

Pre-Development Site Analysis

FOR:

1620 S. 49TH STREET
1631 S. 49TH STREET
1700 S. 49TH STREET
3000 S. 56TH STREET
4910 BOTANIC AVENUE

Prepared For:



Driving growth to every corner of Philadelphia

Prepared By:



Expect More. Experience Better.

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October 25, 2019



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CHAPTER 1: EXISTING SITE CHARACTERISTICS

1.1 Existing Site Information & Zoning Review

Project Overview:

Kimley-Horn has partnered with PIDC to perform a pre-development site analysis of five properties, totaling approximately 39.9 acres, within the City of Philadelphia’s Innovation District. Four of the properties, totaling 19 acres, are located north of Bartram’s Garden (“Bartram’s North” herein) and one property that is 21 acres is located south of Bartram’s Garden (“Bartram’s South” herein). Below is a summary of the property information for each assemblage. Please refer to **Appendix A** for the Zoning Exhibits.

TABLE 1: BARTRAM’S NORTH PROPERTY SUMMARY

Property Address	OPA Account Number	Lot Area	Zoning Base District	Zoning Overlay District
1620 S. 49 th Street	884217100	348,479 S.F. (8.00 Acres)	I-2 (Medium Industrial District)	1. Open Space and Natural Resources – Flood Protection – Within the Special Flood Hazard Area
1631 S. 49 th Street	885891640	334,296 S.F. (7.67 Acres)	I-2 (Medium Industrial District)	1. Open Space and Natural Resources – Flood Protection – Within the Special Flood Hazard Area
1700 S. 49 th Street	885916780	42,888 S.F. (0.98 Acres)	I-2 (Medium Industrial District)	1. Open Space and Natural Resources – Flood Protection – Within the Floodway 2. Open Space and Natural Resources – Flood Protection – Within the Special Flood Hazard Area 3. Open Space and Natural Resources – Waterfront Setbacks
4910 Botanic Ave	884218607	103,431 S.F. (2.37 Acres)	I-2 (Medium Industrial District)	1. Open Space and Natural Resources – Flood Protection – Within the Floodway 2. Open Space and Natural Resources – Flood Protection – Within the Special Flood Hazard Area 3. Open Space and Natural Resources – Waterfront Setbacks
		829,094 S.F. (19.03 Acres)		

TABLE 2: BARTRAM'S SOUTH PROPERTY SUMMARY

Property Address	OPA Account Number	Lot Area	Zoning Base District	Zoning Overlay District
3000 S. 56 th Street	884158515	910,210 S.F. (20.90 Acres)	I-2 (Medium Industrial District) & I-3 (Heavy Industrial District)	1. Open Space and Natural Resources – Flood Protection – Within the Special Flood Hazard Area

The Lower Schuylkill Master Plan established for this area of the City is focused on creating development opportunities specifically geared towards creating new and modern business campuses. In an effort to capture the wide-range of uses and capture a representative sample for an all-in-one campus, the pre-development analysis considered a development that consisted of the following uses:

1. Quality Control Laboratories: 10%
2. R&D Laboratories: 20%
3. Administrative Functions: 30%
4. Warehouse Facilities: 10%
5. Production Facilities: 30%

The functions described above correspond to the “Research and Development Facility,” “Business / Professional Office,” and “Warehouse” uses described in the §14-602 of The Philadelphia Code. The above-mentioned uses are all permitted within the I-2 and I-3 Zoning Districts. Below are the dimensional standards associated with these base zoning districts:

TABLE 3: DIMENSIONAL STANDARDS

Requirement	I-2 (Medium Industrial District)	I-3 (Heavy Industrial District)
Maximum Occupied Area (% of Lot)	100% of Lot	100% of Lot
Minimum Front Yard Depth	0'	0'
Minimum Side Yard Depth	8' if abutting residential district	8' if abutting residential district. Reduced to 6' if the building is less than or equal to 4-stories
Minimum Rear Yard Depth	8' if abutting residential district	8' if abutting residential district
Max Height	60' if abutting residential or SP-PO district; otherwise, no limit	60' if abutting residential or SP-PO district; otherwise, no limit
Maximum Floor Area Ratio (% of Lot)	500% of Lot	500% of Lot

The overlay districts are all focused on the open space and natural resource protection standards because of the proximity of the sites to the Schuylkill River. As described in §14-704 of The Philadelphia Code, the following standards must be considered:

1. 50' waterfront setback from the top of the Schuylkill River bank
2. No encroachment within the Floodway
3. Within the Special Flood Hazard Areas (i.e. Zone AE), the lowest finished floor elevation (including a basement) must be 18" above the Base Flood Elevation. If this is not feasible, any proposed building will require substantial floodproofing and structural components capable of resisting hydrostatic, hydrodynamic loading, and effects experienced from buoyancy.

PIDC provided a phased approach to the full build-out of this site; a Phase 1 component and two options for a Phase 2 component. Based on the conceptual developments PIDC provided, below is a summary of the necessary parking to achieve compliance with §14-803 of The Philadelphia Code.

TABLE 4: BARTRAM'S NORTH: PARKING SUMMARY*

Proposed Use	Zoning Ordinance Use	Gross Floor Area (S.F.)	Parking Spaces Per Use	Total Parking Count
Phase 1 (300,000 S.F. Building Area)				
Quality Control Laboratories (10%)	Research / Development Facility	30,000	38	331
R&D Laboratories (20%)	Research / Development Facility	60,000	75	
Administrative Functions (30%)	Business / Professional Office	90,000	90	
Warehouse (10%)	Warehouse	30,000	15	
Production (30%)	Research / Development Facility	90,000	113	
Phase 2 – Option 1 (200,000 S.F. Building Area)				
Quality Control Laboratories (10%)	Research / Development Facility	20,000	25	220
R&D Laboratories (20%)	Research / Development Facility	40,000	50	
Administrative Functions (30%)	Business / Professional Office	60,000	60	
Warehouse (10%)	Warehouse	20,000	10	
Production (30%)	Research / Development Facility	60,000	75	
Phase 2 – Option 2 (215,000 S.F. Building Area)				
Quality Control Laboratories (10%)	Research / Development Facility	21,500	27	238
R&D Laboratories (20%)	Research / Development Facility	43,000	54	
Administrative Functions (30%)	Business / Professional Office	64,500	65	
Warehouse (10%)	Warehouse	21,500	11	
Production (30%)	Research / Development Facility	64,500	81	
<p><i>*Based on the following parking ratios:</i> <i>Research and Development Facility Use: 1 Parking Space / 800 S.F. of gross floor area</i> <i>Business Professional Office Use: 1 Parking Space / 1,000 S.F. of gross floor area</i> <i>Warehouse Use: 1 Parking Space / 2,000 S.F. of gross floor area</i></p>				

TABLE 5: BARTRAM'S SOUTH: PARKING SUMMARY*

Proposed Use	Zoning Ordinance Use	Gross Floor Area (S.F.)	Parking Spaces Per Use	Total Parking Count
Phase 1 (300,000 S.F. Building Area)				
Quality Control Laboratories (10%)	Research / Development Facility	30,000	38	331
R&D Laboratories (20%)	Research / Development Facility	60,000	75	
Administrative Functions (30%)	Business / Professional Office	90,000	90	
Warehouse (10%)	Warehouse	30,000	15	
Production (30%)	Research / Development Facility	90,000	113	
Phase 2 – Option 1 (260,000 S.F. Building Area)				
Quality Control Laboratories (10%)	Research / Development Facility	26,000	33	287
R&D Laboratories (20%)	Research / Development Facility	52,000	65	
Administrative Functions (30%)	Business / Professional Office	78,000	78	
Warehouse (10%)	Warehouse	26,000	13	
Production (30%)	Research / Development Facility	78,000	98	
Phase 2 – Option 2 (160,000 S.F. Building Area)				
Quality Control Laboratories (10%)	Research / Development Facility	16,000	20	176
R&D Laboratories (20%)	Research / Development Facility	32,000	40	
Administrative Functions (30%)	Business / Professional Office	48,000	48	
Warehouse (10%)	Warehouse	16,000	8	
Production (30%)	Research / Development Facility	48,000	60	
<p><i>*Based on the following parking ratios:</i> <i>Research and Development Facility Use: 1 Parking Space / 800 S.F. of gross floor area</i> <i>Business Professional Office Use: 1 Parking Space / 1,000 S.F. of gross floor area</i> <i>Warehouse Use: 1 Parking Space / 2,000 S.F. of gross floor area</i></p>				



1.2 Environmental Conditions

Overview:

Kimley-Horn partnered with Narravo and Wright Consulting Engineers, Inc. to complete an environmental review based on the numerous reports provided by PIDC between 1998 – 2019. A summary of the findings from the Environmental Site Assessments (ESA) and relevant documents provided by PIDC are included in **Appendix B**, but a brief summary of the findings and recommendations are also included below for each site.

Bartram's North Assemblage:

- ◆ **1620 S. 49th Street – Phase 1 ESA & Phase 2 ESA Summarized**

Phase 1 prepared by Langan dated 7/12/17 indicated the presence of recognized environmental conditions (RECs), including a waste oil storage area, historic rail spurs, potential off-site impacts, site groundwater, and imported fill areas. Phase 2 prepared by Langan dated 7/12/17 recommended collecting additional soil samples to delineate the vertical and horizontal extents of mercury and lead levels in soil to evaluate the soil to groundwater pathway. The Phase 2 also recommended installing additional monitoring wells to delineate the compounds of concern detected in groundwater at the site.

