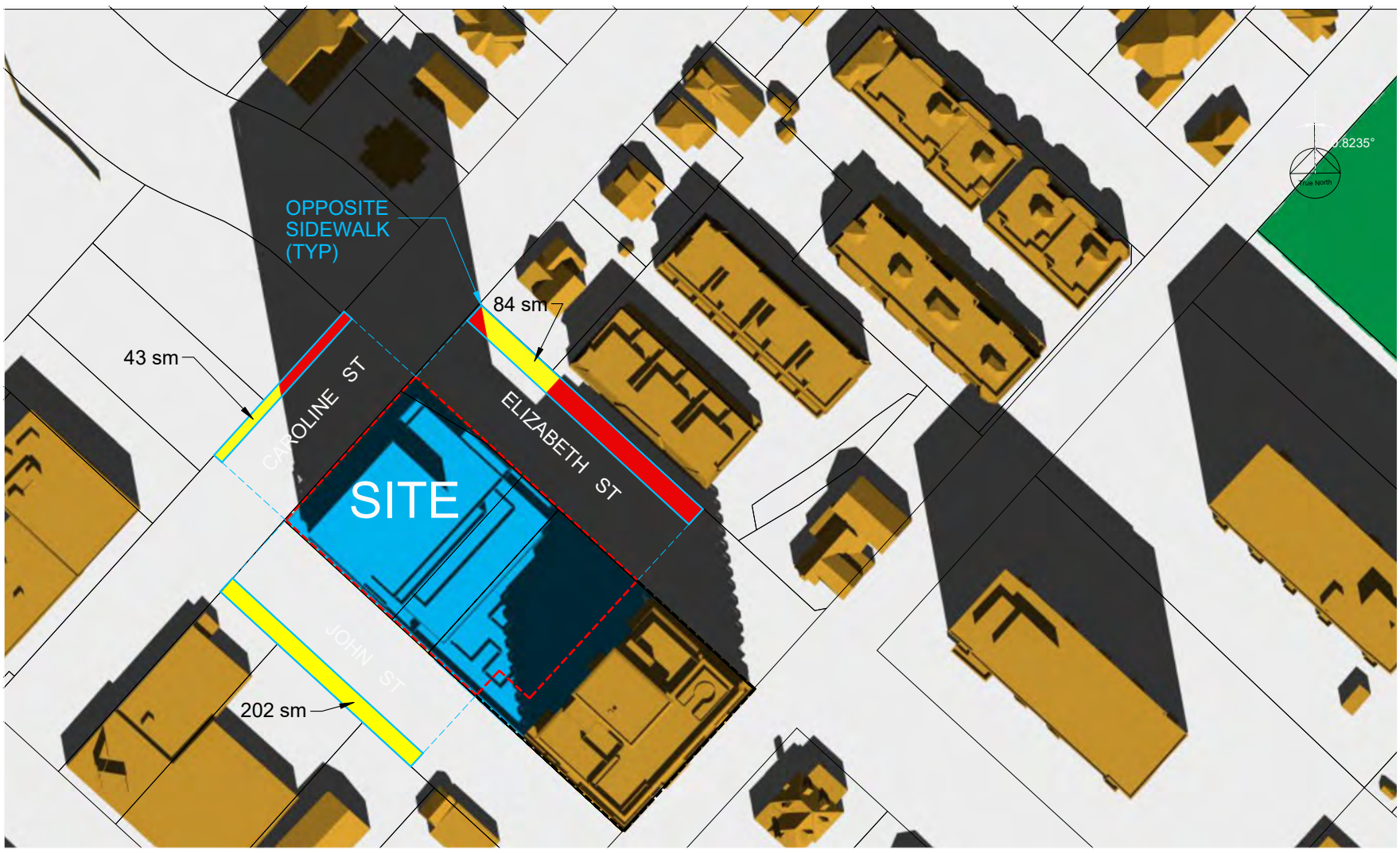
2030 Caroline

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Calculated by:	RB	Project:	S23028	Drawing No.: 4.6-2
Drawn by:	RB	Scale:	1 : 1250	
Checked by:	RB	Date:	JUN 21/24	



