

UNDERGROUND PARKING DECK FEASIBILITY STUDY: SITES 2 & 3 RALEIGH, NC

MASTER PLAN REPORT

Final Draft 10.20.2016



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CITY OF RALEIGH PROJECT TEAM

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PARKING, STRUCTURAL, TRAFFIC, AND CIVIL

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Project Summary

PROJECT SUMMARY

This feasibility study examines the practicality of constructing an underground parking deck below lots 2 & 3, between Lenoir St. and South St. The purpose of this study is to illustrate how the parking deck allows for better urban design and increased density at the southern end of the Fayetteville Street district, while providing an opportunity to maximize the development potential of this site by meeting associated parking demands.

DESIGN PROCESS

In developing the master plan, the design team worked closely with the City of Raleigh project team to determine long-term needs, create conceptual layouts, and determine estimates of development costs. The team worked with City representatives to confirm vision and priorities for the project.

Major project goals which emerged from these discussions included:

- Determine parking capacity of underground parking, organized by level.
- Determine cost of each level of parking, including incremental costs increase for deeper development.
- Explore vehicular and pedestrian ingress and egress to underground and above ground structures.

Following the visioning sessions, the design team developed conceptual master plans for review. The entire team offered feedback on potential site layouts, and discussions led to one master plan for further development.

Existing Conditions



SITE CONDITION

The subject site is currently being used as a surface parking lot, and is bounded on the north edge by Lenoir Street, south edge by South Street, eastern edge by Wilmington Street, and western edge by Salisbury Street. The site is mostly paved with some mature landscaping within its boundaries. The surface is generally flat within the western half, but slopes downward toward Wilmington Street in the eastern half. The Lenoir / Wilmington intersection is approximately 8 feet lower than the middle of the site, and the South / Wilmington Street intersection is an additional 4 feet lower than Lenoir.

Existing Conditions

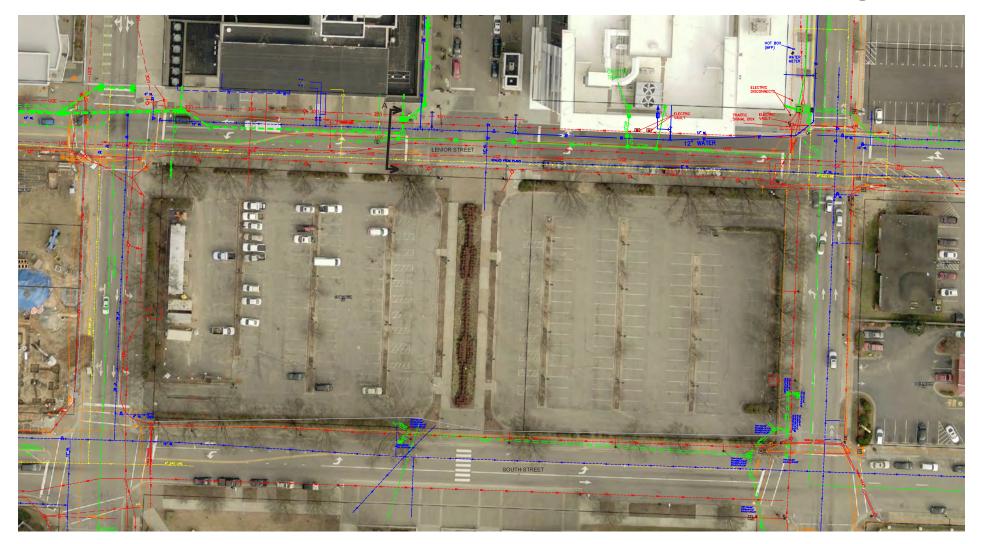


TRAFFIC

The city is currently in the process of completing a conversion of the one-way traffic operations for Lenoir and South Streets to two-way. The first phase of this conversion, which includes this block, was completed approximately seven years ago. The second phase is currently in progress. Once completed, this will allow traffic to flow in both east and west directions on each street within this block and beyond. Salisbury Street currently flows southward, and Wilmington Street northward, forming a one-way pair with no current plans to change in the foreseeable future.

The 4 corners of this block are bounded by signalized intersections, where the signal timings are integrated with the downtown signal grid. The most recent traffic analysis we are aware of was completed in 2013 as part of the Lenoir/South two-way conversion. Based on that analysis, each of the four intersection signals currently function at a Level-of-Service C or better for both the AM and PM peak periods. Most of these are LOS B or better, and are expected to continue to function at that level within the foreseeable future.

Existing Conditions



UTILITIES

The block is bounded by utilities within the street, where water (potable and fire), sanitary sewer, gas, cable, communications, power, and storm water are all available immediately adjacent to the site. The capacity of each system for accepting additional development is currently unknown, but is presumed to be adequate for the purposes of this study.