A Phase 1 for the parcel was created by RT Environmental Services, Inc. prepared for Gold Medal Environmental of PA dated 5/26/15 and concluded that the site has been through the Act 2 Land Recycling Program and is considered to be in a Special Industrial Area with cleanup liability protection under Act 2 of 1995 conferred on the site with impacted soil and groundwater present, but not of further concern so long as any materials excavated at the site are appropriately managed and appropriate reports are filed. RT also noted that a Spill Pollution Control and Countermeasure Plan (SPCC) and Preparedness Prevention and Contingency Plan (PPC) should be prepared and it should be determined if a discharge permit with the City of Philadelphia is required for stormwater and/or combined sewer discharges.



- ◆ **1631 S. 49th Street – Final Report for Soil**

ESA's have indicated that multiple petroleum releases occurred on this site (former oil terminal), which resulted in the conclusion that elevated concentrations of benzene are present in the groundwater and soil at some locations. Additionally, certain polynuclear aromatic hydrocarbons and lead have been reported in concentrations in excess of current standards. The Notice of Intent to Remediate (NIR) summary concludes that the intended future use of the property is for non-residential commercial/industrial purposes. Remedial activities occurred from December of 2014 through June of 2015. Approximately 2,470 tons of petroleum impacted soils were excavated and recycled off site to improve shallow groundwater quality and resolve petroleum release incidents recorded for the property. In addition, approximately 7,700-gallons of oily water recovered from excavations was pumped and disposed of off-site. Numerous structures once utilized for oil terminal operations (e.g. concrete tank pads and foundations, and outbuildings) were demolished and removed from the site and soils below structures were reviewed and no obvious indications of a release were observed in those areas. Clean fill was utilized to restore the site. Four of the eight quarterly groundwater monitoring periods were completed at the time of report preparation in 2017. The report concludes that site characterization and post-remedial analytical results indicate that the Non-residential Statewide Health Standards are attained for most regulated substances with the exception of benzene and lead which demonstrate attainment of the site-specific standard through pathway elimination and institutional controls which will be established to maintain engineering controls and meet regulatory Act 2 requirements.

- ◆ **1700 S. 49th Street – Phase 1 ESA Summarized**

Phase 1 indicated the presence of three RECs, including historical long-term use of the site as an oil terminal facility with bulk oil aboveground storage tanks, potential for groundwater/vapor impacts from adjoining/nearby sites to migrate, and that historic fill materials may contain regulated compounds at concentrations above applicable regulatory limits. A Phase 2 ESA is recommended to investigate the subsurface conditions. Please refer to **Appendix C** for the full report prepared by Narravo and Wright Consulting Engineers, Inc.



- ◆ **4910 Botanic Avenue – Phase 1 ESA & Phase 2 ESA Summarized**

Phase 1 indicated the presence of RECs, including, history of industrial usage, former No. 6 fuel oil UST, former aboveground storage tanks (ASTs), potential groundwater impacts/vapor encroachment from adjoining and vicinity sites, and historic fill materials. Phase 2 recommended that regulatory exceedances in soil and groundwater be further investigated through the performance of additional site characterizations across the site to include the delineation of groundwater conditions through the installation and sampling of permanent monitoring wells.

Bartram's South Assemblage:

- ◆ **3000 S. 56th Street – Act 2 Remediation Summarized**

Environmental Covenant was issued that limits the use to commercial and industrial (with exclusions) and disallows the use of groundwater. Additionally, existing soil conditions, along with the potential for vapor intrusion, must be addressed during future redevelopment of the property under a PADEP approved Remedial Investigation Report/Cleanup Plan. This must also include provisions for management of the groundwater contaminant (LNAPL) at the property during and after construction. Additionally, a Post-Remediation Care Plan for soil will be prepared by the site developer of the Property after site development plans have been finalized and a Final Report for Soil has been approved.

1.3 Sound and Seismic Study

Overview:

Kimley-Horn partnered with Narravo and Wright Consulting Engineers, Inc. to complete a acoustical and seismic review (see **Appendix D**), as portions of Bartram's North and South border a CSX freight line. As such, a preliminary or baseline type of evaluation to continuously monitor and measure both sound and ground vibration levels was completed in areas planned for occupied development/vertical construction.

The noise and vibration test location at Bartram's North was located at the southeast corner of the parcel addressed as 1631 S. 49th Street. The noise and vibration test location at Bartram's South was located at the center of the parcel addressed as 3000 S. 56th Street. This study was conducted over a 6-day period beginning on Wednesday, July 3rd at 11:35am and operated continuously until removal on Monday, July 8th at 9:35 am.

The sound meter and seismograph testing equipment were installed at Bartram's North in the field approximately 650 feet to the east of the CSX railroad tracks in the southeast corner of 1631 S. 49th Street. The second sound meter and seismograph were installed at Bartram's

South in a cleared area located approximately 700 feet east of the CSX railroad tracks at 3000 S. 56th Street.

Bartram’s North Assemblage:

In general, sound levels ranged from 38.8dB to 92.4dB. During the five-day monitoring period, only two readings were slightly elevated (detected above 90 dBs), however this sound level did not sustain into the next hour at the monitoring position. Vibration levels typically ranged between 0.00187 in/sec and 0.00562 in/sec, well below the set seismic trigger levels of 0.015 in/sec, which is at or approaching the levels perceptible by humans and is not considered capable of causing structural damage. Refer to the charts included on the next page for a sound level reference chart.

Bartram’s South Assemblage:

In general, sound levels ranged from 37.2dB to 99.5dB. During the five-day monitoring period, five readings were slightly elevated (detected above 90 dBs), however this sound level did not sustain into the next hour at the monitoring position. Vibration levels typically ranged between 0.00687 in/sec and 0.0187 in/sec approximately 30’ from the train tracks, generally lower than the set seismic trigger levels of 0.015 in/sec, which is at or approaching the levels perceptible by humans and is not considered capable of causing structural damage. Vibration levels typically ranged between 0.00375 in/sec and 0.00562 in/sec approximately 700’ from the train tracks, below the set seismic trigger levels of 0.015 in/sec, which is at or approaching the levels perceptible by humans and is not considered capable of causing structural damage.

Sound Level Reference Chart:

The below chart is provided by Narravo and Wright Consulting Engineers, Inc.:

TABLE 6: SOUND LEVEL REFERENCE CHART	
Description of Sound	Sound Level (dB)
Threshold of Hearing	0
Rustling Leaves	20
Quiet Whisper (3 feet away)	30
Quiet Home	40
Quiet Street	50
Normal Conversation	60
Inside Car	70
Automobile (25 feet away)	80
OSHA 1926.52 Permissible Noise Exposure for an 8 hour duration per day	90
Train Whistle (500 feet away)	90
Level at which sustained exposure may result in hearing loss	90 - 95

Diesel Truck (30 feet away)	100
Power Mower (3 feet away)	107
Amplified Rock and Roll (6 feet away)	120
Pain Begins	125
Jet Airplane (100 feet away)	140
Even short term exposure can cause permanent damage – Loudest recommended exposure WITH hearing protection	140

Vibration Severity Reference Chart:

The below chart is provided by Narravo and Wright Consulting Engineers, Inc.:

VIBRATION SEVERITY PER ISO 10816						
Machine		Class I small machines	Class II medium machines	Class III large rigid foundation	Class IV large soft foundation	
in/s	mm/s					
Vibration Velocity Vrms	0.01	0.28				
	0.02	0.45				
	0.03	0.71		good		
	0.04	1.12				
	0.07	1.80				
	0.11	2.80		satisfactory		
	0.18	4.50				
	0.28	7.10		unsatisfactory		
	0.44	11.2				
	0.70	18.0				
	0.71	28.0		unacceptable		
1.10	45.0					

1.4 Elevation and Floodplain Conditions

Much of Bartram’s North and Bartram’s South is located in close proximity to the Schuylkill River. As such, a significant portion of the properties are located in some combination of the floodway, Zone AE special flood hazard area, or Zone X per FEMA FIRM Flood Insurance Rate Map #4207570179G (map revised 01/17/2007) and #4207570187H (map revised 11/18/2015). A Floodplain Exhibit is included in **Appendix E** that correlates the approximate floodplain boundaries to each site and the approximate topography per available GIS data.

Kimley-Horn met with the City of Philadelphia Floodplain Management team in July of 2019 to discuss the scope of the anticipated development for Bartram’s North and South. The meeting notes are included in **Appendix F**.

Below is a summary of the development regulations related to the floodplains:

- ◆ **Floodway Area:** No encroachment is permitted, including fill, new construction, or development.
- ◆ **Zone AE:** Lowest finished floor elevation must be 18” above the base flood elevation. Alternatively, the building can be floodproofed & structurally designed to be substantially impermeable to the passage of water and be able to resist the hydrostatic & hydrodynamic load and effects of buoyancy.
- ◆ **Zone X:** Not currently regulated, but Floodplain Manager indicated that regulations may be forthcoming (no anticipated timeline provided).

Below is a chart that outlines the floodplain regulations that will be applicable for each site. Generally, both Bartram’s North and Bartram’s South will need to consider all the above-mentioned regulations.

