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PROJECT

SPRING GARDEN ROAD AND CARLTON STREET DEVELOPMENT

DEVELOPMENT AGREEMENT PLANNING APPLICATION

CLIENT

DEXEL DEVELOPMENTS INC.

SCALE	DATE	
NTS	2016.08.18	
DRAWN BY	CHECKED	REVIEWED
CC		

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CC

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NOT FOR CONSTRUCTION

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COVER

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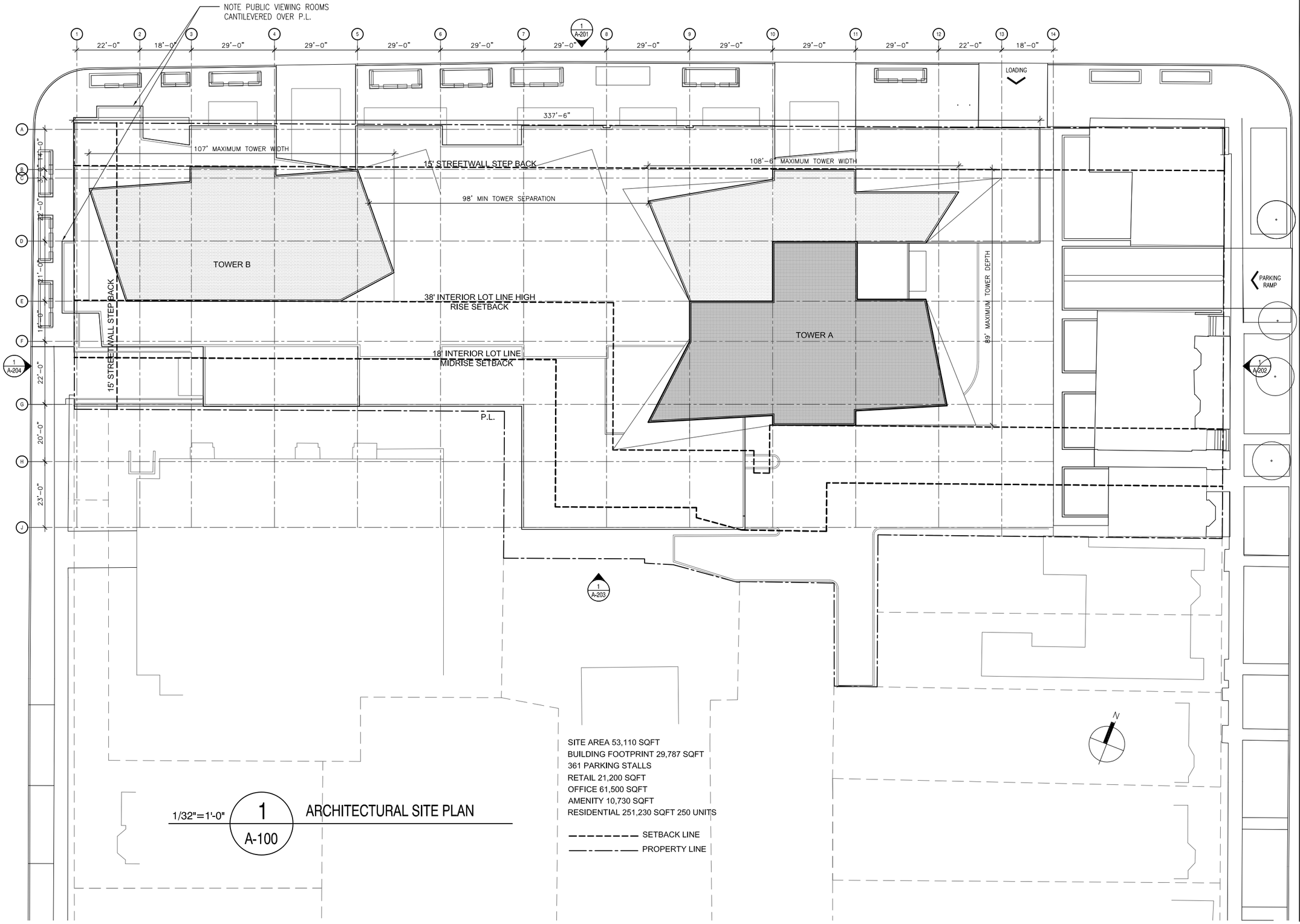
A-000



1/32"=1'-0" 1 A-100 ARCHITECTURAL SITE PLAN

EKISTICS PLANNING & DESIGN

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CLIENT

DEXEL DEVELOPMENTS INC.

SCALE	DATE	
1/32"=1'-0"	2016.08.18	
DRAWN BY	CHECKED	REVIEWED
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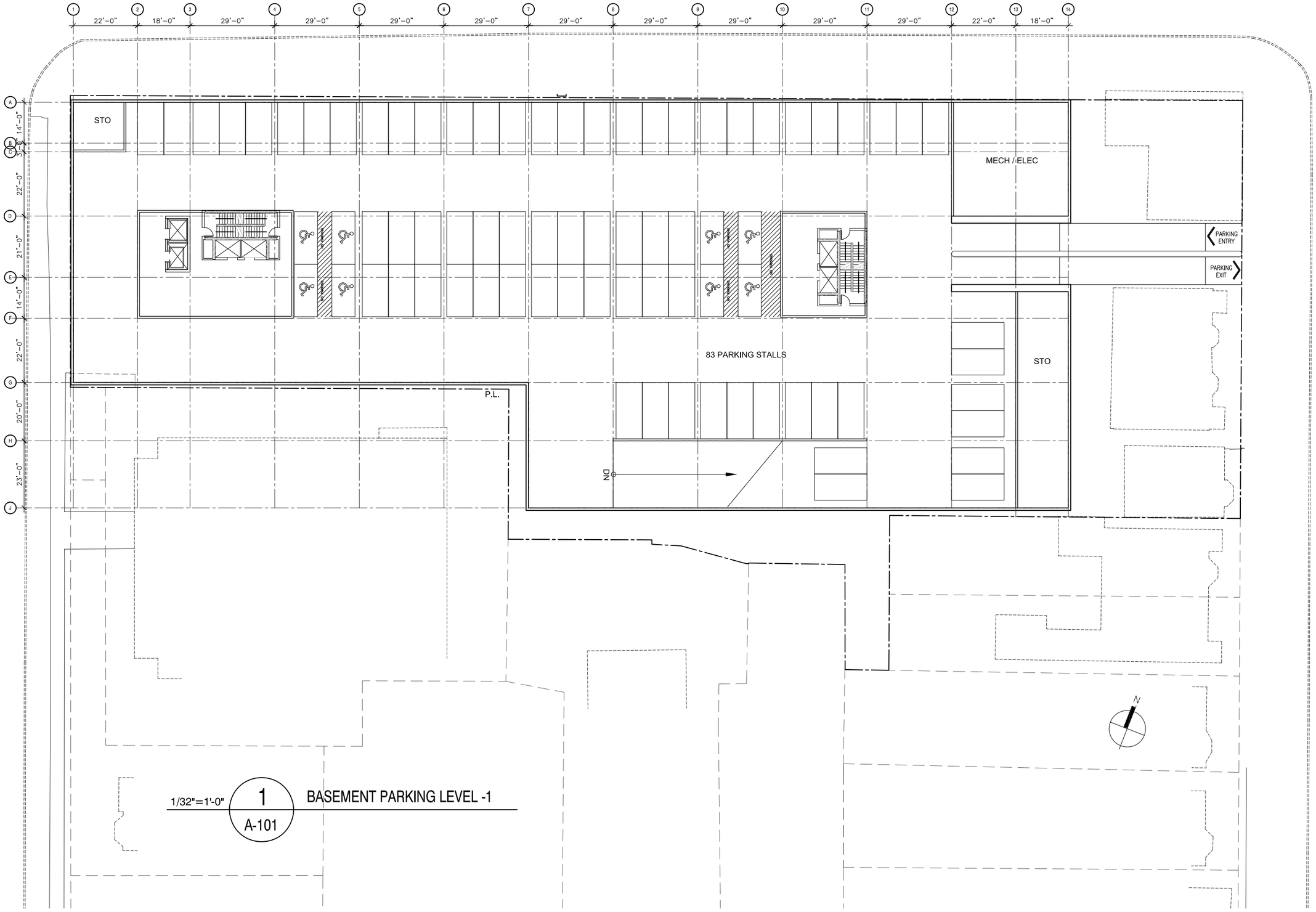
ARCH_SITE_PLAN

DRAWING NO.

A-100



1/32"=1'-0" 1 A-101 BASEMENT PARKING LEVEL -1

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CLIENT

DEXEL DEVELOPMENTS INC.

SCALE	DATE	
1/32"=1'-0"	2016.08.18	
DRAWN BY	CHECKED	REVIEWED
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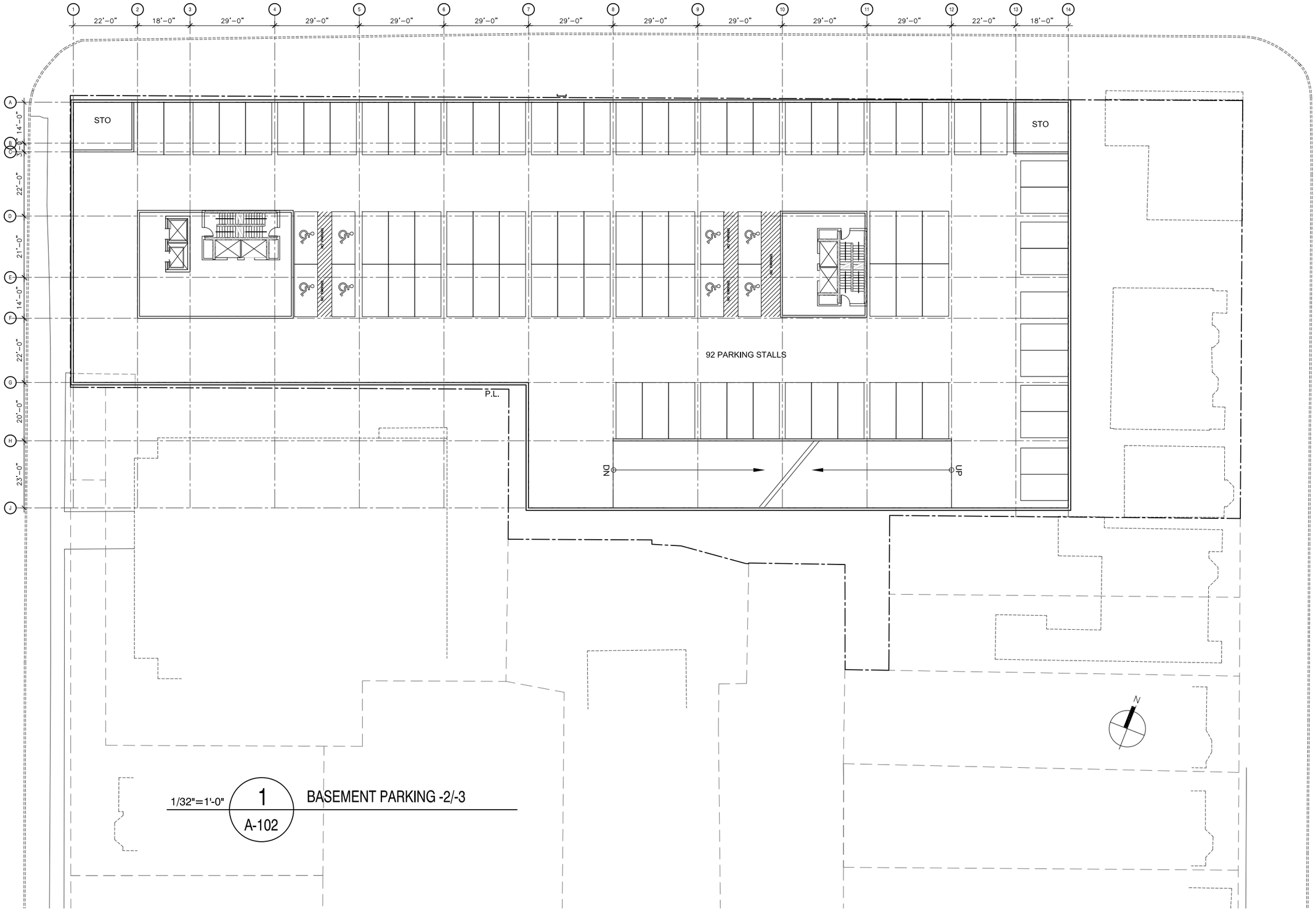
-01_PARKING_LEVEL

DRAWING NO.

A-101



1/32"=1'-0" 1 A-102 BASEMENT PARKING -2/-3

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CLIENT

DEXEL DEVELOPMENTS INC.

SCALE	DATE	
1/32"=1'-0"	2016.08.18	
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CC		

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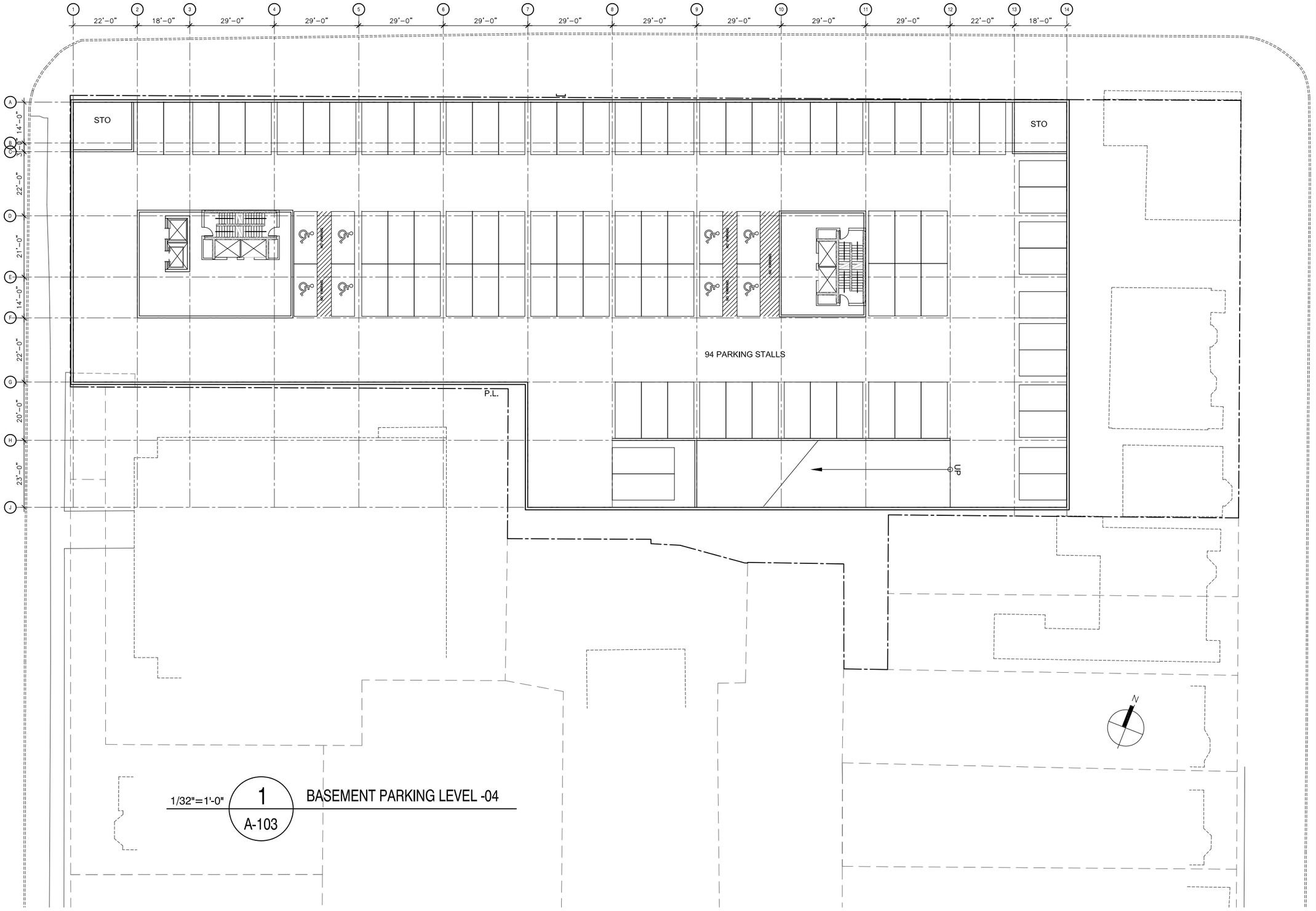
-02_-03_PARKING_LEVEL

DRAWING NO.

A-102



1/32"=1'-0" 1 A-103 BASEMENT PARKING LEVEL -04

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CLIENT

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1/32"=1'-0"	2016.08.18	
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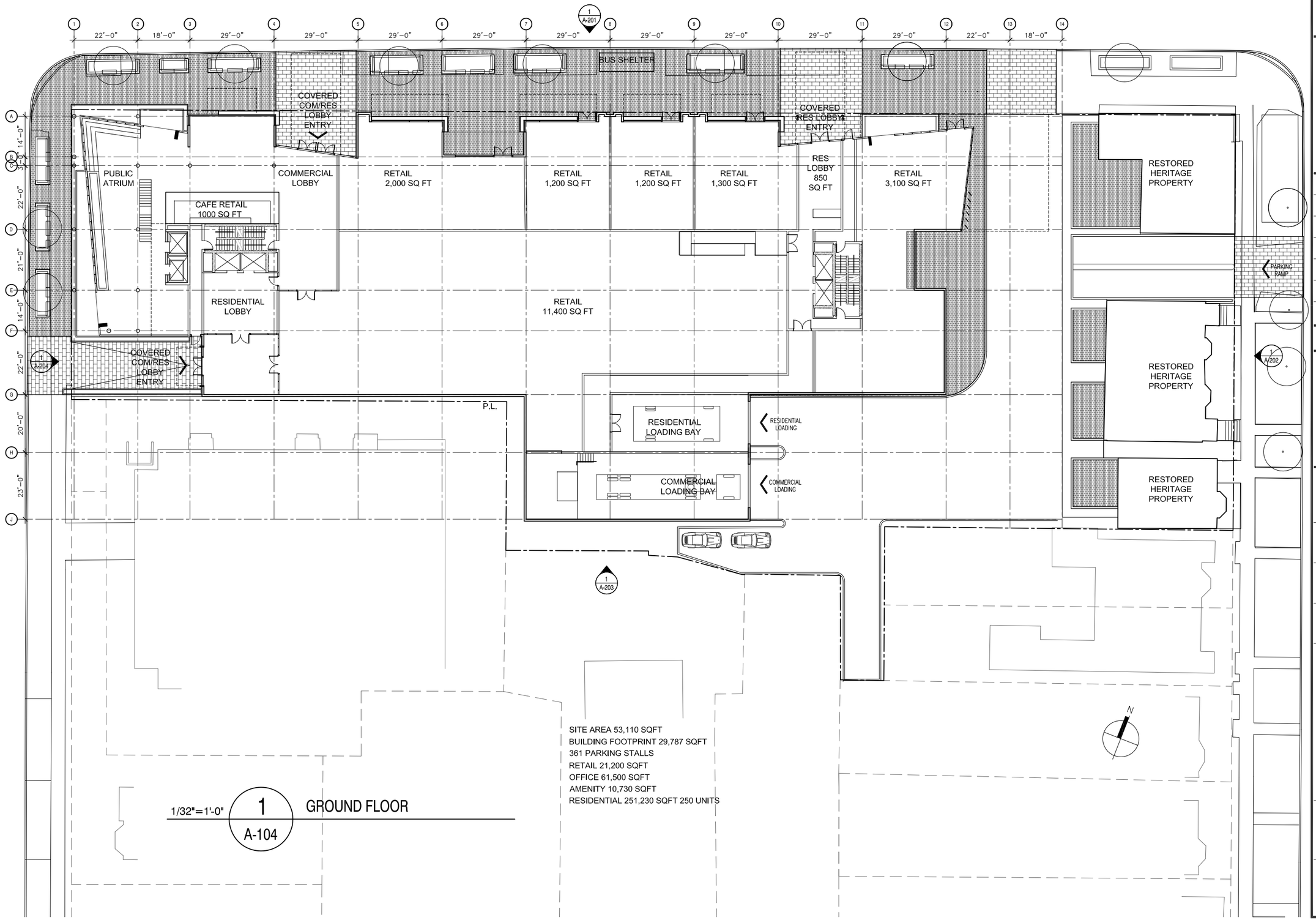
-04_PARKING_LEVEL

DRAWING NO.

A-103



SITE AREA 53,110 SQFT
BUILDING FOOTPRINT 29,787 SQFT
361 PARKING STALLS
RETAIL 21,200 SQFT
OFFICE 61,500 SQFT
AMENITY 10,730 SQFT
RESIDENTIAL 251,230 SQFT 250 UNITS

1/32"=1'-0" 1 A-104 GROUND FLOOR

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DEXEL DEVELOPMENTS INC.

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DRAWN BY	CHECKED	REVIEWED
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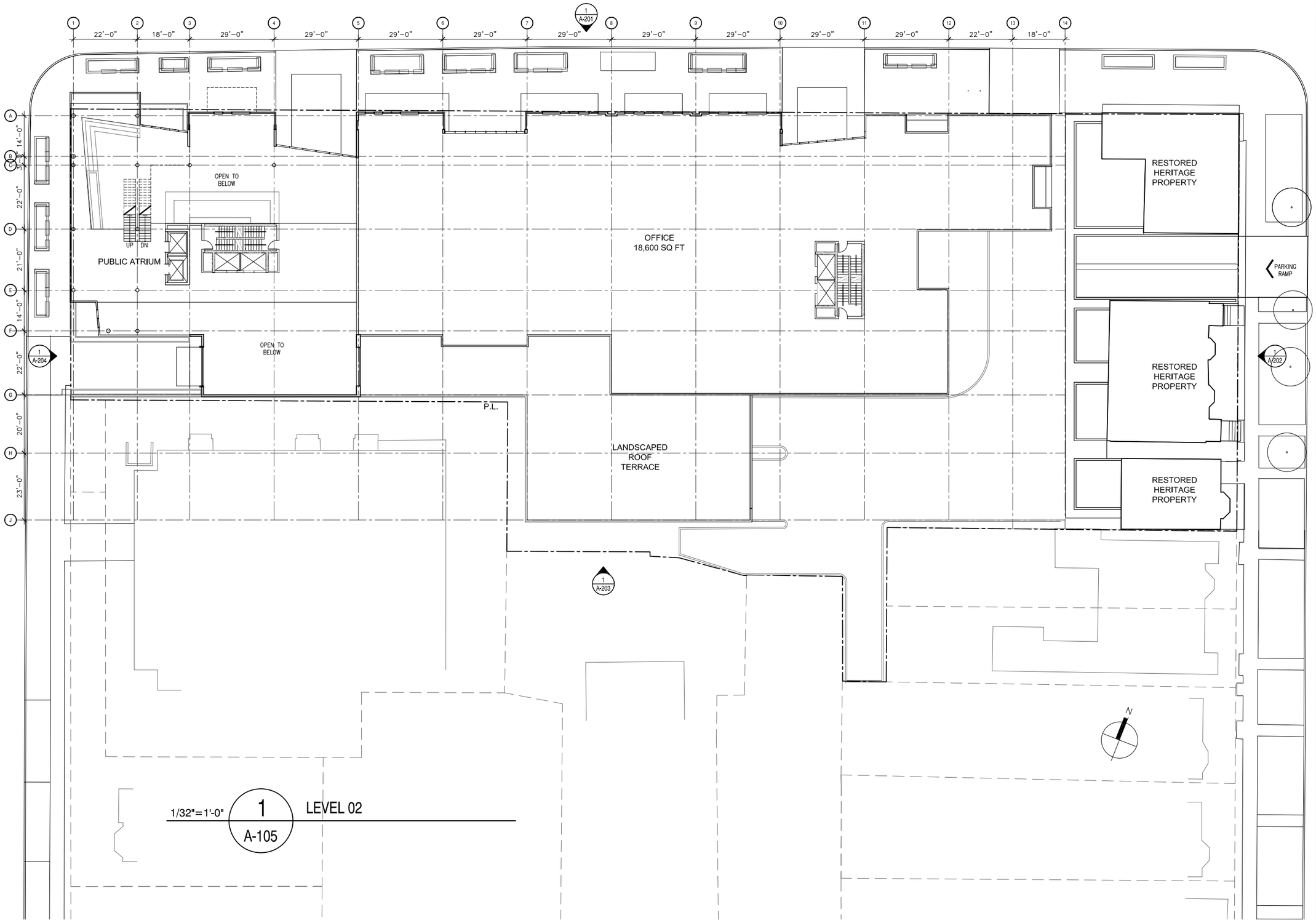
DRAWING
GROUND_FLOOR

DRAWING NO.
A-104



1/32"=1'-0" 1 A-105 LEVEL 02

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SEAL

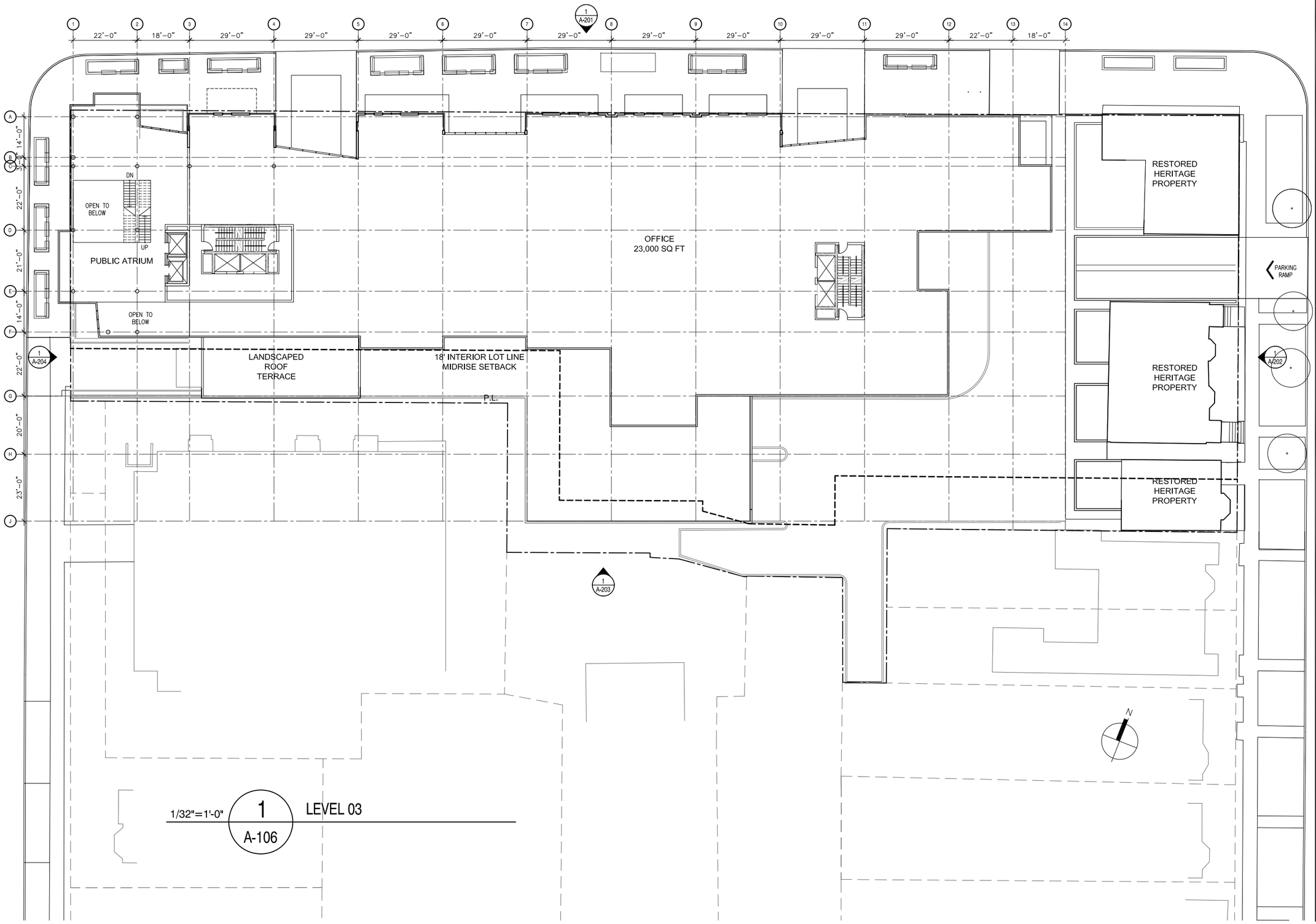
NOT FOR CONSTRUCTION

DRAWING

LEVEL_02

DRAWING NO.

A-105



1/32"=1'-0" 1 A-106 LEVEL 03

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CLIENT

DEXEL DEVELOPMENTS INC.

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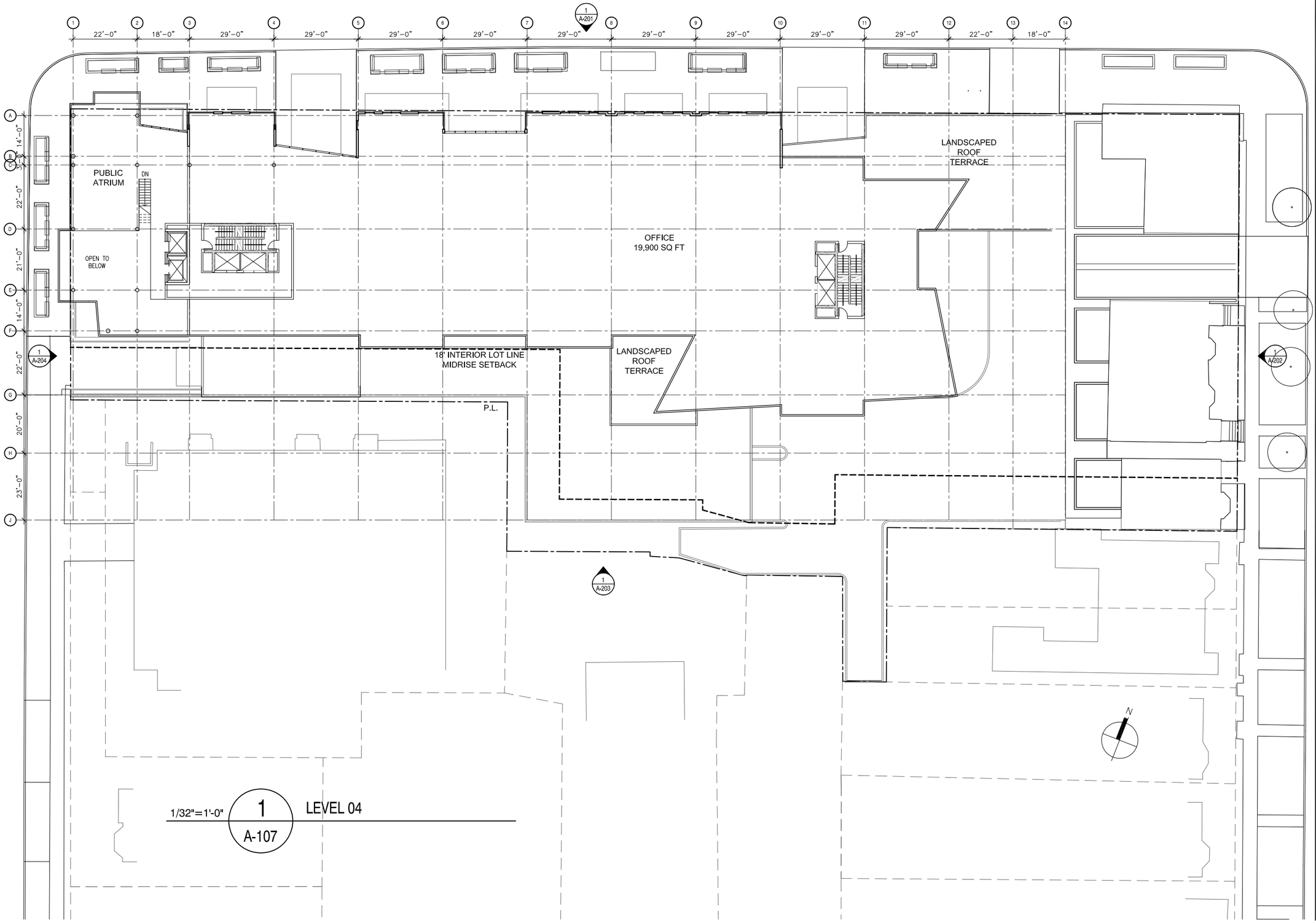
NOT FOR CONSTRUCTION

DRAWING

LEVEL_03

DRAWING NO.