Existing Conditions



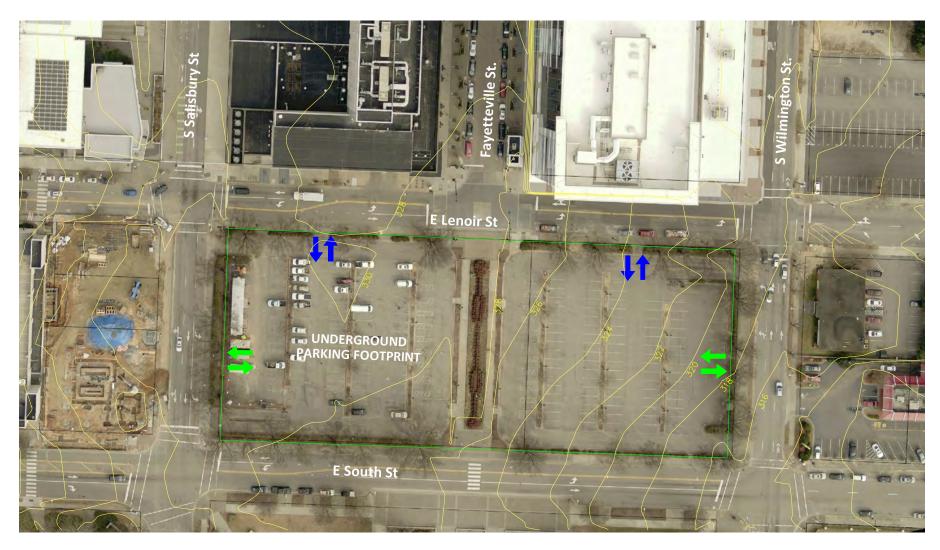




SOIL CONDITIONS

Based on excavation and construction of the Performing Arts Parking Deck (one block to the west) and the Marriott hotel and underground parking deck (adjacent block to the north), it is anticipated that the site is underlain with a combination of residual soils, and layers of partially weathered rock conditions found in similar situations within the downtown area. For purposes of this study, no specific geotechnical analysis or investigation was conducted, so any references are based on the adjacent properties. Further analysis will be needed with an investigation of this site upon the next phases of design. Based on the previous adjacent projects, it is possible that hard rock will be encountered at depths of 40 to 50' below grade. It is also anticipated that groundwater may be encountered within approximately 20 to 40 feet below grade. As such, it is highly likely that both rock excavation and ground water collection systems will be required for any excavations below 30 to 40 feet. In addition, the Marriott hotel and underground parking for the convention center encountered contaminated groundwater, which required a collection and treatment system to properly handle and discharge that water from the site. This is a permanent system that is in operation today.

Parking Access







CONCEPT 1 UNDERGROUND PARKING

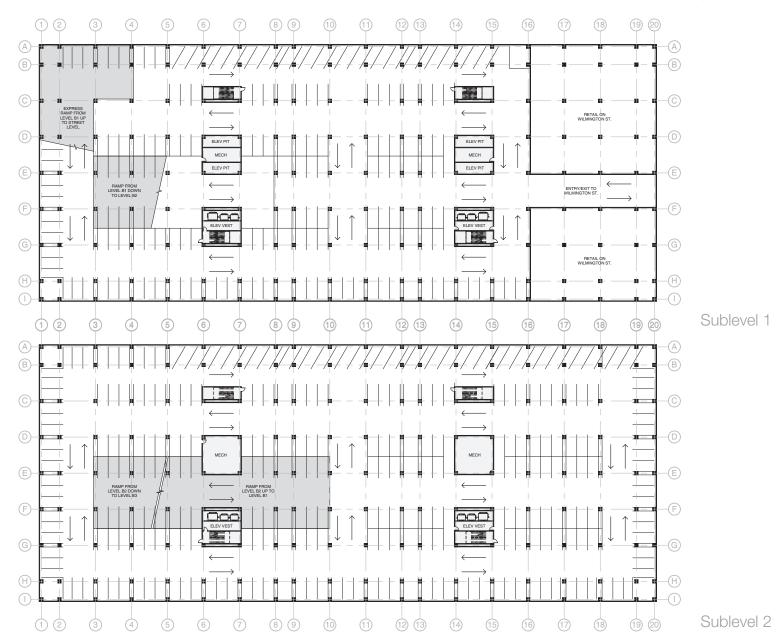
This layout consists of parking bays and drive aisles oriented in the east-west direction in order to take advantage of the longer combined site underground. The layout primarily consists of 60 foot parking bays, with 2-way drive aisles and 90-degree parking stalls that fit within the 30'x30' column grid. Due to the 210' width of the site, one edge of the layout consists of a single loaded parking bay and a one-way drive aisle with angled parking along the edge. A parking ramp for vertical circulation between levels is provided under the western portion of the site oriented in the east-west direction to align with the basic parking layout.

Due to the sloping site, the first level of parking below grade will not extend to the full length of the site toward Wilmington Street. This top level of parking will stop approximately 100' short of the east end, and as such will have fewer spaces. All lower levels of parking will extend the full length of the site.

The concept anticipates the core areas for stairs / elevators from the buildings above, and accommodates those within the parking and circulation patterns. Veichular access from the streets is anticipated at each end, with ramps that would be required to ramp down from Salisbury Street into the parking level, while the entry from Wilmington Street will be basically on grade with the street.

This parking layout provides a slightly more efficient parking layout, with approximately 275 spaces on a typical level. If 4 below grade parking levels are assumed, a total of 983 parking spaces will be provided with this concept.

Concept 1 Underground Parking



CONCEPT 1 ABOVE GROUND PARKING

This concept was developed to study possible above ground development and highlight potential constraints imposed from the underground development.