TABLE 7: FLOODPLAIN SUMMARY				
Property Address	Portions Located Within Floodway Area	Portions Located Within Zone AE Special Flood Hazard Area	Portions Located Within Zone X	Approximate Site Topography Range
1620 S. 49 th Street	No	Yes	Yes	11’ – 32’
1631 S. 49 th Street	No	Yes	Yes	2’ – 32’
1700 S. 49 th Street	Yes	Yes	No	2’ – 10’
4910 Botanic Ave	Yes	Yes	Yes	2’ – 11’
3000 S. 56 th Street	Yes	Yes	Yes	2’ – 32’



1.5 Geotechnical Conditions

Overview

Kimley-Horn partnered with Narravo and Wright Consulting Engineers, Inc. to complete a Geotechnical Investigation for the sites. The full Report of Geotechnical Investigation can be found in **Appendix G**, which includes a detailed summary of the locations and specific sub-surface geologic conditions at 12 boring locations throughout the subject area. A summary of the groundwater conditions and sub-surface geologic conditions is included below.

Groundwater Conditions

Static groundwater was not recorded within any of the borings performed during this investigation. However, due to the proximity of the sites to the Schuylkill River, groundwater is anticipated to be encountered between 5 and 10 feet below existing grades. It should be noted that fluctuations in the groundwater level can occur due to several factors, including variations in precipitation, seasonal changes, and site development activities.

Sub-Surface Geologic Conditions

The subject property is situated within the Trenton Gravel Formation. This formation generally consists of gray or pale-reddish-brown, very gravelly sand interstratified with cross-bedded sand and clayey silt beds of the Quaternary Age. Based on the results of the subsurface investigation, heterogeneous fill materials with erratic densities underlain by compressible cohesive soils are present at each site. Conventional foundation and slab-on-grade construction is not feasible, as direct contact on either of these materials will likely result in intolerable total and differential settlements leading to cracking of slabs and foundations as well as longitudinal distortion. Additionally, consolidation settlement will need to be considered should fills be placed on site due to the presence of soft, compressible soils at both sites. Refer to the Report of Geotechnical Investigation for two recommendations prepared by Narravo and Wright Consulting Engineers, Inc. in regards to foundation support options.



1.6 Utility Infrastructure

Overview:

Kimley-Horn has been coordinating with the following respective agencies to better understand the availability of utilities in proximity to Bartram's North and Bartram's South:

- ◆ **Electric Service:** Philadelphia Electric Company (PECO)
- ◆ **Gas Service:** Philadelphia Gas Works (PGW)
- ◆ **Communication Service:** Verizon
- ◆ **Water, Sanitary Sewer, and Stormwater Management:** Philadelphia Water Department (PWD)

Below is a summary of the anticipated utility service availability for the respective assemblages. A Utility Exhibit has also been included in **Appendix H**.

Bartram's North Assemblage:

The preliminary utility investigation indicates that the Bartram's North properties have access to communication lines, electricity, water, gas, and sewer via the streets surrounding them. From the initial investigation, it appears that 1620 S. 49th Street already has connections to the property from the electric lines. Since the existing building located on 4910 Botanic Avenue has been recently utilized the site has access to all the above-mentioned utilities.

Bartram's South Assemblage:

The preliminary utility investigation indicates that the Bartram's South property does not currently have direct connections to any utility lines. This is based on the mapping provided by the respective utility companies. Since the property was once developed, it is anticipated that there could be abandoned connections to the utilities that could be reused or new connections to the street will be necessary. It appears that sewer and electric service connections could be made within the S. 56th Street right-of-way.



1.7 Access

Overview:

Currently, only one parcel (4910 Botanic Ave.) is developed and utilized daily by the City of Philadelphia. However, since all sites have previously been developed, there are existing points of entry to each property, although most are fenced off from public use. A traffic study was completed by Kimley-Horn & Associates, Inc. and is included within **Appendix I**.

Bartram's North Assemblage:

Below is a summary of the existing points of access for each site:

- ◆ **1631 S. 49th Street – One Vehicle Entrance**

Currently there is an entrance to the property on the southwest corner of the property on to S. 49th Street. To the north of the entrance is a railroad crossing and the crossing is closed by a fence. Therefore, access to the site is attained by utilizing S. 51st Street and Botanic Avenue. There are no pedestrian walks that have accessibility to the site, and no defined bicycle paths.
- ◆ **1620 S. 49th Street – Two Vehicle Entrances**

There are two entrances onto this parcel with right turn and left turn capabilities, in and out of the site. One entrance is accessible from S. 51st Street, and the other entrance is accessible from S. 49th Street. As mentioned above, the entrance from S. 49th Street can only be accessed by traveling from S. 51st Street and Botanic Avenue. There is a pedestrian sidewalk on the opposite side of S. 51st Street, and then the Bartram's Mile Trail for pedestrians/bicyclists border the eastern border of the property, however, with no direct access to the site.
- ◆ **1700 S. 49th Street – No Vehicle Entrance**

There is currently no visible entrance from Botanic Avenue to this parcel. There is a pedestrian sidewalk and a pedestrian/bicyclist trail opposite from the parcel on Botanic Avenue. However, this sidewalk and trail does not allow direct access to the site.
- ◆ **4910 Botanic Avenue – Two Vehicle Entrances**

There are two entrances onto this parcel with right turn and left turn capabilities, in and out of the site. Both entrances are accessible from Botanic Avenue and are spread apart on both corners of the property. There is a pedestrian sidewalk and a pedestrian/bicyclist trail opposite from the parcel on Botanic Avenue. However, this sidewalk and trail does not allow direct access to the site.



Bartram's South Assemblage:

- ◆ **3000 S. 56th Street – Three Vehicle Entrances**

There are three existing entrances onto this parcel of land. Two entrances on S. 56th Street, one on the northwest corner of the parcel and the other in the middle of the northern property boundary, have right turn and left turn capabilities in and out of the site. The third entrance via S. 58th street has left turn in capabilities along with right turn out capabilities. All entrances are currently gated and fenced off from public use. There is no pedestrian sidewalk or defined bicycle paths on S. 58th Street, however, there are pedestrian sidewalks on S. 56th Street, but no defined bicycle paths.



CHAPTER 2: CAPACITY TO SUPPORT CONCEPTUAL DEVELOPMENT PROGRAM

2.1 Access Study

Executive Summary

The Philadelphia Industrial Development Corporation (PIDC) proposes to develop up to 1,075,000 square feet (S.F.) of research and development center space between two development sites. Bartram's North (515,000 S.F.) is comprised of multiple vacant parcels at 1620 S. 49th Street, 1631 S. 49th Street, 1700 S. 49th Street, and 4910 Botanic Avenue. Bartram's South (560,000 S.F.) is comprised of the vacant parcel at 3000 S. 56th Street. Current access to the Bartram's North site is provided at 51st Street via Grays Avenue. Current access to the Bartram's South site is provided at 56th Street via Lindbergh Boulevard. A second access to Bartram's South is proposed via a new connection to 61st Street.

The results of the traffic analysis indicate that the study intersections are expected to operate at an acceptable level of service at build out of the proposed development and the project trips are expected to have minor impacts to the study area intersections compared to the existing conditions. Installation of traffic signals at the study intersections are not currently warranted based upon existing, pre-development traffic volumes. An exclusive northbound right-turn lane at the intersection of Grays Avenue & 51st Street is warranted, but minimal right-of-way appears to be available.

Based upon Philadelphia's Air Management Regulation, project mitigation may be required due to the expectation that the redevelopment projects will generate greater than 100 motor vehicle trips during the peak hour. The mitigation required may include installing GridSmart cameras, pedestrian push button signals, etc. at signalized intersections within the study area. For example, at the signalized intersections 58th Street and 61st Street at Lindbergh Boulevard, there are old electromechanical traffic signal controllers and it is assumed that these will need to be upgraded with new traffic signal cabinets and controllers in the near future. Additionally, fiber interconnect or wireless interconnect between these traffic signals may be required to allow for coordinated traffic signal timings. As a condition of approval for these redevelopment projects, the City of Philadelphia Streets Department may require the traffic signal cabinets and controllers be updated and the fiber interconnect runs, or wireless interconnect devices be installed at the intersections of 58th Street and 61st Street at Lindbergh Boulevard.

Introduction

Kimley-Horn was retained by PIDC to prepare a pre-development access study to evaluate the existing conditions of the site access intersections and the post development impact at the site access intersections. The specific elements of this analysis included:

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- ◆ An inventory of the existing roadway facilities near the project site, including the existing physical and traffic operating characteristics;
 - ◆ Generation, distribution, and assignment of the vehicle trips associated with the proposed site; and
 - ◆ Weekday morning and weekday evening peak-hour capacity analyses of the site access intersections.

Current access to the Bartram North site is provided at 51st Street via Grays Avenue. Current access to the Bartram South site is provided at 56th Street via Lindbergh Boulevard. A second access to Bartram South is proposed via a new connection to 61st Street. Each of the existing and proposed site access intersections provide for full turning movements.

Based upon discussions with PIDC staff, the proposed land uses for the Bartram North and Bartram South sites were considered a “Research and Development Center” with the following mix of uses:

- Quality Control Laboratories: 10%
- R&D Laboratories: 20%
- Administrative Functions: 30%
- Warehouse Facilities: 10%
- Production Facilities: 30%

Based upon this mix of land uses and information contained in the Institute of Transportation Engineers’ (ITE) Trip Generation Manual, 10th Edition, land use code (LUC) 760 – Research and Development Center was used to estimate the number of trips to be generated by the proposed development. Please refer to **Appendix I** for a detailed summary of the land uses.