A-106



1/32"=1'-0" 1 A-107 LEVEL 04

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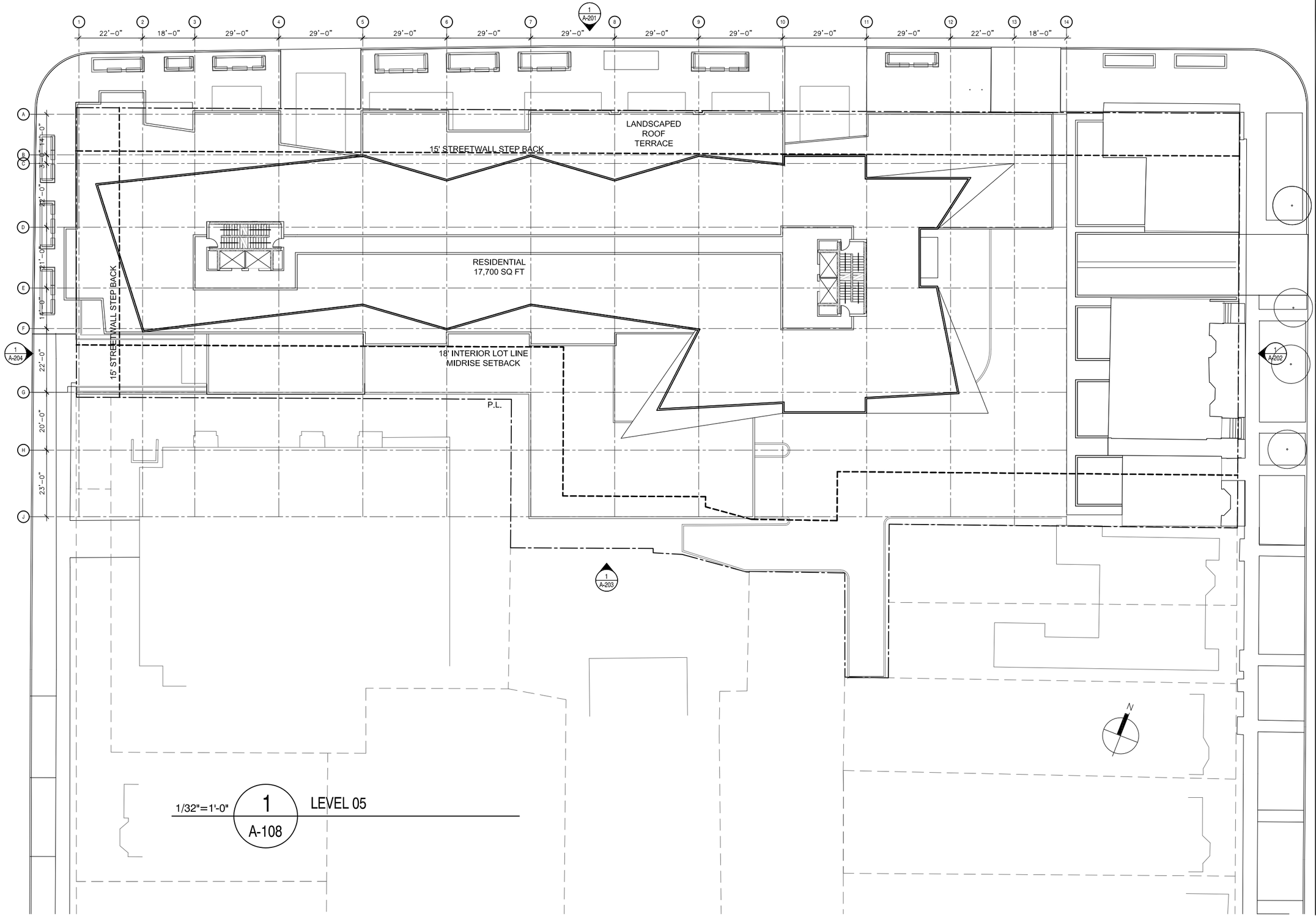
DRAWING

LEVEL_04

DRAWING NO.

A-107



1/32"=1'-0" 1 A-108 LEVEL 05

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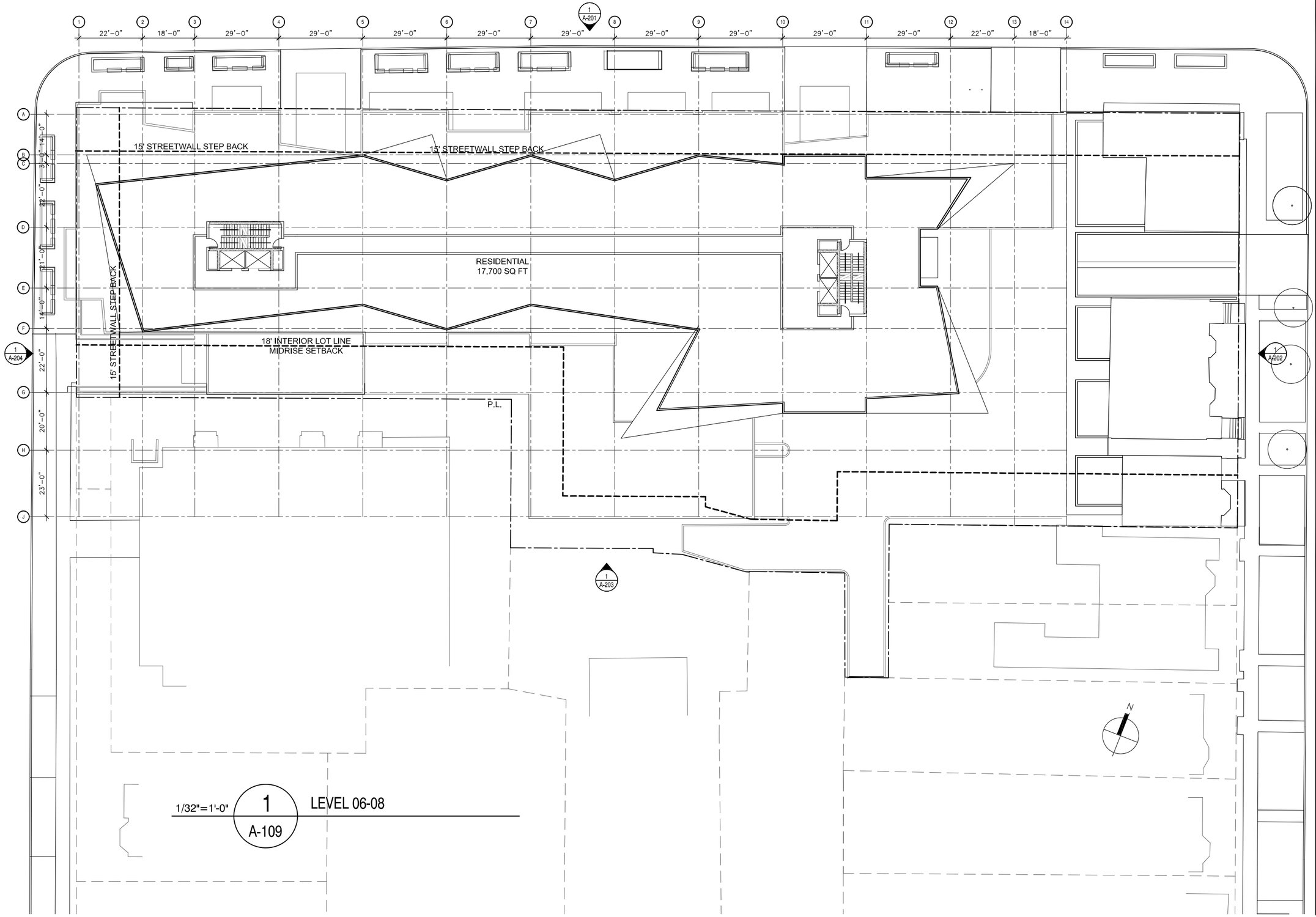
NOT FOR CONSTRUCTION

DRAWING

LEVEL_05

DRAWING NO.

A-108



1/32"=1'-0" 1 A-109 LEVEL 06-08

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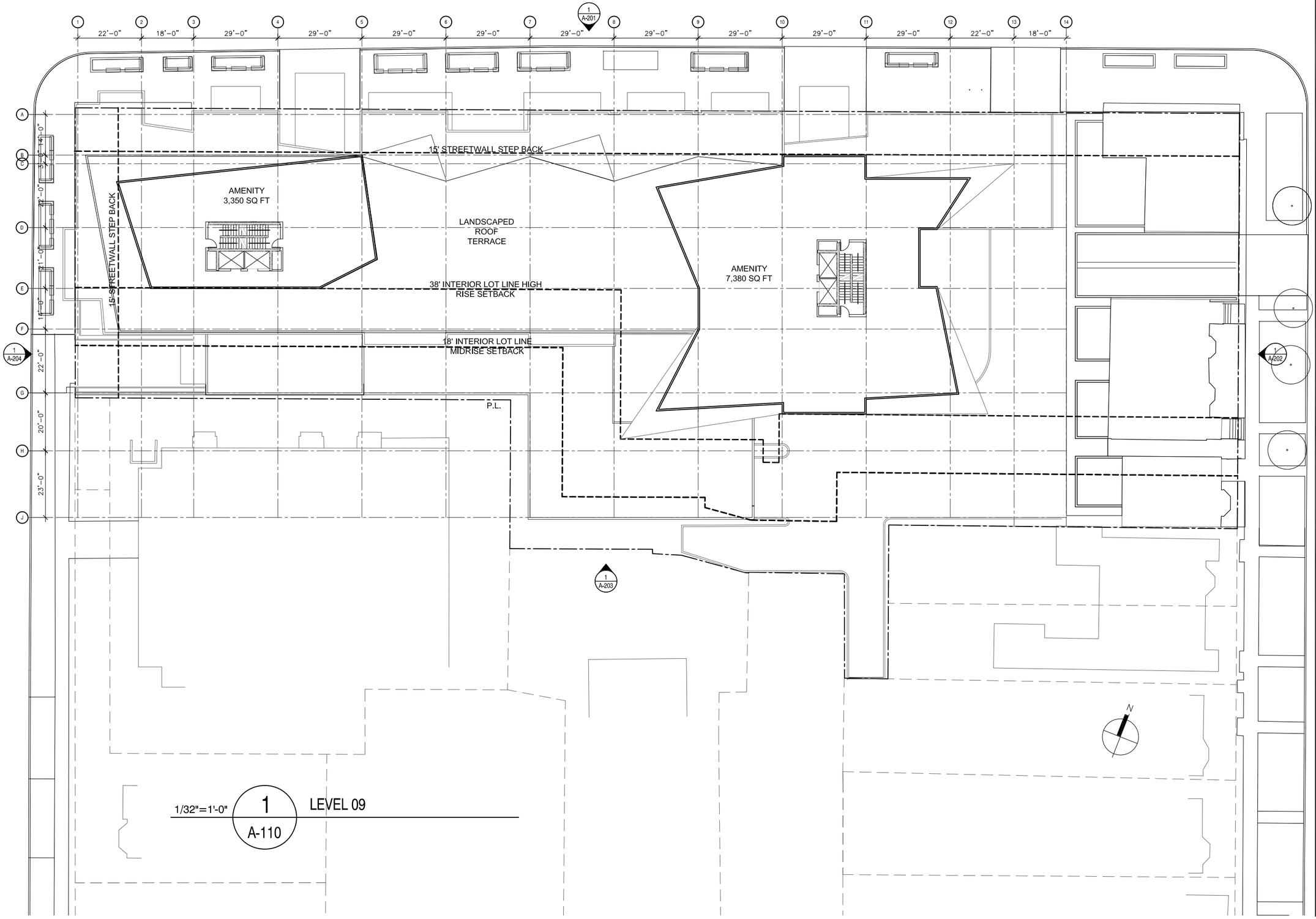
LEVEL_6-8

DRAWING NO.

A-109



1/32"=1'-0" 1 A-110 LEVEL 09

EKISTICS PLANNING & DESIGN

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CLIENT

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SCALE	DATE
1/32"=1'-0"	2016.08.18

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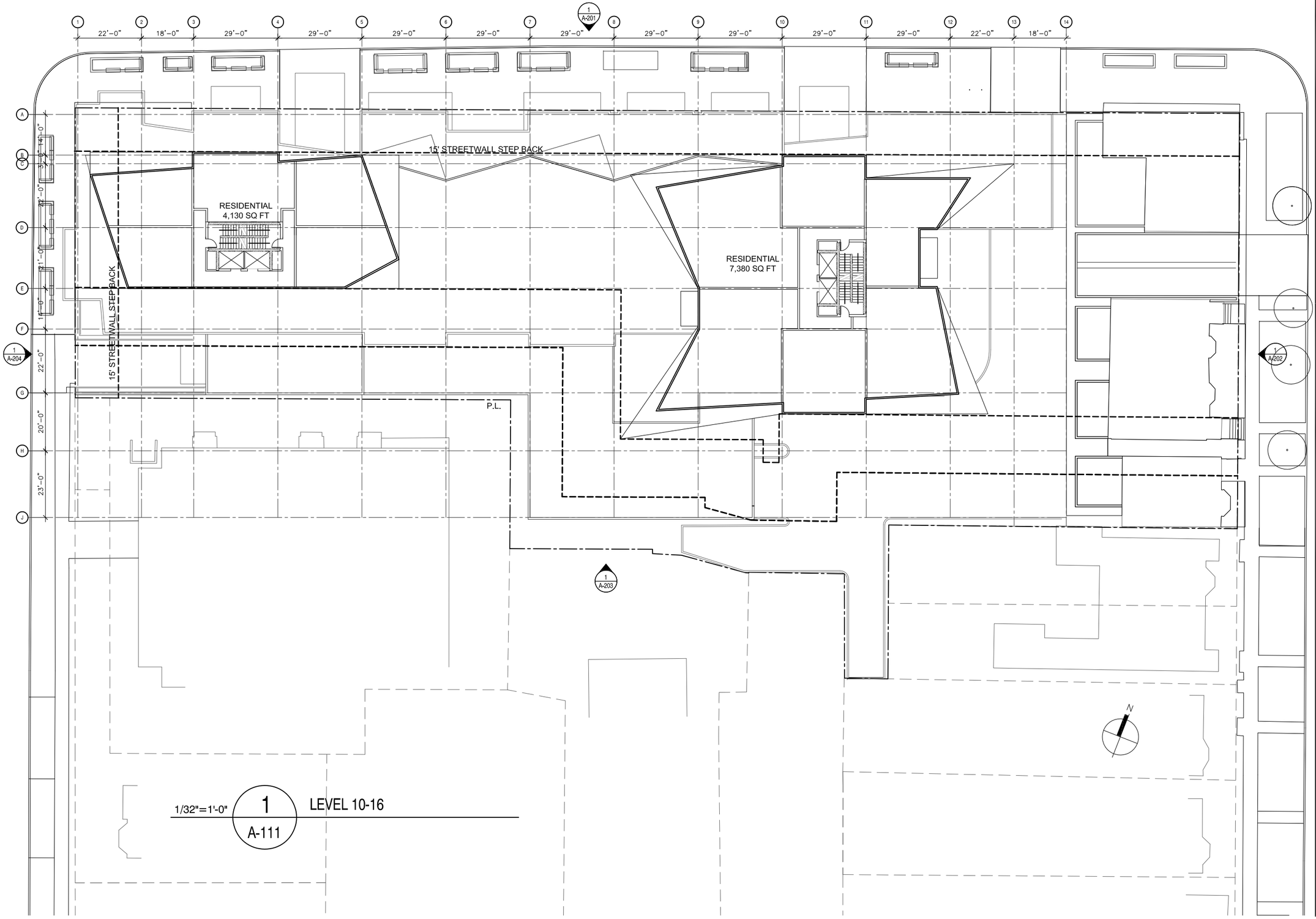
DRAWING

LEVEL_9

DRAWING NO.

A-110



1/32"=1'-0" 1 A-111 LEVEL 10-16

EKISTICS PLANNING & DESIGN

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CLIENT

DEXEL DEVELOPMENTS INC.

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1/32"=1'-0"	2016.08.18	
DRAWN BY	CHECKED	REVIEWED
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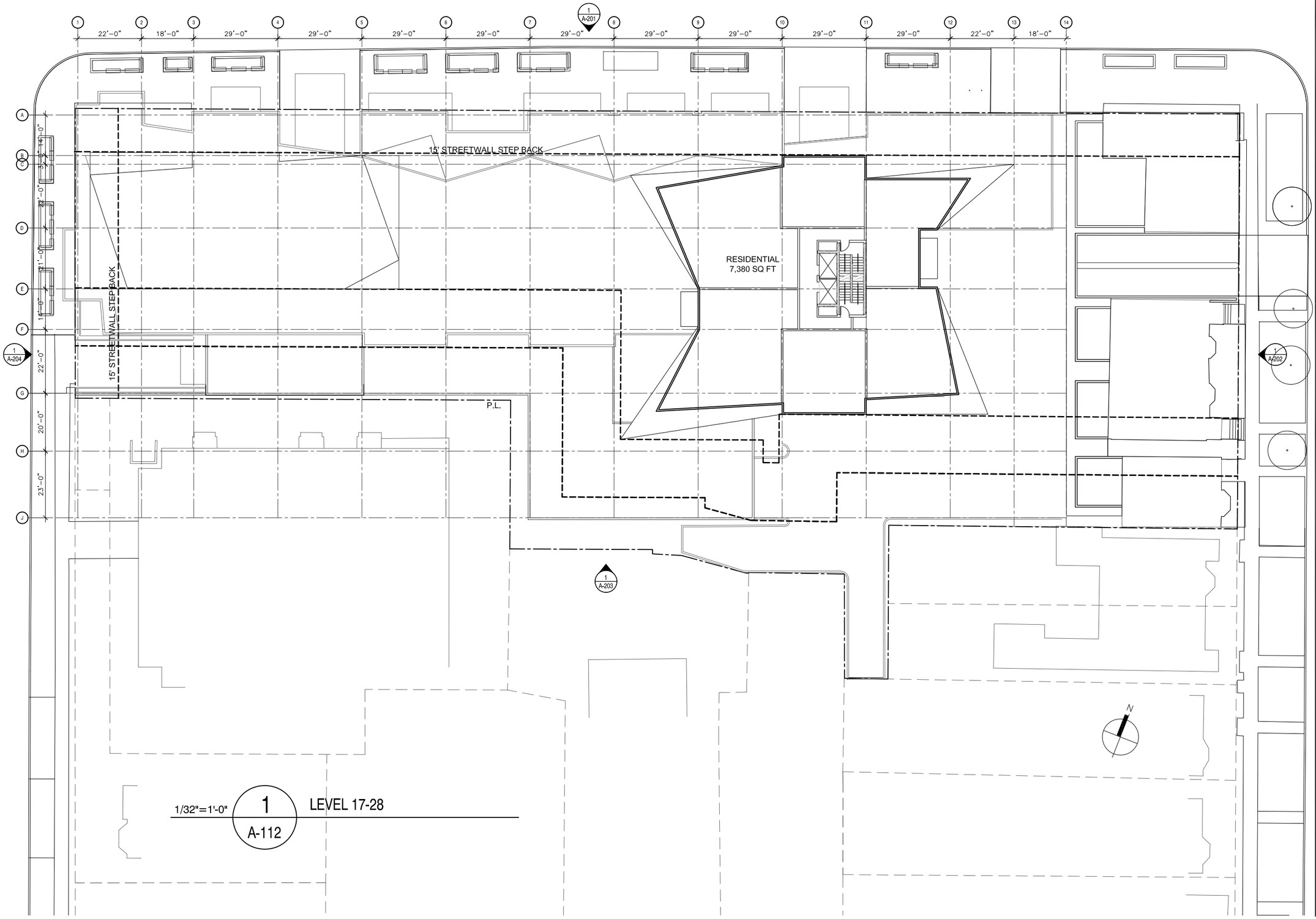
LEVEL_10-16

DRAWING NO.

A-111



1/32"=1'-0" 1 A-112 LEVEL 17-28

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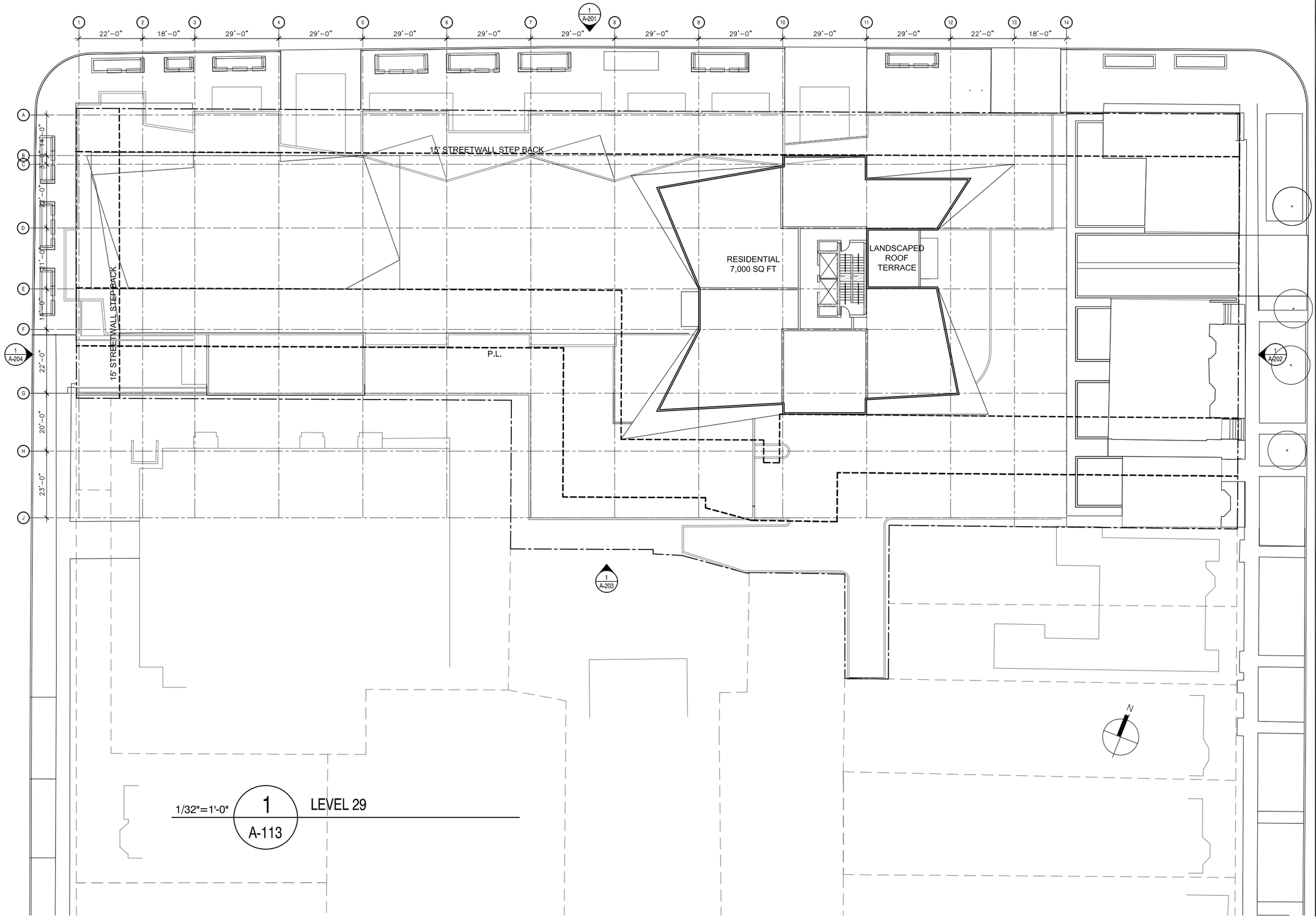
LEVEL_17-28

DRAWING NO.

A-112



1/32"=1'-0" 1 A-113 LEVEL 29

EKISTICS PLANNING & DESIGN

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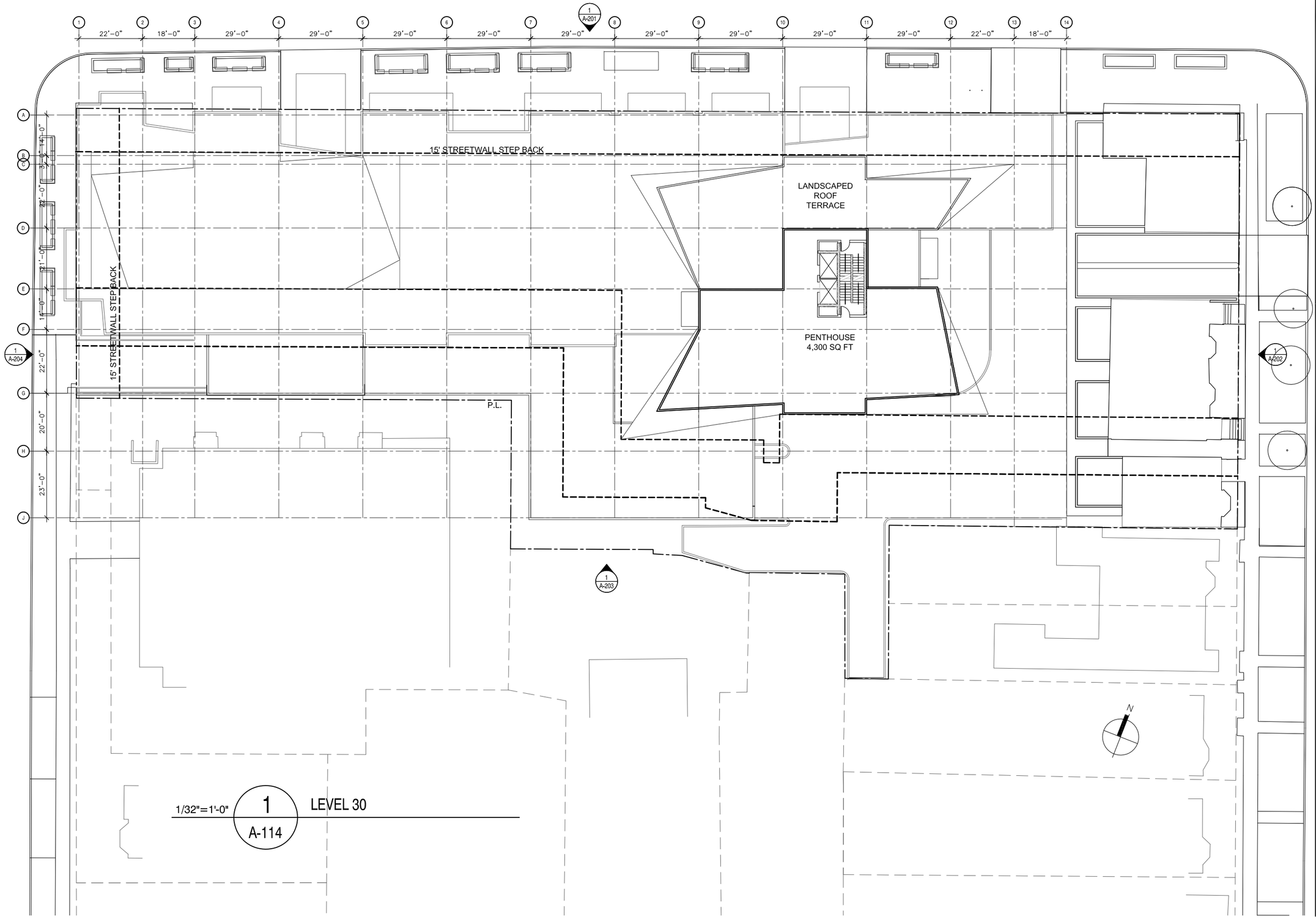
DRAWING

LEVEL_29

DRAWING NO.

A-113



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DEXEL DEVELOPMENTS INC.

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1/32"=1'-0"	2016.08.18	
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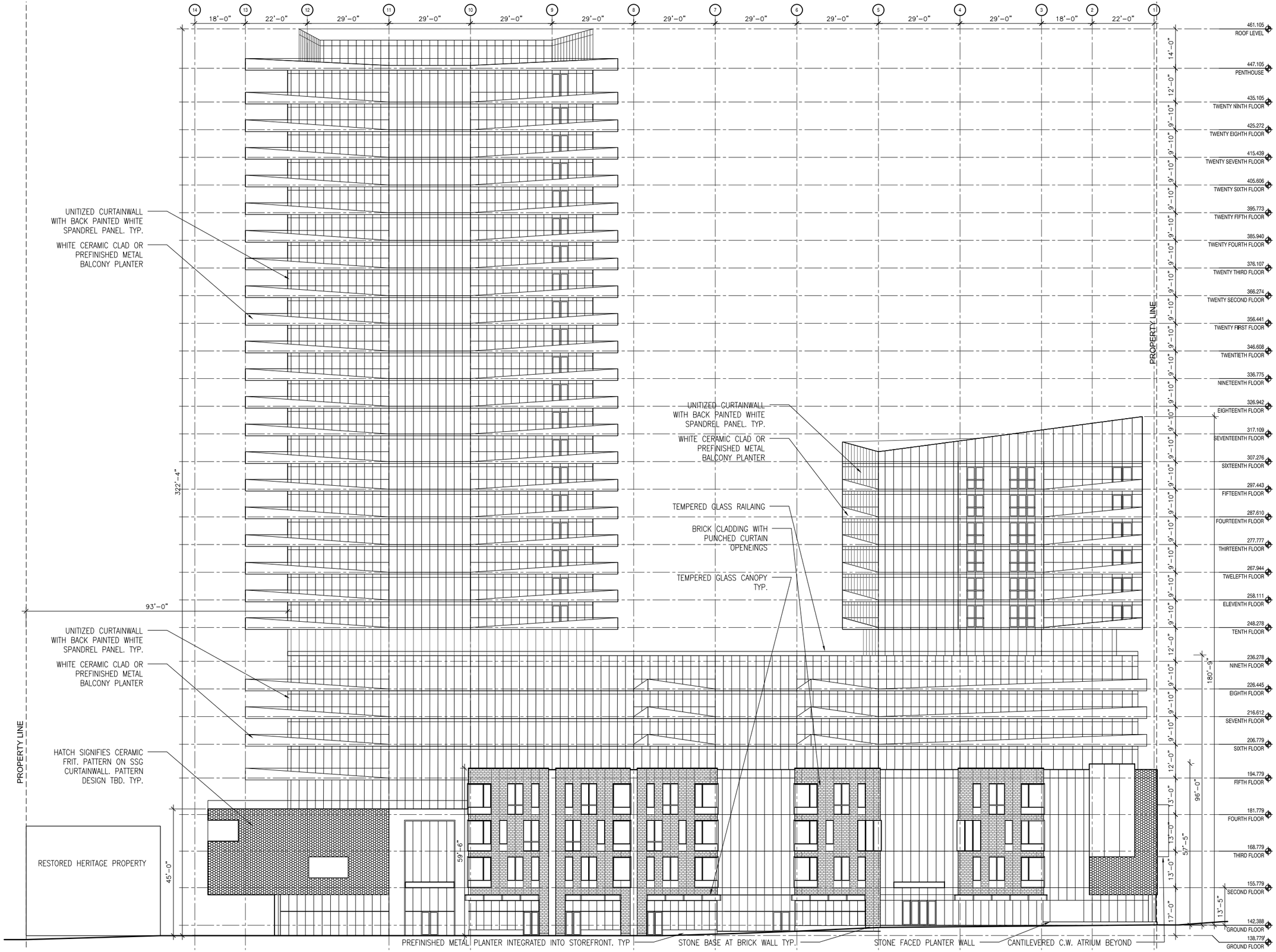
DRAWING

LEVEL_30

DRAWING NO.