The first level of the parking deck primarly serves as circulation to parking above and below. On the west lot, it is possible to provide limited parking on the first level. Above the first level of transition, the parking footprint extends over the entire lot, with building structure above. Eight levels of parking will provide approximately 879 parking spaces with 114 spaces on a typical level.

The concept anticipates the core areas for stairs / elevators throughout the parking decks, and accommodates those within the parking and circulation patterns. Veichular access from the streets is anticipated at each end with entrances from Salisbury Street and Lenoir Street.

With east-west oriented parking below grade, the building core is limited to one major bank of vertical circulation in the building core. This will constrain the ability to constructe vertically mixed use building types in future development.

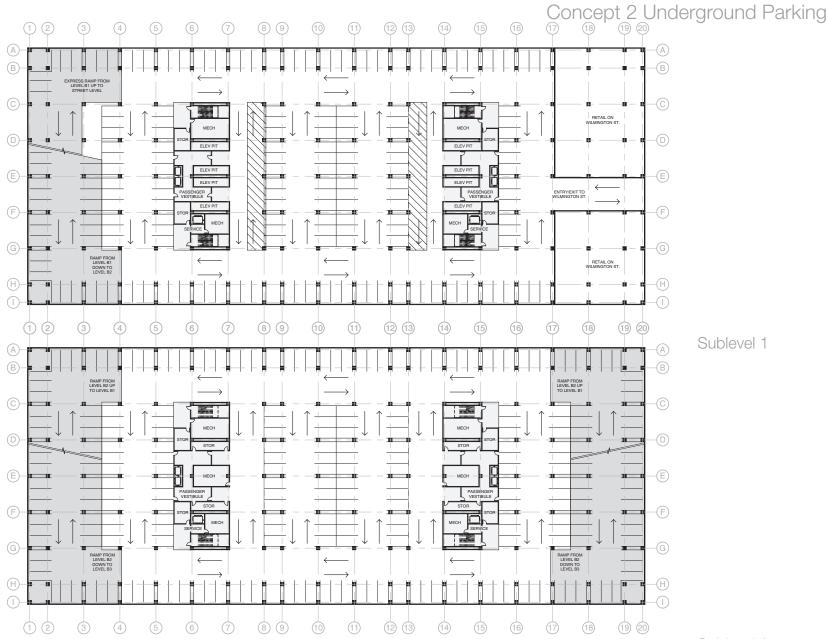


CONCEPT 2 UNDERGROUND PARKING

Parking Concept 2 orients the parking bays below grade in the north-south direction. This allows the full footprint for parking to be utilized with all bays incorporating 2-way drive aisles and 90-degree parking. A parking ramp for vertical circulation would be provided at each end of the structure, with all flat floor parking between. Similar to Option 1, the core areas for elevator and stairs from the building above have been accommodated. In addition, it is assumed that vehicular entry would also be provided at each end from Salisbury and Wilmington Streets.

Similar to Concept 1, the upper level of parking would not consist of the entire site, as the eastern edge would terminate approximately 100' from Wilmington Street.

This layout provides slightly fewer spaces per level, 270 spaces +/-. However, one advantage of this concept is to more easily divide the structure into 2 phases, which could be constructed separately, or possibly even operated independently, if desired. Assuming 4 levels below grade, an approximate total of 934 parking spaces would be provided.



CONCEPT 2 ABOVE GROUND PARKING

This concept was developed to study possible above ground development and highlight potential constraints imposed from the underground development.

The first level of the parking deck primarly serves as circulation to parking above and below. On the west lot, it is possible to provide limited parking on the first level. Above the first level of transition, the parking footprint is partial on the overall lot, with building structure on the other part of the lot. Eight levels of parking will provide approximately 591 parking spaces with 78 spaces on a typical level.

The concept anticipates the core areas for stairs / elevators throughout the parking decks, and accommodates those within the parking and circulation patterns. Veichular access from the streets is anticipated at each end with entrances from Salisbury Street and Lenoir Street.

With north-south oriented parking below grade, the building core allows for two banks for vertical circulation through the building core. This will allow for greater flexibility of mixed use building types in future development.

Concept 2 Above Ground Parking



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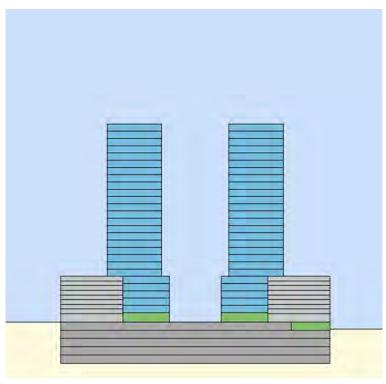
Future Development

PRELIMINARY DESIGN CONCEPTS

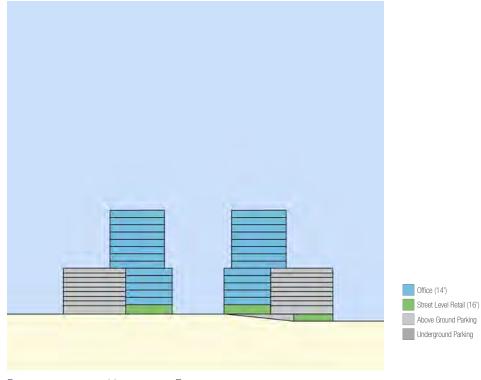
The study includes preliminary design concepts for future development. Several draft scenarios have been prepared as a starting point for discussion with the city staff and designers. Each scenario includes area and parking calculations. The purpose of this portion of the study is to illustrate the flexible development options possible above a well-designed underground parking deck.