Existing Roadway Facilities

- ◆ Lindbergh Boulevard (SR 3025)/Grays Avenue is a two-lane undivided roadway classified as an Urban – Minor Arterial according to the PennDOT Traffic Information Repository (TIRe). Adjacent to the site, the roadway runs generally north-south with a posted speed limit of 35 mph. On-Street parking is generally provided on both sides of the arterial. Sidewalks and bike lanes are present throughout the corridor with SEPTA trolley tracks running between the intersections of 51st Street & Grays Avenue and Lindbergh Boulevard & Elmwood Avenue.
- ◆ Elmwood Avenue (SR 3021) is a two-lane undivided roadway classified as an Urban – Minor Arterial according to PennDOT TIRe. Adjacent to the site, the roadway runs generally northeast-southwest with a posted speed limit of 25 mph. On-Street parking is generally provided on both sides of the arterial. Sidewalks and bike lanes are present throughout the corridor with SEPTA trolley tracks running the entire length of Elmwood Avenue.

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- ◆ 51st Street is a two-lane undivided roadway, classified as a local road according to PennDOT TIRe. Adjacent to the site, the roadway runs generally east-west with a posted speed limit of 25 mph. Sidewalks and bike lanes are present throughout the roadway, with portions of the sidewalk being overgrown, missing, or in need of repair. The curb ramps and sidewalks should be reviewed for compliance with ADA standards. The bike lanes need to be restriped
 - ◆ 56th Street is a two-lane undivided roadway, classified as a local road according to PennDOT TIRe. Adjacent to the site, the roadway runs generally east-west with no posted speed limit. Sidewalks and bicycle sharrows are present throughout the roadway. The sidewalks appear to be generally in good condition but are severely overgrown or missing along portions of the roadway. Utility poles are currently located within the sidewalk on the south side of 56th Street. The curb ramps and sidewalks should be reviewed for compliance with ADA standards.
 - ◆ 61st Street is a four-lane undivided roadway, with a two-way left-turn lane median within the study area, classified as an Urban – Minor Arterial according to the PennDOT TIRe. Adjacent to the site, the roadway runs generally east-west with no posted speed limit. On-Street parking is generally provided on both sides of the arterial with a large presence of parked heavy vehicles. Sidewalks are provided on certain sections of the roadway, with the condition of the sidewalks varied along the corridor. Bike lanes are present throughout the corridor, but the pavement markings throughout 61st Street are noticeably poor and proper lane utilization for vehicles is difficult to discern.

Study Intersections:

- ◆ Grays Avenue & 51st Street is a three-legged unsignalized intersection. The minor street approach along 51st Street is stop-controlled, and all movements are permitted for all approaches, with no exclusive turn lanes present.
- ◆ Lindbergh Boulevard & Elmwood Avenue is a three-legged signalized intersection. This intersection has fixed timing throughout the day and is not part of a coordinated signal system. The cycle length of the intersection varies from 52 seconds to 92 seconds, depending upon pedestrian actuation and if a SEPTA trolley is present on the southbound Lindbergh Boulevard approach or northbound Elmwood Avenue approach. An exclusive southbound right-turn lane exists on Lindbergh Boulevard. The signal timing information is included in **Appendix I**.
- ◆ Lindbergh Boulevard & 56th Street is a four-legged unsignalized intersection with exclusive left-turn and right-turn lanes for the northbound approach. The intersection is a two-way stop-controlled intersection with the minor street approaches along 56th street being stop-controlled, and all movements are permitted for all approaches.

- ◆ Elmwood Avenue & 56th Street is a four-legged unsignalized intersection. The intersection is a two-way stop-controlled intersection with the minor street approaches along 56th street being stop-controlled, and all movements are permitted for all approaches with no exclusive turn lanes present.

Multi-Modal Services

The following multi-modal services are present within the study area:

- ◆ Transit routes (Trolley, bus, and trains)
- ◆ Pedestrian sidewalks
- ◆ Conventional and shared bike lanes

The current transit service within the study area is provided by Southeastern Pennsylvania Transportation Authority (SEPTA). Currently there are three (3) bus routes, two (2) trolley routes, and two (2) train routes operated by SEPTA near the study sites. SEPTA Trolley Route 36 currently operates along Grays Avenue/Lindbergh Boulevard and Elmwood Avenue. The existing stops near the proposed site are located on the sidewalks and no shelters are provided for the stops. Per SEPTA's 2019-2030 Capital Program Proposal, it is stated that from 2024 to 2030 and beyond that modern lo-floor articulated light rail vehicles will replace the trolleys on Routes 11 and 36.

As previously mentioned, pedestrian sidewalks are present throughout all the existing roadways. However, the condition of the existing sidewalks varies and there are gaps in sidewalks along several corridors.

Conventional bike lanes are present throughout existing roadways on Lindbergh Boulevard/Grays Avenue and 51st Street, while shared bike lanes are located on 56th Street. Bartram's Garden, which is adjacent to both proposed Bartram North and South sites, provides a paved multi-use trail for pedestrians and bicyclists that will allow direct site access between Bartram North and Bartram South.

Please refer to the exhibits in **Appendix I** for a detailed map of the multi-modal services within the study area.

Truck Route

Based upon the surrounding roadway network within the proposed development, trucks can gain access to the sites from multiple routes. Truck traffic traveling from the North will access the Bartram North and Bartram South sites via Grays Ferry Avenue to Paschall Avenue to Grays Avenue/49th Street. Truck traffic traveling from the South and East directions will be routed via I-95 to Island Avenue to Lindbergh Boulevard. Truck traffic from the West will be routed via I-76 to Passyunk Avenue to 61st Street. Currently, there are grade separated railroad crossings at 51st Street and 56th Street. Measurements that were conducted during a site visit on Thursday, August 8th, 2019, indicated that the clearance heights of the bridges vary from



approximately 14'6" to 14'10" over 51st Street and approximately 13'11" to 14'4". Per PennDOT Pub 238, Bridge Safety Inspection Manual, the maximum allowable height of any vehicle in the State of Pennsylvania is 13'6" unless a special permit is obtained. Based upon the field measurements of the existing bridge clearance heights along the site access roadways, truck traffic should be able to access the Bartram North site via 51st Street and should be able to access the Bartram South site via either 56th Street or the proposed access from 61st Street. Please refer to the images in **Appendix I** for the bridge clearance height measurements of the existing structures. A physical survey conducted by a licensed surveyor should be conducted to confirm the bridge clearance heights.

Existing Traffic Volumes

Existing traffic volume data for the study intersections was collected on Tuesday, June 4th, 2019 and Tuesday, July 30th, 2019. Automatic Traffic Recorders (ATR) collected traffic volume data along 61st Street from Tuesday, June 4th, 2019 to Wednesday, June 5th, 2019. No seasonal adjustments were applied to the counts. Based upon the data collected, the weekday AM peak-hour was 7:45 – 8:45 AM and the PM peak-hour was 4:15 – 5:15 PM. Raw traffic count data is included in **Appendix I**.

Existing Traffic Operations

Existing (2019) weekday AM and PM peak-hour operations were evaluated at the study intersections using the Synchro version 10 methodology for the signalized study intersection and HCM 2010 methodology for the unsignalized study intersections. Default values for Saturation Flow Rate, Start-up Lost Time, and Critical Headways were adjusted per PennDOT Publication 46. All intersections currently operate at an acceptable level of service (LOS) during both peak hours. The existing conditions operations are summarized in Table 1. Summary outputs of the analysis are provided in **Appendix I** and the definitions of Level of Service are provided in **Appendix I**.

TABLE 8: EXISTING CONDITIONS LOS SUMMARY

		Existing Conditions	
Intersection	Mvmt	AM Peak	PM Peak
		Delay (LOS)	Delay (LOS)
1. Lindbergh Boulevard and Elmwood Avenue (Signalized)			
Eastbound (Elmwood Ave)	L	18.4 (B)	17.4 (B)
	Overall	18.4 (B)	17.4 (B)
Northbound (Lindbergh Blvd)	T	10.5 (B)	10.4 (B)
	Overall	10.5 (B)	10.4 (B)
Southbound (Lindbergh Blvd)	T	8.9 (A)	10.8 (B)
	R	-	0.1 (A)
	Overall	7.4 (A)	8.6 (A)
Overall Intersection		10.4 (B)	10.0 (B)
2. Lindbergh Boulevard and 56th Street (TWSC)			
Eastbound (56th St)	LTR	10.2 (B)	12.9 (B)
Westbound (56th St)	LTR	12.8 (B)	13.5 (B)
Northbound (Lindbergh Blvd)	L	7.8 (A)	8.3 (A)
	T	-	-
	R	-	-
Southbound (Lindbergh Blvd)	LTR	0.2 (A)	0.3 (A)
3. Elmwood Avenue and 56th Street (TWSC)			
Eastbound (56th St)	LTR	9.8 (A)	10.5 (B)
Westbound (56th St)	LTR	9.3 (A)	10.1 (B)
Northbound (Elmwood Ave)	LTR	-	0.1 (A)
Southbound (Elmwood Ave)	LTR	1.6 (A)	1.2 (A)
4. Grays Avenue and 51st Street (TWSC)			
Eastbound (Parking Lot)	LTR	-	11.1 (B)
Westbound (51st Street)	LTR	15.0 (B)	13.9 (B)
Northbound (Grays Ave)	LTR	-	-
Southbound (Grays Ave)	LTR	-	0.2 (A)

Future Pre-Development Traffic Volumes

The following assumptions were applied to develop future pre-development traffic volumes:

- ◆ The Growth Factor for the roadways was assumed to be 1.00% per year – according to PennDOT growth rate info, the annual growth rate for Philadelphia County is 0.00% per year; and
- ◆ There are no planned transportation improvements within the study area that would add or modify the number of travel lanes at the study intersections.