Criteria 4.6 - Public Realm and Sidewalks

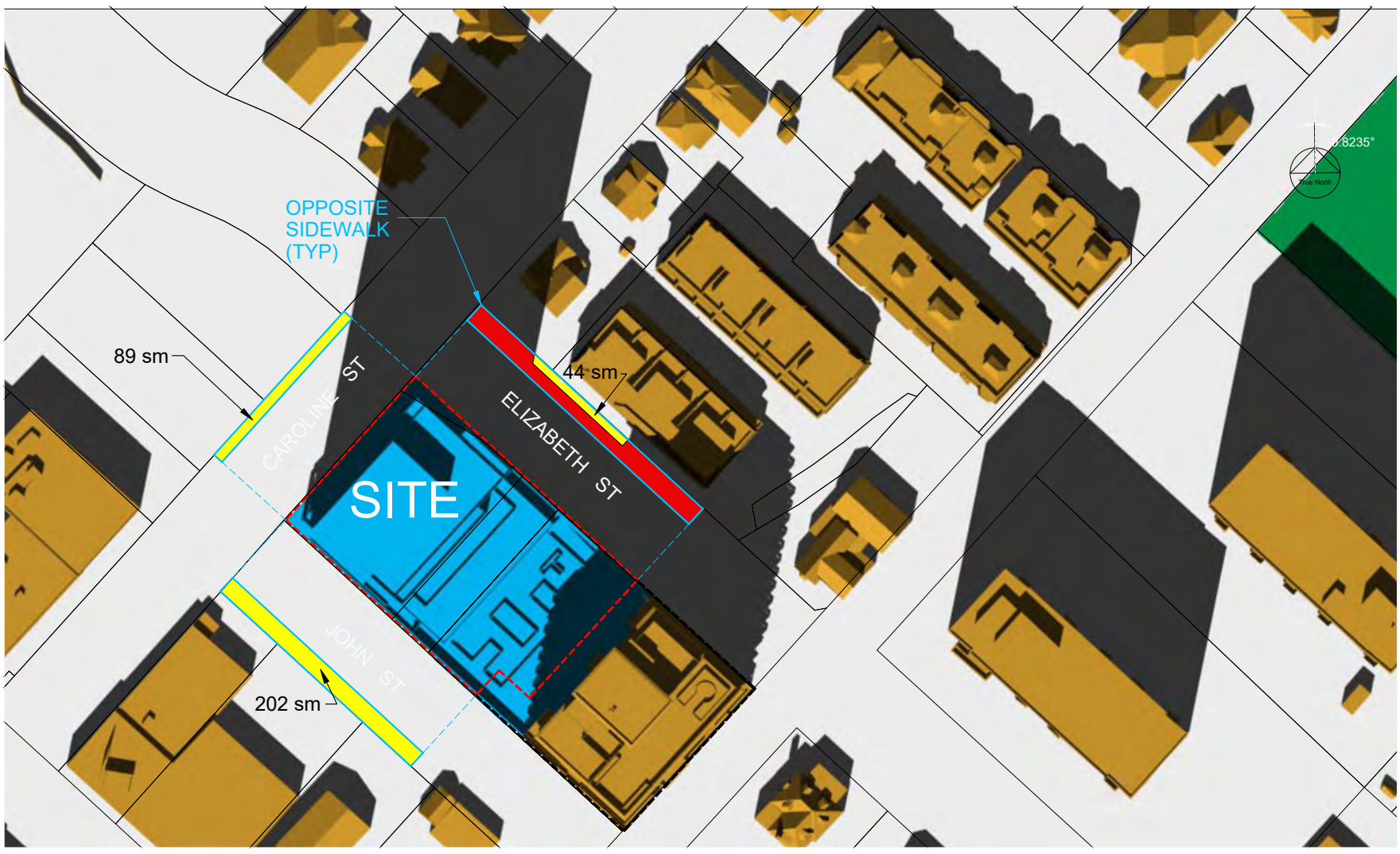
1:00 PM

Existing boulevard and sidewalk area

Area exposed to sunshine

Area in shadow (existing + proposed)

	Boulevard/Sidewalk Area (sm)
Caroline St	89
John St	202
Elizabeth St	270



Criteria 4.6 - Public Realm and Sidewalks

2:00 PM

ALL TIMES IN EDT

MAR 21

(NOTE: AREA FIGURES DENOTE TOTAL FOR THE TEST TIME)