SCENARIO 1

This option includes partial above ground parking for 8 levels, with street level retail and office in the building structure. In this scenario, the addition of underground parking adds 13 stories of office on each lot.

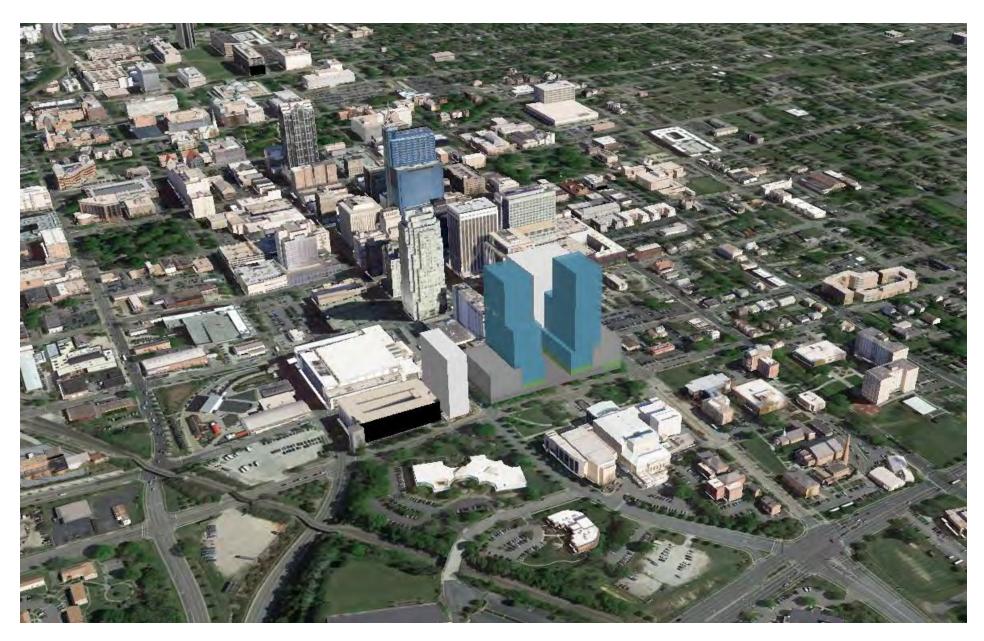


DEVELOPMENT WITH UNDERGROUND PARKING	
West Lot (Salisbury St)	27 stories
Retail (18,000 sf)	1 story
Office (544,500 sf)	26 stories
Parking (600 spaces)	(8 partial stories)
East Lot (Wilmington St)	27 stories
Retail (30,000 sf)	1 story
Office (544,500 sf)	26 stories
Parking (600 spaces)	(8 partial stories)
Provided Parking (975 underground)	2,175 spaces



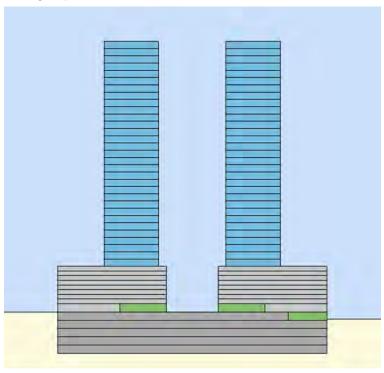
DEVELOPMENT WITHOUT UNDERGROUND PARKING	
West Lot (Salisbury St)	14 stories
Retail (18,000 sf)	1 story
Office (296,100 sf)	13 stories
Parking (600 spaces)	(8 partial stories)
East Lot (Wilmington St)	14 stories
Retail (30,000 sf)	1 story
Office (296,100 sf)	13 stories
Parking (600 spaces)	(8 partial stories)
Provided Parking	1,200 spaces

Scenario 1



SCENARIO 2

This option includes full above ground parking for 8 levels, with street level retail and office in the building structure above parking. In this scenario, the addition of underground parking adds 11 stories of office on each lot and the building height is maxed out per zoning requirements.