It is expected that the construction of the proposed development will be fully completed by 2024.

Vehicular Trip Generation, Distribution and Assignment

The traffic expected to be generated by the proposed redevelopment projects at Bartram North and Bartram South was calculated using the information provided in the Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 10th Edition*, following procedures consistent with PennDOT Publication 639. Land Use Code (LUC) 760: Research and Development Center was utilized to estimate the number of trips to be generated by both sites. An assumption of a 25% modal reduction for the trip generation was applied to the trips generated from the sites based upon site location and presence of multiple public transportation options within the study area. Please see Table 2 and Table 3 below for a summary of the trip generation for both Bartram North and Bartram South.

TABLE 9: BARTRAM'S NORTH TRIP GENERATION								
LUC	Size (S.F.)	Daily	AM In	AM Out	Total	PM In	PM Out	Total
760	515,000	5,678	161	55	216	37	215	252
Gross Trips		5,678	161	55	216	37	215	252
Modal Reduction (25%)		-1,420	-40	-14	-54	-9	-54	-63
Net, New Trips		4,258	121	41	162	28	161	189

TABLE 10: BARTRAM'S SOUTH TRIP GENERATION								
LUC	Size (S.F.)	Daily	AM In	AM Out	Total	PM In	PM Out	Total
760	560,000	6,138	176	59	235	41	233	274
Gross Trips		6,138	176	59	235	41	233	274
Modal Reduction (25%)		-1,535	-44	-15	-59	-10	-58	-69
Net, New Trips		4,603	132	44	176	31	175	205

Traffic expected to be generated by the proposed redevelopment was distributed and assigned to the adjacent roadway network based upon existing travel patterns, the existing roadway network, location, and type of site access. Please see **Appendix I** to see an illustration of the distribution and assignment of the site trips to the roadway network within the study area. The traffic volumes generated by the proposed redevelopment were added to the future pre-development traffic volumes to develop the future post-development traffic volumes. Please see **Appendix I** for an overview of the total post-development traffic volumes.



Post Development Traffic Operations

The post-development traffic volumes were evaluated utilizing a similar methodology as the existing conditions analysis. The results of the post-development traffic conditions analysis indicated that the site access intersections are expected to continue operating at acceptable conditions without the need for additional vehicular lanes. The post-development operations are summarized in Table 4. Summary outputs of the analysis are provided in **Appendix I**.

Traffic Signal Warrant Analysis

The purpose of this analysis was to evaluate the peak-hour volume warrants for the existing and post-development traffic volume conditions at the unsignalized study intersections of 51st Street & Grays Avenue, 56th Street & Lindbergh Boulevard, and 61st Street & Proposed Driveway. Utilizing the PennDOT Traffic Signal Warrant Analysis Workbook and existing traffic volumes, a traffic signal warrant analysis was performed for Signal Warrants 1 (Eight-Hour Volume), 2 (Four-Hour Volume), and 3 (Peak-Hour Volume). The results of the existing conditions analysis indicated no traffic signals are warranted at the study intersections.

Using the same methodology as the existing conditions, the post-development conditions were analyzed to determine if traffic signals may be warranted at the intersections based upon estimate future traffic volumes. This future traffic conditions analysis evaluated only the AM peak-hour and PM peak-hour volumes; a full eight-hour traffic signal warrant analysis was not performed. The results of the analysis indicated that the PM peak-hour volume at 51st Street & Grays Avenue and 56th Street & Lindbergh Boulevard would meet the volume threshold criteria for both Warrant 1 or Warrant 2. The volume threshold criteria for Warrant 3 was not met at any of the study intersections. Please refer to **Appendix I** for the results of the Traffic Signal Warrant Analysis.

Turn Lane Warrant Analysis

The purpose of this analysis was to evaluate the peak-hour volumes for the post-development scenario and to identify whether exclusive left-turn or right-turn lanes may be warranted at the three site access intersections. Utilizing the PennDOT Turn Lane Warrant Analysis Workbook, it was determined that an exclusive right-turn lane was warranted for the northbound approach at Grays Avenue & 51st Street. It should be noted that it appears there is limited right-of-way available in this area to construct a new right-turn lane. Therefore, the parking lane could be converted to a right-turn lane or, if the property located in the southeast corner of the intersection of Grays Avenue & 51st Street redevelops, additional right-of-way could be requested. In addition, it is understood that SEPTA is planning to upgrade the trolley stop locations along the Trolley Line 36 route. Any street modifications along this route should be coordinated with SEPTA. The results of the turn-lane analysis indicate that no other exclusive turn lanes are warranted at this time. Please refer to **Appendix I** for the results of the turn lane warrant analyses.

TABLE 11: POST-DEVELOPMENT LOS SUMMARY

TABLE 11: POST-DEVELOPMENT LOS SUMMARY			
		Full-Build Conditions	
Intersection	Mvmt	AM Peak	PM Peak
		Delay (LOS)	Delay (LOS)
1. Lindbergh Boulevard and Elmwood Avenue (Signalized)			
Eastbound (Elmwood Ave)	L	19.9 (B)	18.5 (B)
	<i>Overall</i>	<i>19.9 (B)</i>	<i>18.5 (B)</i>
Northbound (Lindbergh Blvd)	T	11.1 (B)	11.1 (B)
	<i>Overall</i>	<i>11.1 (B)</i>	<i>11.1 (B)</i>
Southbound (Lindbergh Blvd)	T	8.9 (B)	11.3 (B)
	R	-	0.1 (A)
	<i>Overall</i>	<i>7.6 (A)</i>	<i>9.2 (A)</i>
<i>Overall Intersection</i>		10.8 (B)	10.7 (B)
2. Lindbergh Boulevard and 56th Street (TWSC)			
Eastbound (56th St)	LTR	17.4 (C)	19.4 (C)
Westbound (56th St)	LTR	18.0 (C)	22.0 (C)
Northbound (Lindbergh Blvd)	L	7.9 (A)	8.4 (A)
	T	-	-
	R	-	-
Southbound (Lindbergh Blvd)	LTR	8.7 (A)	8.2 (A)
3. Elmwood Avenue and 56th Street (TWSC)			
Eastbound (56th St)	LTR	10.1 (B)	10.7 (B)
Westbound (56th St)	LTR	9.6 (A)	10.8 (B)
Northbound (Elmwood Ave)	LTR	-	7.4 (A)
Southbound (Elmwood Ave)	LTR	7.5 (A)	7.5 (A)
4. Grays Avenue and 51st Street (TWSC)			
Eastbound (Parking Lot)	LTR	-	11.4 (B)
Westbound (51st Street)	LTR	29.6 (D)	42.4 (E)
Northbound (Grays Ave)	LTR	7.9 (A)	-
Southbound (Grays Ave)	LTR	9.6 (A)	8.3 (A)
5. 61st Street and Proposed Driveway (TWSC)			
Eastbound (61st St)	L	8.8 (A)	9.1 (A)
	T	-	-
Westbound (61st St)	TR	-	0
Southbound (Proposed Driveway)	LR	13.1 (B)	14.9 (B)



City of Philadelphia Air Management Regulation

The City of Philadelphia Air Management Regulation X (AMR X) is related to Complex Source reviews. A Complex Source is defined as: [any] facility, building, structure or installation, or combination thereof which emits, or in connection with which secondary or adjunctive activity is conducted which may emit, an air pollutant for which there is a National Ambient Air Quality Standard.

Per AMR X, a Complex Source Permit Application, Traffic Impact Study, and Air Quality Impact Statement must be completed for all Complex Sources listed in AMR X. § II.A:

1. New or modified Parking Facilities within the Philadelphia Metropolitan Center with a final total capacity greater than 250 motor vehicles and new or modified Parking Facilities outside of the Philadelphia Metropolitan Center with a final total capacity greater than 500 motor vehicles. Modifications to such Parking Facilities that have a de minimus impact on air quality, as determined by the Department with reference to the National Ambient Air Quality Standards (NAAQS), are exempt from the requirements set forth in Section II.A.
2. New or modified Complex Sources that are projected by the Department to generate peak rate traffic in excess of 100 motor vehicles per hour; 25 diesel buses per hour; or 12 heavy duty diesel vehicles per hour.

The concept plans for the proposed redevelopment at Bartram North and Bartram South indicate that the number of parking spaces at each facility is expected to exceed 500 spaces. The trip generation of the proposed site is expected to generate greater than 100 motor vehicles per hour, but fewer than 12 heavy duty diesel vehicles per hour. Air Management mitigation may be required, which could include installing GridSmart Cameras, pedestrian push button signals, etc. at signalized intersections within the study area. For example, at the signalized intersections 58th Street and 61st Street at Lindbergh Boulevard, there are old electromechanical traffic signal controllers and it is assumed that these will need to be upgraded with new traffic signal cabinets and controllers in the near future. Additionally, fiber interconnect or wireless interconnect between these traffic signals may be required to allow for coordinated traffic signal timings. As a condition of approval for these redevelopment projects, the City of Philadelphia Streets Department may require the traffic signal cabinets and controllers be updated and the fiber interconnect runs, or wireless interconnect devices, be installed at the intersections of 58th Street and 61st Street at Lindbergh Boulevard.