A-114



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1/32"=1'-0"	2016.08.18	
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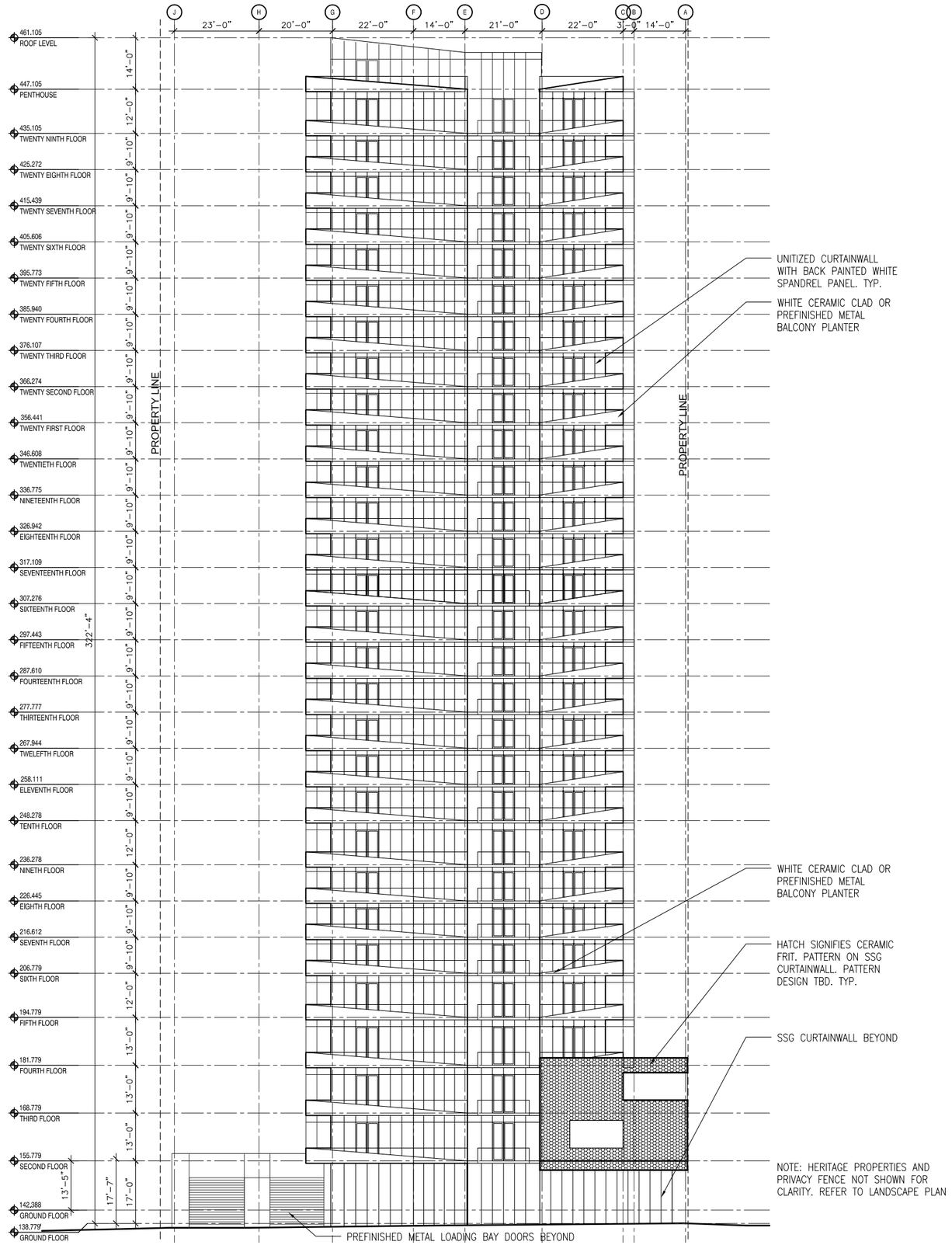
NORTH_ELEVATION

DRAWING NO.

A-201



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DEXEL DEVELOPMENTS INC.

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CC		

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SEAL

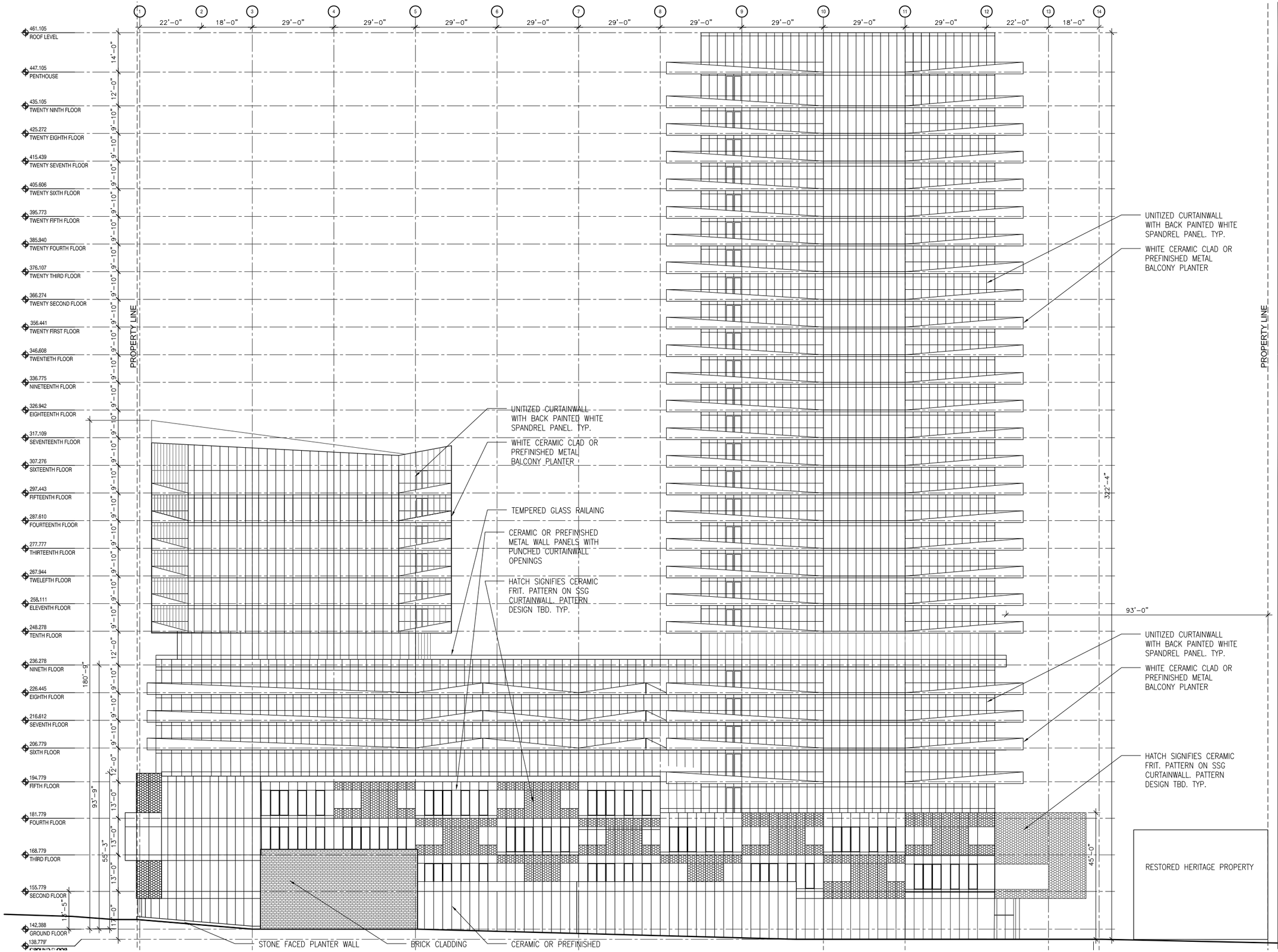
NOT FOR CONSTRUCTION

DRAWING

EAST_ELEVATION

DRAWING NO.

A-202



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CLIENT

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DRAWN BY	CHECKED	REVIEWED
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SEAL

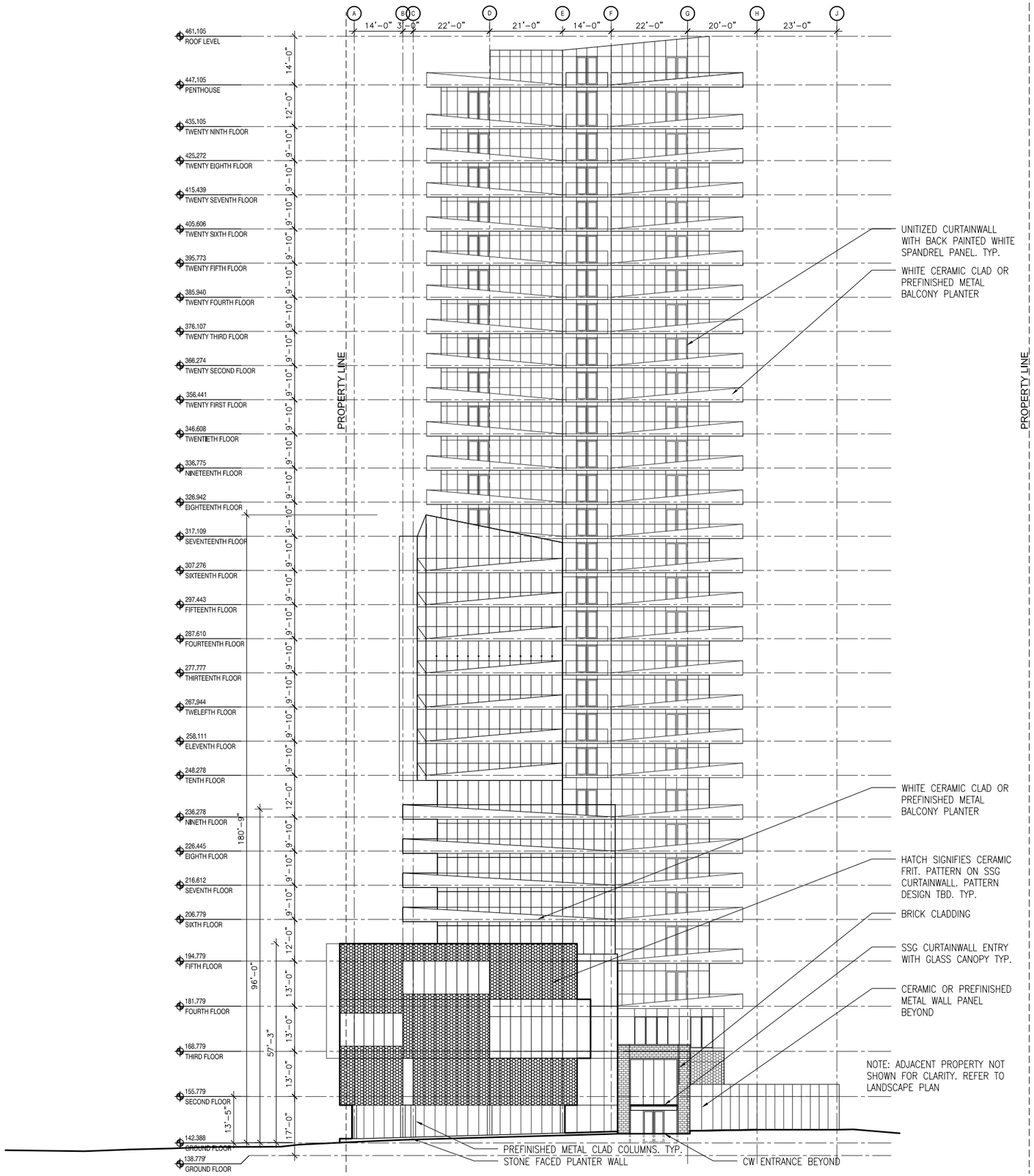
NOT FOR CONSTRUCTION

DRAWING

SOUTH_ELEVATION

DRAWING NO.

A-203



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SEAL

NOT FOR CONSTRUCTION

DRAWING

WEST_ELEVATION

DRAWING NO.

A-204

EKISTICS PLANNING & DESIGN

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DRAWING

PERSPECTIVE_NORTH

DRAWING NO.

A-600

EKISTICS PLANNING & DESIGN

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DRAWING

PERSPECTIVE_SOUTH

DRAWING NO.

A-601

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DEXEL DEVELOPMENTS INC.

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NOT FOR CONSTRUCTION

DRAWING

SPRING_GARDEN_ROAD VIEW_LOOKING_WEST

DRAWING NO.

A-602

EKISTICS PLANNING & DESIGN

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ROBIE_STREET VIEW_LOOKING_SOUTH

DRAWING NO.

A-603

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NOT FOR CONSTRUCTION

DRAWING

SPRING_GARDEN_STREETSCAPE

DRAWING NO.

A-604

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DEXEL DEVELOPMENTS INC.

SCALE	DATE	
NTS	2016.08.18	
DRAWN BY	CHECKED	REVIEWED
CC		

APPROVED

CC

SEAL

NOT FOR CONSTRUCTION

DRAWING

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DRAWING NO.

A-605

EKISTICS PLANNING & DESIGN

KEY PLAN

03	ISSUE FOR DA PRE APP	2016.08.18
02	ISSUE FOR DA REVIEW	2016.07.28
01	ISSUE FOR REVIEW	2016.03.30

REVISIONS DATE

PROJECT

SPRING GARDEN ROAD AND CARLTON STREET DEVELOPMENT

DEVELOPMENT AGREEMENT PLANNING APPLICATION

CLIENT

DEXEL DEVELOPMENTS INC.

SCALE	DATE	
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SGR_STREETSCAPE

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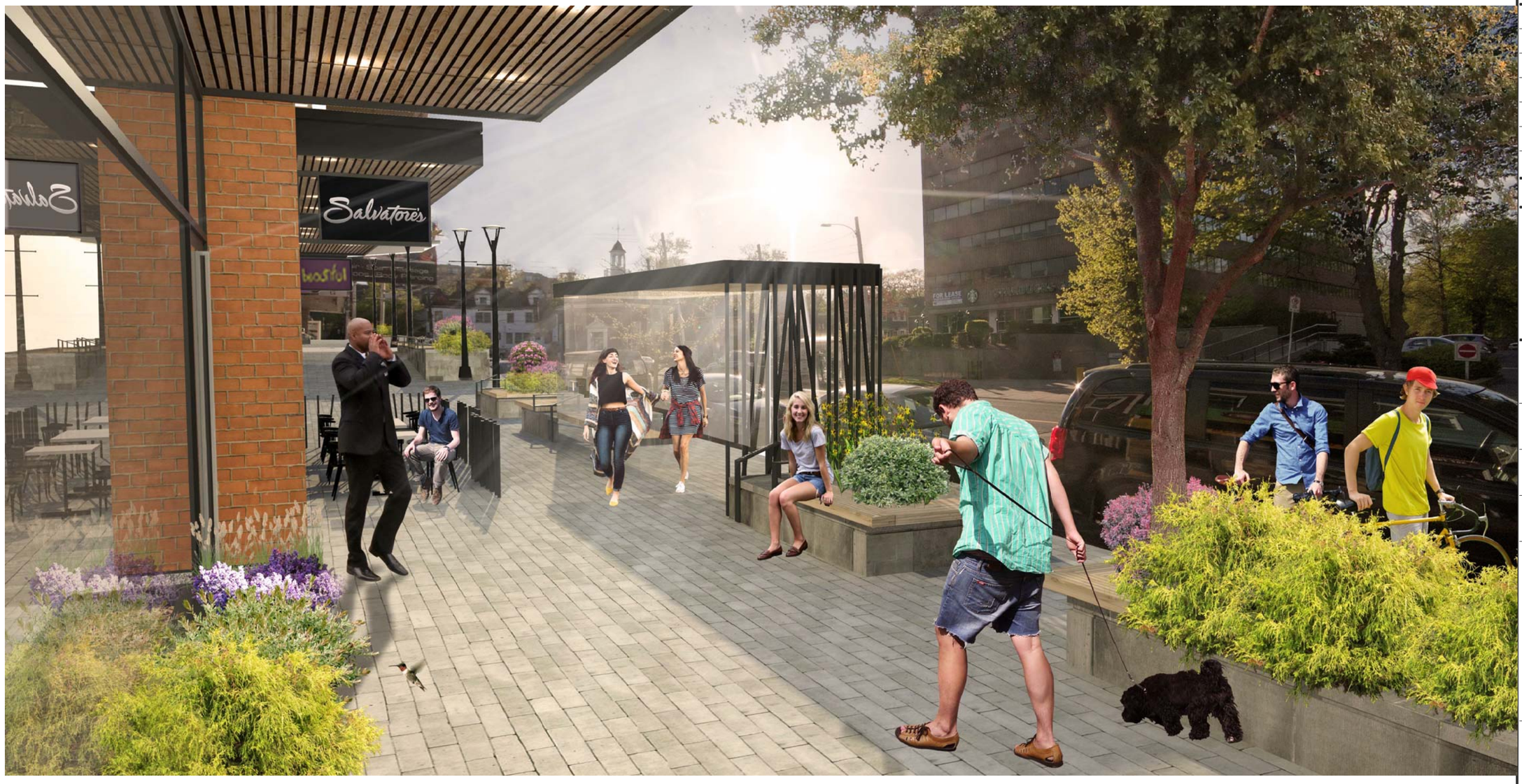

EKISTICS PLANNING & DESIGN

KEY PLAN

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SGR_STREETSCAPE

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02	ISSUE FOR DA REVIEW	2016.07.28
01	ISSUE FOR REVIEW	2016.03.30
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ROBIE_STREETSCAPE

DRAWING NO.

A-609

SPRING GARDEN ROAD

CONCRETE UNIT PAVERS PATTERN 'A'
RAISED PLANTER WITH SEATING
LIGHT STANDARD
RAISED PLANTER WITH SEATING
RAISED PLANTER WITH SEATING
LIGHT STANDARD
RAISED PLANTER WITH SEATING
CONCRETE UNIT PAVERS PATTERN 'A'
NEW BUS SHELTER LOCATION
LIGHT STANDARD
RAISED PLANTER WITH SEATING
CONCRETE UNIT PAVERS PATTERN 'B'
RAISED PLANTER WITH SEATING
CONCRETE UNIT PAVERS PATTERN 'B'
CONCRETE UNIT PAVERS PATTERN 'A'
LIGHT STANDARD
RAISED PLANTER
REINSTATE PEDESTRIAN RAMP TO HRM AS NECESSARY

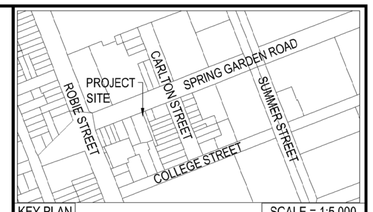
CONCRETE UNIT PAVERS PATTERN 'A'
RAISED PLANTER WITH SEATING
CONCRETE UNIT PAVERS PATTERN 'B'

COVERED COMMRES LOBBY ENTRY
COVERED RES LOBBY ENTRY
SHARED DRIVE
BIKE RACKS
PRIVACY SCREEN
PRIVATE TERRACE
RESTORED HERITAGE BUILDING
SOD
CONCRETE UNIT PAVERS PATTERN 'A'
PARKING RAMP
CONCRETE UNIT PAVERS PATTERN 'B'
EXISTING TREES TO REMAIN AND BE PROTECTED
EXISTING SIDEWALK TO BE REINSTATED AS NECESSARY

PROPOSED BUILDING

RESIDENTIAL LOADING
COMMERCIAL LOADING
RAISED CURB
FENCE
2 PARKING STALLS FOR EXISTING RESIDENCE
1 PARKING STALL FOR EXISTING RESIDENCE

ROBIE STREET
CARLETON STREET



KEY PLAN | SCALE = 1:5,000

LEGEND:
- PROPERTY LINE
- EXISTING FENCE
- HRM APPROVED STREET TREE (DECIDUOUS)
- EXISTING TREE TO PRESERVE AND PROTECT
- HRM APPROVED LIGHT STANDARD
- BIKE RACK (2 BIKES PER)
- BENCH
- PLANTING BED WITH SHRUBS AND/OR PERENNIALS
- SOD
- UNIT PAVER PATTERN 'A'
- UNIT PAVER PATTERN 'B'

NO.	DESCRIPTION	DATE
2	ISSUE FOR DA APP	2016.08.17
1	~~ISSUED FOR CLIENT REVIEW~~	~~2016.08.05~~

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1 Starr Lane, Dartmouth, NS B2Y 4V7
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Landscape Architecture | Engineering

0 5 10
1:250

CLIENT
DEXEL DEVELOPMENTS INC.

PROJECT
SPRING GARDEN ROAD AND CARLTON STREET
DEVELOPMENT AGREEMENT PLANNING APPLICATION
HALIFAX, NOVA SCOTIA

SHEET DESCRIPTION
SITE PLAN

SCALE	DATE	SHEET
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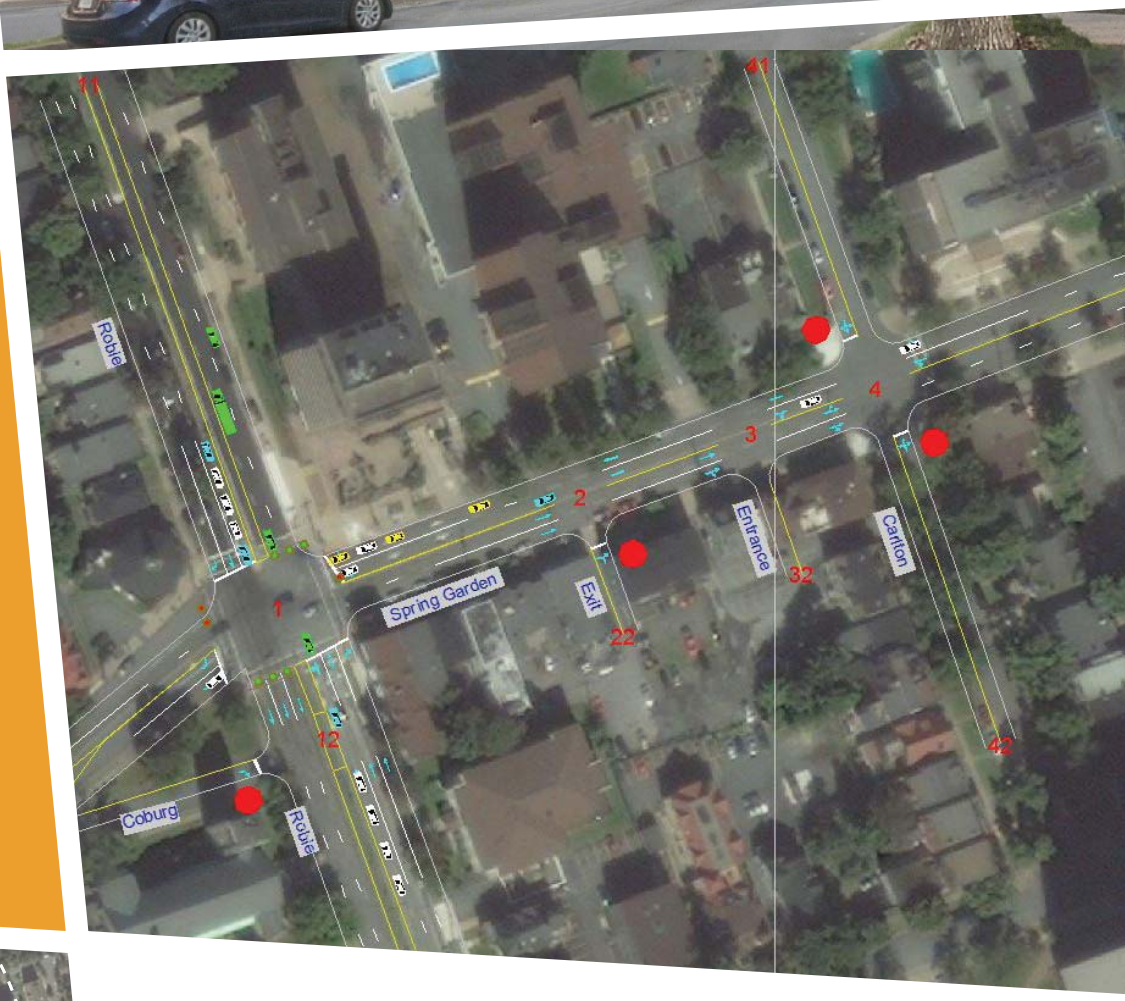
August 29, 2016

DATE:2016/08/29 - FILE: \\SERVER2012\2Cadd\w projects\DEXEL SPRING GARDEN CARLTON\Landscape\Admin\CAD\LANDSCAPE LAYOUT.dwg



Transportation Impact Study

For DEXEL Developments - Spring Garden Road between Robie Street and Carlton Street

August 2016

Submitted by:
Ekistics Planning & Design

1 Starr Lane,
Dartmouth, NS, B2Y-4V7
ph: 902.461.2525

EKISTICS PLANNING & DESIGN

EKISTICS PLANNING & DESIGN

TABLE OF CONTENTS

APPENDICIES

1. INTRODUCTION

This Transportation Impact Study follows HRM's Guidelines for the Preparation of Transportation Impact Studies, 8th Edition and general Traffic and Transportation Engineering principles for such studies. It is intended to address the transportation impacts that may be expected on the road and active transportation networks resulting from the:

HRM: Transportation Impact Studies are prepared to ensure developments are consistent with the objectives and policies of the Municipal Planning Strategies / Municipal Development Plans and the Regional Plan

- Construction of a 30 story residential condominium development as described in the table below:

Proposed Development	Spring Garden Road, Halifax, Nova Scotia
Owner	DEXEL Developments
Location	South of Spring Garden Road between Robie Street and Carlton Street
Building Details	250 Residential Units 21,200 ft^2 Retail Space 61,500 Office Space 10,730 ft^2 Amenity
Parking	361 Car Spaces, Bicycle Spaces

Table 1-1: Project Summary

Figure 1-1: Building Rendering

2. EXISTING CONDITIONS

2.1 Study Area

The Study Areas is defined by the area (roads, intersections and AT network) that may be reasonably expected to be impacted by the proposed development.

The proposed building is located south of Spring Garden Road and between Robie Street and Carlton Street as shown by the yellow rectangle in the figure below. The primary study area for this analysis extends to the limits shown by the blue area, and generally includes Spring Garden Road and the adjacent intersections.

The area is characterized by a number of mid- and high-rise residential buildings on the north side of Spring Garden Road and south of the development, smaller roadside commercial and retail shops on the south side of Spring Garden, and residential neighbourhoods to the east and west of the site.

Figure 2-1: Study Area

2.2 Roadways

The following sections provide a brief summary of each of the key roadways in the study area that are relevant to this study.

Robie Street	Robie Street is classified as an urban arterial roadway and consists of 3 lanes in the northbound and southbound directions separated by a grassed median. There are sidewalks on both sides of the roadway and access to various driveways in the vicinity of Spring Garden Road. At Spring Garden, each approach on Robie Street includes a dedicated right turn lane, through lane, and a shared through/right lane. 
Spring Garden Road	Spring Garden Road is a four lane undivided urban collector with sidewalks on both sides of the roadway. It has numerous driveways to residential and commercial properties and includes parking and bus stop locations along the curb lane in both directions. A well-used midblock crosswalk is located immediately east of Carlton Street. 
Carlton Street	Carlton Street is a two-lane local roadway with parking and sidewalks along both sides of the road. The roadway provides access to various residential properties and small apartment complexes and is approximately 2 blocks in length between College Street and terminating at the Camp Hill Cemetery. 

2.3 Active Transportation (AT)

Peninsular Halifax has documented high cyclist and pedestrian activity (and other AT modes) and this study area is no exception with many local AT origins and destinations in the area. This includes the Halifax Commons, Halifax Public Gardens, Citadel Hill, the Spring Garden commercial corridor, universities, hospitals and more.

As a result, accommodating AT movements past/through the site, as well as connectivity to existing routes, is an important consideration for this development. The majority of routes and intersection crossings are already in place for this development and access points for the development easily connect to existing sidewalk infrastructure. AT elements that should be carefully considered as design progresses:

- Connectivity across Spring Garden Road at the existing signalized (RA-5) cross walk immediately east of Carlton Street. Volumes counts suggest that close to 100 pedestrian per hour cross this crosswalk and many of the adjacent crosswalks are heavily used. Therefore, detailed design should pay close attention to the movement of pedestrians to and from the development by maintaining or enhancing access to the existing sidewalk network surrounding the building; and,
- Traffic counts showed that there is regular cyclist traffic through the area on Spring Garden Road and Carlton Street. Bike access to and from the building from Spring Garden Road is considered important though consideration should also be given to access from Carlton Street and at the rear of the building.

2.4 Vehicle Traffic

Recent and historical traffic counts were provided from HRM for all intersections in the study area and the counts were supplemented by one automated traffic counts carried out at the intersections of Spring Garden Road and Carlton Street (including the pedestrian cross walk). The baseline counts used in this analysis are provided in Appendix A of this report.

2.5 Transit

The existing Halifax Transit map shows approximately 20 bus routes that run in close proximity to the development including 5 directly past the development on Spring Garden Road and 13 along Summer Street. There are transit stops on both sides of Spring Garden Road included a stop directly in front of the proposed building, which makes this development highly accessible for transit use.

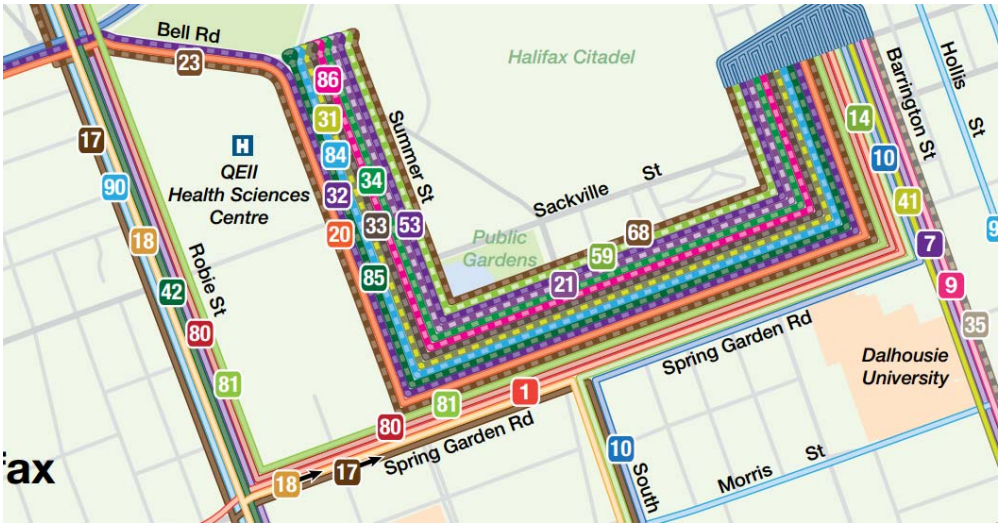


Figure 2-2:
Transit Routes

2.6 Truck Routes

Halifax's By-Law T-400 *Respecting the Establishm ent of Truck Routes for Certain Trucking Motor Vehicle s within the HRM* identifies Bell Road and Robie Street as **Full Time** truck routes (green). In addition, Spring Garden Road and South Park Street are defined as **Daylight** routes between the hours of 7 AM and 9 PM (blue). These routes provide more than adequate access to the new development.