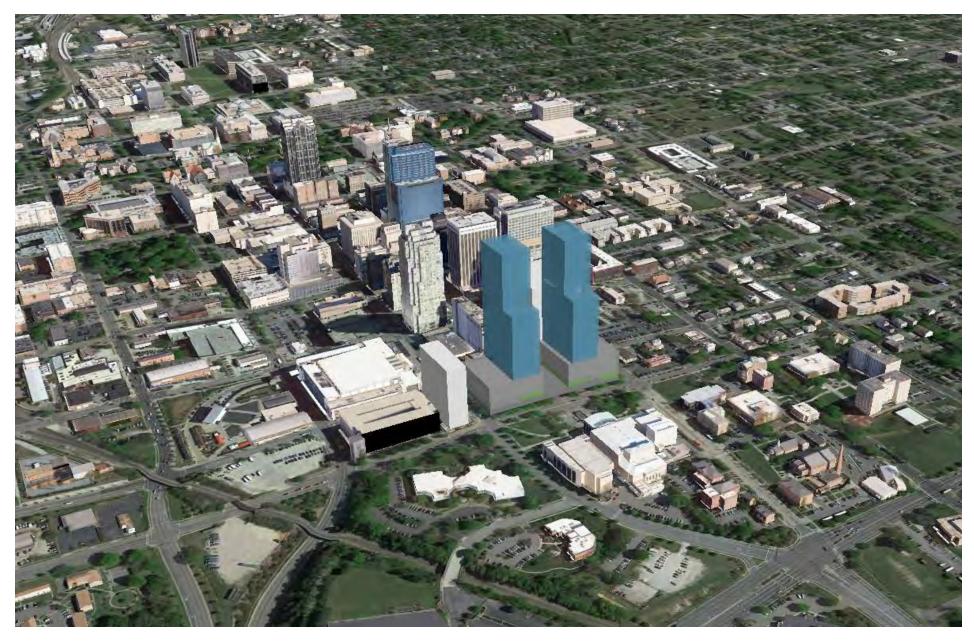


Development with Underground Parkin	G
West Lot (Salisbury St)	40 stories
Retail (18,000 sf)	1 story
Office (680,400 sf)	31 stories
Parking (880 spaces)	8 stories
East Lot (Wilmington St)	40 stories
Retail (18,000 sf)	1 story
Office (680,400 sf)	31 stories
Parking (880 spaces)	8 stories
Provided Parking	2,735 spaces

Office (14) Street Level Retail (1 Above Ground Parking

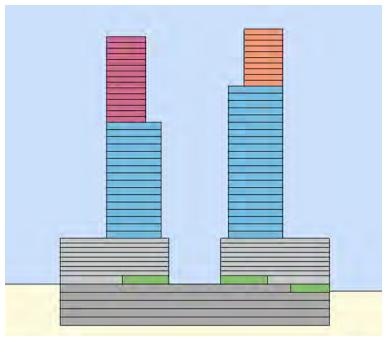
DEVELOPMENT WITHOUT UNDERGROUND PARKING	
West Lot (Salisbury St)	29 stories
Retail (18,000 sf)	1 story
Office (680,400 sf)	20 stories
Parking (880 spaces)	8 stories
East Lot (Wilmington St)	29 stories
Retail (18,000 sf)	1 story
Office (680,400 sf)	20 stories
Parking (880 spaces)	8 stories
Provided Parking	1,760 spaces

Scenario 2



SCENARIO 3

This option includes full above ground parking for 8 levels, with street level retail and residential/hotel over office in the building structure above parking. In this scenario, the addition of underground parking adds 2 stories of office on the west lot, adds 7 stories of office on the east lot, and the building height is maxed out per zoning requirements.



Development with Undergroun West Lot (Salisbury St) Retail (18,000 sf) Office (403,200 sf) Hotel (420 rooms) Parking (880 spaces)	D PARKING 40 stories 1 story 16 stories 15 stories 8 stories
East Lot (Wilmington St) Retail (30,000 sf) Office (529,200 sf) Residential (140 units) Parking (8 full levels)	40 stories 1 story 21 stories 10 stories 880 spaces
Provided Parking	2,735 spaces (surplus of 500)



Residential (11')
Hotel (11')

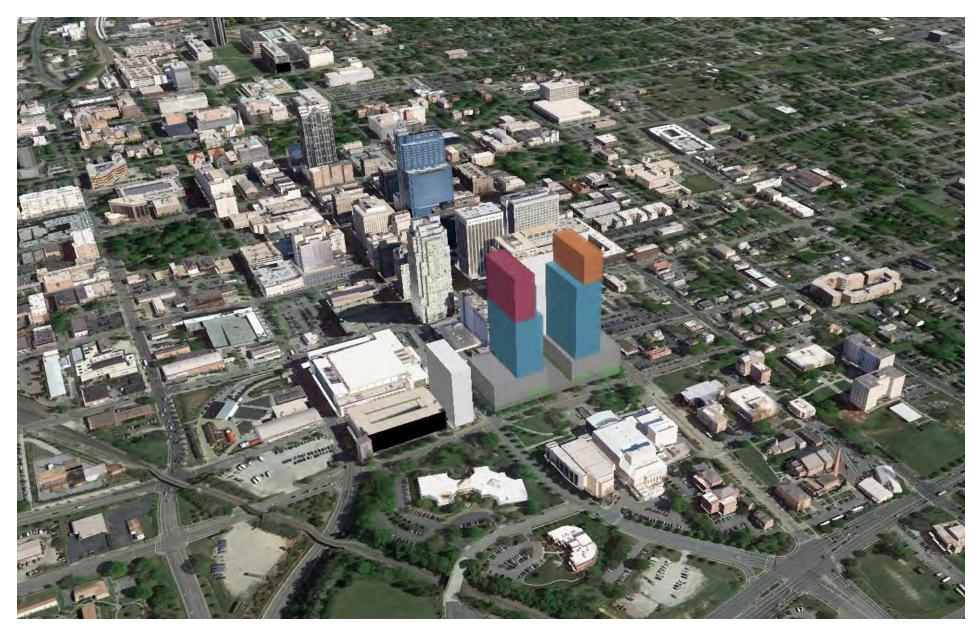
Street Level Retail (16')

