
To:	Andrew Leonard, P.Eng. BC Hydro, 333 Dunsmuir Street, Vancouver, BC	From:	Neal Cormack, P.Eng. Stantec, 1100 -111 Dunsmuir Street, Vancouver, BC
File:	123220785 -01	Date:	March 8, 2017

Reference: BC Hydro Seed: Technical, Environmental and Socio-Economic Study – Addendum #1

Introduction

On February 17th, 2017, Stantec issued its report titled “BC Hydro Seed: Technical, Environmental, and Socio-economic Study” documenting the potential effects of BC Hydro’s proposed projects at Emery Barnes Park and Nelson Park/Lord Roberts Annex. This addendum #1 provides additional information in support of the noise study, correction to area temporarily impacted at Emery Barnes Park, and new Nelson Street Site Diagrams.

1. Noise Study

Referring to:

- Section 2, Subsection 2.3.6 Noise; and,
- Section 3, Subsection 3.3.6 Noise.

Please add the following as clarification to the sections above:

Clarification of Sound Terminology

In Stantec’s noise study, the measurement parameters “sound power level” and “sound pressure level” are used to describe the noise emission source. Sound power level (PWL) quantifies the energy of a noise source. Sound pressure (SPL) quantifies the sound pressure of a noise source at different distances. However, both parameters are measured in A-weighted decibel (dBA). For a sound power level of 100 dBA, the sound pressure level will decrease with distances (i.e. 92 dBA at 1 m or at 82 dBA 10 m). A similar example is a heater, where the total energy of a heater is expressed in watts but the temperature, which diminishes with distance from the heater, is in degrees Celsius.

Baseline Conditions

The City of Vancouver Noise Control By-Law No. 6555, November 15, 2016 (Noise By-Law) regulates noise or sound within the City of Vancouver.

Emery Barnes Park is located in the DD (Downtown) District, which is classified as an activity zone. In an activity zone, the continuous daytime noise limit is 70 dBA and nighttime noise limit is 65 dBA.

Nelson Park/Lord Roberts Annex is located in the RM-5B (West End) District and is classified as quiet zone. Based on the Noise By-Law, in a quiet zone, the continuous daytime noise limit is 55 dBA and nighttime noise limit is 45 dBA.

The measured daytime ambient sound levels at the Emery Barnes Park that Stantec measured during field investigations ranged from 58.3 dBA to 61.8 dBA, which are below the Noise By-Law daytime limit of 70 dBA. However, the measured daytime ambient sound levels that Stantec

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measured at the Nelson Park ranged from 56.1 dBA to 57.6 dBA, which is above the Noise By-Law daytime limit of 55 dBA.

Emery Barnes Park and Nelson Park Construction Noise Effect

The Noise By-Law prescribes a noise limit of 85 dBA during construction in an activity zone or quiet zone during the weekday time period of 7:30 AM to 8:00 PM. The noise limit is applicable at the property line of the parcel of land where the construction is taking place, which is nearest to the point of reception of the sound based on the Noise By-Law.

The worst case noise prediction for construction was based on temporary jack hammering activities. During temporary jack hammering activities (3m from the Project property line), the noise level at the nearest point of reception (i.e. 3 m away from the jack hammer) are predicted to be as high as 101.2 dBA, exceeding the noise limit of 85 dBA prescribed in Noise By-Law for both parks without the implementation of noise mitigation. Similar to other urban projects requiring jack hammering, the projects would follow City of Vancouver guidelines for managing noise and implement mitigation measures such as using quieter equipment and installing noise barriers. With such measures in place, the noise levels for construction activities at Emery Barnes Park and Nelson Park are predicted to be below the Noise By-Law limit of 85 dBA at the closest point of reception. The sound pressure level would be lower at the closest residential receptors, located 7 m from the nearest point of reception at Emery Barnes Park and 20 m for Nelson Park.