2.2 Public Infrastructure & Utilities

Electric and Gas Service Overview:

Kimley-Horn analyzed the proposed land use for Bartram's North and Bartram's South to develop resource consumption ("load") profiles. The load profiles were juxtaposed against the availability of utilities typically purchased directly (e.g. electrical, gas) for the initial and future build out scenarios, and to identify any potential shortfalls in service. The specific elements of this analysis included:

- ◆ *Resource Consumption Prediction*
 - Estimating electrical and gas usage based on the provided land uses for Bartram North and South.
 - Outreach to the utility companies (PECO, PGW) to assess service availability for the estimated load profiles at each site.
- ◆ *Deficiency Resolution Suggestions*
 - Identification of service shortfalls and potential remedies based on results of the utility outreach.

The proposed land use for both Bartram sites are to be considered a "Research and Development Center" with the all-in-one campus use breakdown described in Section 1.1 (10% Quality Control Laboratories, 20% R&D Laboratories, 30% Administrative Functions, 10% Warehouse, and 30% Production)

Estimated Electrical & Gas Loads

To determine the availability of electrical and gas services for purchase near Bartram's North and Bartram's South, load estimates (in kVA/amps or MCF) and service applications were required by the utility companies (PECO and PGW respectively). These estimates consider the total square footage and the defined land use categories as described above. Note that the use case splits have a strong influence on the resource consumption estimates because each application typically requires a different demand intensity (e.g. an R&D lab has greater electrical demand than administrative functions).

For the electrical service estimate, published studies from a variety of sources, to mimic site diversity, were referenced. Based on these references conservative aggregate unit energy requirements per square foot were determined. Data supporting the electrical estimates were sourced from the following entities:

- ◆ ASHRAE – HVAC and Lighting
- ◆ NREL – Plug and process loads
- ◆ NIH – Miscellaneous loads for office and lab spaces
- ◆ EIA – For general energy intensities per square foot by building category

For Bartram’s North and Bartram’s South, the estimated electrical load for each category was calculated to develop a total estimated load (in kVA) and service size (in Amps). A factor of 1.25 was also applied to the service size per the requirements in the NEC [(230.42 (A)(1))]; note that conservatively all loads were treated as continuous.

For the gas service estimate, the unique potential space consumptions are heavily influenced by process (non-building) loads that have not been fully quantified or developed. Thus, the unit value per square foot used to calculate the load size reflects the average for office buildings as reported by the U.S. Energy Information Administration (EIA). A bulk estimate was made for the gas estimate because a broader estimation is too cumbersome and potentially error prone without specific application data. Additionally, as most natural gas consumption is applied to space heating (as shown in the EIA CBECS data), we believe the bulk load estimate reflects realistic usage at each property.

Table 12 below details the load sizing parameters used to generate the utility estimates at each property. Tables 13 and 14 respectively detail the electrical and gas service estimate for Bartram’s North and South. Also, see below for specific descriptions on the selection of each unit value, pointers to source references, and commentary on the estimates.

TABLE 12: LOAD SIZING PARAMETERS			
Criteria	Unit	Value	Reference
Gas	cf/sqft	30	[1]
Electrical (Avg)	kWh/sqft	20	[1]
HVAC - General	kWh/sqft	9	[4]
HVAC - Clean Room	kWh/sqft	125	[4]
Plug and Process - Office	W/sqft	1	[2]
Plug and Process - Lab	W/sqft	2.5	[2]
Lighting Interior	Lumen/m2	250	[5]
Lighting Exterior	Lumen/m2	Varies (100;250;400)	[5]
Miscellaneous	W/sqft	1.6	[3]

[1] EIA – Commercial Building Energy Consumption Survey Data (2012)

- ◆ The electrical average which is used to benchmark against the electrical load estimates for each property is based on the data presented in Table C21 titled “Electricity consumption and condition energy intensity by building size”. Specifically, the data concerning Office buildings is referenced.
- ◆ The unit value for gas service is based on Table C31 titled “Natural gas consumption and conditional energy intensity by building size”

[2] NREL – Plug and Process Loads Capacity and Power Requirements Analysis (2014)

- ◆ The work established in this report served as the basis for our selection of plug and process load (PPL) estimation at both properties. Note that slightly more conservative values were chosen for Office and Lab PPLs.
- ◆ PPLs generally consider receptacle loads such as office equipment, as well as equipment used in industrial or commercial processes.

[3] National Institutes of Health (NIH) – Design Requirements Manual (2016)

- ◆ Table 10.2.2(A) Normal Power Load Demand was referenced for miscellaneous office and lab load requirements.

[4] Multiple sources –

- ◆ ASHRAE Handbook: HVAC Applications; ASHRAE Standard 62-1999; ISO/DIS 1464401 Cleanrooms and Associated Controlled Environments; High Performance Commercial Buildings – A Technology Road Map

- ◆ The General and Clean Room HVAC calculations are based on an amalgamation of several different sources, several of which are shown above.
- ◆ The Clean Room calculation assumes that a small portion of the usable square footage will be used for hyper-sensitive processes that require a higher level of HVAC service. Please be aware that this is a rough estimate as it is difficult to establish a hard answer without specific data.

[5] IESNA/ASHRAE

- ◆ The interior lighting value is based on an assumption for commercial office buildings.
- ◆ The exterior lighting varies based on the outdoor space and considers the parking lots, walkways, and building entrances.

TABLE 13: ELECTRICAL LOAD ESTIMATES

	Bartram's North		Bartram's South	
Building Area	515,000 S.F.		560,000 S.F.	
	Electrical Load (kVA)	% of Total Load	Electrical Load (kVA)	% of Total Load
Lighting	121.0	6%	130.0	6%
Interior	109.4	5%	119.7	5%
Exterior	11.7	1%	10.4	1%
HVAC	662.0	31%	708.0	30%
General	518.8	24%	565.1	24%
Clean Room	142.7	7%	142.7	6%
PPL	545.0	25%	590.0	25%
Misc.	824.0	38%	896.0	39%
Totals (kVA)	2,152		2,324	
Service Size (A) @ 480 V	3,250		3,500	
kWh Annual	18,851,520		20,358,240	
kWh/sqft	36.6		36.4	
Notes:	<ul style="list-style-type: none"> ◆ Assumes a 480 V, 3 phase system and single primary service meter ◆ Service Size (A) includes 1.25 sizing factor per NEC 230.42 (A)(1) 			

TABLE 14: GAS LOAD ESTIMATES

	Bartram's North	Bartram's South
Building Area	515,000 S.F.	560,000 S.F.
Gas Load (MCF)	15,450	16,800



Electric Service Load Assumptions

- ◆ In engaging with the utility company (PECO) we assumed a single primary service feed to the property. This approach was taken to assess the “maximum” case with the utility and provided visibility into the existing electrical infrastructure’s ability to support a high service load.
- ◆ The utility application assumes a bulk square footage served of 515,000 and 560,000 for Bartram North and South, respectively. This reflects Phase I and the largest configurations proposed for Phase II at each property.
- ◆ The service configuration assumes that individual secondary lines would feed from the primary service to individual buildings requiring proportionally smaller service loads.

Electric Service Load Commentary

- ◆ The annual kilowatt-hour (kWh) and kilowatt-hour per square foot (kWh/sqft) detail the estimated electrical usage at each property. These numbers can be used to estimate the cost of electrical service over time.
- ◆ The estimated kWh/sqft for Bartram’s North and South stands in contrast to the average of 20 kWh/sqft for commercial office buildings over 100,000 sqft as reported in EIA’s CBECS.
 - Due to the unique intended nature of the building spaces (R&D and advanced manufacturing) we feel the higher than average electrical usage estimates are reflective of the proposed use cases.

Electric Service & Capacity Availability

Based on the estimated electrical loads and service sizes detailed in the previous section electrical service applications for Bartram’s North and Bartram’s South were submitted to PECO. The utility company has communicated the following service characteristics for both properties:

- ◆ **Service Rate Classification:** High Tension (HT). The load size restriction for PECO’s single meter General Service (GS) rate is capped at 1500 kVA, at which point customers must use the High Tension (HT) service. The HT service is defined as an untransformed service where the customer installs, owns, and maintains any transforming, switching, and other receiving equipment required. There is also a separate rate schedule specific to the HT service.
- ◆ **Primary Service Voltage:** 13.2 kV. Due to the nature of the HT service a higher operating voltage may be used on the primary side of the transformer. In this area PECO has indicated that the primary serving voltage will be 13.2 kV; transformers should be chosen accordingly.
- ◆ **Available Circuit Capacity:** Yes. PECO’s capacity team has determined that they have available HT circuits to support the estimated load and service size at each property.



This is not a reflection of the maximum capacity available near each property, but rather indicates that existing circuitry can be used to deliver an HT service at the specified loads and sizes without requiring upgrades to the network. Service requiring network upgrades would come with an increased installation cost.