Above Ground Parking

Underground Parking

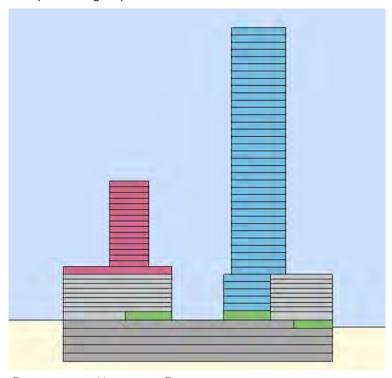
Development with Underground Parking	
West Lot (Salisbury St)	38 stories
Retail (18,000 sf)	1 story
Office (352,800 sf)	14 stories
Hotel (420 rooms)	15 stories
Parking (880 spaces)	8 stories
East Lot (Wilmington St)	33 stories
Retail (30,000 sf)	1 story
Office (352,800 sf)	14 stories
Residential (140 units)	10 stories
Parking (8 full levels)	880 spaces
Provided Parking	

Scenario 3



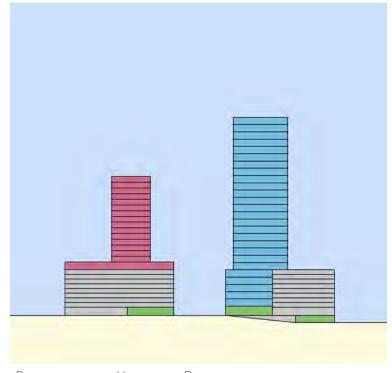
SCENARIO 4

This option includes full above ground parking for 8 levels on the west lot, with street level parking and a 16-story convention hotel above parking. The east lot has partial above ground parking for 8 levels, with street level retail and office in the building structure. In this scenario, the addition of underground parking adds 13 stories on office building on east lot and the building height is maxed out per zoning requirements.



DEVELOPMENT WITH UNDERGROUND PARKING	
West Lot (Salisbury St)	25 stories
Retail (18,000 sf)	1 story
Hotel (420 rooms)	16 stories
Parking (880 spaces)	8 stories

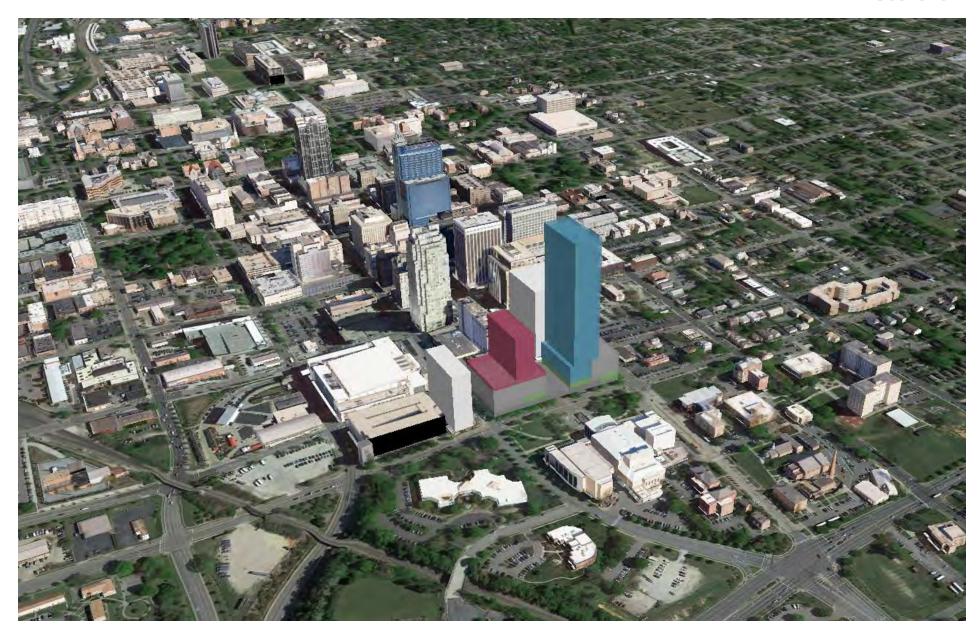
East Lot (Wilmington St) Retail (30,000 sf) Office (951,300 sf) Parking (600 spaces)	40 stories 1 story 39 stories (8 partial stories)
Provided Parking	2,455 spaces (surplus of 340)



Hotel (11')
Office (14')
Street Level Retail (16')
Above Ground Parking
Underground Parking

Development without Underground Parking West Lot (Salisbury St) Retail (18,000 sf) Hotel (420 rooms) Parking (880 spaces)	25 stories 1 story 16 stories 8 stories
East Lot (Wilmington St) Retail (30,000 sf) Office (623,700 sf) Parking (600 spaces)	27 stories 1 story 26 stories (8 partial stories)
Provided Parking	1,480 spaces

Scenario 4



OPINION OF PROBABLE COST

OPINION OF PROBABLE COST SUMMARY

These preliminary construction costs are provided as "concept level" estimates and as such are based on very preliminary estimates as well as average \$/sf costs. In addition to the basic structural costs in \$/sf of floor area, estimates have been included for retaining walls as well as for excavation of soil and rock. The estimates assume that 25% of the area for level B3 and 50% of level B4 will require rock excavation. If additional levels are developed below B4, it would be anticipated that rock excavation would be required Any additional levels added below B4 will most likely require rock excavation for the full amount thereby resulting in much higher excavation costs.