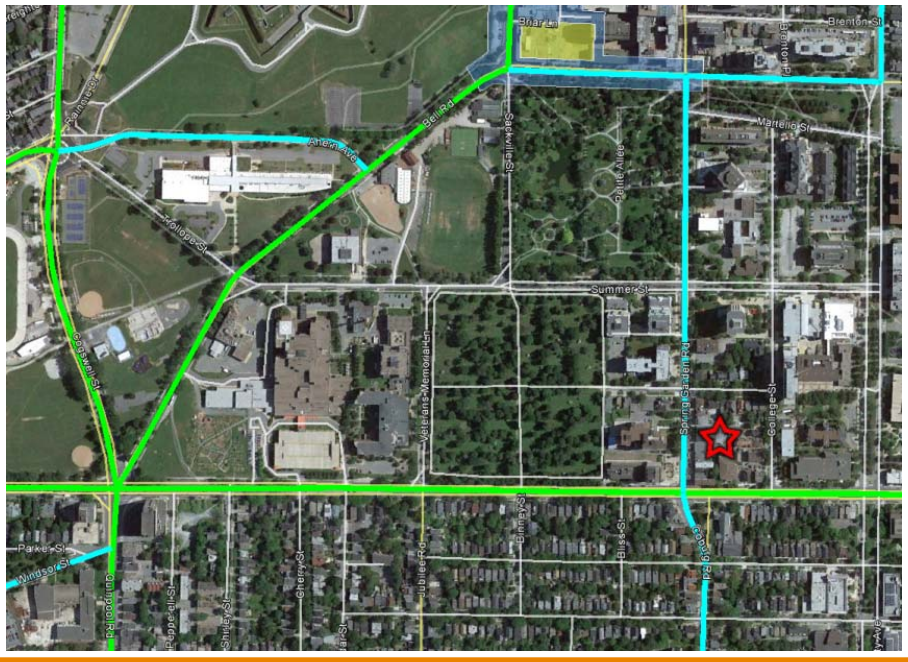


Figure 2-3:
Truck Routes

3. FUTURE CONDITIONS

3.1 Context

3.1.1 Analysis Time Horizon

Based on recommended HRM guidelines, the base year for this study has been established as 2016 and would typically address a 5-year time horizon (2021).

3.1.2 Background Traffic

Traditional background traffic growth rates used for traffic impact studies throughout HRM have been in the 1 – 2% range though actual growth is frequently less than this and even negative in some cases. Historical traffic counts along the Spring Garden Road corridor between 2008 and 2014 actually show a decrease in traffic over this period. For the purposes of this study, a 1% background traffic growth rate was considered reasonable and conservative.

3.1.3 Analysis Period

This area of Halifax is highly commuter oriented therefore, the weekday AM and PM peak hours are considered to be the critical periods for the analysis.

3.2 The Development Traffic

3.2.1 Trip Generation

The addition of new traffic related to the development is summarized in the table below and a more detailed summary of the trip generation rates are provided in Appendix B of this report.

Table 3-1: Trip Generation Table

	ITE Land Use Type	AM Peak			PM Peak		
		Enter	Exit	Total	Enter	Exit	Total
Apartments	ITE 222	15	45	60	43	27	70
Drug Store (or equivalent)	ITE 880	20	11	31	44	45	89
Restaurant	ITE 932	9	8	17	10	6	16
General Office	ITE 710	68	9	77	12	61	73
Internal Capture/Pass-by		0	0	0	-50	-50	-100
Total Volume to Adjacent Streets		112	73	185	59	89	148

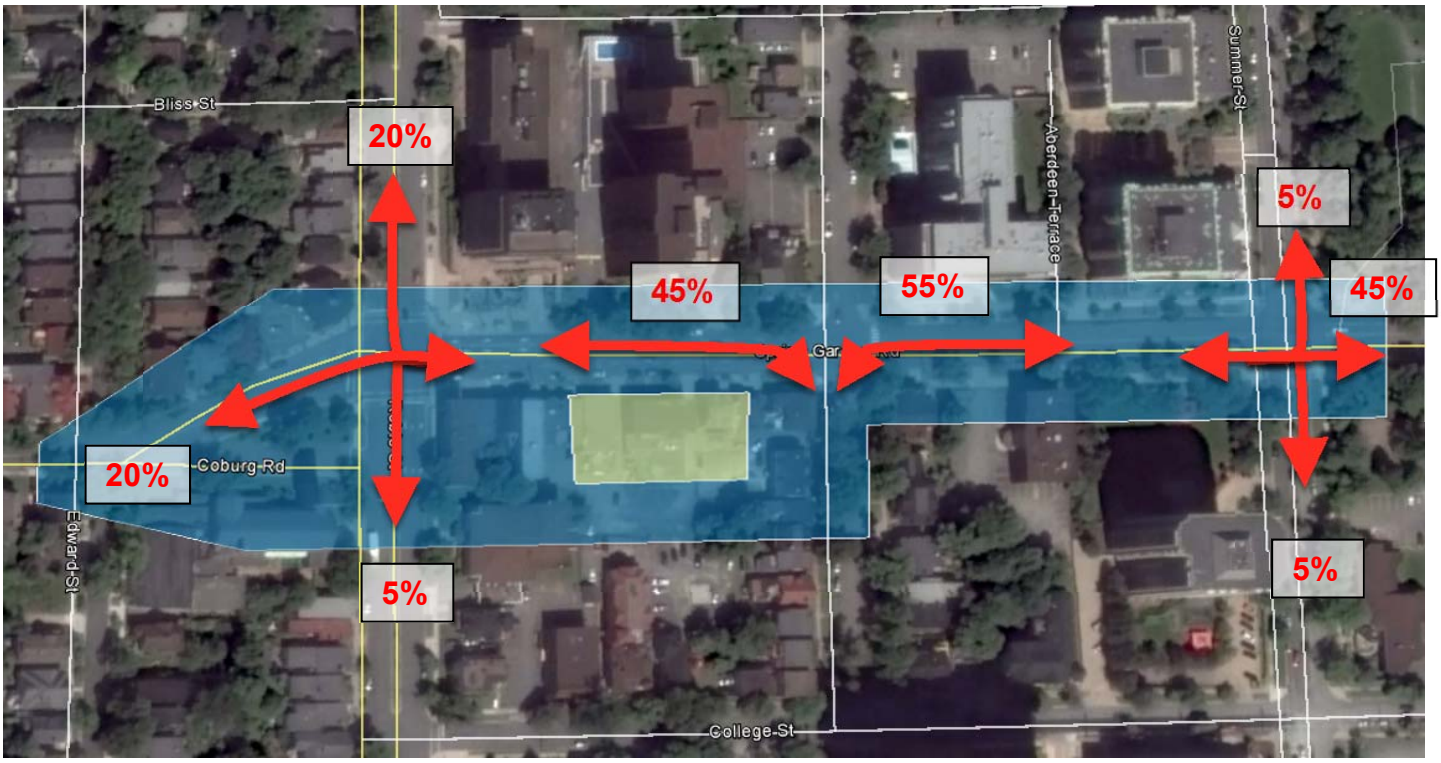
The trip generation rates for residential units and general office space shown above have been reduced approximately 20% to account for a higher than average modal share use from Active Transportation and Transit users, which we consider to be a conservative assumption. In

addition, we have reduced commercial and retail estimates by half to account for the fact that the majority of traffic to this site is expected to be local traffic. This traffic is most likely to access the site by an active transportation mode similar to what is occurring today. It is likely that the modal share to non-motorized modes may be higher than assumed in this study, though a one-half reduction from ITE rates is considered a worst case estimate.

3.2.2 Trip Distribution and Assignment

It is assumed that traffic will distribute itself through the network in a similar manner to the existing traffic. The trip distribution assumptions based on existing conditions is shown in the Figure below. In general, there does not appear to be any incentives for traffic to alter current travel patterns.

Figure 3-1: Traffic Distribution



4. ANALYSIS

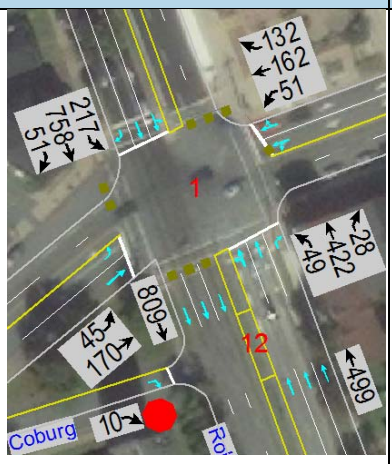
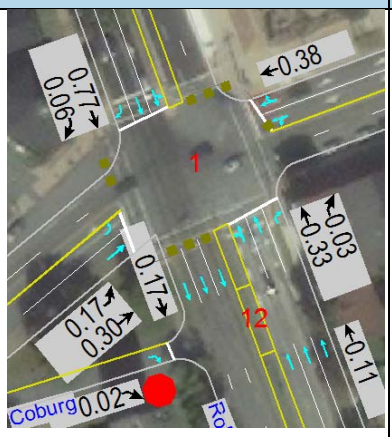
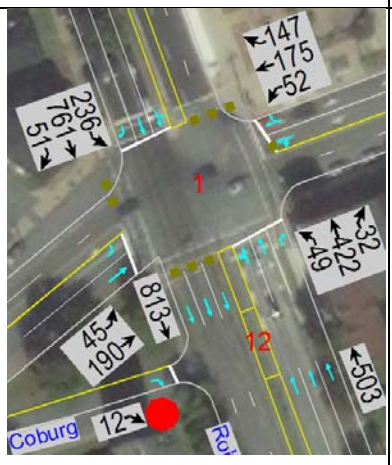
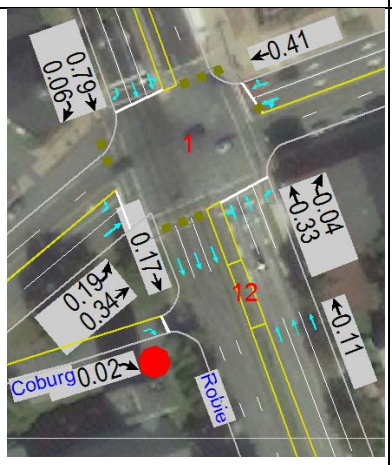
4.1 Transportation Modelling

A microscopic traffic model was prepared using the Synchro/SimTraffic platform for the AM and PM peak hours of analysis. The model extended along the Spring Garden corridor between Robie Street and Summer Street. It also included the intersections at Carlton Street and the entrance and exit driveways to the development.

Spring Garden Road in the vicinity of the development currently operates at a relatively low level of capacity utilization with maximum volume to capacity (v/c) ratios typically being less than 50% under existing and proposed conditions. This results in minimal change in performance measures between the pre- and post-development scenarios.

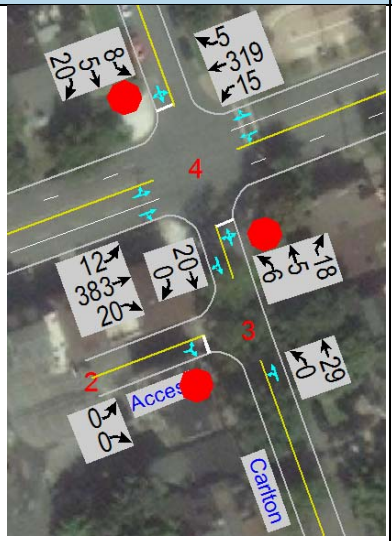
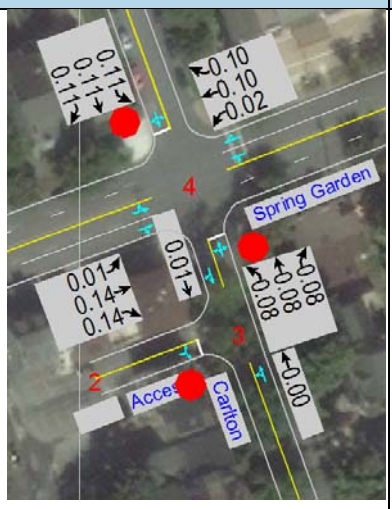
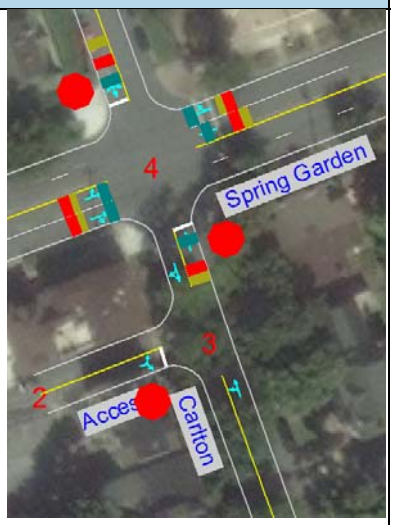
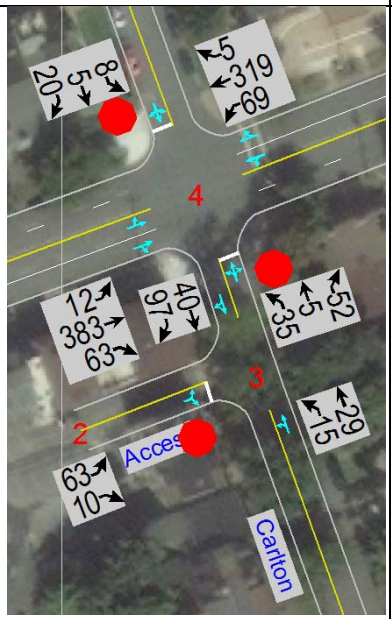
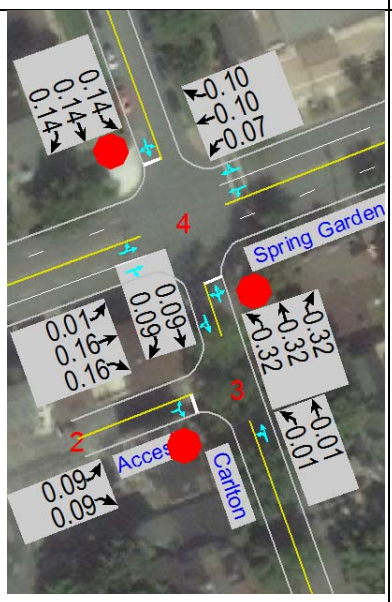
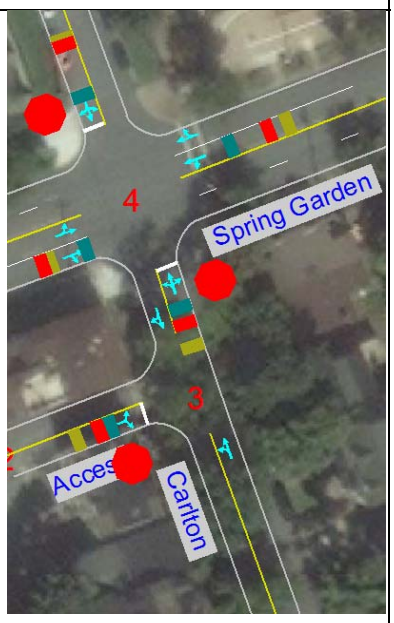
The figures on the following pages summarize the volumes, volume to capacity (v/c) ratios, and approximately queue lengths in each of the scenarios with additional detail being provided in Appendix C of this report.

Figure 4-1: AM Peak Hour – Spring Garden and Robie

	Volume	V/C Ratio	Queues
Existing PM Peak			
Future PM Peak			

This scenario shows minor increases in V/C ratios, delays and queues at the intersection. The most critical movement at the intersection during the AM peak hour is the southbound left turn movement through the development traffic only contributes to a 0.02 increase. As expected, longer queue are experienced on Robie Street during the AM peak hour representing traffic inbound to the major employment centers in the downtown.

Figure 4-2: AM Peak Hour – Spring Garden and Carlton

	Volume	V/C Ratio	Queues
Existing PM Peak			
Future PM Peak			

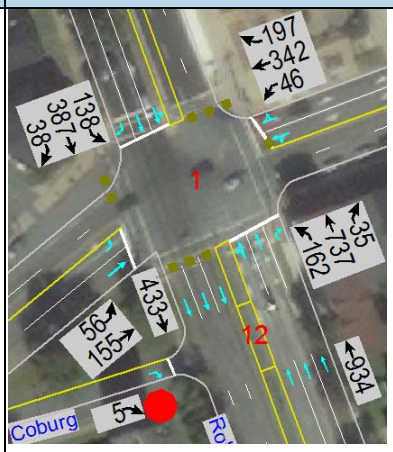
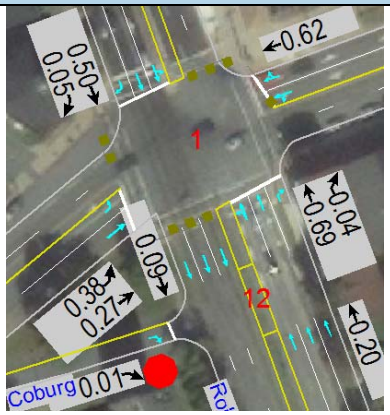
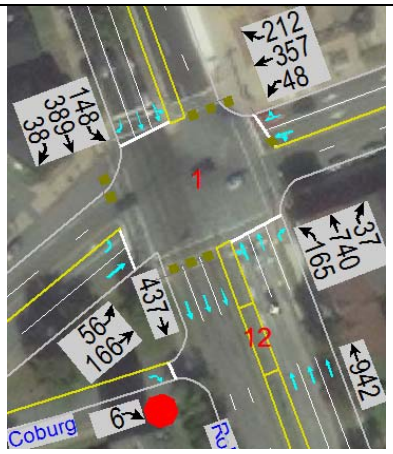
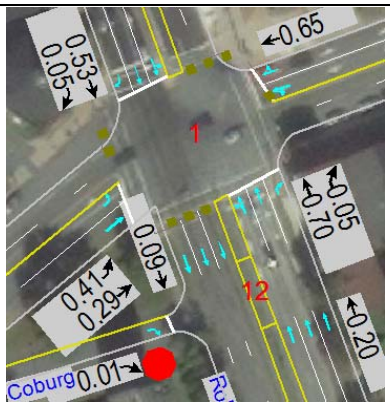
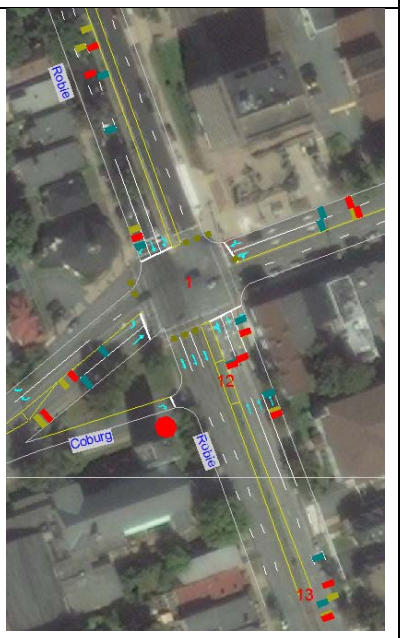
The Carlton intersection and driveway access all operate with high measures of performance under existing and future conditions. The gaps available in traffic on Spring Garden Road allow minor road left turns to be made efficiently with limited delay or resulting queuing.

Figure 4-3: AM Peak Hour – Spring Garden and Summer

	Volume	V/C Ratio	Queues
Existing PM Peak			
Future PM Peak			

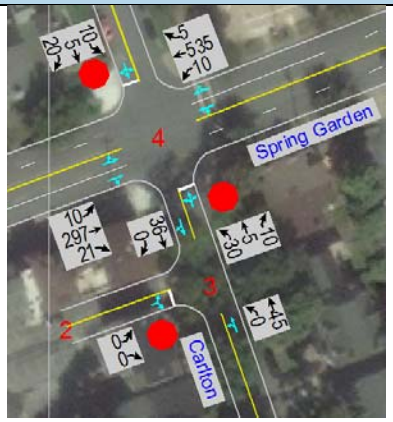
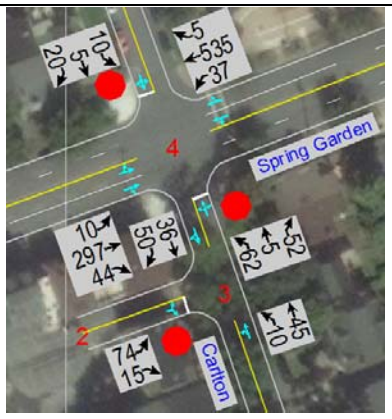
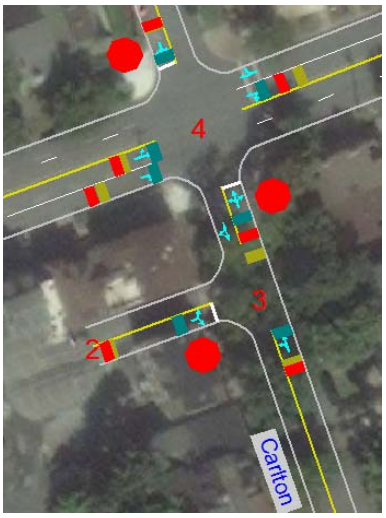
The Summer Road intersection operates well under both existing and future scenario as a result of the existing traffic signals at the intersection. It is unlikely that any changes will be required to the intersection timings as a result of the development traffic. The most significant v/c ratio increase is the peak inbound direction on Spring Garden Road though the increase is only 0.04 (approx. 4%).

Figure 4-4: PM Peak Hour – Spring Garden and Robie

	Volume	V/C Ratio	Queues
Existing PM Peak			
Future PM Peak			

As expected during the PM peak, the higher volumes, delays and queue occur in the outbound direction (westbound Spring Garden and northbound Robie). Again, there is little change in capacity utilization, delays and queues between the existing and future scenarios.

Figure 4-5: PM Peak Hour – Spring Garden and Carlton

	Volume	V/C Ratio	Queues
Existing PM Peak			
Future PM Peak			

The Spring Garden corridor, Carlton intersection and the development access driveway operate at a high level of service similar to the AM peak hour. There are limited increases in any of the standard performance measures.

Figure 4-6: PM Peak Hour – Spring Garden and Summer

	Volume	V/C Ratio	Queues
Existing PM Peak			
Future PM Peak			

Similar to the AM peak, the Summer intersection operates well during the PM peak hour with limited impact from the proposed development. Again, queues, delays and capacity utilization are all well within good operational ranges, and flexibility at the intersection is enhanced by the presence of existing traffic signals.

In general, the Synchro report results contained in Appendix C of this report show that there are only very minor impacts to volume to capacity (v/c) ratios at all intersections in the study area. There are no notable increases in delay or queue lengths as a result of the addition of the development. With respect to the overall magnitude of traffic added to the surrounding road network as a result of the development, volume increases on Spring Garden near Carlton are in the range of 18 - 20% of total traffic. At the Robie Street intersection, development traffic represents between a 5 and 6% increase in traffic volume. It should also be noted that this study did not reduce the traffic related to the removal of existing development in the area, keeping this analysis more conservative.

5. CONCLUSIONS

This development appears to be well suited to this location from a transportation perspective by integrating into a predominately residential neighbourhood that is already characterized by apartment complexes and commercial retail development that supports the community. It is near the intersection of a number of major transportation corridors meaning traffic can conveniently navigate to various parts of the city. Consequently, traffic related to the development is expected to distribute itself widely throughout the network.

The development is well placed to take advantage of the high levels of local employers and institutions (hospitals, schools, downtown Halifax business area, etc.), all of which are directly connected to robust Active Transportation and Halifax Transit networks immediately adjacent to the site.

We expect that the impacts from this proposed development will negligible on Spring Garden Road and other roads in the area. The intersection most significantly impact is the Carlton Road intersection which has significant excess capacity to accommodate the volumes and is afforded significant gaps in traffic as a result of traffic signals at both Robie Street and Summer Street. The level of new traffic from this site does not warrant any modifications to existing roadway or active transportation infrastructure.

In summary, this development is expected to effectively integrate into the community with very minimal impacts to the existing transportation network.

We trust that this report satisfies the HRM requirements for the preparation of Transportation Impact Studies. Should there be any questions or comments regarding the content of the study, please do not hesitate to contact the undersigned.

Sincerely,

Original Signed

Original Signed

Original Signed .

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EKISTICS PLANNING & DESIGN

APPENDIX A

Traffic Counts

HALIFAX REGIONAL MUNICIPALITY
TRANSPORTATION & PUBLIC WORKS
TRAFFIC & RIGHT OF WAY

CODE NO. 14-TM-230

MANUAL TRAFFIC COUNTS

INTERSECTION: COBURG ROAD AT ROBIE STREET AND SPRING GARDEN ROAD

WEATHER: OVERCAST
RECORDER: MIO

DAY	DATE	MONTH	YEAR
WED	8	OCT.	2014

STREET:		SPRING GARDEN ROAD			COBURG ROAD			ROBIE STREET			ROBIE STREET			
TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
7:00:00 AM	7:15:00 AM	2	16	10	1	17	0	13	108	5	10	68	3	253
7:15:00 AM	7:30:00 AM	1	12	18	8	16	0	23	151	11	8	68	4	320
7:30:00 AM	7:45:00 AM	2	22	19	12	32	0	34	198	4	7	75	4	409
7:45:00 AM	8:00:00 AM	7	41	16	6	38	0	42	199	14	10	84	7	464
TOTAL		12	91	63	27	103	0	112	656	34	35	295	18	1446
PEAK			166			130			802			348		
15 MIN PEAK			256			176			1020			404		
PEAK HOUR FACTOR			0.65			0.74			0.79			0.86		PEAK HR
TWO WAY TOTALS			399			290			1187			1016		FACTOR
														0.98
														1417

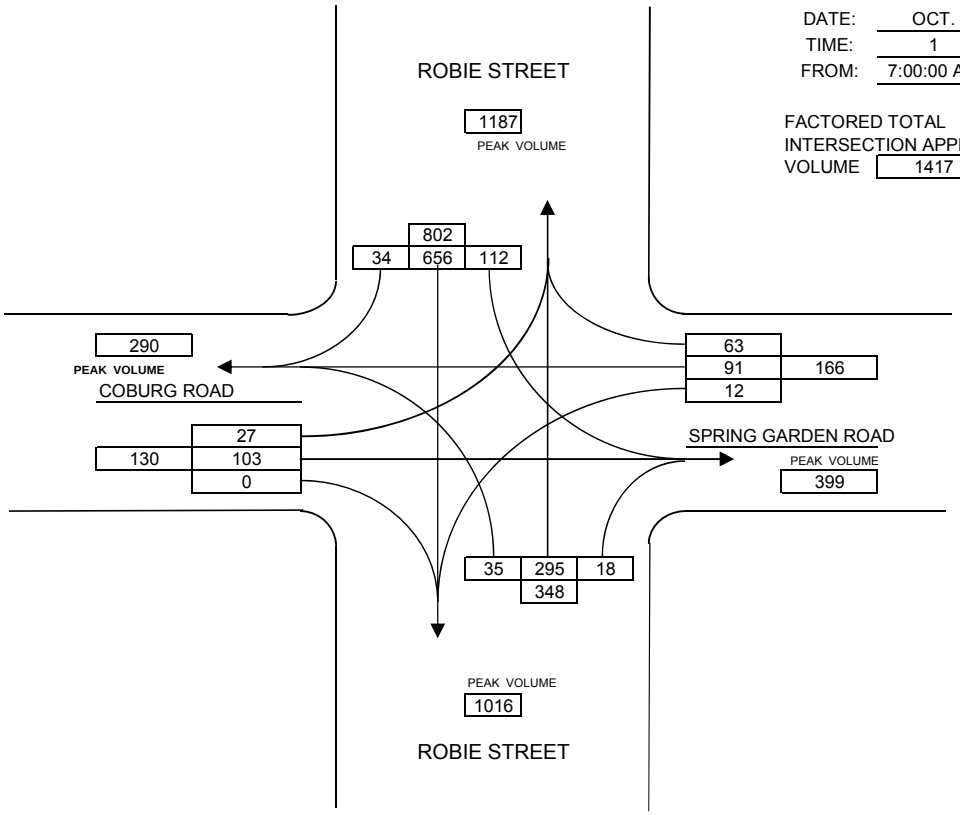
DAY	DATE	MONTH	YEAR
WED	8	OCT.	2014

TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
8:00:00 AM	8:15:00 AM	5	31	24	9	36	1	57	218	8	11	97	9	506
8:15:00 AM	8:30:00 AM	10	37	30	9	38	1	56	194	20	12	100	10	517
8:30:00 AM	8:45:00 AM	13	38	37	13	44	1	52	181	13	18	113	5	528
8:45:00 AM	9:00:00 AM	18	43	23	13	50	1	50	157	9	7	108	3	482
TOTAL		46	149	114	44	168	4	215	750	50	48	418	27	2033
PEAK			309			216			1015			493		
15 MIN PEAK			352			256			1132			544		
PEAK HOUR FACTOR			0.88			0.84			0.9			0.91		PEAK HR
TWO WAY TOTALS			719			463			1591			1293		FACTOR
														0.98
														1992

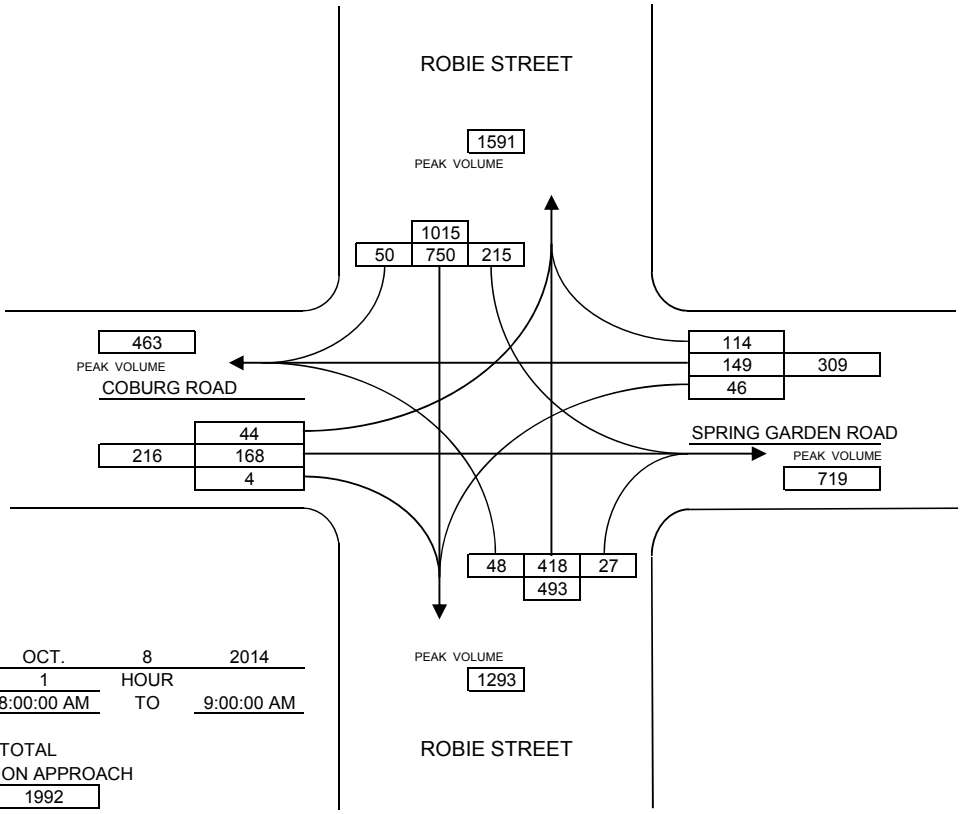
VEHICULAR GRAPHIC SUMMARY SHEET

INTERSECTION : COBURG ROAD AT ROBIE STREET AND SPRING GARDEN ROAD

DATE: OCT. 8 2014
TIME: 1 HOUR
FROM: 7:00:00 AM TO 8:00:00 AM



FACTORED TOTAL
INTERSECTION APPROACH
VOLUME 1417



DATE: OCT. 8 2014
TIME: 1 HOUR
FROM: 8:00:00 AM TO 9:00:00 AM

FACTORED TOTAL
INTERSECTION APPROACH
VOLUME 1992

HALIFAX REGIONAL MUNICIPALITY
TRANSPORTATION & PUBLIC WORKS
TRAFFIC & RIGHT OF WAY

CODE NO. 14-TM-230

MANUAL TRAFFIC COUNTS

INTERSECTION: COBURG ROAD AT ROBIE STREET AND SPRING GARDEN ROAD

WEATHER: OVERCAST
RECORDER: MIO

DAY	DATE	MONTH	YEAR
WED	8	OCT.	2014

STREET:		SPRING GARDEN ROAD			COBURG ROAD			ROBIE STREET			ROBIE STREET			
TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
4:00:00 PM	4:15:00 PM	10	71	35	19	32	2	33	105	12	42	177	10	548
4:15:00 PM	4:30:00 PM	12	88	50	4	30	0	32	93	14	36	190	9	558
4:30:00 PM	4:45:00 PM	12	88	51	17	42	0	26	89	3	43	182	5	558
4:45:00 PM	5:00:00 PM	5	69	42	15	32	0	28	96	8	39	181	5	520
TOTAL		39	316	178	55	136	2	119	383	37	160	730	29	2184
PEAK			533			193			539			919		
15 MIN PEAK			604			236			600			940		
PEAK HOUR FACTOR			0.88			0.82			0.9			0.98		PEAK HR
TWO WAY TOTALS			817			706			1502			1343		FACTOR
														0.98
														2140