Table 1 summarized the predicted sound levels for temporary jack hammering activities during construction. As recommended by Vancouver Coastal Health, additional mitigation measures (i.e. imposing conditions on construction permits, limiting noisy activities to the least disruptive periods) could be implemented to further reduce nuisance and noise levels to below the 85 dBA threshold.

Table 1 Summary of Sound Level for Construction

Location	City of Vancouver Noise By-Law Limits (dBA)	Estimated Sound Pressure Level at "Closest" Reception (dBA)	Estimated Mitigated Sound Pressure Level at "Closest" Reception (dBA)
Emery Barnes Park	85	101.2	85
Nelson Park	85	101.2	85

Emery Barnes and Nelson Park Operation Noise Effect

Based on BC Hydro's conceptual design, which is conservative at this point, the ventilation system (air intake and outlet) for the substation at Emery Barnes Park is designed with a maximum sound power level of 97 dBA, which would result in a maximum sound pressure level of 64.8 dBA at the "closest" point of reception. The closest point of reception is defined as the project property line at the northeast corner. The closest residential receptor is located at 8 m from the Project property line. Based on a worst case scenario, the sound pressure level of 64.8 dBA would not exceed the Noise By-Law limits of 70 dBA for daytime and 65 dBA for nighttime.

Reference: BC Hydro Seed: Technical, Environmental and Socio-Economic Study – Addendum #1

Similar to the Emery Barnes Park, the ventilation system for the substation at Nelson Park is designed with a maximum sound power level of 79 dBA at the air intake and 78 dBA at the air outlet which would result in a sound pressure level of 45 dBA at the “closest” point of reception. The closest point of reception is located along the residential side (north-east) of Nelson Street, approximately 13 m from the Project property line. The closest residential receptor is located 20m from the Project property line. Based on a worst case scenario, the sound pressure level would not exceed the Noise By-Law limits of 55 dBA for daytime and 45 dBA for nighttime Table 2 summarizes the project sound pressure levels at the “closest” point of receptor. The sound pressure levels are compared to the Noise By-Law limits and the measured ambient sound level within the park.

Additional mitigation measures can be employed during the detailed design phase of the substation to further reduce the operation noise effect. One way this can be achieved is by upgrading the silencer specification for the ventilation inlets and exhaust. It is reasonable to assume that the maximum operational noise levels (at any time of day or night) could be reduced significantly below the nighttime noise-by-law limits using mitigation measures such as this.

Table 2 Operation Sound Pressure Level at “Closest” Point of Reception

Location	City of Vancouver Noise By-Law Limits (dBA)		Current Measured Ambient Sound Level (dBA)	Estimated Sound Pressure Level at “Closest” Reception (dBA)
	Daytime (7:00-22:00)	Nighttime (22:00-7:00)		
Emery Barnes Park	70	65	61.8 (12:32 PM to 1:35 PM) 58.3 (5:52 PM to 6:57 PM)	64.8
Nelson Park	55	45	56.1 (2:06 PM to 3:09 PM) 57.6 (4:12 PM to 5:14 PM)	45.0

Closing

With the implementation of mitigation measures, the noise levels for construction and operations activities at Emery Barnes Park and Nelson Park are predicted to meet the City of Vancouver noise bylaw requirements.

Stantec's noise studies are based on BC Hydro's conceptual design, and reference worst case scenarios for noise. For operations, the worst case scenario assumes the ventilation system would operate continuously at maximum capacity during daytime and nighttime hours. In reality, the

Reference: BC Hydro Seed: Technical, Environmental and Socio-Economic Study – Addendum #1

ventilation system would only operate at maximum capacity during peak load. For the majority of the time, non-peak operational noise is predicted to be much quieter.

During construction, the adoption of additional mitigation measures, such as those recommended by Vancouver Coastal Health, will also help to further reduce nuisance and disruption to local residents.

If BC Hydro's seed concept is approved, additional refinements to the projects designs (i.e. possible relocation of the vest stacks and/or installation of different silencers) may also support further reductions of noise below the City of Vancouver's by-law requirements. Additional studies to monitor ambient noise levels at night will also be undertaken.