Finally, when the next phase of design is started, it is recommended that a site specific geotechnical investigation be undertaken to confirm actual site conditions related to rock excavation, groundwater, and other parameters that will directly impact the project costs.

City of Raleigh - Site 2 and 3 Parking Structure Study

Conceptual Design Alternatives Comparison

Conceptual Design Alternatives Cor	riparisori			
Comparison Criteria	Above Ground Concept 1	Above Ground Concept 2	Below Grade Concept 1	Below Grade Concept 2
Description	Full Footprint - 3 bays of parking / floor	Half Footprint - 2 bays of parking / floor	East to West oriented drive aisles	North to South oriented drive aisles
General				
Total No. of Parking Spaces	879	591	983	934
Parking Square Footage (below grade includes roof slab)	364,500	207,100	509,000	506,000
Efficiency: Square Foot per Space	415	350	518	542
Year 2016 Hard Construction Costs (Excludes Soft Costs	\$26,290,000	\$15,590,000	\$38,380,000	\$38,270,000
Cost per Space - Hard Construction Costs Only	\$29,909	\$26,379	\$39,044	\$40,974
Cost / SF - Hard Construction Costs Only	\$72.13	\$75.28	\$75.40	\$75.63
Total Estimated Project Costs (Includes 30% Soft Costs - A/E fees, Material Testing, Contingencies)	\$35,500,000	\$21,100,000	\$51,900,000	\$51,700,000
Cost per Space - Total Project Costs	\$40,400	\$35,800	\$52,800	\$55,400

Notes

- 1 Estimates are preliminary "concept level" estimates, based on average \$/sf costs for various components.
- 2 Estimates for below grade include estimates for rock excavation, retention systems, dewatering, and possible contamination. These costs will vary widely, and should be studied further in future phases of design
- 3 Below grade concept costs include roof level slab that will serve as the base street level slab for building above
- 4 Estimates for all parking levels include mechanical ventilation, sprinklering

City of Raleigh - Site 2 and 3 Parking Structure Study Conceptual Design Opinion of Probable Construction Cost