Gas Service & Capacity Availability

PGW has indicated that gas services are in the vicinity of both the Bartram North and South properties and has provided gas availability letters detailing that services can be delivered. PGW's estimation team also provided the following service characteristics for each property:

◆ Bartram South

- **Rate Classification:** General Service (GS)-Commercial*. This service encompasses standard gas usage activities such as heating and cooking.
- **Gas Main Type:** High-pressure. A high-pressure gas main can be used to deliver a high-pressure service or can be down-regulated to deliver a low-pressure service. For Bartram South, service would be fed from a high-pressure gas main. This provides the property with the option to explore different service configurations that may better fit the needs of the development.
- **Service Pressure:** Low-pressure at 4.5-inches water column (0.16 PSI). PGW classifies high-pressure services as those being delivered at over 4.5 inches of water column. A low pressure service may introduce some design challenges as this range of operating pressure can restrict equipment choices and could require larger distribution piping or a pressure booster within the building should site pressure equipment be incompatible with or require higher pressure at the burner tip. In practice, a higher-pressure service may need to be requested when ordering the gas utility to avoid limiting equipment selection and to allow for pressure losses due to intra-building pipe routing. This will also provide a future developer with more flexibility in regulating the pressure at the service entrance to meet the needs of the property.
- **Connection:** 8-inch HDPE plastic. This reflects a standard size and material for a primary gas line.
- **Available Capacity:** Yes. PGW has confirmed that the estimated load flow can be supported. This is not a reflection of the maximum capacity available near the property, but rather indicates that existing infrastructure can support the specified load without requiring upgrades to the network.

◆ Bartram North

- **Rate Classification:** General Service (GS)-Commercial*
- **Gas Main Type:** Low-pressure. PGW indicated that low pressure gas mains are the only service access available near Bartram North.

- 
- **Service Pressure:** Low-pressure at 4.5-inch water column (0.16 PSI). As mentioned for Bartram's South, a low pressure service may introduce design challenges that could restrict equipment choices.
 - **Connection:** 8-inch HDPE plastic
 - **Available Capacity:** Yes. PGW has confirmed that the estimated load flow can be supported. This is not a reflection of the maximum capacity available near the property, but rather indicates that existing infrastructure can support the specified load without requiring upgrades to the network.

**If gas service will be used for process applications, service will be classified as GS-Industrial. A minor savings can be realized under the GS-Industrial service due to a rate difference from the GS-Commercial service.*

Service Shortfalls and Remedies

The analysis of available utilities was conducted to determine deficiencies in service availability and identify opportunities to employ alternate energy technologies.

Electrical

The electrical utility has provided a positive response and confirmed that the estimated power load and predicted consumption can be accommodated through traditional means. Further system design details will be required to refine the final loads and applicable rate schedule. At that time, it may be desired to compare the capital and operational costs associated with the traditional system to alternate energy strategies. However, note that after conducting a preliminary solar generation analysis we would not recommend pursuing an alternate electrical strategy given the current economic incentives in place to support projects of this type.

Under consideration in this scenario is a hybrid system that employs a roof-mounted solar array and a Battery Energy Storage System (BESS) that could either be fed from the grid or the PV array. The BESS could be mounted indoors or outdoors to maximize owner options.

A simulation was created to determine, using a typical 500,000 square foot, roof-mounted system, the potential power generation capabilities given the project's location. Due to the fact that the intended system would be designed and installed such that typical loss-factor inducing variables are mitigated, e.g., mounting to a roof negates any impacts of following a variable topography as for a ground-mounted system, the simulation's predicted output performance ratio is applicable to any system size that ultimately would be built. This ratio relates the system size, as measured by total (DC) Watts (Wp) which is a function of each panel's rating, to the output as measured in kWh (kilowatt-hours). Specifically, the analysis predicts that a ratio of approximately 1,350 kWh/kWp is applicable. A CAIV (Cost As Independent Variable) Analysis was created to determine, absent of capital investment limitations and considering only typical construction and expected regulatory constraints, the maximum number of panels that could be



installed is approximately 11,950. This arrangement would create a system with a very low intra-row shading deficit and allow for 20% of the building roof to be uncovered by panels.

The output for an array of this type could be expected to generate approximately 5.7 million kWh (year 1, standard system declination would need to be factored into a detailed financial analysis). This quantity represents approximately two-thirds of the amount of energy predicted to be consumed by each building, irrespective of time of use.

The BESS component of the analysis can provide many functions and sizing would be determined at the time of final analysis. For the purposes of analysis herein, a system sized to obviate the need of a direct-fired backup generator is considered. A standard sized BESS of 2.5 MW / 2.5 MWH is considered and matches the predicted power requirements for the site; the size of the system would provide one hour (1h) of backup power without the need for air permitting, testing, secondary containment, etc.

Gas

The regional utility has provided assurance that the quantity of gas requested is available at both sites. The one deficiency noted in our coordination with PGW is one of pressure supply. Typical supply pressure requirements at equipment for building heating are approximately 7 inches of water column (7" w.c.); this is in comparison to the 4.5" w.c. that the utility has quoted. As such, a booster device is recommended for installation at each service point (building) to increase the pressure to approximately 2 pounds per square inch (psig) or 55" w.c., to allow for pressure drop as the supply piping runs from service point to usage point within each building.

Financial Impacts

To evaluate the impact to project finances, both first costs (Capital Expenses, or CAPEX) and ongoing costs (Operational Costs, or OPEX) were considered. CAPEX figures were obtained from Q32019 projects of similar type, size and location. Due to the variables involved, an accurate calculation of impacted operation costs and/or payback periods are not attainable at this time. The qualitative assessment, however, remains valid.

TABLE 15: ALTERNATE ENERGY COSTS

Technology	Grid Resilience	Grid Independence	Operational Savings	System Description	Infrastructure Impact(s)	Estiamted Capital Cost for Installation	Total Installation Cost (Both Buildings)
Photovoltaic (PV) Rooftop	X	X	TBD	Traditional roof mounted PV array. Approximately 11,950 panels are estimated to fit on the aggregate roof space. String inverters would be used.	System output (AC) would tie-in to building power system and provide means to switch between "grid power" and "solar power" with no impact to the site. Dedicated metering is required to take advantage of any net metering opportunities.	\$9,201,500	\$18,403,000
Battery Energy Storage System (BESS)	X		TBD	Energy storage system sized to provide backup power. Could be fed from the grid or a PV array. System sized to 2.5 MW.	An equipment area of approximately 50 feet by 50 feet should be reserved. Electrical tie-ins are relatively straightforward.	\$3,750,000	\$7,500,000
Natural Gas Booster	X		Slight cost to run device	A booster device is required to ensure pressure deliveries of the grid supplied gas are adequate for all process needs. For example, most building HVAC systems require a tip pressure of 7 inches of water column, much higher than the 4.5 inches of water column quoted by PGW.	The inline device would require 240 Volt power and integration to the building control system as well as safety devices per ASME and other applicable codes.	\$10,000	\$20,000

Timelines

In all cases, project timelines are relatively straightforward, as the regulatory processes are known within the Commonwealth. Project planning allocations of 18 months would accommodate the life cycle from planning and design through permitting and construction.



Water & Sewer Service Commentary

Based on the utility mapping available at the time of preparing this report, it appears that Bartram's North has existing water and sewer service connections that may be able to be upgraded and re-used. It appears that main extensions may be required for Bartram's South. Coordination with Philadelphia Water Department's (PWD) Utility Plan Review and Water Transport Records Department's will likely be necessary. Coordination early in the development process will help in confirming the locations of the existing mains in the vicinity of the site and confirming that the mains have enough capacity to support the anticipated demands from the proposed development. Furthermore, coordination early in the development process is recommended with the Philadelphia Water Department and the Pennsylvania Department of Environmental Protection to confirm that there is enough capacity at the downstream sewage treatment plant to account for the anticipated sewage flows and/or if a planning module will be necessary. An Act 537 Sewage Facilities Act application will be need to be submitted during the technical design phase for each development for review by the above-mentioned agencies. The anticipated sewer count can either be provided by the developer if known or can be established based on the following calculations from PA Code §73.17.(b):

- ◆ 35 gallons / day per employee for factories and plants (exclusive of industrial waste)
- ◆ 10 gallons / day per employee for offices
- ◆ 35 gallons / day per employee for warehouses

It is recommended to coordinate with PWD as soon as feasible to confirm if flow testing can be scheduled for the nearest fire hydrant(s) to the site. This will help in further understanding the water service flow in the vicinity of the site. Furthermore, any abandonment of utilities associated with potentially vacating Botanic Avenue and S. 49th Street will require abandonment in accordance with PWD's Water & Sewer Design Manual. It would be beneficial to submit a PA One Call request to obtain existing utility mapping once the conceptual development process has progressed.



2.3 Stormwater Management Strategy

Site Characteristics

Based on the Conceptual Development plans provided by PIDC, a rough estimate of impervious areas were calculated for both sites. Due to the preliminary nature of the CAD file received, these estimates are preliminary and are subject to change when a more detailed drawing is presented. Bartram's North includes approximately 635,500 S.F. of impervious area (about 68% of the property) and Bartram's South includes approximately 721,000 S.F. of impervious area (about 79% of the property). Due to the high percentage of impervious area on the site, two stormwater management practices (bioretention facilities and FocalPoint BioFiltration Systems) will be necessary to ensure that the site is compliant with current Philadelphia Water Department (PWD) regulations.