2. Correction to Area Temporarily Impacted at Emery Barnes Park

Referring to:

- Section 2, Subsection 2.2.2 Summary of Construction, Sub-subsection 2.2.2.4 Construction Schedule and Areas Impacted; and

Please add the following as clarification to the sections above:

Stantec originally calculated that construction of the underground substation at Emery Barnes Park would temporarily impact 4,014 m², or 45% of the park for approximately three years.

Based on feedback received during the public consultation process, Stantec reassessed our study of the areas impacted at Emery Barnes Park and have concluded that an error was made in the original calculation. The original calculation of 4,014m², or 45% of the park inadvertently included two parcels of land (PID 009429689 and 009429697) outside of the park boundary at the corner of Seymour Street and Helmcken Street. We have recalculated the area and can confirm that the temporary impact would be 5,739m² or 64% of the park, based on the current conceptual design. The table below provides the updated area and percentage of land within Emery Barnes Park that will be temporarily impacted by the three-year construction of the proposed substation.

Table 2-1 Construction Impact and Duration

Site	Construction Impact and Duration	Area (m ²)	Percent
Emery Barnes Park (PID 006337651, 006337716, 006337775, 027938212)	Permanently Lost	228	3%
	Temporary Lost min. 3 years (substation construction)	5,739	64%
	Temporary Lost 1-2 months (cable installation)	400	4%
	Not impacted	2,601	29%
	Total Area	8,967	

Stantec has reviewed all other calculations and can confirm that they are correct.

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3. Nelson Street Site Diagrams

Referring to:

- Section 4

Please add new Subsection 4.4 Nelson Street Site Diagrams, including the following:

4.4.1 Introduction

Stantec has been commissioned to work with BCHydro and Vancouver School Board to ensure that a 510 person capacity school plus 69 person capacity daycare could be realized on this site, alongside the proposed substation. This has been done as a due diligence exercise for the Vancouver School Board so that they are not limited in the future if they agree to proceed with the SEED concept.

If SEED proceeds, detailed design and collaboration between BCHydro, Vancouver School Board, City of Vancouver and Vancouver Parks Board would be required as well as comprehensive public consultation.

4.4.2 Description Summary

- The diagrams and images in the following Appendix H describe the basic spatial organizational and design parameters for the proposed school on the Vancouver School Board property at Nelson, between Thurlow and Bute, next to Nelson Park. They are not a school design and must be read in conjunction with associated reports and documents which fully describe the project.
- In conjunction with a new school in Coal Harbour, the existing 156 student Lord Roberts Annex school building is to be demolished and the site is to contain a new substation below grade and with a new building at the westerly end of the property containing a school for up to 510 students and a possible child care facility.
- This concept was first illustrated in the "Seed" document of January 2017. The Nelson street location illustrated is one of the elements of an alternate substation concept for Vancouver which is different from the usual way of doing business. Through consultation and refinement, the concept has been developed beyond the original seed document layout. This process sought possible ways to minimize the requirements for technical structures associated with the substation above grade and are subject to further discussions with stakeholders.
- Several opportunities influence the concept, layouts, and forms of the elements of the project on site. The substation below grade provides an opportunity to re-imagine the outdoor area of the school district property, in this case proposing an artificial playing surface to address the desire for this amenity in the community. Shared access to parking and loading below grade affords an opportunity to minimize the extent of substation technical structures above grade. The colonnade of trees on the site perimeter are maintained.

Reference: BC Hydro Seed: Technical, Environmental and Socio-Economic Study – Addendum #1

- The volumetric diagram of the school begins with an intent to provide adequate open interior space at grade to accommodate the comings and goings of 510 students on a daily basis and with respect to school events. In this context the active school community spaces such as the gym and multi-purpose areas are placed adjacent to the field. Actively occupied school program areas such as administration and classrooms are placed along the street edges at grade. Open play areas are distributed up through the building on its sunny sides. Connecting these and internal common areas and teaching spaces are open area stairs, elevators, and perimeter exits.

Add new Appendix H – Nelson Street Site Diagrams (attached for reference).