Conceptual Design Opinion of Probable Construction Cost

r				I	Park	king Square Fo	otage		I	Façade	E	arthwork (C	Y)	Wa	ills	1			Estimated Co	nstruction Cost				
Alternative	Level	FF Elevation (Relative to P1 Level)	# of Spaces	On Grade/ Below Grade	On Grade/ Above Grade	Elevated Roof Level	Elevated	Total Parking SF	Parking SF/Space	(SF)	Excav. (CY)	Excav. Rock (CY)	Fill (CY)	20' or less (SF)	20' or more (SF)	\$ for Parking Structured Floors	Façade Costs above "Normal Façade"	Dewatering	Contaminated Soil/Groundwater Allowance	\$ for Earthwork	\$ for Ret Walls / Retention Systems	Total Estimated Hard Construction Costs	Total Estimated Project Costs including Contingency	\$/Space (including High End façade)
																\$0	\$0			\$0	\$0	\$0	\$0	
	P9	412.0	81				34,600	34,600	427	8,600						\$2,145,200	\$430,000			\$0	\$0	\$2,575,200	\$3,476,520	
	P8	402.0	114				45,600	45,600	400	8,600						\$2,827,200	\$430,000			\$0	\$0	\$3,257,200	\$4,397,220	
Above Ground Concept 1	P7	392.0	114				45,600	45,600	400	8,600						\$2,827,200	\$430,000			\$0	\$0	\$3,257,200	\$4,397,220	
	P6	382.0	114				45,600	45,600	400	8,600						\$2,827,200	\$430,000			\$0	\$0	\$3,257,200	\$4,397,220	
	P5	372.0	114				45,600	45,600	400	8,600						\$2,827,200	\$430,000			\$0	\$0	\$3,257,200	\$4,397,220	1
	P4	362.0	114				45,600	45,600	400	8,600						\$2,827,200	\$430,000			\$0	\$0	\$3,257,200	\$4,397,220	_
	P3	352.0	114				45,600	45,600	400	8,600						\$2,827,200	\$430,000			\$0	\$0	\$3,257,200	\$4,397,220	
	P2	342.0	114				45,600	45,600	400	8,600						\$2,827,200	\$430,000			\$0	\$0	\$3,257,200	\$4,397,220	
Full Footprint - 3 bays of parking / floor	P1/Street	328.0	0				10,700	10,700	0	5,000	0	0	0	0	0	\$663,400	\$250,000			\$0	\$0	\$913,400	\$1,233,090	.
	Total		879	0	0	-	364,500	364,500	415	73,800	0	0	0	0	0	\$22,599,000	\$3,690,000	\$0	\$0	\$0	\$0	\$26,289,000	\$35,500,000	\$40,400
						 										\$0	\$0			\$0	\$0	\$0	\$0	
	P9	412.0	45				15,500	15,500	344	6,800						\$961,000	\$340,000			\$0	\$0	\$1,301,000	\$1,756,350	
	P8	402.0	78				25,800	25,800	331	6,800						\$1,599,600	\$340,000			\$0	\$0	\$1,939,600	\$2,618,460	
Above Ground Concept 2	P7	392.0	78				25,800	25,800	331	6,800						\$1,599,600	\$340,000			\$0	\$0	\$1,939,600	\$2,618,460	
	P6	382.0	78				26,500	26,500	340	6,800						\$1,643,000	\$340,000			\$0	\$0	\$1,983,000	\$2,677,050	
	P5	372.0	78				26,500	26,500	340	6,800						\$1,643,000	\$340,000			\$0	\$0	\$1,983,000	\$2,677,050	
	P4	362.0	78				26,500	26,500	340	6,800						\$1,643,000	\$340,000			\$0	\$0	\$1,983,000	\$2,677,050	
	P3	352.0	78				26,500	26,500	340	6,800						\$1,643,000	\$340,000			\$0	\$0	\$1,983,000	\$2,677,050	
Half Footprint - 2 bays of parking / floor	P2	342.0	78				26,500	26,500	340	6,800						\$1,643,000	\$340,000			\$0	\$0	\$1,983,000	\$2,677,050	
Train Tooping 2 bays of parting 7 hour	P1/Street	328.0	0				7,500	7,500	0	500	0	0	0	0	0	\$465,000	\$25,000			\$0	\$0	\$490,000	\$661,500	
	Total		591	0	0	0	207,100	207,100	350	54,900	0	0	0	0	0	\$12,840,200	\$2,745,000	\$0	\$0	\$0	\$0	\$15,585,200	\$21,100,000	\$35,800
	t / Transition	328.0	\blacksquare				100,000	100,000	0							\$6,200,000	\$0			\$0	\$0	\$6,200,000	\$8,370,000	
Below Grade Concept 1	B1	314.0	175				90,000	90,000	514		56,000			20,400		\$5,580,000	\$0	\$168,000	\$168,000	\$1,120,000	\$918,000	\$7,954,000	\$10,737,900	
1	B2	305.0	278				109,000	109,000	392		37,000			13,000		\$6,758,000	\$0	\$111,000	\$55,500	\$740,000	\$585,000	\$8,249,500	\$11,136,825	
F W	B3	296.0	278				109,000	109,000	392		30,000	7,000		13,000		\$6,758,000	\$0	\$90,000		\$1,475,000	\$585,000	\$8,908,000	\$12,025,800	
East to West oriented drive aisles	B4 Total	287.0	252	99,000			2,000	101,000	401		17,000	20,000		13,000		\$3,589,000	\$0	\$51,000	4000 500	\$2,840,000	\$585,000	\$7,065,000	\$9,537,750	250 000
			983	99,000	0	<u> </u>	410,000	509,000	518	0	140,000	27,000	0	59,400	0	\$28,885,000	\$0	\$420,000	\$223,500	\$6,175,000	\$2,673,000	\$38,376,500	\$51,900,000	\$52,800
Below Grade Concept 2	t / Transition B1	328.0	182				100,000	100,000	0 495		50,000			00.400		\$6,200,000 \$5,580,000	\$0 \$0	\$168 000	****	\$0 \$1.120.000	\$0 \$918.000	\$6,200,000 \$7,954,000	\$8,370,000 \$10.737.900	├
		314.0 305.0	182 270				90,000	90,000			56,000			20,400 13.000		40,000,000		4.00,000	\$168,000					1
l	B2 B3	305.0 296.0	270				108,000	108,000	400 400		37,000	7.000		13,000		\$6,696,000 \$6.696,000	\$0 \$0	\$111,000	\$55,500	\$740,000 \$1.475.000	\$585,000	\$8,187,500	\$11,053,125 \$11.942.100	
		296.0	2/0				108,000	108,000	400		30,000	7,000		13,000		\$6,096,000	\$0	\$90,000	1	\$1,475,000	\$585,000	\$8,846,000	\$11,942,100	
North to South oriented drive aisles		207.0	242	00.000			4.000	400.000	470		47.000	00.000		40.000		80 000 000	00	054.000		00 040 000	0505.000	67.004.000	80 500 400	
North to South oriented drive aisles	B4 Total	287.0	212 934	96,000 96,000	0		4,000 410,000	100,000 506,000	472 542	0	17,000 140,000	20,000 27,000	0	13,000 59,400	_	\$3,608,000 \$28,780,000	\$0 \$0	\$51,000 \$420,000	\$223,500	\$2,840,000 \$6,175,000	\$585,000 \$2,673,000	\$7,084,000 \$38,271,500	\$9,563,400 \$51,700,000	\$55,400

Assumptions: All costs are for relative cor	nparison or	nly;
Estimated Construction \$/SF for On-Grade / Below Grade Parking	\$	35.00
Estimated Construction \$/SF for On Grade / Above Grade Parking	\$	30.00
Estimated Construction \$/SF for Elevated Roof level	\$	75.00
Estimated Construction \$/SF for Elevated Parking	\$	62.00
Estimated Construction \$/SF for Façade	\$	50.00
Estimated Construction \$/CY for Excavation	\$	20.00
Estimated Construction \$/CY for Excavation - Rock	\$	125.00
Estimated Construction \$/CY for Fill	\$	20.00
Estimated Construction \$/SF for 20' or less tall Retaining walls	\$	45.00
Estimated Construction \$/SF for 20' or more tall Retaining walls	\$	100.00
Contingencies (Design (10%) Material Testing and Inspections (5%), Construction Cont	ingency	35.0%