Design Approach

On most sites, surface-level bioretention basin or any basin that holds water is preferred since it is typically a lower cost stormwater management practice and water can be treated by infiltrating into the groundwater table. However, due to the proximity to the Schuylkill River, infiltrating water will likely not be feasible. However, if infiltration is not feasible, it is possible to line the bioretention facility with an impervious liner and install an underdrain system. This underdrain system would ultimately connect with the outlet control structure that would then discharge to either existing PWD infrastructure or directly into the Schuylkill River. Bartram's North and Bartram's South sites are located within the Lower Schuylkill Watershed. This watershed permits direct discharge of treated stormwater from the sites to the Schuylkill River as well as making the sites exempt from the PWD Flood Control requirements. It will be critical for the developer of this site to confirm if any existing outfalls have been approved for any of the sites located immediately adjacent to the Schuylkill River. Any direct discharge permitting will include lengthy review times by multiple agencies, including PWD and the Pennsylvania Department of Environmental Protection. Furthermore, a US Army Corps of Engineers General Permit 4 will also likely be necessary since there will be construction, operation, and maintenance for stormwater outfalls that would discharge into the Schuylkill River. It appears that there may be a direct discharge located within the S. 49th Street right-of-way, so Bartram's North may be able to utilize this existing discharge location. However, as noted above, verification will be needed prior to design.

The other benefit of the bioretention facilities is that PWD requires that these stormwater facilities have a loading ratio of 16:1 (i.e. for every 16 square feet of impervious area, there is 1 square foot of stormwater management facilities required). The requirement for below-ground stormwater management facilities increases to a loading ratio of 8:1 (more strict than surface-level). Therefore, it is best to maximize the amount of surface-level stormwater management practices throughout the site.

Proposed Stormwater Management Practices

To manage the stormwater runoff anticipated for this site, generic biofiltration facilities and the FocalPoint BioFiltration System can be utilized to treat the stormwater. These two practices are low-cost when it comes to construction and maintenance, making them suitable for the development of these sites.

Below briefly describes the benefits of each of these stormwater management practices (SMP):

Bioretention Facility (Surface Level SMP)

- ◆ 16:1 loading ratio as surface-level SMP
- ◆ Low construction costs
- ◆ Very effective in removing pollutants
- ◆ Low maintenance activities costs
- ◆ Improves site aesthetics with attractive landscaping



FocalPoint BioFiltration System

- ◆ 16:1 loading ratio as surface-level SMP (to be confirmed)
- ◆ Low construction costs
- ◆ Efficient usage of space
- ◆ High water quality volume treatment



Bartram's North Conceptual Stormwater Management Design

The Conceptual Development plans provided by PIDC were used as the basis of the anticipated design to be outlined below. With minor modifications to the layout of this Conceptual Development, Bartram's North has the adequate available surface-level area to support three bioretention facilities. Please refer to the below chart for the facility sizing and the exhibit included in **Appendix J** for additional details.

TABLE 16: BARTRAM'S NORTH CONCEPTUAL STORMWATER MANAGEMENT SUMMARY				
SMP Label	Total SMP Area (S.F.)	Total SMP Capacity (cu. ft.)	Contributing Impervious Area (S.F.)	Loading Ratio
N1 BF	8,184	19,244	65,646	14:1
N2 BF	3,154	6,499	20,017	16:1
N3 BF	35,553	95,705	549,873	16:1

BF: Bioretention Facility | FF: FocalPoint BioFiltration System

Bartram's South Conceptual Stormwater Management Design

The Conceptual Development plans provided by PIDC were used as the basis of the anticipated design to be outlined below. Even with minor modifications to the layout of this Conceptual Development, Bartram's South will not be able to treat the stormwater with only bioretention facilities. Therefore, it will be necessary to utilize an alternative treatment method as a secondary form of stormwater management. The FocalPoint BioFiltration System is one option to consider, as it provides surface level treatment with an underground storage component. Please refer to the below chart for the facility sizing and the exhibit included in **Appendix J** for additional details.

TABLE 17: BARTRAM'S SOUTH CONCEPTUAL STORMWATER MANAGEMENT SUMMARY				
SMP Label	Total SMP Area (S.F.)	Total SMP Capacity (cu. ft.)	Contributing Impervious Area (S.F.)	Loading Ratio
S1 BF	3,289	7,132	40,636	16:1
S2 BF	7,047	15,180	47,310	15:1
S3 BF	11,243	23,948	79,428	16:1
S4 BF	7,155	14,592	43,356	13:1
S5 FF	6,087	4,434	110,201	38:1
S6 FF	5,821	4,074	121,362	48:1
S7 FF	1,559	1,256	23,771	25:1
S8 FF	861	673	20,227	42:1
S9 FF	1,684	2,203	48,979	85:1
S10 FF	903	1,174	39,591	124:1
S11 FF	592	594	27,551	475:1
S12 FF	4,331	7,182	73,071	26:1
S13 FF	3,886	6,364	78,613	32:1

BF: Bioretention Facility | FF: FocalPoint BioFiltration System

Stormwater Management Summary

Kimley-Horn met with PWD during walk-in hours in July of 2019 to discuss the above-mentioned strategy. The meeting notes are included in **Appendix F**. Once a survey is completed, it is recommended to attend a walk-in appointment with PWD to confirm that the above-described strategy is an acceptable approach. Below is a summary of the total proposed stormwater management facilities for each site:

TABLE 18: TOTAL AREA OF STORMWATER MANAGEMENT			
Site	Bioretention Facility (S.F.)	FocalFiltration Facility (S.F)	Total Area Used (S.F.)
Bartram's North	46,891	0	46,891
Bartram's South	28,734	25,724	54,458

BF: Bioretention Facility | FF: FocalPoint BioFiltration System

2.4 Potential Funding Sources

Below is a list of potential funding sources for future development. A portion of the summary to follow is sourced specifically from the agencies listed. Please note that this list is subject to change over time and is intended to provide a cursory review of potential funding sources. Specific requirements for the below listed applications will need to be reviewed to confirm applicability.

- ◆ **Building PA (BPA)**

Managed by the Pennsylvania Department of Community and Economic Development, this Program focuses on helping finance industrial, commercial, and multi-use projects that will support the acquisition, development, redevelopment, and revitalization of communities. This Program currently has a total funding pool of approximately \$300 million, with \$150 million available for loans to real estate fund managers and \$150 million of private capital that can be leveraged.

- ◆ **Business In Our Sites Grants/Loans (BOS)**

This Program is managed by the Pennsylvania Department of Community and Economic Development and administered through the Commonwealth Financing Authority. This program focuses on grants and loans for the acquisition and development of key sites for future use by businesses, private developers, and others. At this time, there is no limit to the loan amount and there is a maximum grant amount of \$4 million or 40% of the total combined award (whichever is less).



- ◆ **Industrial Sites Reuse Program (ISRP)**

Managed by the Pennsylvania Department of Community and Economic Development, this Program provides grants and low-interest loans for environmental assessments and remediation. Furthermore, this is designed to foster the clean-up of environmental contamination at industrial sites. The maximum amount that can be awarded for an assessment project cannot exceed 75% of the total cost of the assessment or \$200,000 (whichever is less per fiscal year). The maximum amount that can be awarded for a remediation project cannot exceed 75% of the total cost of the assessment or \$1 million (whichever is less per fiscal year).

- ◆ **Pennsylvania First Program (PA First)**

Managed by the Pennsylvania Department of Community and Economic Development, this Program established to facilitate increased investment and job creation in PA. This Program can provide grants, loans, and loan guarantees for many construction related activities.

- ◆ **Pennsylvania Industrial Development Authority (PIDA)**

Managed by the Pennsylvania Department of Community and Economic Development, this Program provides loans and lines of credit to eligible businesses that commit to creating and/or retaining jobs and for the development of industrial parks and multi-tenant facilities. The specific loan amounts vary from \$250,000 to \$2.25 million.

- ◆ **Research and Development (R&D) Tax Credit Assignment Program**

Managed by the Pennsylvania Department of Community and Economic Development, this Program is available to taxpayers incurring qualified expenses for research and development in Pennsylvania.

- ◆ **PA Alternative and Clean Energy Program (ACE)**

Managed by the Pennsylvania Department of Community and Economic Development, this Program provides financial assistance in the form of grant and loan funds for the utilization, development, and construction of alternative and clean energy projects in PA.

- ◆ Potential grants / funding sources are also offered by PWD, PECO, and PGW.



2.5 Pre-Development Site Analysis General Notes

Please note that Kimley-Horn has no control over the actions of jurisdictional agencies or other parties. Accordingly, professional opinions as to the status of permits and entitlements or their suitability for any specific purpose and professional opinions as to the probability and timeframe for approvals are made solely on the basis of professional experience and available data.

Because its opinions are based upon limited site investigation and scope of services, Kimley-Horn does not guarantee that the outcome of permits and entitlements or their suitability will not vary from its opinions or that all issues affecting the site have been investigated.

Kimley-Horn was retained to perform a limited due diligence report, and we performed only those tasks specifically stated in our scope of services. This report may be relied upon only by Kimley-Horn's Client. It is not intended for use by any other party.

The Client may use this report as part of its due diligence, but this report should not be used as the sole basis for the Client's decision making. We endeavored to research site development issues and constraints to the extent practical given the scope, budget, and schedule agreed to with the Client. Our assessment is based in large part on information provided to us by others (city staff, DOT staff, Utility Company Representatives, etc.) and therefore is only as accurate and complete as the information provided to us. This report is based on our knowledge as of 10/11/2019 and is based on the desires of the Client that have been specifically disclosed to us. New issues may arise during development because of changes in governmental rules and policy, changed circumstances, or unforeseen conditions.