0 10 50 100

SCALE 1 : 1250

SUN / SHADOW STUDY

Proposed Mixed-Use Development

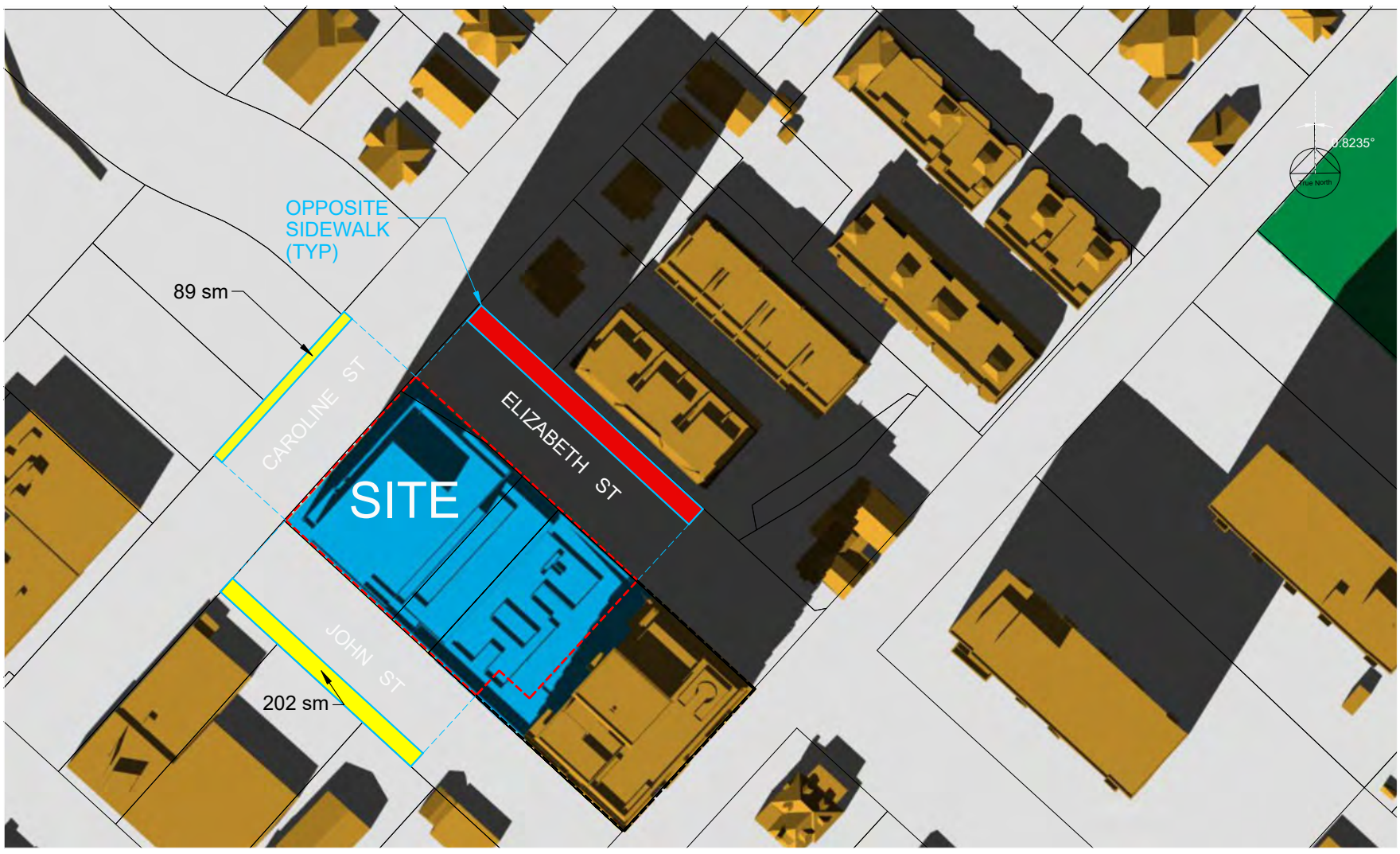
2030 Caroline

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Calculated by:	RB	Project:	S23028	Drawing No.: 4.6-3
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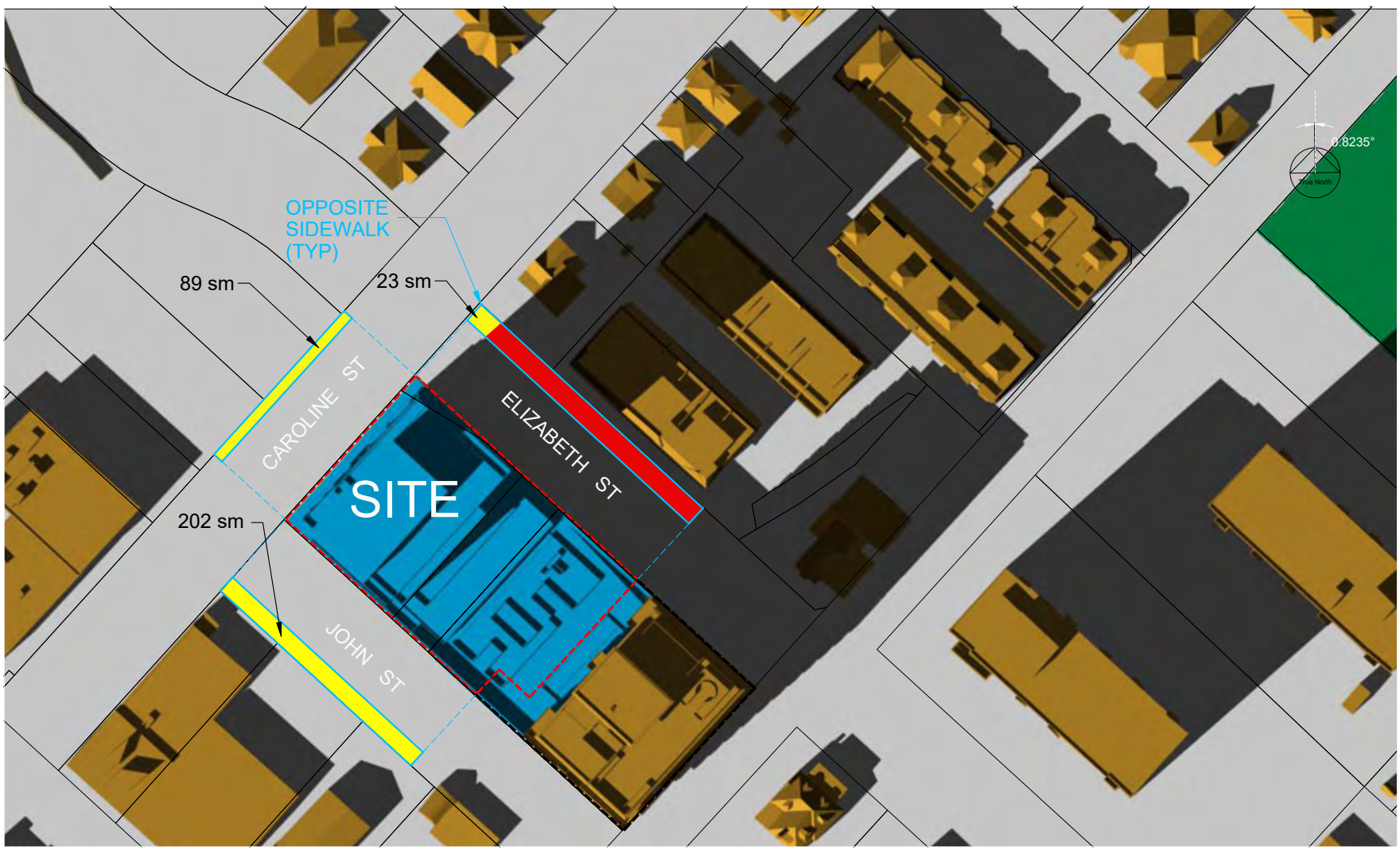


Criteria 4.6 - Public Realm and Sidewalks

3:00 PM

Existing boulevard and sidewalk area	
Area exposed to sunshine	
Area in shadow (existing + proposed)	

	Boulevard/Sidewalk Area (sm)
Caroline St	89
John St	202
Elizabeth St	270



Criteria 4.6 - Public Realm and Sidewalks

4:00 PM

ALL TIMES IN EDT

MAR 21

(NOTE: AREA FIGURES DENOTE TOTAL FOR THE TEST TIME)