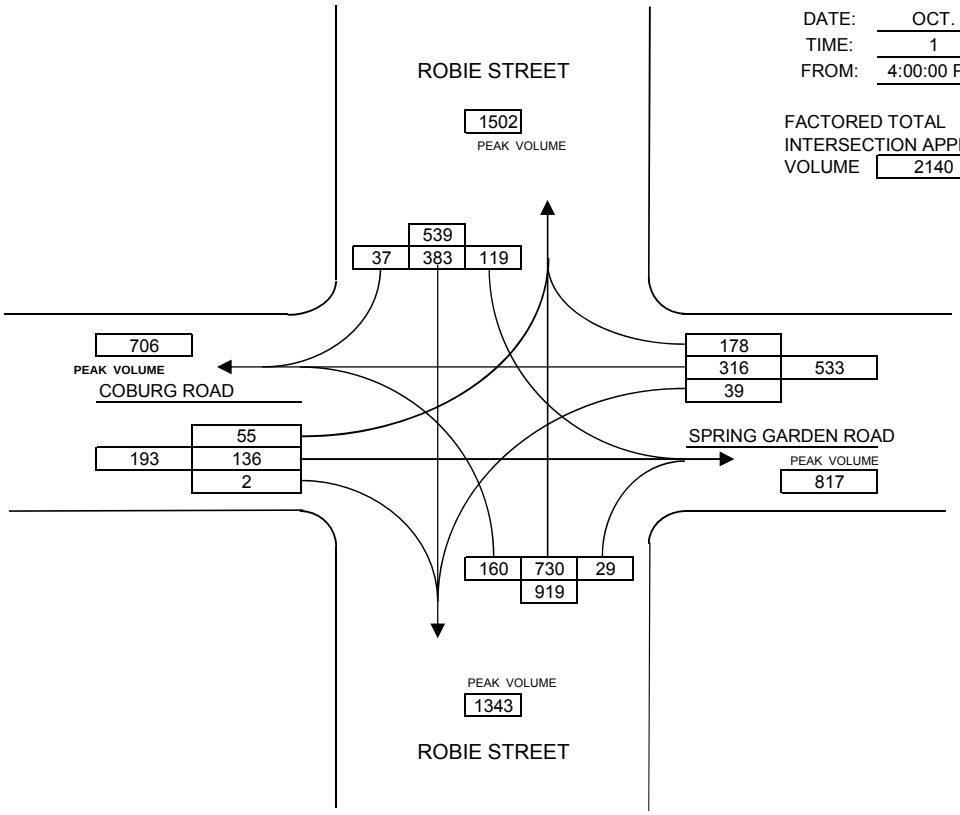
DAY	DATE	MONTH	YEAR
WED	8	OCT.	2014

TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
5:00:00 PM	5:15:00 PM	9	67	33	13	31	0	23	103	21	27	170	9	506
5:15:00 PM	5:30:00 PM	9	45	34	17	27	0	28	111	9	31	161	3	475
5:30:00 PM	5:45:00 PM	4	31	30	20	30	1	15	104	10	22	150	9	426
5:45:00 PM	6:00:00 PM	7	41	31	13	26	3	22	105	6	18	137	5	414
TOTAL		29	184	128	63	114	4	88	423	46	98	618	26	1821
PEAK			341			181			557			742		
15 MIN PEAK			436			204			592			824		
PEAK HOUR FACTOR			0.78			0.89			0.94			0.9		PEAK HR
TWO WAY TOTALS			569			509			1366			1198		FACTOR
														0.98
														1785

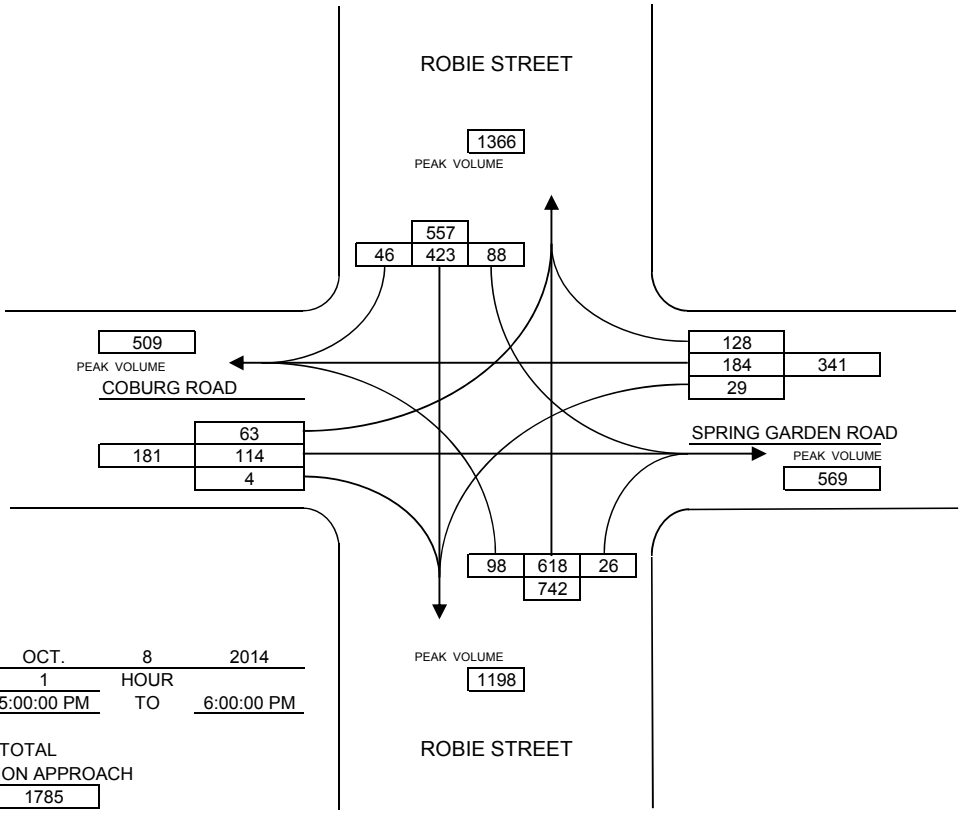
VEHICULAR GRAPHIC SUMMARY SHEET

INTERSECTION : COBURG ROAD AT ROBIE STREET AND SPRING GARDEN ROAD

DATE: OCT. 8 2014
TIME: 1 HOUR
FROM: 4:00:00 PM TO 5:00:00 PM



FACTORED TOTAL
INTERSECTION APPROACH
VOLUME 2140



DATE: OCT. 8 2014
TIME: 1 HOUR
FROM: 5:00:00 PM TO 6:00:00 PM

FACTORED TOTAL
INTERSECTION APPROACH
VOLUME 1785

HALIFAX REGIONAL MUNICIPALITY
TRANSPORTATION & PUBLIC WORKS
TRAFFIC & RIGHT OF WAY

CODE NO. 14-TM-267

MANUAL TRAFFIC COUNTS

INTERSECTION: SPRING GARDEN ROAD AT SUMMER STREET

WEATHER: CLEAR
RECORDER: MIO

DAY	DATE	MONTH	YEAR
WED.	8	OCT.	2014

STREET:		SPRING GARDEN ROAD			SPRING GARDEN ROAD			SUMMER STREET			SUMMER STREET			
TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
7:00:00 AM	7:15:00 AM	0	18	6	2	17	3	3	45	8	7	22	0	131
7:15:00 AM	7:30:00 AM	2	15	10	2	25	5	10	52	10	4	31	1	167
7:30:00 AM	7:45:00 AM	0	24	9	5	37	7	14	58	21	5	27	2	209
7:45:00 AM	8:00:00 AM	2	23	16	2	43	5	17	62	26	5	30	1	232
TOTAL		4	80	41	11	122	20	44	217	65	21	110	4	739
PEAK			125			153			326			135		
15 MIN PEAK			164			200			420			144		
PEAK HOUR FACTOR			0.76			0.77			0.78			0.94		PEAK HR
TWO WAY TOTALS			295			319			488			376		FACTOR
														0.98
														724

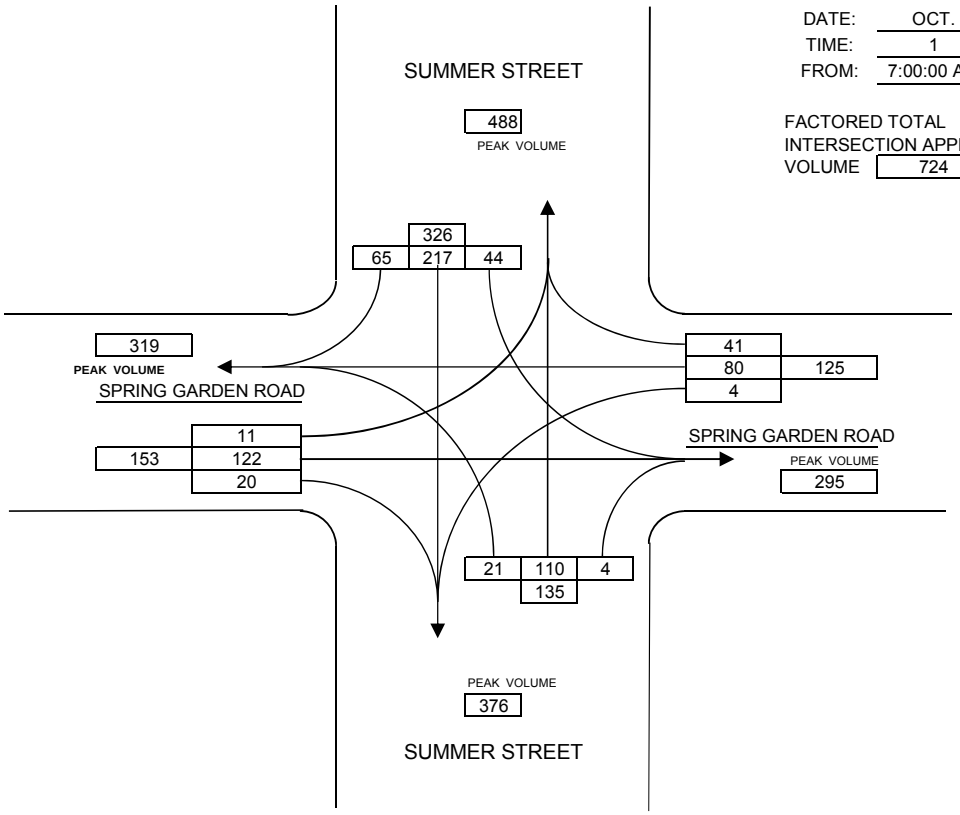
DAY	DATE	MONTH	YEAR
WED.	8	OCT.	2014

TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
8:00:00 AM	8:15:00 AM	4	31	9	4	46	8	29	79	24	4	28	3	269
8:15:00 AM	8:30:00 AM	2	39	13	13	61	8	30	84	39	18	45	14	366
8:30:00 AM	8:45:00 AM	4	47	19	7	63	5	31	59	38	6	51	9	339
8:45:00 AM	9:00:00 AM	2	31	7	7	49	4	15	58	48	9	32	3	265
TOTAL		12	148	48	31	219	25	105	280	149	37	156	29	1239
PEAK			208			275			534			222		
15 MIN PEAK			280			328			612			308		
PEAK HOUR FACTOR			0.74			0.84			0.87			0.72		PEAK HR
TWO WAY TOTALS			561			609			769			539		FACTOR
														0.98
														1214

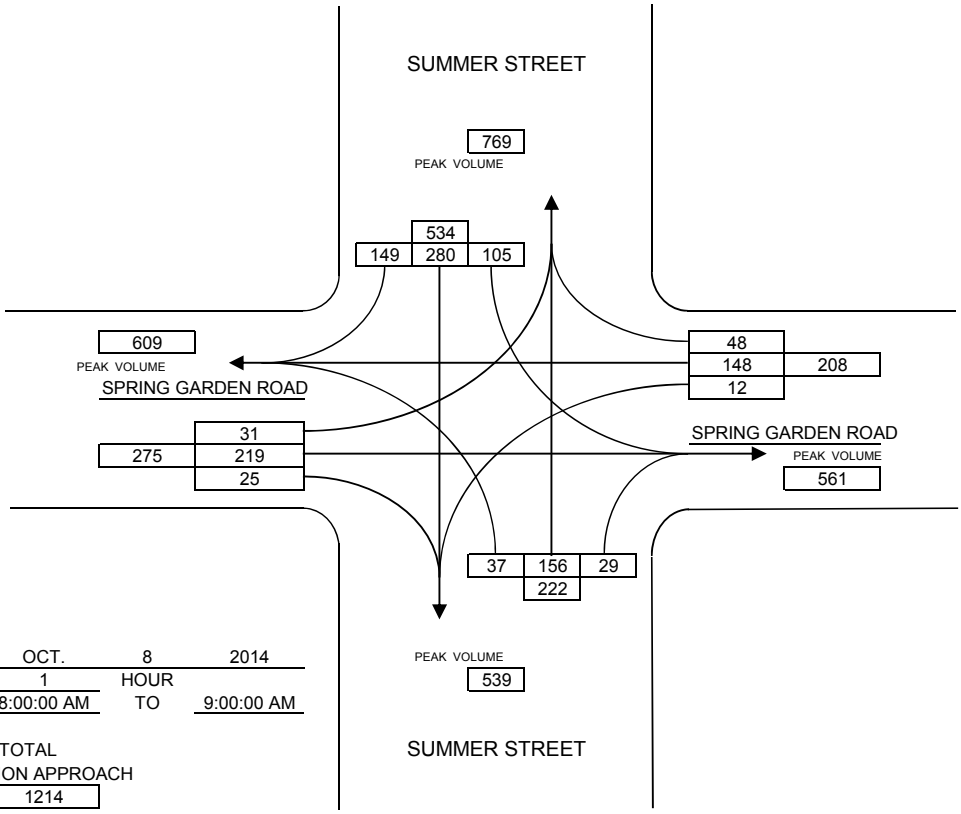
VEHICULAR GRAPHIC SUMMARY SHEET

INTERSECTION : SPRING GARDEN ROAD AT SUMMER STREET

DATE: OCT. 8 2014
TIME: 1 HOUR
FROM: 7:00:00 AM TO 8:00:00 AM



FACTORED TOTAL
INTERSECTION APPROACH
VOLUME 724



DATE: OCT. 8 2014
TIME: 1 HOUR
FROM: 8:00:00 AM TO 9:00:00 AM

FACTORED TOTAL
INTERSECTION APPROACH
VOLUME 1214

HALIFAX REGIONAL MUNICIPALITY
TRANSPORTATION & PUBLIC WORKS
TRAFFIC & RIGHT OF WAY

CODE NO. 14-TM-267

MANUAL TRAFFIC COUNTS

INTERSECTION: SPRING GARDEN ROAD AT SUMMER STREET

WEATHER: CLEAR
RECORDER: MIO

DAY	DATE	MONTH	YEAR
WED.	8	OCT.	2014

STREET:		SPRING GARDEN ROAD			SPRING GARDEN ROAD			SUMMER STREET			SUMMER STREET			
TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
4:00:00 PM	4:15:00 PM	2	74	17	18	50	8	10	38	15	24	95	5	356
4:15:00 PM	4:30:00 PM	2	53	13	16	49	7	13	28	34	22	118	2	357
4:30:00 PM	4:45:00 PM	3	65	13	14	42	4	19	23	30	34	95	3	345
4:45:00 PM	5:00:00 PM	1	64	22	13	49	3	12	28	24	20	81	2	319
TOTAL		8	256	65	61	190	22	54	117	103	100	389	12	1377
PEAK			329			273			274			501		
15 MIN PEAK			372			304			300			568		
PEAK HOUR FACTOR			0.88			0.9			0.91			0.88		PEAK HR
TWO WAY TOTALS			585			732			789			648		FACTOR
														0.98
														1349

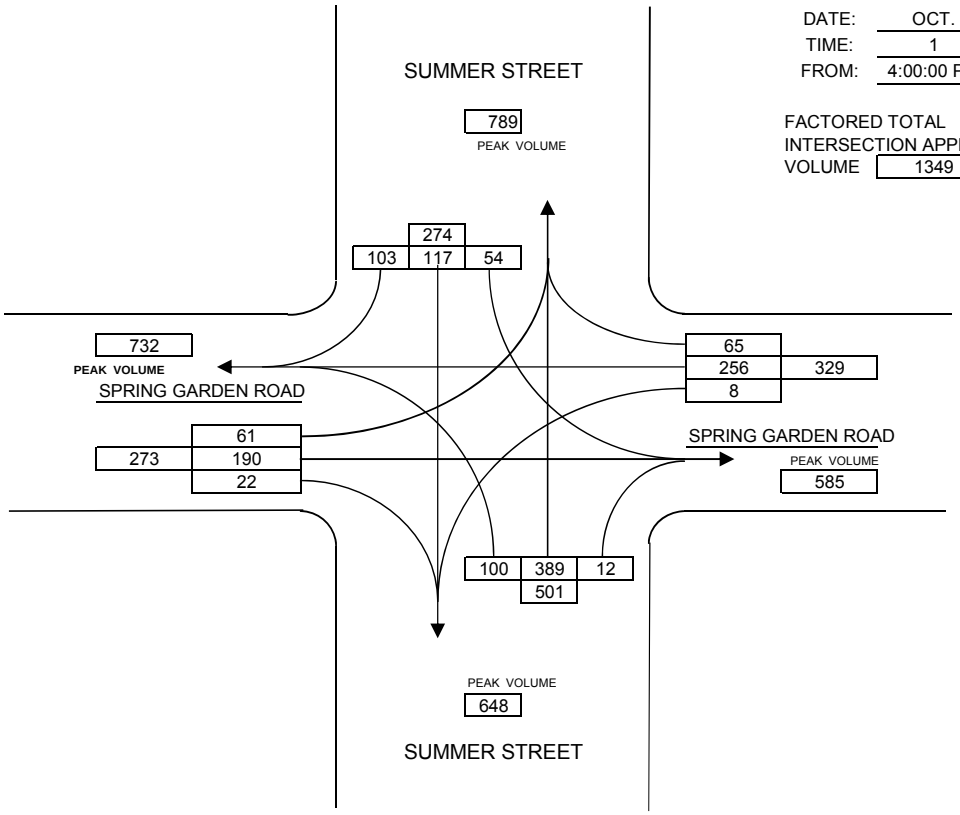
DAY	DATE	MONTH	YEAR
WED.	8	OCT.	2014

TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
5:00:00 PM	5:15:00 PM	1	56	11	10	53	5	14	32	28	16	80	4	310
5:15:00 PM	5:30:00 PM	1	49	15	12	40	6	11	21	20	14	53	3	245
5:30:00 PM	5:45:00 PM	6	27	11	5	46	0	11	18	16	13	50	3	206
5:45:00 PM	6:00:00 PM	1	48	9	5	46	4	5	18	13	10	27	2	188
TOTAL		9	180	46	32	185	15	41	89	77	53	210	12	949
PEAK			235			232			207			275		
15 MIN PEAK			272			272			296			400		
PEAK HOUR FACTOR			0.86			0.85			0.7			0.69		PEAK HR
TWO WAY TOTALS			473			542			495			388		FACTOR
														0.98
														930

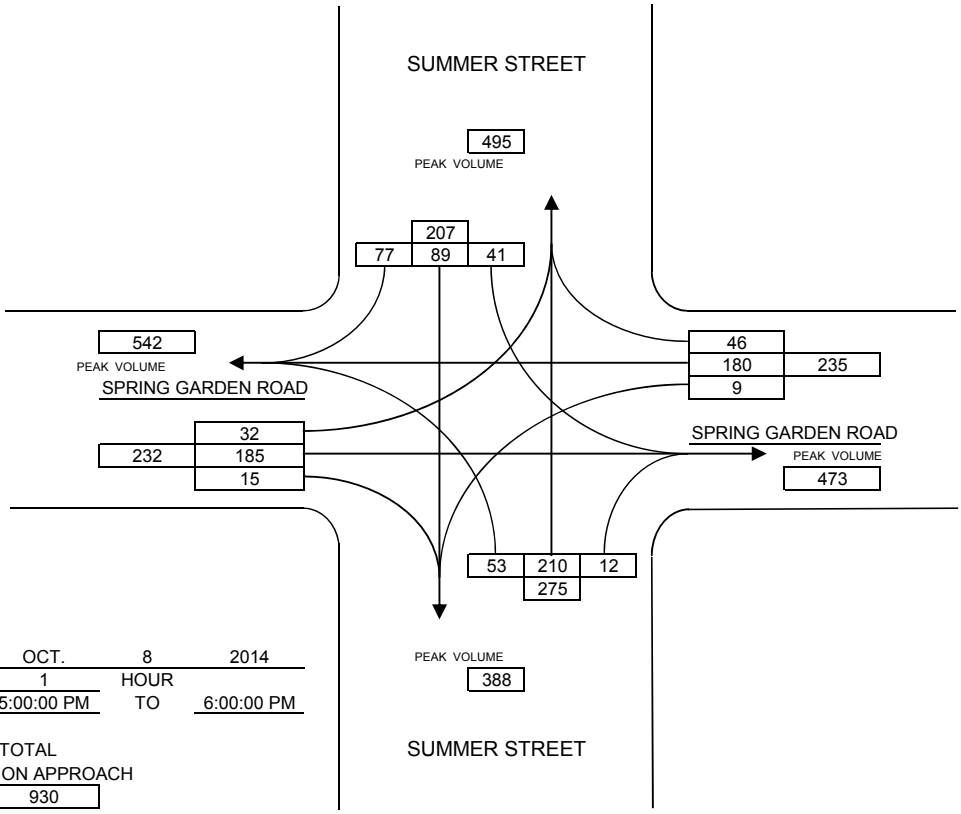
VEHICULAR GRAPHIC SUMMARY SHEET

INTERSECTION : SPRING GARDEN ROAD AT SUMMER STREET

DATE: OCT. 8 2014
TIME: 1 HOUR
FROM: 4:00:00 PM TO 5:00:00 PM



FACTORED TOTAL
INTERSECTION APPROACH
VOLUME 1349



DATE: OCT. 8 2014
TIME: 1 HOUR
FROM: 5:00:00 PM TO 6:00:00 PM

FACTORED TOTAL
INTERSECTION APPROACH
VOLUME 930

Ekistics Plan + Design
1 Starr Lane

Dartmouth, Nova Scotia, Canada B2Y4V7
(902) 461-2525 roger@ekistics.net
Ekistics

Count Name: DEXEL - Spring Garden - AM Peak
Site Code:
Start Date: 05/15/2015

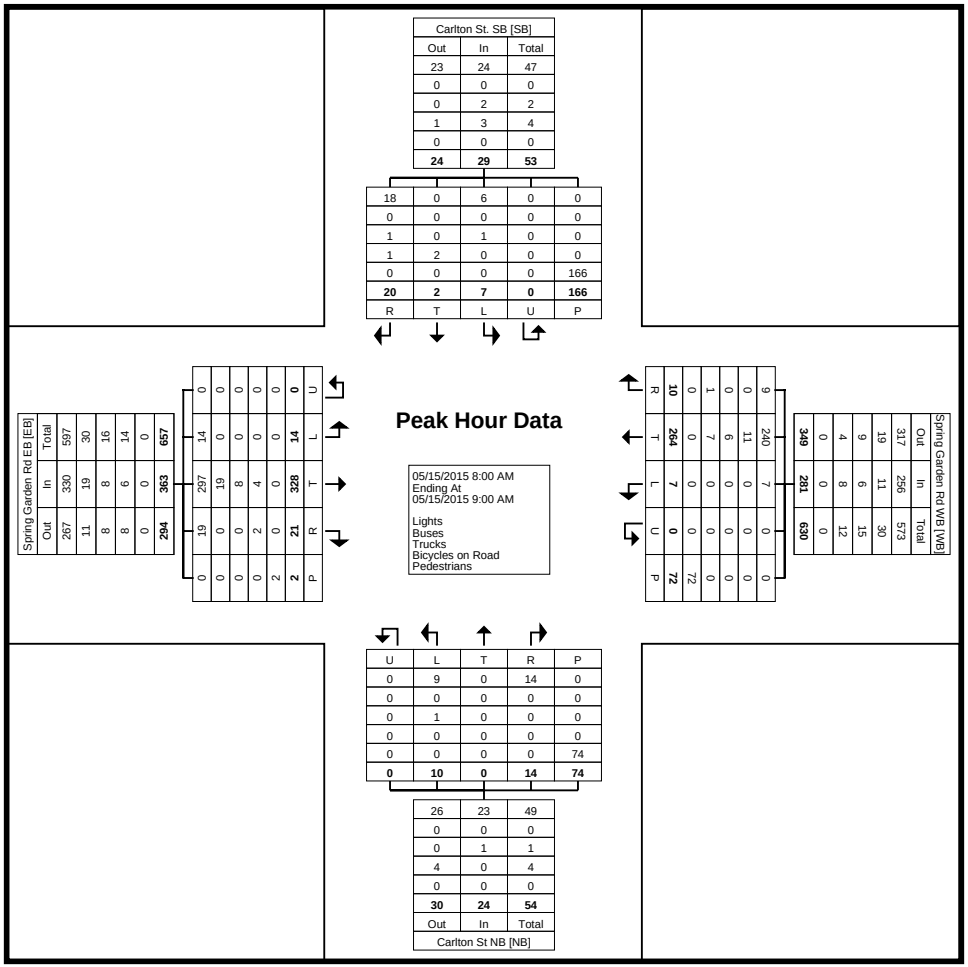
Turning Movement Peak Hour Data (8:00 AM)

Start Time	Carlton St. SB Southbound						Spring Garden Rd WB Westbound						Carlton St NB Northbound						Spring Garden Rd EB Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
8:00 AM	1	0	1	0	31	2	0	71	1	0	9	72	3	0	0	0	16	3	5	89	3	0	0	97	174
8:15 AM	7	2	3	0	44	12	1	66	4	0	19	71	4	0	4	0	23	8	7	85	5	0	1	97	188
8:30 AM	6	0	2	0	46	8	5	80	1	0	27	86	5	0	2	0	17	7	4	83	1	0	0	88	189
8:45 AM	6	0	1	0	45	7	4	47	1	0	17	52	2	0	4	0	18	6	5	71	5	0	1	81	146
Total	20	2	7	0	166	29	10	264	7	0	72	281	14	0	10	0	74	24	21	328	14	0	2	363	697
Approach %	69.0	6.9	24.1	0.0	-	-	3.6	94.0	2.5	0.0	-	-	58.3	0.0	41.7	0.0	-	-	5.8	90.4	3.9	0.0	-	-	-
Total %	2.9	0.3	1.0	0.0	-	4.2	1.4	37.9	1.0	0.0	-	40.3	2.0	0.0	1.4	0.0	-	3.4	3.0	47.1	2.0	0.0	-	52.1	-
PHF	0.714	0.250	0.583	0.000	-	0.604	0.500	0.825	0.438	0.000	-	0.817	0.700	0.000	0.625	0.000	-	0.750	0.750	0.921	0.700	0.000	-	0.936	0.922
Lights	18	0	6	0	-	24	9	240	7	0	-	256	14	0	9	0	-	23	19	297	14	0	-	330	633
% Lights	90.0	0.0	85.7	-	-	82.8	90.0	90.9	100.0	-	-	91.1	100.0	-	90.0	-	-	95.8	90.5	90.5	100.0	-	-	90.9	90.8
Buses	0	0	0	0	-	0	0	11	0	0	-	11	0	0	0	0	-	0	0	19	0	0	-	19	30
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	4.2	0.0	-	-	3.9	0.0	-	0.0	-	-	0.0	0.0	5.8	0.0	-	-	5.2	4.3
Trucks	1	0	1	0	-	2	0	6	0	0	-	6	0	0	1	0	-	1	0	8	0	0	-	8	17
% Trucks	5.0	0.0	14.3	-	-	6.9	0.0	2.3	0.0	-	-	2.1	0.0	-	10.0	-	-	4.2	0.0	2.4	0.0	-	-	2.2	2.4
Bicycles on Road	1	2	0	0	-	3	1	7	0	0	-	8	0	0	0	0	-	0	2	4	0	0	-	6	17
% Bicycles on Road	5.0	100.0	0.0	-	-	10.3	10.0	2.7	0.0	-	-	2.8	0.0	-	0.0	-	-	0.0	9.5	1.2	0.0	-	-	1.7	2.4
Pedestrians	-	-	-	-	166	-	-	-	-	-	72	-	-	-	-	-	74	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

Ekistics Plan + Design
1 Starr Lane

Dartmouth, Nova Scotia, Canada B2Y4V7
(902) 461-2525 roger@ekistics.net
Ekistics

Count Name: DEXEL - Spring Garden - AM Peak
Site Code:
Start Date: 05/15/2015



Turning Movement Peak Hour Data Plot (8:00 AM)

Ekistics Plan + Design
1 Starr Lane

Dartmouth, Nova Scotia, Canada B2Y4V7
(902) 461-2525 roger@ekistics.net
Ekistics

Count Name: DEXEL - Spring Garden Road - PM Peak
Site Code:
Start Date: 05/14/2015

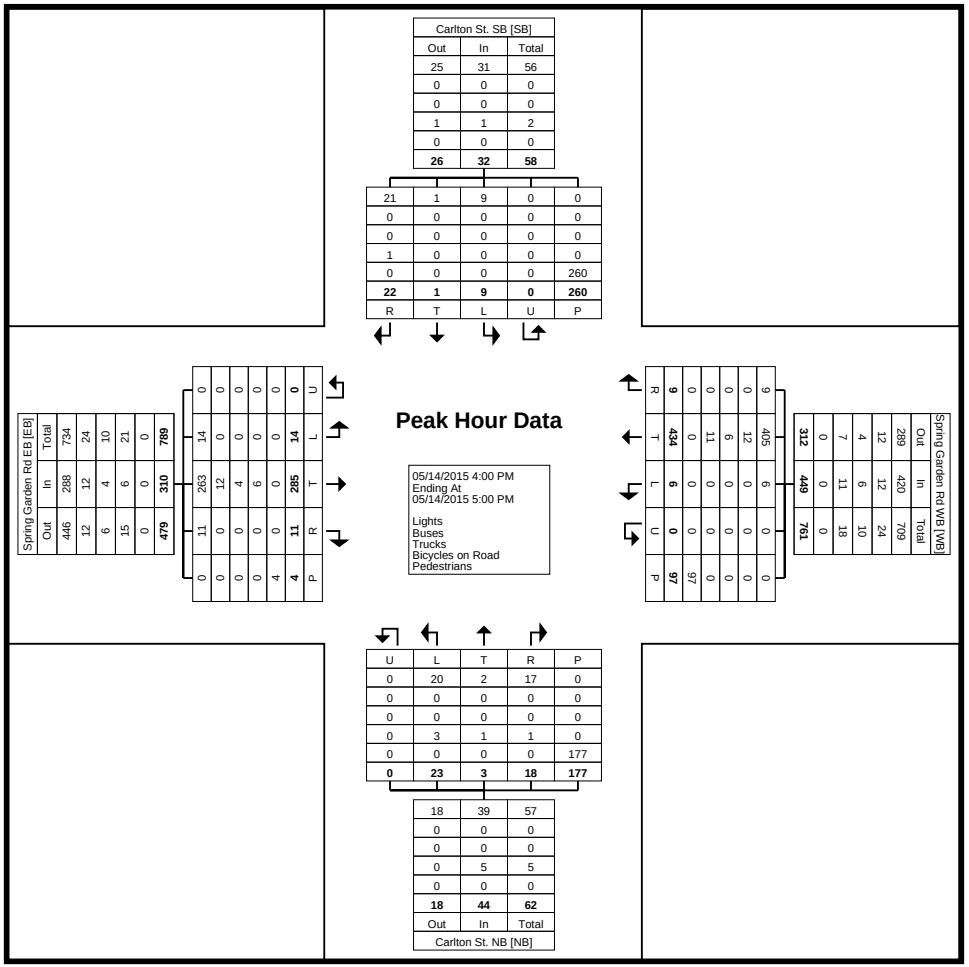
Turning Movement Peak Hour Data (4:00 PM)

Start Time	Carlton St. SB Southbound						Spring Garden Rd WB Westbound						Carlton St. NB Northbound						Spring Garden Rd EB Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
4:00 PM	2	0	1	0	61	3	3	123	2	0	32	128	8	2	8	0	42	18	3	67	3	0	1	73	222
4:15 PM	11	1	3	0	74	15	0	110	1	0	12	111	5	1	4	0	41	10	5	75	4	0	3	84	220
4:30 PM	3	0	5	0	65	8	5	99	2	0	30	106	2	0	5	0	48	7	1	83	3	0	0	87	208
4:45 PM	6	0	0	0	60	6	1	102	1	0	23	104	3	0	6	0	46	9	2	60	4	0	0	66	185
Total	22	1	9	0	260	32	9	434	6	0	97	449	18	3	23	0	177	44	11	285	14	0	4	310	835
Approach %	68.8	3.1	28.1	0.0	-	-	2.0	96.7	1.3	0.0	-	-	40.9	6.8	52.3	0.0	-	-	3.5	91.9	4.5	0.0	-	-	-
Total %	2.6	0.1	1.1	0.0	-	3.8	1.1	52.0	0.7	0.0	-	53.8	2.2	0.4	2.8	0.0	-	5.3	1.3	34.1	1.7	0.0	-	37.1	-
PHF	0.500	0.250	0.450	0.000	-	0.533	0.450	0.882	0.750	0.000	-	0.877	0.563	0.375	0.719	0.000	-	0.611	0.550	0.858	0.875	0.000	-	0.891	0.940
Lights	21	1	9	0	-	31	9	405	6	0	-	420	17	2	20	0	-	39	11	263	14	0	-	288	778
% Lights	95.5	100.0	100.0	-	-	96.9	100.0	93.3	100.0	-	-	93.5	94.4	66.7	87.0	-	-	88.6	100.0	92.3	100.0	-	-	92.9	93.2
Buses	0	0	0	0	-	0	0	12	0	0	-	12	0	0	0	0	-	0	0	12	0	0	-	12	24
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	2.8	0.0	-	-	2.7	0.0	0.0	0.0	-	-	0.0	0.0	4.2	0.0	-	-	3.9	2.9
Trucks	0	0	0	0	-	0	0	6	0	0	-	6	0	0	0	0	-	0	0	4	0	0	-	4	10
% Trucks	0.0	0.0	0.0	-	-	0.0	0.0	1.4	0.0	-	-	1.3	0.0	0.0	0.0	-	-	0.0	0.0	1.4	0.0	-	-	1.3	1.2
Bicycles on Road	1	0	0	0	-	1	0	11	0	0	-	11	1	1	3	0	-	5	0	6	0	0	-	6	23
% Bicycles on Road	4.5	0.0	0.0	-	-	3.1	0.0	2.5	0.0	-	-	2.4	5.6	33.3	13.0	-	-	11.4	0.0	2.1	0.0	-	-	1.9	2.8
Pedestrians	-	-	-	-	260	-	-	-	-	-	97	-	-	-	-	-	177	-	-	-	-	-	4	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

Ekistics Plan + Design
1 Starr Lane

Dartmouth, Nova Scotia, Canada B2Y4V7
(902) 461-2525 roger@ekistics.net
Ekistics

Count Name: DEXEL - Spring Garden Road - PM Peak
Site Code:
Start Date: 05/14/2015



Turning Movement Peak Hour Data Plot (4:00 PM)

EKISTICS PLANNING & DESIGN

APPENDIX B

Trip Generation

Trip Generation Summary

Alternative: Build Out
Phase:
Project: DEXEL - Spring Garden Road

Open Date: 2015-08-17
Analysis Date: 2015-09-01

ITE	Land Use		Weekday Average Daily Trips *	Enter	Exit	Total	Weekday AM Peak Hour of Adjacent Street Traffic *	Enter	Exit	Total	Weekday PM Peak Hour of Adjacent Street Traffic *	Enter	Exit	Total
222	Apartments			420	420	840		15	45	60		43	27	70
	250	Dwelling Units												
710	General Office Space			272	271	543		68	9	77		12	61	73
	61.5	Gross Floor Area 1000 SF												
880	Drug Store			478	477	955		20	11	31		44	45	89
	21.2	Gross Floor Area 1000 SF												
932	Restaurant			102	101	203		9	8	17		10	6	16
	3.2	Gross Floor Area 1000 SF												
Unadjusted Volume				1272	1269	2541		112	73	185		109	139	248
Internal Capture Trips				267	267	534		0	0	0		32	32	64
Pass-By Trips				0	0	0		0	0	0		18	18	36
Volume Added to Adjacent Streets				1005	1002	2007		112	73	185		59	89	148

Total Weekday Average Daily Trips Internal Capture = 21 Percent
Total Weekday AM Peak Hour of Adjacent Street Traffic Internal Capture = 0 Percent
Total Weekday PM Peak Hour of Adjacent Street Traffic Internal Capture = 26 Percent

* - Custom rate used for selected time period.

Source: Institute of Transportation Engineers, Trip Generation Manual 9th Edition, 2012

EKISTICS PLANNING & DESIGN

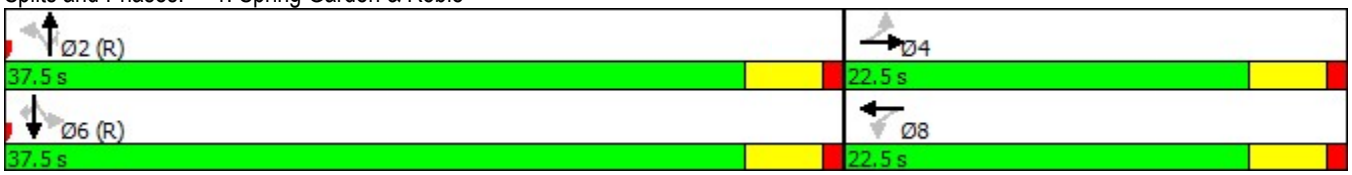
APPENDIX C

Synchro Output

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	45	170	51	162	49	422	28	217	758	51
Future Volume (vph)	45	170	51	162	49	422	28	217	758	51
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4		8		2			6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	2	2	2	6	6	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	37.5	37.5	37.5	37.5	37.5	37.5
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5		4.5	4.5		4.5	4.5
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	18.0	18.0		18.0		33.0	33.0		33.0	33.0
Actuated g/C Ratio	0.30	0.30		0.30		0.55	0.55		0.55	0.55
v/c Ratio	0.17	0.30		0.38		0.33	0.03		0.77	0.06
Control Delay	17.5	17.8		17.0		8.2	2.8		15.2	2.4
Queue Delay	0.0	0.0		0.0		0.0	0.0		0.0	0.0
Total Delay	17.5	17.8		17.0		8.2	2.8		15.2	2.4
LOS	B	B		B		A	A		B	A
Approach Delay		17.8		17.0		7.9			14.6	
Approach LOS		B		B		A			B	

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Pretimed	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 13.7	Intersection LOS: B
Intersection Capacity Utilization 74.5%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Spring Garden & Robie



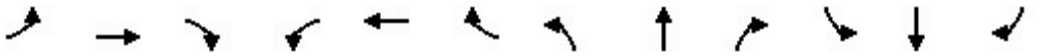
Lane Group	EBL	EBT	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	49	185	374	512	30	1060	55
v/c Ratio	0.17	0.30	0.38	0.33	0.03	0.77	0.06
Control Delay	17.5	17.8	17.0	8.2	2.8	15.2	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.5	17.8	17.0	8.2	2.8	15.2	2.4
Queue Length 50th (m)	4.2	16.3	13.6	15.4	0.0	45.0	0.0
Queue Length 95th (m)	11.4	30.6	25.5	23.8	2.9	69.2	3.9
Internal Link Dist (m)		56.0	122.1	8.1		103.6	
Turn Bay Length (m)	30.0						
Base Capacity (vph)	281	614	986	1545	884	1383	886
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.30	0.38	0.33	0.03	0.77	0.06

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	29	20	0
Future Volume (Veh/h)	0	0	0	29	20	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	32	22	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	54	22	22			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	54	22	22			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	954	1055	1593			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	0	32	22
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1593	1700
Volume to Capacity	0.00	0.00	0.01
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	6.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	383	20	15	319	5	6	5	18	8	5	20
Future Volume (Veh/h)	12	383	20	15	319	5	6	5	18	8	5	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	416	22	16	347	5	7	5	20	9	5	22
Pedestrians					66			34			122	
Lane Width (m)					3.6			3.6			3.6	
Walking Speed (m/s)					1.2			1.2			1.2	
Percent Blockage					6			3			10	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		146			150							
pX, platoon unblocked												
vC, conflicting volume	474			472			717	993	319	826	1002	298
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	474			472			717	993	319	826	1002	298
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			97	98	97	95	98	96
cM capacity (veh/h)	974			1055			258	207	621	188	205	627

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	221	230	190	178	32	36
Volume Left	13	0	16	0	7	9
Volume Right	0	22	0	5	20	22
cSH	974	1700	1055	1700	383	336
Volume to Capacity	0.01	0.14	0.02	0.10	0.08	0.11
Queue Length 95th (m)	0.3	0.0	0.4	0.0	2.2	2.9
Control Delay (s)	0.6	0.0	0.8	0.0	15.2	17.0
Lane LOS	A		A		C	C
Approach Delay (s)	0.3		0.4		15.2	17.0
Approach LOS					C	C

Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	39.2%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	31	353	12	150	38	156	105	280	151
Future Volume (vph)	31	353	12	150	38	156	105	280	151
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	23.0	23.0	23.0	23.0	37.0	37.0	37.0	37.0	37.0
Total Split (%)	38.3%	38.3%	38.3%	38.3%	61.7%	61.7%	61.7%	61.7%	61.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	0.0
Total Lost Time (s)		4.5		4.5		4.5		4.5	4.5
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		18.5		18.5		32.5		32.5	32.5
Actuated g/C Ratio		0.31		0.31		0.54		0.54	0.54
v/c Ratio		0.45		0.23		0.27		0.49	0.18
Control Delay		20.9		12.5		7.7		11.0	1.9
Queue Delay		0.0		0.0		0.0		0.0	0.0
Total Delay		20.9		12.5		7.7		11.0	1.9
LOS		C		B		A		B	A
Approach Delay		20.9		12.5		7.7		8.4	
Approach LOS		C		B		A		A	

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 45	
Control Type: Pretimed	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 12.6	Intersection LOS: B
Intersection Capacity Utilization 65.1%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 5: Summer & Spring Garden

Lane Group	EBT	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	445	228	243	418	164
v/c Ratio	0.45	0.23	0.27	0.49	0.18
Control Delay	20.9	12.5	7.7	11.0	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	20.9	12.5	7.7	11.0	1.9
Queue Length 50th (m)	24.0	7.7	12.3	27.2	0.0
Queue Length 95th (m)	m31.6	15.1	23.5	47.7	6.8
Internal Link Dist (m)	125.6	70.4	44.3	45.0	
Turn Bay Length (m)					20.0
Base Capacity (vph)	1000	1009	900	856	932
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.45	0.23	0.27	0.49	0.18

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

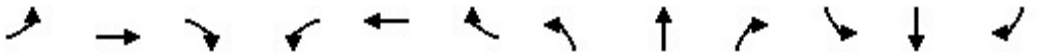
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	45	190	52	175	49	422	32	236	761	51
Future Volume (vph)	45	190	52	175	49	422	32	236	761	51
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4		8		2			6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	2	2	2	6	6	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	37.5	37.5	37.5	37.5	37.5	37.5
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5		4.5	4.5		4.5	4.5
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	18.0	18.0		18.0		33.0	33.0		33.0	33.0
Actuated g/C Ratio	0.30	0.30		0.30		0.55	0.55		0.55	0.55
v/c Ratio	0.19	0.34		0.41		0.33	0.04		0.79	0.06
Control Delay	17.8	18.3		18.1		8.2	2.7		16.4	2.4
Queue Delay	0.0	0.0		0.0		0.0	0.0		0.0	0.0
Total Delay	17.8	18.3		18.1		8.2	2.7		16.4	2.4
LOS	B	B		B		A	A		B	A
Approach Delay		18.2		18.1		7.8			15.7	
Approach LOS		B		B		A			B	

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Pretimed	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 14.6	Intersection LOS: B
Intersection Capacity Utilization 77.0%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Spring Garden & Robie

Lane Group	EBL	EBT	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	49	207	407	512	35	1084	55
v/c Ratio	0.19	0.34	0.41	0.33	0.04	0.79	0.06
Control Delay	17.8	18.3	18.1	8.2	2.7	16.4	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.8	18.3	18.1	8.2	2.7	16.4	2.4
Queue Length 50th (m)	4.2	18.4	15.1	15.4	0.0	47.2	0.0
Queue Length 95th (m)	11.5	33.9	27.5	23.8	3.1	72.9	3.9
Internal Link Dist (m)		56.0	122.1	8.1		103.6	
Turn Bay Length (m)	30.0						
Base Capacity (vph)	264	614	994	1540	886	1368	886
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.34	0.41	0.33	0.04	0.79	0.06

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	383	63	69	319	5	35	5	52	8	5	20
Future Volume (Veh/h)	12	383	63	69	319	5	35	5	52	8	5	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	416	68	75	347	5	38	5	57	9	5	22
Pedestrians					66			34			122	
Lane Width (m)					3.6			3.6			3.6	
Walking Speed (m/s)					1.2			1.2			1.2	
Percent Blockage					6			3			10	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		146			150							
pX, platoon unblocked												
vC, conflicting volume	474			518			858	1134	342	981	1166	298
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	474			518			858	1134	342	981	1166	298
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			93			80	97	91	93	97	96
cM capacity (veh/h)	974			1015			194	161	600	129	154	627

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	221	276	248	178	100	36
Volume Left	13	0	75	0	38	9
Volume Right	0	68	0	5	57	22
cSH	974	1700	1015	1700	310	262
Volume to Capacity	0.01	0.16	0.07	0.10	0.32	0.14
Queue Length 95th (m)	0.3	0.0	1.9	0.0	10.9	3.8
Control Delay (s)	0.6	0.0	3.2	0.0	22.0	20.9
Lane LOS	A		A		C	C
Approach Delay (s)	0.3		1.8		22.0	20.9
Approach LOS					C	C

Intersection Summary				
Average Delay	3.7			
Intersection Capacity Utilization	49.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	35	380	15	197	42	156	105	283	154
Future Volume (vph)	35	380	15	197	42	156	105	283	154
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	23.0	23.0	23.0	23.0	37.0	37.0	37.0	37.0	37.0
Total Split (%)	38.3%	38.3%	38.3%	38.3%	61.7%	61.7%	61.7%	61.7%	61.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	0.0
Total Lost Time (s)		4.5		4.5		4.5		4.5	4.5
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		18.5		18.5		32.5		32.5	32.5
Actuated g/C Ratio		0.31		0.31		0.54		0.54	0.54
v/c Ratio		0.49		0.28		0.28		0.49	0.18
Control Delay		21.2		13.9		7.8		11.1	1.9
Queue Delay		0.0		0.0		0.0		0.0	0.0
Total Delay		21.2		13.9		7.8		11.1	1.9
LOS		C		B		A		B	A
Approach Delay		21.2		13.9		7.8		8.5	
Approach LOS		C		B		A		A	

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 50	
Control Type: Pretimed	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 13.2	Intersection LOS: B
Intersection Capacity Utilization 67.8%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 5: Summer & Spring Garden

Lane Group	EBT	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	481	282	248	422	167
v/c Ratio	0.49	0.28	0.28	0.49	0.18
Control Delay	21.2	13.9	7.8	11.1	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	21.2	13.9	7.8	11.1	1.9
Queue Length 50th (m)	25.8	10.5	12.8	27.6	0.0
Queue Length 95th (m)	m34.1	18.9	24.1	48.3	6.9
Internal Link Dist (m)	125.6	70.4	44.3	45.0	
Turn Bay Length (m)					20.0
Base Capacity (vph)	991	1007	888	856	934
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.49	0.28	0.28	0.49	0.18

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

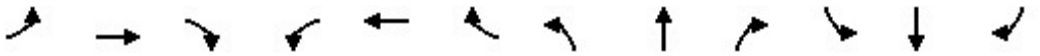
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	56	155	46	342	162	737	35	138	387	38
Future Volume (vph)	56	155	46	342	162	737	35	138	387	38
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4		8		2			6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	2	2	2	6	6	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	37.5	37.5	37.5	37.5	37.5	37.5
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5		4.5	4.5		4.5	4.5
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	18.0	18.0		18.0		33.0	33.0		33.0	33.0
Actuated g/C Ratio	0.30	0.30		0.30		0.55	0.55		0.55	0.55
v/c Ratio	0.38	0.27		0.62		0.69	0.04		0.50	0.05
Control Delay	24.7	17.5		25.9		13.0	2.6		10.4	2.6
Queue Delay	0.0	0.0		0.0		0.0	0.0		0.0	0.0
Total Delay	24.7	17.5		25.9		13.0	2.6		10.4	2.6
LOS	C	B		C		B	A		B	A
Approach Delay		19.4		25.9		12.6			9.9	
Approach LOS		B		C		B			A	

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 55	
Control Type: Pretimed	
Maximum v/c Ratio: 0.69	
Intersection Signal Delay: 15.9	Intersection LOS: B
Intersection Capacity Utilization 80.0%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Spring Garden & Robie

Lane Group	EBL	EBT	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	61	168	636	977	38	571	41
v/c Ratio	0.38	0.27	0.62	0.69	0.04	0.50	0.05
Control Delay	24.7	17.5	25.9	13.0	2.6	10.4	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	17.5	25.9	13.0	2.6	10.4	2.6
Queue Length 50th (m)	5.5	14.7	31.9	38.6	0.0	19.4	0.0
Queue Length 95th (m)	15.8	28.2	47.7	58.4	3.3	31.3	3.4
Internal Link Dist (m)		56.0	122.1	8.1		103.6	
Turn Bay Length (m)	30.0						
Base Capacity (vph)	162	614	1022	1421	887	1131	879
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.27	0.62	0.69	0.04	0.50	0.05

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	297	21	10	535	5	30	5	10	10	5	20
Future Volume (Veh/h)	10	297	21	10	535	5	30	5	10	10	5	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	323	23	11	582	5	33	5	11	11	5	22
Pedestrians					66			34			122	
Lane Width (m)					3.6			3.6			3.6	
Walking Speed (m/s)					1.2			1.2			1.2	
Percent Blockage					6			3			10	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		146			150							
pX, platoon unblocked	0.96						0.96	0.96		0.96	0.96	0.96
vC, conflicting volume	709			380			728	1122	273	992	1130	416
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	604			380			624	1036	273	900	1045	297
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			89	97	98	93	97	96
cM capacity (veh/h)	833			1142			288	188	665	162	185	600

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	172	184	302	296	49	38
Volume Left	11	0	11	0	33	11
Volume Right	0	23	0	5	11	22
cSH	833	1700	1142	1700	310	289
Volume to Capacity	0.01	0.11	0.01	0.17	0.16	0.13
Queue Length 95th (m)	0.3	0.0	0.2	0.0	4.4	3.6
Control Delay (s)	0.7	0.0	0.4	0.0	18.8	19.3
Lane LOS	A		A		C	C
Approach Delay (s)	0.4		0.2		18.8	19.3
Approach LOS					C	C

Intersection Summary				
Average Delay	1.8			
Intersection Capacity Utilization	41.4%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	65	226	8	309	115	389	54	117	126
Future Volume (vph)	65	226	8	309	115	389	54	117	126
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.8	22.8	22.8	22.8	37.2	37.2	37.2	37.2	37.2
Total Split (%)	38.0%	38.0%	38.0%	38.0%	62.0%	62.0%	62.0%	62.0%	62.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	0.0
Total Lost Time (s)		4.5		4.5		4.5		4.5	4.5
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		18.3		18.3		32.7		32.7	32.7
Actuated g/C Ratio		0.30		0.30		0.54		0.54	0.54
v/c Ratio		0.39		0.34		0.63		0.24	0.15
Control Delay		23.4		17.3		13.3		8.1	1.9
Queue Delay		0.0		0.0		0.0		0.0	0.0
Total Delay		23.4		17.3		13.3		8.1	1.9
LOS		C		B		B		A	A
Approach Delay		23.4		17.3		13.3		5.5	
Approach LOS		C		B		B		A	

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 55	
Control Type: Pretimed	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 14.8	Intersection LOS: B
Intersection Capacity Utilization 63.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 5: Summer & Spring Garden

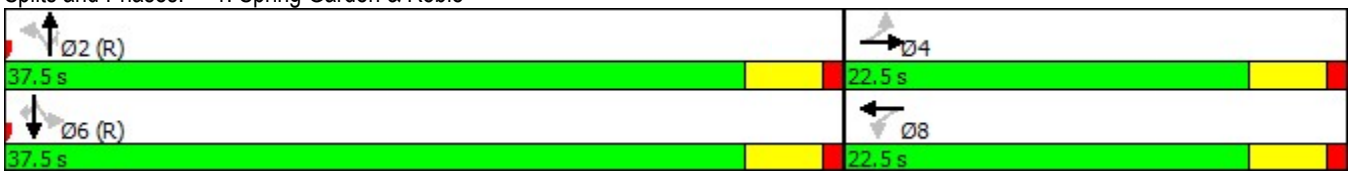
Lane Group	EBT	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	345	348	561	186	137
v/c Ratio	0.39	0.34	0.63	0.24	0.15
Control Delay	23.4	17.3	13.3	8.1	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	23.4	17.3	13.3	8.1	1.9
Queue Length 50th (m)	19.4	16.1	40.0	10.1	0.0
Queue Length 95th (m)	31.2	26.1	69.5	19.8	6.2
Internal Link Dist (m)	125.6	70.4	44.3	45.0	
Turn Bay Length (m)					20.0
Base Capacity (vph)	880	1018	897	788	925
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.39	0.34	0.63	0.24	0.15

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	56	166	48	357	165	740	37	148	389	38
Future Volume (vph)	56	166	48	357	165	740	37	148	389	38
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4		8		2			6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	2	2	2	6	6	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	37.5	37.5	37.5	37.5	37.5	37.5
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5		4.5	4.5		4.5	4.5
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	18.0	18.0		18.0		33.0	33.0		33.0	33.0
Actuated g/C Ratio	0.30	0.30		0.30		0.55	0.55		0.55	0.55
v/c Ratio	0.41	0.29		0.65		0.70	0.05		0.53	0.05
Control Delay	26.7	17.7		26.3		13.3	2.6		10.8	2.6
Queue Delay	0.0	0.0		0.0		0.0	0.0		0.0	0.0
Total Delay	26.7	17.7		26.3		13.3	2.6		10.8	2.6
LOS	C	B		C		B	A		B	A
Approach Delay		20.0		26.3		12.9			10.2	
Approach LOS		C		C		B			B	

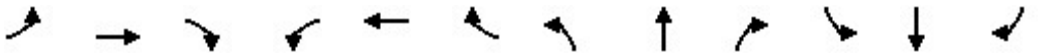
Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Pretimed	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 16.4	Intersection LOS: B
Intersection Capacity Utilization 82.1%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: Spring Garden & Robie



Lane Group	EBL	EBT	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	61	180	670	983	40	584	41
v/c Ratio	0.41	0.29	0.65	0.70	0.05	0.53	0.05
Control Delay	26.7	17.7	26.3	13.3	2.6	10.8	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.7	17.7	26.3	13.3	2.6	10.8	2.6
Queue Length 50th (m)	5.6	15.8	33.7	39.2	0.0	20.2	0.0
Queue Length 95th (m)	16.4	29.9	50.3	59.7	3.4	32.9	3.4
Internal Link Dist (m)		56.0	122.1	8.1		103.6	
Turn Bay Length (m)	30.0						
Base Capacity (vph)	149	614	1025	1405	888	1102	879
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.29	0.65	0.70	0.05	0.53	0.05

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	297	44	37	535	5	62	5	52	10	5	20
Future Volume (Veh/h)	10	297	44	37	535	5	62	5	52	10	5	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	323	48	40	582	5	67	5	57	11	5	22
Pedestrians					66			34			122	
Lane Width (m)					3.6			3.6			3.6	
Walking Speed (m/s)					1.2			1.2			1.2	
Percent Blockage					6			3			10	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		146			150							
pX, platoon unblocked	0.95						0.95	0.95		0.95	0.95	0.95
vC, conflicting volume	709			405			798	1192	286	1096	1214	416
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	581			405			676	1091	286	989	1114	272
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			96			74	97	91	91	97	96
cM capacity (veh/h)	841			1118			256	168	653	125	163	618

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	172	210	331	296	129	38
Volume Left	11	0	40	0	67	11
Volume Right	0	48	0	5	57	22
cSH	841	1700	1118	1700	341	247
Volume to Capacity	0.01	0.12	0.04	0.17	0.38	0.15
Queue Length 95th (m)	0.3	0.0	0.9	0.0	13.7	4.3
Control Delay (s)	0.7	0.0	1.3	0.0	21.9	22.2
Lane LOS	A		A		C	C
Approach Delay (s)	0.3		0.7		21.9	22.2
Approach LOS					C	C

Intersection Summary				
Average Delay	3.6			
Intersection Capacity Utilization	52.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	68	262	10	333	116	390	54	118	128
Future Volume (vph)	68	262	10	333	116	390	54	118	128
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.8	22.8	22.8	22.8	37.2	37.2	37.2	37.2	37.2
Total Split (%)	38.0%	38.0%	38.0%	38.0%	62.0%	62.0%	62.0%	62.0%	62.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	0.0
Total Lost Time (s)		4.5		4.5		4.5		4.5	4.5
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		18.3		18.3		32.7		32.7	32.7
Actuated g/C Ratio		0.30		0.30		0.54		0.54	0.54
v/c Ratio		0.44		0.37		0.63		0.24	0.15
Control Delay		23.4		17.6		13.3		8.1	1.9
Queue Delay		0.0		0.0		0.0		0.0	0.0
Total Delay		23.4		17.6		13.3		8.1	1.9
LOS		C		B		B		A	A
Approach Delay		23.4		17.6		13.3		5.5	
Approach LOS		C		B		B		A	

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 55	
Control Type: Pretimed	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 15.1	Intersection LOS: B
Intersection Capacity Utilization 65.3%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 5: Summer & Spring Garden

Lane Group	EBT	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	391	376	563	187	139
v/c Ratio	0.44	0.37	0.63	0.24	0.15
Control Delay	23.4	17.6	13.3	8.1	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	23.4	17.6	13.3	8.1	1.9
Queue Length 50th (m)	22.0	17.6	40.3	10.2	0.0
Queue Length 95th (m)	34.5	28.1	69.8	19.9	6.2
Internal Link Dist (m)	125.6	70.4	44.3	45.0	
Turn Bay Length (m)					20.0
Base Capacity (vph)	879	1014	896	788	925
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.44	0.37	0.63	0.24	0.15

Intersection Summary

EKISTICS PLANNING & DESIGN

August 23, 2016

EKISTICS PLANNING & DESIGN
Landscape Architecture | Engineering
1 Starr Lane, Dartmouth, NS
Canada, B2Y 4V7 | 902.461.2525
www.ekistics.net

HRM Planning & Development
Eastern Region, Alderney Gate
40 Alderney Drive, 2nd Floor
Dartmouth, NS

To Whom It May Concern,

RE: Proposed 5972 Spring Garden Road – 1478 Carlton Street Wind Impact Qualitative Assessment and Shadow studies

The proposed 29.5 storey mixed use development project is located at the corner of Spring Garden Road and Carlton Street. To the north, east and south of the site, the Spring Garden Corridor has a range of mid and high rise building types (some up to 22 storeys) which typify the mixed use urban corridor. To the west of the site, the surrounding residential neighbourhood includes mostly low rise 2-3 storey residential.

The following assessment looks to interpret the likely wind impacts on surrounding properties and sidewalks as a result of the proposed development. Clearly a building this scale will require a more detailed wind tunnel assessment in later stages of the DA process. This desktop assessment is meant to provide a high level overview of some of the possible impacts that will need to be validated and quantified in a more detailed flume study or computer simulation. Generally tall buildings will interact with other neighboring tall buildings to create impacts between the buildings and at the ground level for some distance surrounding the development.

Wind data from the Shearwater Airport was assembled and analyzed (1953 -2000) using Windrose PRO 2.3 to understand the intensity, frequency and direction of winds at the development site. The resulting diagram (Fig. 1) shows that the highest and most frequent wind speeds come from the west and south. The relative distribution of higher wind speeds is somewhat constant from the north, north-west, and south-west. High winds from the north-east, east, and south-east are substantially infrequent when compared to other directions. This has visible implications for development on this site as is shown in Fig.2.