0 10 50 100

SCALE 1 : 1250

SUN / SHADOW STUDY

Proposed Mixed-Use Development

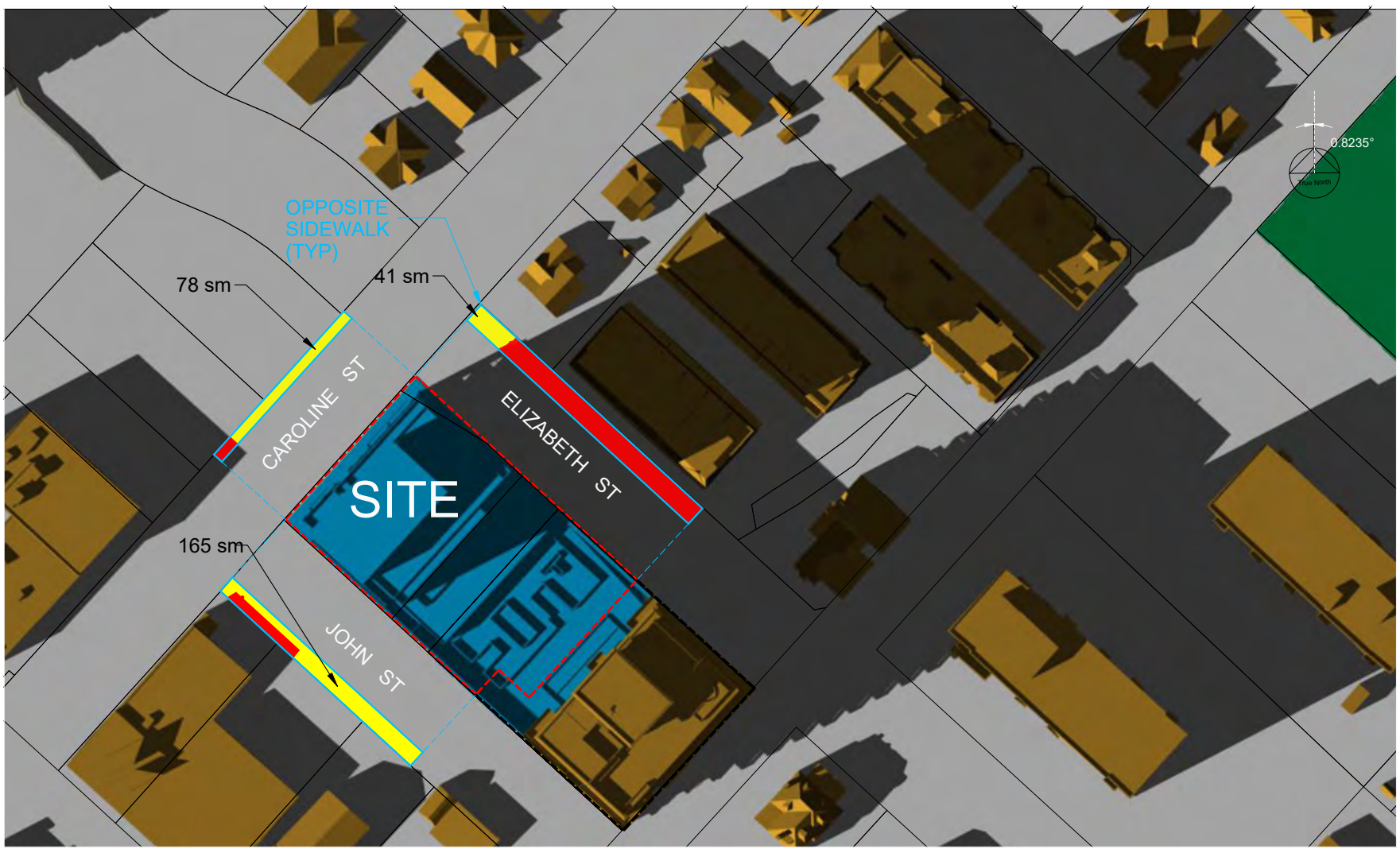
2030 Caroline

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Calculated by:	RB	Project:	S23028	Drawing No.:
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Checked by:	RB	Date:	JUN 21/24	

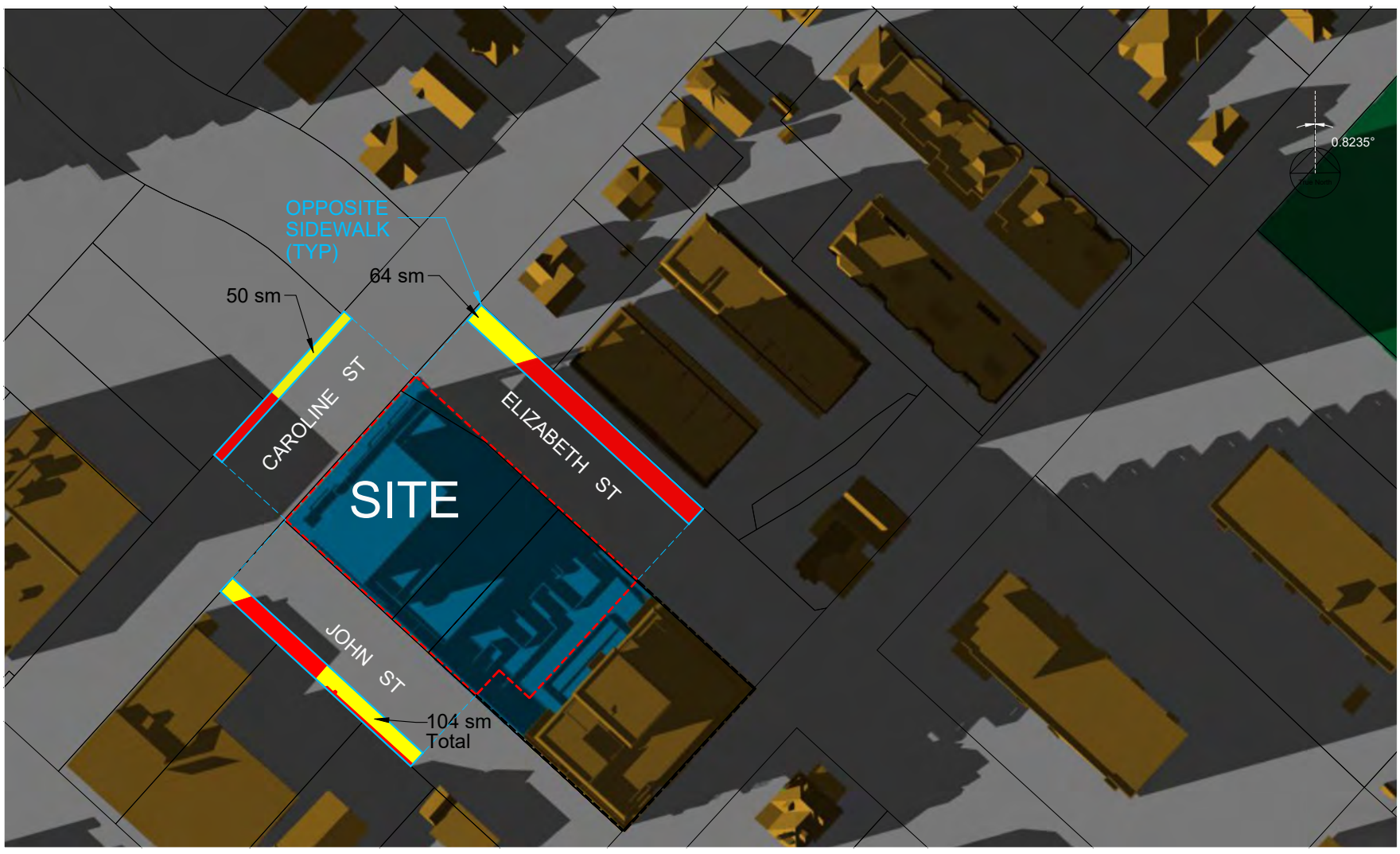


Criteria 4.6 - Public Realm and Sidewalks

5:00 PM

Existing boulevard and sidewalk area	
Area exposed to sunshine	
Area in shadow (existing + proposed)	

	Boulevard/Sidewalk Area (sm)
Caroline St	89
John St	202
Elizabeth St	270



Criteria 4.6 - Public Realm and Sidewalks

6:00 PM

ALL TIMES IN EDT

MAR 21

(NOTE: AREA FIGURES DENOTE TOTAL FOR THE TEST TIME)

0 10 50 100

SCALE 1 : 1250

SUN / SHADOW STUDY

Proposed Mixed-Use Development

2030 Caroline

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Calculated by:	RB	Project:	S23028	Drawing No.: 4.6-5
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Checked by:	RB	Date:	JUN 21/24	