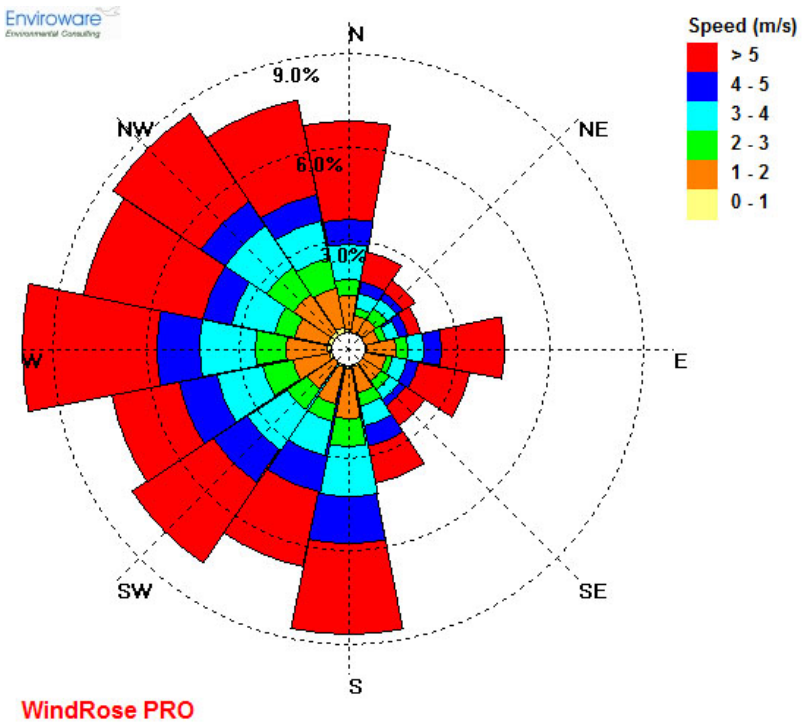
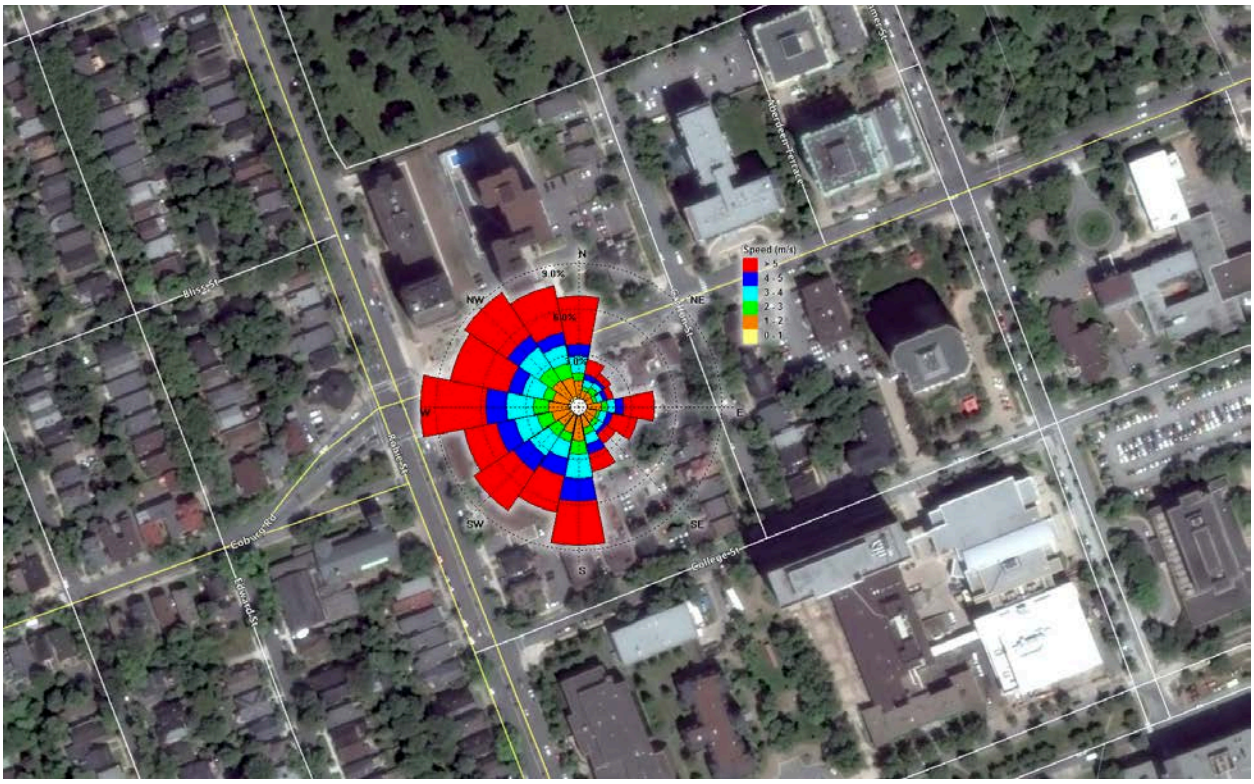


Fig 1. Wind Rose Shearwater 1953-2000

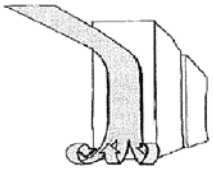
Fig 2. Wind Rose overlay on site

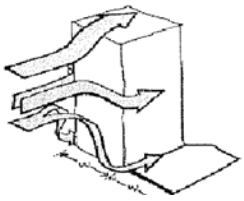


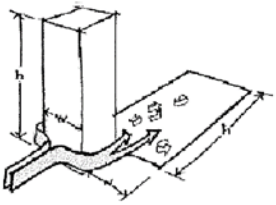
Wind Impacts from tall Buildings

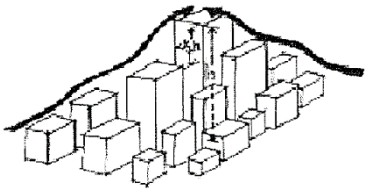
There will be a number of impacts from the new building including:

1) Downwash: Wind speed increases with height so when a tower is exposed to wind, the pressure differential between the top and the bottom of tower forces the high pressure at the top down the windward face dramatically increasing pedestrian wind speeds. The taller the exposed face is, the higher the wind speed will be at the base. The stepback at the 4th storey will receive the bulk of this downwash rather than Spring Garden Road. A 30 storey building can cause up to 100% increase in wind speeds at the base.
2) The corner effect: at the windward corners of buildings there can be unexpected increases in wind speeds as wind forces around the windward corners from high pressure on the windward face to low pressure on the lee side. Some of the ways to decrease this impact is to create pyramidal steps which increases the surface area of the edges. This has been designed into the Spring Garden tower.
3) The Wake Effect: Wake is generally caused by both the downwash and corner effect. The greatest impact area occurs within an area of direct proportion to the tower height and width on the leed side of the wind. Impacts are minimized by creating a stepback base on the building.
4) Building Groups: The effects that occur individually around buildings cannot be applied directly to groups of buildings. The cumulative effect of many clustered tall buildings, like in this situation, can create a wide range of different wind scenarios that must be modelled as a group to understand the cumulative impacts.









Pedestrian Comfort:
Pedestrian comfort and safety is an important factor to consider in the design of a building and an area's built form, especially in a windier city such as Halifax. The design of a building will impact how wind interacts at the ground level, impacting the pedestrian experience. The Beaufort scale is an empirical measure that relates wind speed to observed conditions on land and sea. The attached Beaufort scale is a general summary of how wind affects people and different activities, and distinguishes at what points wind speeds can become uncomfortable or dangerous.
A building can impact both the wind speed and the wind turbulence at the pedestrian level. Wind turbulence not only creates uncomfortable environments through the rising of dust and other particles, it also decreases the temperature on the site. A properly designed building can mitigate some of the negative impacts of wind on the street level.

Seasonal Wind Impacts:
Looking at the seasonal wind impacts (Fig.3), during the summer, most of the wind comes from the south (12% of the time) and southwest (10% of the time). During the summer, the pedestrian realm along Spring Garden Road and Carlton Street will not be impacted by winds blowing from the south/southwest.

In the winter, the prevailing winds shift and come from the west, north-west, and north. These winds could elevate the wind speeds for the portion of Spring Garden to the west and east of the building due to corner effects. Additionally, high winter winds (>18 mi/hr) which are prevalent from the north-west and the east (which occur 1.75% and 1.25% of the time, respectively) could impact the west side of the building, and the corner of Carlton Road and Spring Garden. A large canopy will be needed over the main entry plaza to reduce the impacts of downwash in the winter.

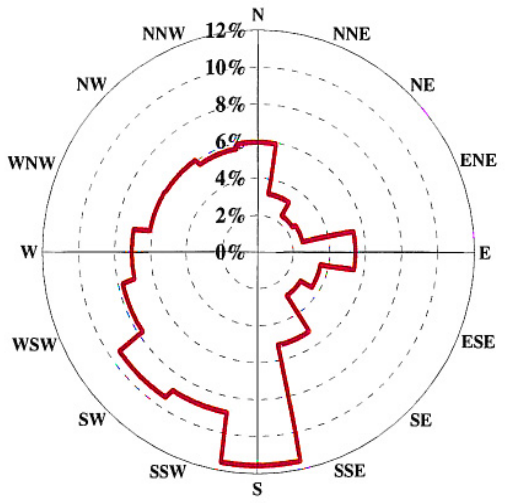
It should be noted that the building's stepped massing nature and podium-tower design (including the added benefit of the surrounding heritage properties as an extension of the podium) should significantly decrease pedestrian discomfort caused by downwash winds. The stepped terraces and podium act to deflect a large amount of downwash away and around the tower before it reaches ground level, decreasing the wind speed, but adding slightly more turbulence. In addition, canopies have been added to ground floor entrances, and patios will surround the façade of the building, again adding a second level of wind and weather protection.

Surrounding Development:
The taller surrounding buildings shown on Fig 4 already have wind implications on this site and the neighbouring residential area. Since there are a number of buildings that ring the site from the north and east of the development (the direction of winter, and high speed winter winds), the area is already in the wake zone of these surrounding buildings. The wake zone usually extends 8-30 times the height of a building. So, a 10 storey building will have reduced wind speeds for 800-3000 feet on the lee side of the building, depending on prevailing wind. Beyond the 8-30 wake zone there is typically more gusts and eddies as a result of more turbulent air.

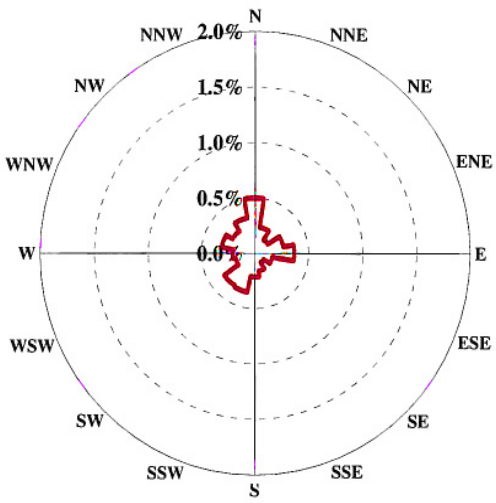
Fig 3. Wind Rose frequencies during 4 seasons

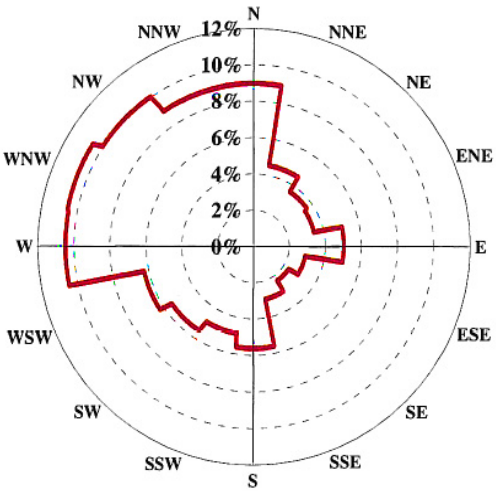
Shearwater, NS. 1953-2000

All Summer Winds

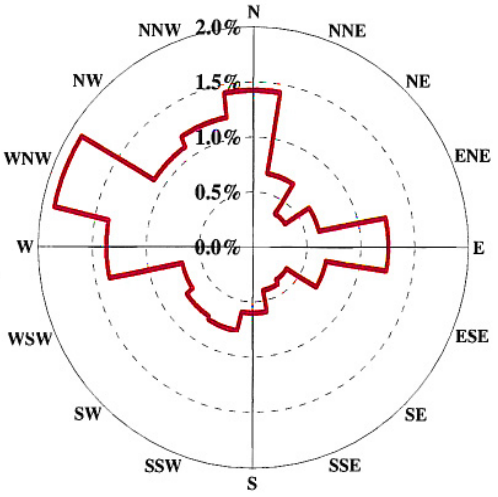


Summer Winds > 18 mi/hr





All Winter Winds



Winter Winds > 18 mi/hr

Figure 4. Tall surrounding buildings

Building Form:
Changes in wind speed as a result of buildings vary depending on wind direction and building morphology. On the upwind side of the building (west and north side; or on the Spring Garden towards Robie Street side) there can be more turbulent wind but little change in wind speed as the building is vertically terraced. On the downwind side of the building (south and east; the backlot of the building and Carlton Road), wind speed is often reduced up to 8X the height of the building in what is often referred to as the "quiet zone". This means that the Carlton heritage street will not be adversely impacted in the summer (wind from the south and south-west) but could have more intense gusts in the winter as a result of corner effects. The main building entrance is recessed and canopied to protect the entrance from any turbulence which might arise on the north side of the building. Figure 5

With the terraced and podium design there should be reduced impacts from the 30-storey tower but the cumulative impacts of all the surrounding towers on the neighbourhood is to hard to speculate without a more in depth simulation.

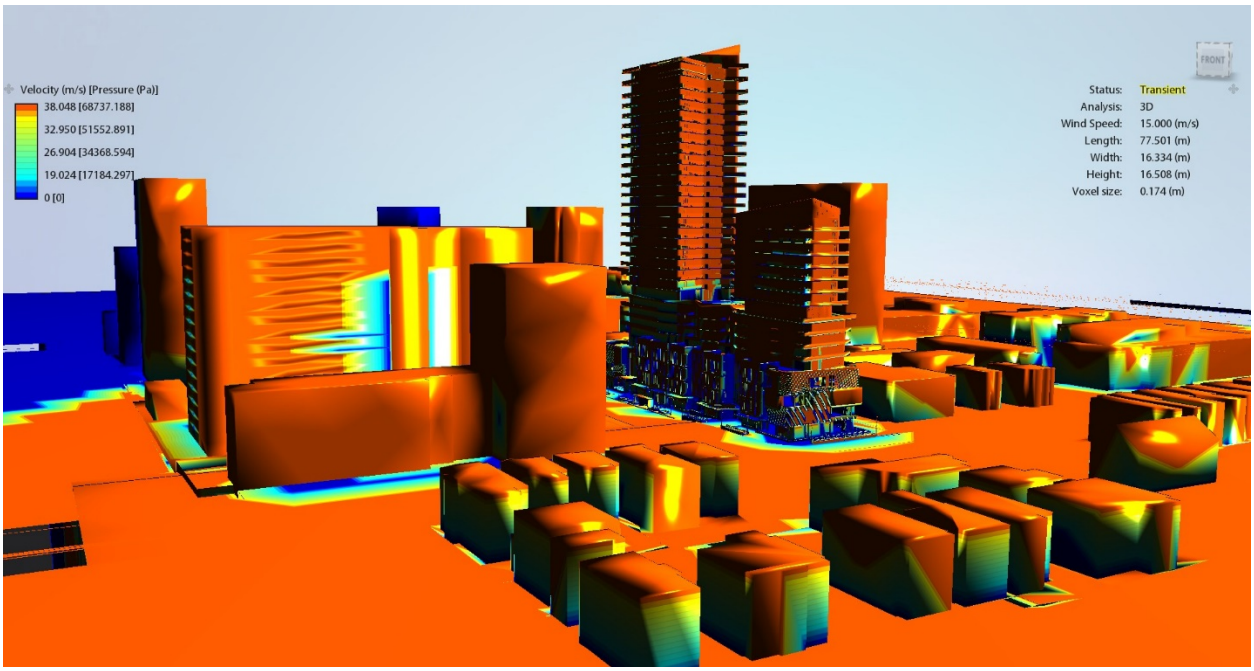


Figure 5. Predominant winter wind pressure simulation

Shadow Study

A shadow Study was undertaken to assess the impacts of the 30 storey and 16-storey towers on surrounding properties. A 3D computer model was placed in real-world space and assessed on an hourly basis for the winter solstice (Dec 21), Summer Solstice (June 21) and Equinox (Sept 21 and March 21) periods. These simulations provide a good overview of the best case conditions (summer solstice where the sun is high and shadows are short) and worst case scenario (winter solstice where days are short, sun angles are low and shadows are long).

Winter Solstice (Dec 21): In the winter sunrise is at 7:48 am and sundown is at 4:37 pm giving only about 8 hours of sunlight. At 8am and 4pm the shadows are so long (sun angle so low) that even a tree can shade an area for very long distances up to 10x the height of the object. In a downtown, the impacts of any building on these hours should be discounted because virtually everything is in shade from surrounding buildings and trees. The shade diagram confirms that within a few blocks of the development, the existing tall buildings in the Sub-Area already produce enough shade such that the impact of the new building will be fairly minimal. On exception is around 4pm in the public gardens where this building will cast some additional shade that currently doesn't exist. In the winter, the Gardens are closed and the shade will not impact vegetation growth or vigour.

Summer Solstice (Jun 21): In the summer, sunrise is at 5:29 am and sundown is at 9:04 pm giving about 15.5 hours of sunlight. At 6am and 9pm the shadows are so long (sun angle so low) that even a tree can shade an area for very long distances up to 10x the height of the object. In a downtown, the impacts of any building on these hours should be discounted because virtually everything is in shade from surrounding buildings and trees. The shade diagram shows that at 7am the building will cast shade on Coburg Road for a few blocks, and a few properties at the corner of Robie and Coburg from about 8-10am, and from 10am-2pm the south side of Spring Garden Road and some of the north side will be in shade. Note that the south side of the street is already in shade from the existing 3 storey buildings. The change will be some additional shade on the north side of Spring Garden (already partially in shade from trees) from 11am to 1pm. After 3pm much of Carlton Street will be in shade from the building however, the street is already in partial shade from the existing 3 storey buildings and the large trees that line the street. After 6pm, there will be some slight additional shade on College Street. There are no shade impacts on the public gardens.

Equinox (Sept 21 and Mar 21): In the equinox sunrise is at 7:00 am and sundown is at 7:22 pm giving only about 12 hours of sunlight. At 8am and 7pm the shadows are so long (sun angle so low) that even a tree can shade an area for very long distances up to 10x the height of the object. In a downtown, the impacts of any building on these hours should be discounted because virtually everything is in shade from surrounding buildings and trees. The shade diagram confirms that around 9am-10:30am there will be some new shade cast on the corner of Robie and Spring Garden, and some additional new shade on the north side of Spring Garden Road from 11am to 3pm. Generally the south side of Spring Garden stays in shade as it currently does today. There are no changes in shade from 3pm onwards due to existing buildings casting shadow. In the fall and winter there are no shadows cast on the Public Gardens from this development.

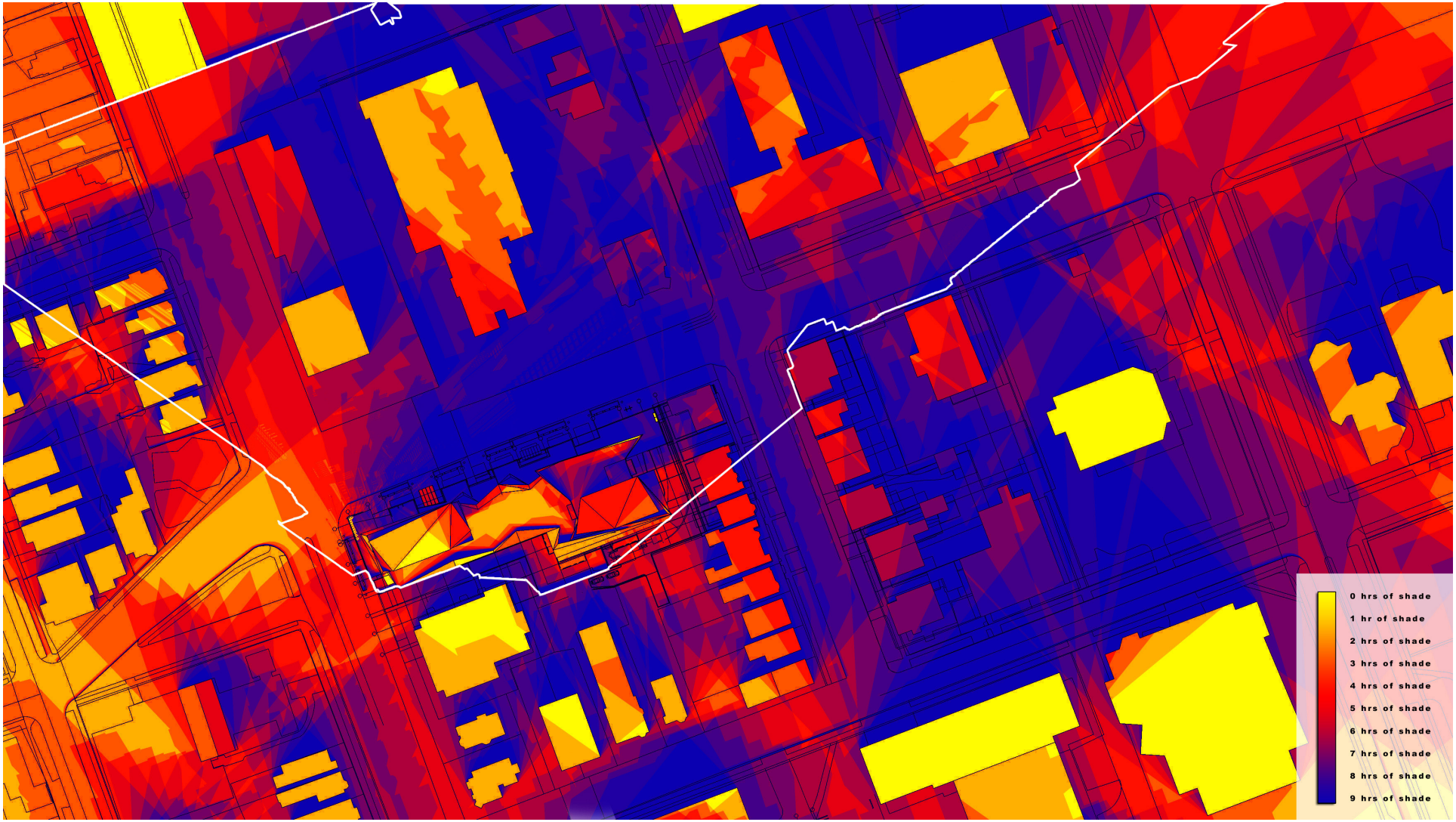
If you have any questions please contact me at your convenience.

Sincerely,

Original Signed

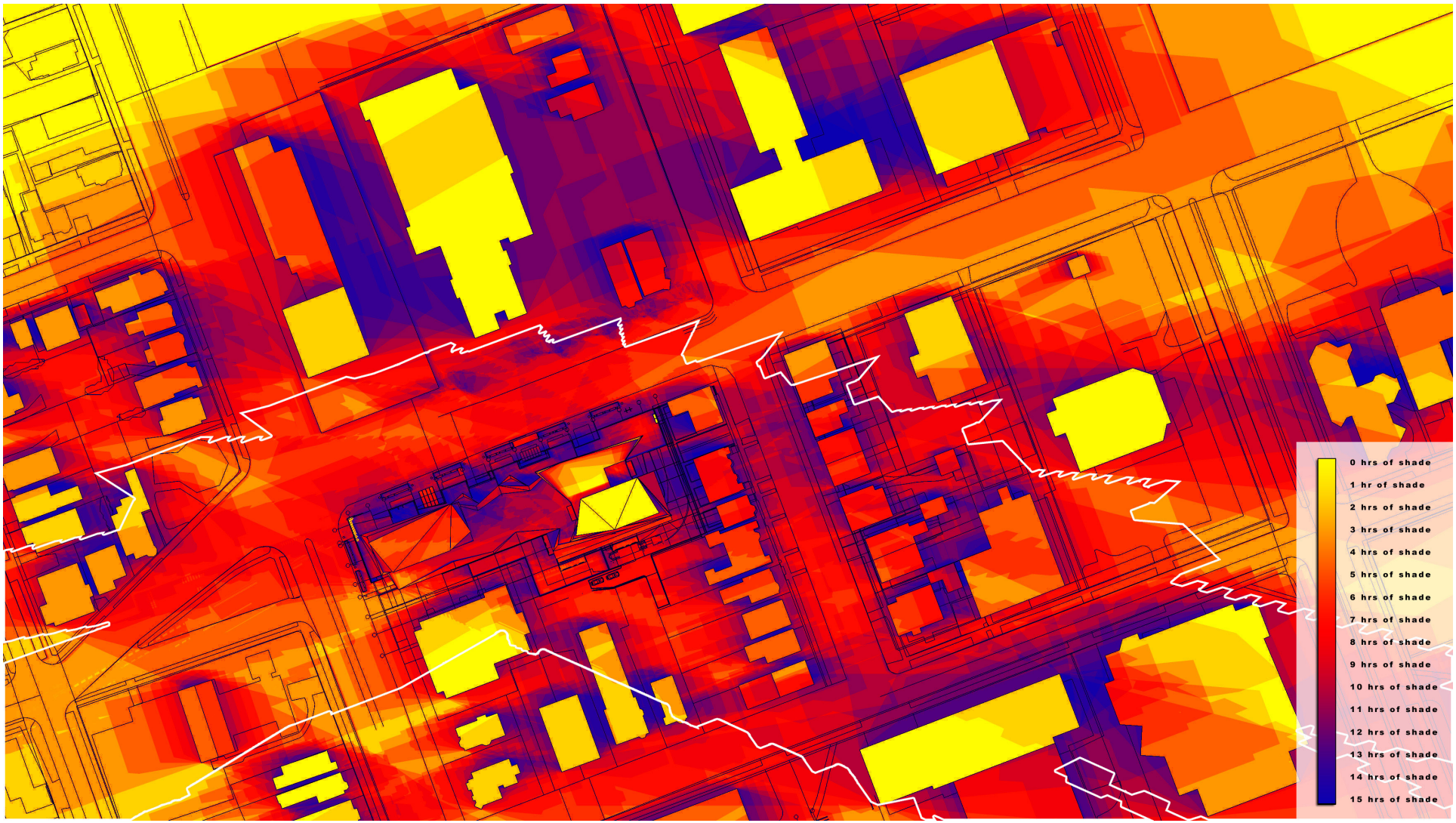
Rob LeBlanc
Ekistics Planning & Design

DECEMBER 21ST



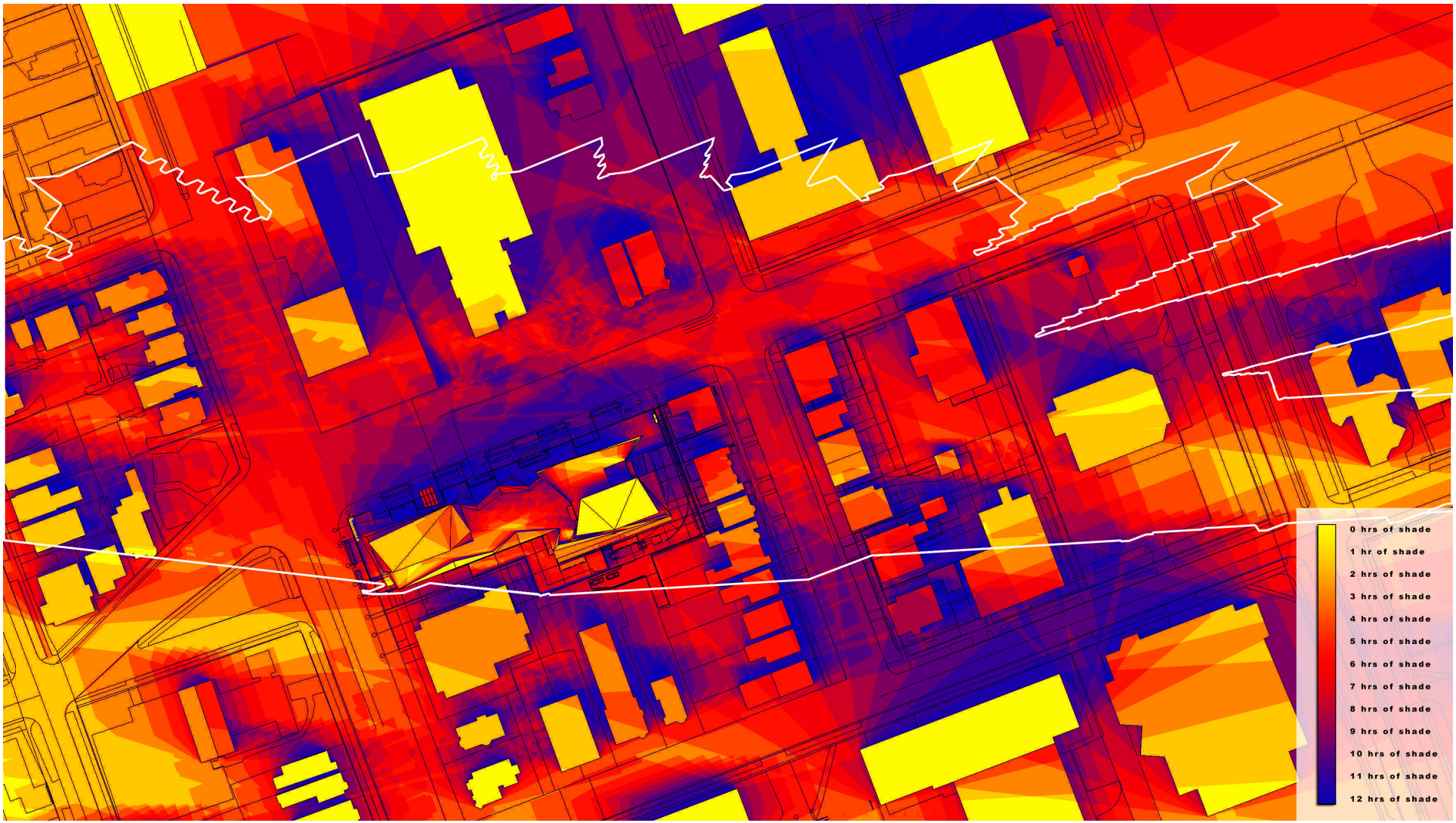
SPRING GARDEN WEST SHADOW STUDY

JUNE 21ST



SPRING GARDEN WEST SHADOW STUDY

MARCH & SEPTEMBER 21ST



SPRING GARDEN WEST SHADOW STUDY

EKISTICS PLANNING & DESIGN
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www.ekistics.net

August 17, 2016

HRM Planning & Development
Eastern Region, Alderney Gate
40 Alderney Drive, 2nd Floor
Dartmouth, NS

To Whom It May Concern,

RE: Proposed 5972 Spring Garden Road – 1478 Carlton Street – Wastewater Capacity

The proposed 30 story mixed use development is located along spring Garden Road between Carlton Street and Robie Street. To construct the building, a number of existing buildings are to be removed which include:

- Office space (approx. 2,600 ft^2);
- Commercial space (approx. 8,300 ft^2);
- Residential units (approx. 24 units); and,
- Restaurants (approx. 6,500 ft^2)

Existing building laterals currently connect to a 900mm diameter combined sanitary sewer located within the Spring Garden Road right-of-way. This collection system consists of a series of manholes and main pipes that flow in an easterly direction to Carlton Road, then southerly along Carlton Road. The removal of these existing buildings and land uses equates to an estimated reduction in current wastewater flow of approximately 57,000 litres/day based on calculations generated using guidelines provided in the Halifax Water Design and Construction Specifications and the Atlantic Canada Wastewater Guidelines Manual.

The new development consists of:

- 250 residential units;
- 21,200 ft^2 retail space;
- 61,500 ft^2 commercial space; and,
- 3,200 ft^2 of restaurant space.

This level of development equates to approximate 244,000 litres/day of new wastewater design flow as summarized in the table below.

Estimated Wastewater Flows - Proposed Development								
	FLOOR	ft^2	m^2	Units	People	Flow Calc	Units	FLOW (l/d)
Residential	30	-	-	250	563	330	l/d/p	185,625
Retail Area	1	21,200	1,970	-	10	6	l/d/m2	11,817
Commercial Area	1	61,500	5,714	-	30	6	l/d/m2	34,281
Restaurant	1	3,200		50 seats	6	225/100	l/d/s_e	11,850
TOTAL		**85,900**	**7,683**		**609**			**243,573**

Sub-total Wastewater Flow	243,573	litres / day
Removed from Previous Development	57,286	litres / day
Total New Wastewater Flow	**186,288**	**litres / day**
	2.16	litres / second

Pipe calculations for the lateral pipe from the building to the main are based on a 150mm diameter service lateral at 2% grade. Peak wet weather flow calculations as per the recommended guidelines suggest a maximum peak wet weather flow of 14.4 L/s which equates to approximately 51% pipe capacity utilization in the 150mm diameter pipe under peak flow conditions.

With respect to the 900mm diameter combined sewer main along Spring Garden Road immediately downstream of the building connection, the peak wastewater flow from the building contributes an additional 0.4% capacity utilization to that pipe when considering the reduction due to the removal of the existing buildings. A summary of the capacity calculations for both pipes are shown in the table below.

Pipe #	From	From Invert	To	To Invert	Length (m)	Pipe Size (mm)	Pipe Area (m^2)	Pipe Slope (%)	Manning's 'n'	Velocity (m/s)	Pipe Capacity (l/s)	% Full
1	Building	39.65	CMH1	39.35	15	150	0.018	2.00%	0.01	1.59	28.0	51.4%
2	CMH1	39.3	CMH2	38.95	26	900	0.636	1.34%	0.01	4.29	2729.3	0.4%

**** CMB = Combined Manhole*

Min Velocity =	0.75	m/s
Net Peak Wet Weather Flow =	10.67	l/s

Based on known information and the estimated peak flows from the proposed development, the volume of new wastewater requires a very small percentage of total capacity in the receiving pipes. Therefore, there do not appear to be any capacity issues present in the wastewater collection system servicing this building. That said, it should be noted that these calculations have assumed that there are no significant downstream capacity restrictions or operational issues in the combined sewer system. As this project progresses, confirmation that no such issues exist is recommended.

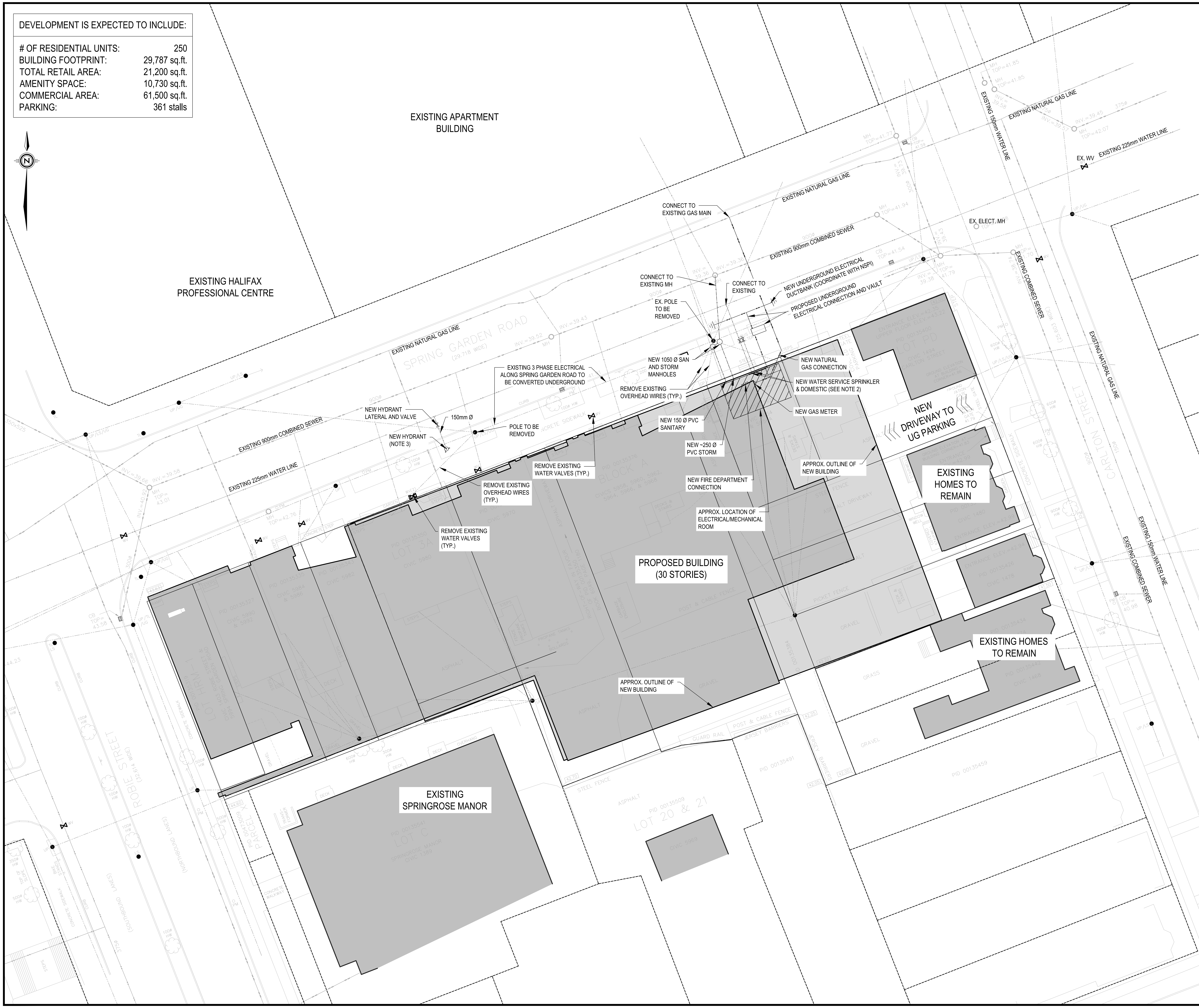
If you have any questions or require any additional information, please contact me at your convenience.

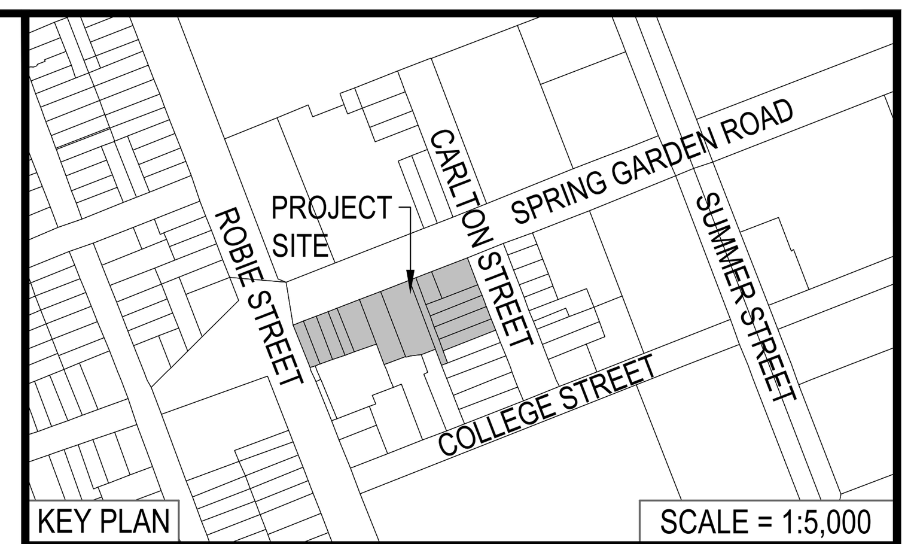
Sincerely,

Original Signed

Roger N. Boychuk, P. Eng.
Ekistics Planning & Design

DEVELOPMENT IS EXPECTED TO INCLUDE:	
# OF RESIDENTIAL UNITS:	250
BUILDING FOOTPRINT:	29,787 sq.ft.
TOTAL RETAIL AREA:	21,200 sq.ft.
AMENITY SPACE:	10,730 sq.ft.
COMMERCIAL AREA:	61,500 sq.ft.
PARKING:	361 stalls





KEY PLAN

SCALE = 1:5,000

LEGEND

	PROPOSED	EXISTING
CATCH BASIN		
PYRAMID CB		
HYDRANT		
SAN MANHOLE		
STM MANHOLE		
VALVE		
POWERPOLE		
CULVERT		
SANITARY		
STORM		
WATER		
FENCE		
SWALE / DITCH		
ELECT. OVERHEAD		
CONTOUR	0.0	0.0
SPOT ELEVATION	0.00	0.0
PROFILE GRADE		

SANITARY LATERAL		ALIANT PEDESTAL	
STORM LATERAL		NSP URD BOX	
WATER LATERAL		SIAMESE CONN.	
CATCH BASIN LEAD		ROCK / SURGE	
FORCE MAIN		END CAP	
EASEMENT		DRIVEWAY CUT	
RIGHT-OF-WAY		HEADWALL	
PROPERTY LINE		LIGHT STANDARD	
LOT LINE		UTILITY POLE	
GAS LINE		ROAD SIGN	
TOE/TOP OF BANK		STREET TREE	
CLEARING LIMIT		SIDEWALK	

NOTES:

1. CONTRACTOR TO CONFIRM LOCATION OF ALL UNDERGROUND SERVICES PRIOR TO CONSTRUCTION WITH RESPECTIVE UTILITIES.

2. PROPOSED WATER CONNECTION TO BE INSTALLED AS PER HWSD - 1220 OF DESIGN AND CONSTRUCTION SPECIFICATIONS FOR HALIFAX WATER, LATEST EDITION.

3. NEW HYDRANT TO BE INSTALLED AS PER HALIFAX WATER DETAIL HWSD - 1110.

4. POWER LOAD CALCULATIONS NOT AVAILABLE AT THIS TIME.

0 5 10
1:250

NO.	DESCRIPTION	DATE
2	ISSUE FOR DA APP	2016.08.17
1	ISSUE FOR UTILITY REVIEW	2015.07.07

EKISTICS PLANNING & DESIGN
1 Starr Lane, Dartmouth, NS B2Y 4V7
902.461.2525 www.ekistics.net
Landscape Architecture | Engineering

CLIENT

DEXEL DEVELOPMENTS INC.

PROJECT

SPRING GARDEN ROAD AND CARLTON STREET
DEVELOPMENT AGREEMENT PLANNING APPLICATION
HALIFAX, NOVA SCOTIA

SHEET DESCRIPTION

SERVICING SCHEMATIC

SCALE	DATE	SHEET
1:250	2016/08/18	C1

DRAWN	CHECKED	PROJECT NO.	OF
DJH	RNB	15-001	1

August 18, 2016

ekistics plan+design

1 Starr Lane, Dartmouth, NS
Canada, B2Y-4V7 | 902.461.2525
www.ekistics.net

Aug 12, 2016

Landscape Architecture

Urban Planning

Architecture

Engineering

HRM Planning & Development
Eastern Region, Alderney Gate
40 Alderney Drive, 2nd Floor
Dartmouth, NS

To Whom it May Concern

RE: 5972 Spring Garden Road – 1478 Carlton Street, Planning Application

Ekistics, on behalf of Dexel Developments, is submitting an application to enter into a development agreement to permit a mixed used (residential, commercial office, and commercial retail) building along Spring Garden Road between Robie Street and Carlton Street; one full downtown block.

Existing Planning and Land-Use Context:

PIDs: #00135368, #00135376, #00135384, #00135392, #00135400, #40286213, #00135418, #00135426, # 00135350, # 00135343, #00135335, #00135327, #00135319.
RMPS Designation: Regional Centre
Plan Area: Halifax Peninsula
Plan Sub-Area: Peninsula Centre Area – Spring Garden Road Sub-Area
Plan Area Designation: Residential – Commercial Mix (RC) and Medium Density Residential (MDR)
Zoning: General Residential (R-2) and Multiple Dwelling (R-3) and C2A

The site in consideration is located from civic address 1403 Robie Street, along Spring Garden Road around the corner down to, and including, 1478 Carlton Street. The proposed development site contains 13 PIDs. Six of the PID's is zoned C-2A (Minor

Figure 1. Zoning

Commercial), PIDs #00135376, #00135384, #00135392 are zoned R-3 (Multiple Dwelling) and PIDs #00135400, #40286213, #00135418, #00135426 are zoned R-2 (General Residential). These buildings are currently a mix of residential, office and small commercial spaces, such as Jean's Chinese Restaurant and Aurora Aesthetics. The existing heritage properties along Carlton Street are to be left as their original footprints and fully restored as heritage properties.

To support the investigation into a development agreement to allow the proposed development we are providing additional rationale taking into consideration the Vision and Guiding Principles of the Regional Municipal Planning Strategy (RP+5), and further informed by the Halifax Municipal Planning Strategy and the Halifax Peninsula Land Use By-Law.

The proposed development does not conform to the LUB in terms of:

- Unit count – it is not permitted to have more than 4 units on a building site
- Lot Coverage – maximum lot coverage permitted is 35%; proposed lot coverage is 75%
- Height – maximum height permitted is 35ft, the proposed development reaches a maximum height of 320ft
- Yard setbacks – As there is no required frontage, side or rear yard setbacks for a building of greater than 4 units, proposed setbacks are non-compliant by omission
- Frontage/Side yard setback for a 4 unit building: 80 ft / 6 ft
- Land Use – no commercial space is permitted within an R-2 zone.

Therefore, in order to permit the proposed development, site specific amendments must be made to the MPS and LUB to allow for a Development Agreement for the site that alters the permitted requirements as outlined above. The area is designated as one of the "Primary Growth Areas" in the upcoming Centre Plan with recommendations for 'tall' and 'moderate' height buildings. However, at this stage, there is still no defined recommendations for this block.

Figure 2. Spring Garden Road Sub-Area

The Site and Context

Spring Garden Road is one of the most prominent streets in Nova Scotia and transitions from high-density retail downtown to a residential and small scale commercial typology as it approaches Robie Street. Lined with restaurants, cafes, over 200 retail stores and specialty shops, and abutting the Halifax Public Gardens, Spring Garden Road accommodates a high density of people, whether residents or visitors.

The proposed development builds on the abundance of amenities in the neighborhood. In addition to multiple small scale commercial and restaurants in the immediate block, this site is extremely well connected to the commercial and office amenities located at the east end of Spring Garden (3 min bus ride, 7 min walk), Downtown Waterfront (7 min bus ride, 12 min walk) and on Quinpool Road (7 min bus ride, 12 min walk). With 5 bus routes (1, 17, 18, 80, 81) passing directly in front of the property, and many others running down surrounding blocks, this development supports current Halifax transit initiatives and encourages a lifestyle surrounding more sustainable transportation options, discouraging regular car use.

In addition to commercial connectivity, the site is exceptionally connected to some of the most prominent employers and destinations in the area including the IWK Health Centre; the Victoria General Hospital; QEII Health Sciences Centre & Emergency Department; the NS Rehabilitation Centre; the Spring Garden Professional Centre; and Dalhousie University. Aligning with the high density of medical land uses in the area, the building will be developed as a Healthy Building, utilizing best practice design for encouraging a healthy lifestyle. This will include rooftop gardens, prioritizing office space for medical use, and offering a percentage (6%) of affordable residential units and affordable office spaces for NGO medical organizations.

Though connected to many institutional and commercial uses, the proposed development is located in a highly residential area. To the North and East of the site there are a number of older high rise multi-unit residential buildings with limited interaction at

the streetscape level, which set the precedence for residential density along this strip of Spring Garden. In the midst of these residential towers is Carlton Street, a protected heritage streetscape lined with historic properties.

Policy Context:

This development provides an opportunity to increase residential density on peninsula Halifax within a desirable and transit oriented area, within close proximity to the Spring Garden Road commercial area, universities, major recreation areas, hospitals, and downtown Halifax. Though this block is considered low-rise currently (35' height precinct), it is surrounded by significant height to the north (16-storeys to the north, and 13 storeys to the north east), to the east (21-storeys), and to the south (240' tall 15-storeys for the Charles Tupper Building). The Carlton Terrace project is also proposed as a 18-storey development just north of this site. The Spring Garden Sub-Area MPS policy 8.1.2 makes provisions for additional height beyond the height precinct (labelled as 45' on ZM17 but accommodating a 16 and 13 storey buildings) north of Spring Garden Road so long as the shadows do no impact the Public Gardens. This same consideration would need to be accommodated in the MPS amendment for the southern part of the Spring Garden Road Sub-Area. This south Spring Garden Road Area already hosts the 21-storey Summer Gardens tower in a 45' height precinct. Clearly the MPS needs to be updated for the Spring Garden Sub-Area to take into consideration the considerable height that exists in the district.

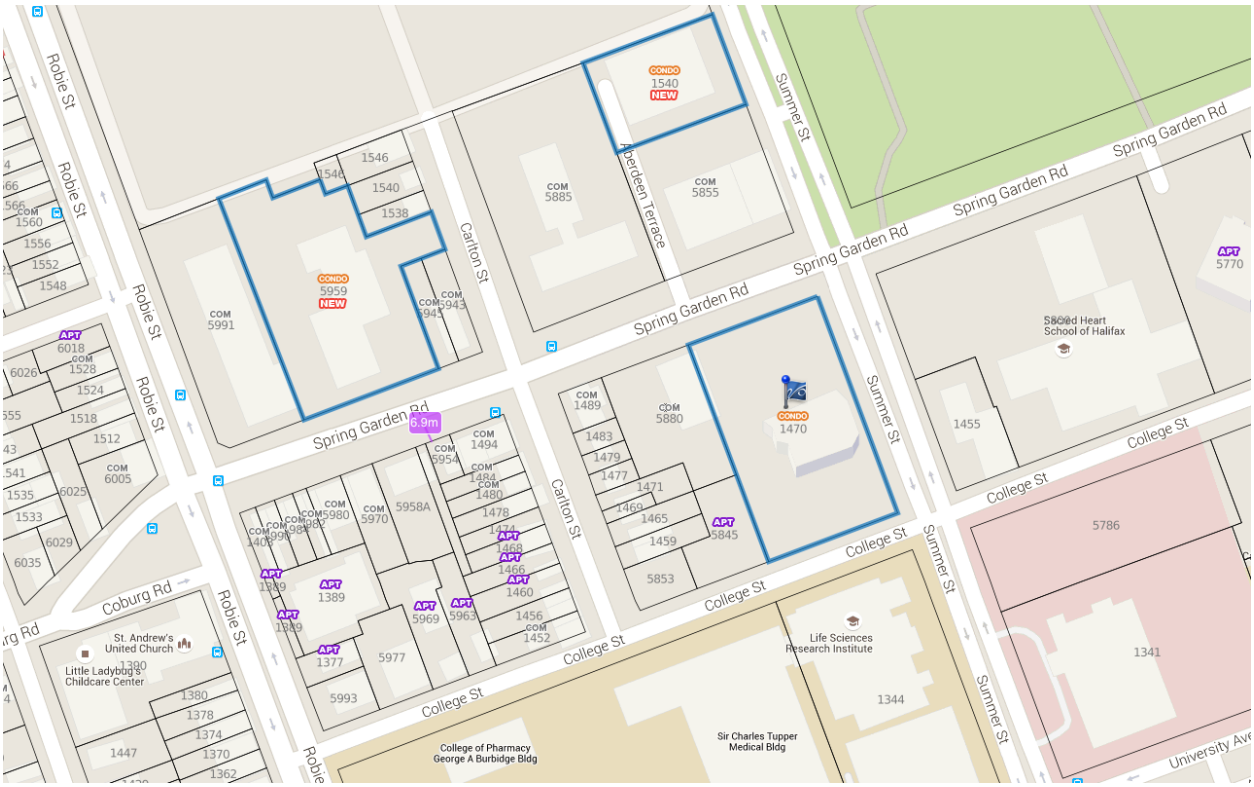


Figure 3. Parcel density on each of the 4 blocks of the Spring Garden Road Sub-Area

The mixed nature of the zoning in this area R3, C2-A, and R2 on very small urban lots is a function of the historic urban grid in this area though only the Carleton Street heritage buildings remain (and will be preserved). This block remains the one remaining block in the 4-block Spring Garden Road Sub-Area that still has a 35' height precinct. This was primarily due to the small parcels all individually owned. However, the land for this development has been assembled over the last 20 years to create an iconic development in an iconic location. This is a high foot traffic site between Spring Garden Road Commercial Area, Dalhousie University, the hospitals and research facilities and the Public Gardens. This is the one block where enough land has been assembled to create a mixed use development which will last the next hundred years. The current zoning in this area (even the R3 zone) would not permit this type of comprehensive development so the developer is requesting a site specific development agreement.

The Regional Plan, adopted in 2006 and reviewed in 2014, aims to balance housing growth over the life of the plan (2006-2031) and targets that 25% of the growth be directed to the Regional Centre (RP+5, Section 1.1). This development will help the municipality reach that targeted growth through the addition of 183 residential units.

While this development proposes a height significantly higher than what is currently permitted, additional height proposed through Development Agreement in this area is not without precedent. There are currently three developments being proposed in the Quinpool area. The first two, located along the corner of Quinpool Road and Robie Street, are being considered for MPS amendments under a single process, with the intention that a more comprehensive and higher quality design solution will arise through the shared process due to the proximity of the two developments. These developments propose a total of three towers with heights of 22 storeys, 11 storeys, and 18 storeys. The third development being proposed is located at 6112 Quinpool Road and is proposing an 8 storey building through Development Agreement. Additional developments are waiting in the wings including the MacDonalds site on Quinpool, the corner of Peperrell and Robie Street, and the St. Pats site currently going through a design process.

The current influx of Development Agreements highlights that circumstances have changed since the existing plans were adopted, to the extent that the original land use policy is no longer appropriate to satisfy the need for growth in the urban core. The current Centre Plan initiative being undertaken by the city to replace the jumble of out-of-date and conflicting existing plans in a simplified, holistic plan is an attempt to address the shortcomings of the existing zoning. Either way, this application could inform the Centre Plan process with regard to the type and scale of developments that developers are trying to implement in key locations of the urban core. The proposed design is in keeping with what we understand to be the Centre Plan's guiding principles by featuring well designed streetwall massing, appropriate tower setbacks, activated streetscapes with no blank walls, high quality design and materials, proper considerations for sidewalk solar access, wind considerations and appropriate scaled neighbourhood context.

We believe the location and form of the development is appropriate for the context of the area and will help to reinforce a walkable, densified, transit oriented community that will benefit the residents, nearby students as well as the commercial and institutional organizations in the vicinity.

Rational for Changes:

Recognizing the strategic significance of this property, our goal is to create a development which capitalizes on the unique opportunity of a large land assembly (an entire block of land with 13 PIDS), that can be redeveloped to increase residential density and uses within a desirable and transit-oriented area, creating "a diverse, vibrant and livable urban environment" (Policy S-1, RMPS). We believe that the proposed development offers an attractive prominence that has been lacking along the current 2 and 3 storey mixed use of this end of Spring Garden Road and can bridge the university and Spring Garden Road with some

Figure 4. Parcel density on each of the 4 blocks of the Spring Garden Road Sub-Area

additional density and uses that will continue to activate the street. The proposed development meets the HRM's Regional Plan principle of directing new growth where infrastructure and services already occur (RP+5, Section 1.1) and aligns with the goals of the Greater Halifax Economic Strategy 2011-2016 by promoting investment in the urban core. This block is currently surrounded on 3 sides by density and height and this development offers the opportunity extend the high quality feel of the Spring Garden Road commercial district closer to Dalhousie University, finishing off the last piece of one of Halifax's great streets.

The road r.o.w. from property line to street face is currently 6.2 meters offering significant space for a wide public streetscape, some of which could be executed as part of this development.

The parcel scale on the Spring Garden Road Sub-Area has changed significantly over the last century, moving from small 20-30' wide lots to the larger consolidated development parcels we see surrounding the remaining 3 of 4 blocks around this proposed development. The other 3 blocks have seen significant height and density added over the last 30 years. Fortunately, the historic character of Carlton Street has remained intact south of Spring Garden Road. This proposal intends to preserve the historic buildings on Carlton and access into the development is from Spring Garden Road. Figure 4 shows the extent of the density and parcel scale on the 3 surrounding blocks of the Sub-Area.

Recognizing the need to balance the desire for increased residential density within the Regional Centre with the need to retain the livability and access to amenities that draws the population to the Core, the proposed development will provide a transition from the mid and high-rise buildings surrounding this and provide an anchor for the south end of Spring Garden Road while preserving the character of the Carlton Street historic properties. The approach of adding density around major urban parks and in the vicinity of urban universities is common in most cities whether that be Central Park, the Boston Commons, the Community Commons (Mississauga), or Prince Island Park in Calgary. The larger taller buildings are typically set back 1 block from the major parks so that shade impacts and surrounding heritage buildings are preserved. The Public Gardens and the Camp Hill Cemetery are two signature open spaces in the city that will likely see increased density and development on their fringes. Increasing density across from large urban parks (like the Public Gardens) is a direct result of the increased land values that accrue from these important public spaces. The transition from high rise developments like the existing 21-storey Summer Gardens to the east and this proposed high-rise use (4 story podium and 30 & 16 storey towers) will be done partially through transition of height, and partially through transition of use from commercial to mixed to residential. The transition between low-density residential on Carlton Street to high-rise tower will be solidified through preserving and restoring the buildings on Carlton Street to provide a base for the tower. The majority of the building's height will be located at the centre of the block while the Robie Street corner will step down to 16-storeys with a 4 storey podium. The tower setbacks, stepbacks, dimensions and separation are consistent with the Downtown LUB.

The Proposal

The architects and urban designers of the proposed development have followed the spirit and intent of the downtown Halifax bylaw as it relates to building massing, form, stepbacks, street related uses, mixed use and tower dimensions. Firstly, Carlton Street properties will be preserved and restored as part of the plan. They will form the base of the tower on the north east side of the proposed development. Access into the development will be from Spring Garden Road and not Carlton Street as described in the accompanying traffic impact statement.

The elements of the building include:

- The 4.5m base of the tower will be fully commercial and we would anticipate the developer participating in streetscape improvements in front of the building as part of this development.
- The scale of the groundfloor commercial uses will be kept as small-plate uses along the street with any large-plate uses along the back of the property to the east.
- The streetwall base has been set at less than 18.5m (4 storeys) consistent with the downtown LUB.
- The Streetwall steps back 3m from the edge above 18m.
- The mid-rise portion of the building is setback at least 5.5m from all interior lot lines. The interior lot lines for all of the consolidated parcels will be dissolved to create one larger land assembly and eliminating any self-imposed interior lot lines within the development.
- Above 33.5m the tower has been set back no less than 11.5m from any lot lines.
- The mid-rise portion of the building (from 18m high to 33m high) is less than 36m.
- The high rise portion of the building (above 33.5m) is 36m x 36m
- The towers (30-storey and 16-storey) are separated 32m
- The total proposed height is 98 m
- The total units are about 250

- A 1000 sq.m amenity space is included in the building
- 5,750 sq.m. office space
- 5,030 sq.m. of commercial space
- 2,000 sq.m. of retail space
- 361 public parking stalls are provided in the development

These design elements all fit the requirements of the downtown bylaw with the exception of height (which varies throughout downtown). The building design addresses the unique opportunity a large scale development site this close to the urban core presents. The ground level will be occupied by the residential and commercial lobbies, and ground floor retail along Spring Garden Road. This ground floor retail combined with planned streetscape improvements will improve the neighborhood, provide greater activity to the streetscape, improve accessibility, and help reinforce Spring Garden Road retail. With the commercial office space and residential units above, this retail will be supported with the new inhabitants of the site and the mixed use characteristics will provide more consistent activity across the site.

Community Improvements:

It is the intention of the developer to improve the overall community through public realm improvements. These improvements will focus on streetscape improvements abutting the proposed development, improvements to Balcom Park located at the Robie Street and Spring Garden Road intersection, and the restoration of heritage properties along Carlton Street.

In regards to streetscaping, it is Dexel's intention to have the power transmission lines and poles removed and the transmission lines placed underground. This will drastically improve the neighborhood and streetscape. The improved ground floor retail will be of the highest standard and increase activity at the ground level. Additional street space improvements may include public bike parking, exterior seating, improved plantings, trees, and improved accessibility.

It is Dexel's intention to keep in the spirit of Sam Balcom, a local resident who cleaned and cared for the park located by the intersection of Robie and Coburg for many years, and revitalize this park space into a neighborhood parklette. The park currently lacks public amenities like seating and areas for gathering. User groups that pass the site include Dalhousie students, St. Andrews church parishioners, and residents of the surrounding neighborhoods. With the creation of the park we look to provide spaces for these user groups to gather and interact, improve the landscape and plantings, improve the transit stop, and potentially provide greater amenity space for the church. The reclamation of the end of Coburg Road bordering the south side of the park would provide a traffic calmed hardscaped parking area for the church, improved pedestrian safety at crosswalks, and greater gathering space and seating areas during times when church parking is not required.

It is the intention to restore each of the owned heritage properties along Carlton Street. This will include new landscaping, mechanical, electrical and interior restoration. These properties will be converted to mixed use and will maintain the residential character of this street.

Dexel organized 3 stakeholder meetings and 3 public consultation engagements for the project. Each event built on the outcomes from the previous event with participation by over 300 people (including the local councilor and other public officials like Andy Fillmore) and included a public lecture by Brent Toderian (Urbanworks) which saw an additional 150 people attend. The face to face engagement was complimented with an online engagement strategy creating one of the most comprehensive engagement programs ever sponsored by a developer in Halifax. The public engagement directly influenced the design from start to finish and the design team feels strongly that the final design represents the views and aspirations of the public. The engagement process and outcomes are described in more detail in the accompanying public engagement summary submission book.

Public Benefits

The following are public amenities developed and validated by the public engagement process

- Public parking
- 6% affordable office space for NGO
- 6% Affordable Housing residential units
- Heritage restoration to Carlton Street
- Improved street scape including snow melt sidewalks
- Improvements to Balcom park
- Free indoor public bike parking
- Contribution to undergrounding utilities

QUALIFICATION OF PUBLIC AMENITIES – A GREAT OPORTUNITY TO REINVIGORATE SPRING GARDEN WEST

The significant public amenities incorporated into this amended development proposal were derived from public input gathered during the voluntary public engagement process as described in chapters 2 and 3. The value of these public amenities are summarized in the following table (1).

SUMMARY OF PUBLIC AMENITIES - SPRING GARDEN WEST
Prepared by Cantwell & Company Consulting Ltd
August 2016

Item	Description	Quantity	Units	Rate	Total Cost	Public Amenity Component	Amenity Value
1	Affordable Housing	16	units	$96,842	$ 1,549,474	100%	$ 1,549,474
2	Affordable Office Space	348	SM	$1,078	$ 375,000	100%	$ 375,000
3	Public Atrium & Living Room	409	SM	$ 5,379	$ 2,200,000	50%	$ 1,100,000
4	Free Indoor Public Bike Parking	37	SM	$ 2,703	$ 100,000	100%	$ 100,000
5	Public Park Improvements	1,171	SM	$ 538	$ 630,250	100%	$ 630,250
6	Streetscape Improvements	1,307	SM	$ 603	$ 787,808	100%	$ 787,808
7	Creation of Public Parking	11,148	SM	$ 54	$ 600,000	50%	$ 300,000
8	Heritage Façade Restoration	1,045	SM	$ 1,130	$ 1,181,250	50%	$ 590,625
9	Contribution to Underground Power	214	Lin M	$ 4,673	$ 1,000,000	33%	$ 333,000
	TOTAL CONTRIBUTIONS						**$5,766,157**

The report estimates approximately $2.8 M value for the bonus density requested in this proposal which is far inferior to the estimated approximate value of $5.8 M for the amenities the developer wishes to provide as detailed in the above.
As mandated by the public engagement, it is clear that both HRM and the citizens have a very advantageous opportunity to reinvigorate the Spring Garden West district. In recognition of the significance this site to the city's urban fabric and the commitment made to the public established through extensive dialogue, the developer wishes to state that these public amenities are an intrinsic part of the proposal.

Amendments

A site specific plan amendment and development agreement would be needed to support the development. The plan amendment would generally extend policy 8.1.2 to include the south side of Spring Garden Road. The Development Agreement would follow the standard DA format requirements. The applicant has held 4 public engagement sessions on the project which was generally well received by the local community and genuinely influenced 3 different versions of the design.

Dexel would like to formally commence a Plan Amendment and DA process to initiate the development application. We trust you will find the following submission documents suitable to begin the process. The developer acknowledges that the Centre Plan is progressing towards completion and asks that, should a DA process not be considered, this proposal shaped by public dialogue and support by the public be integrated in the new plan.

If you have any questions, please feel free to contact me at your convenience.

Sincerely

Original Signed

Robert LeBlanc, MCIP, LPPANS
Ekistics Plan + Design