Regards,



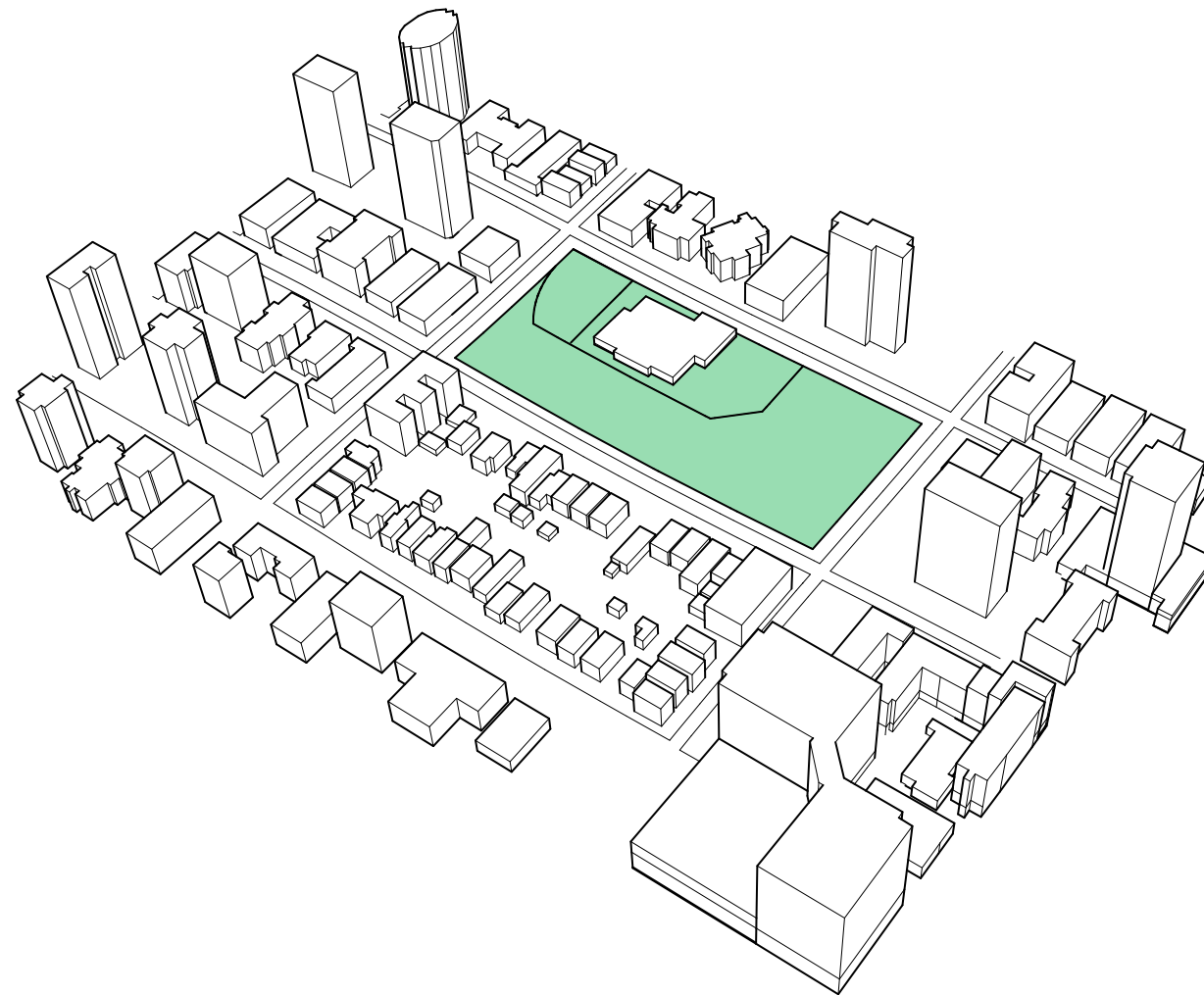
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ADDENDUM 1

APPENDIX H

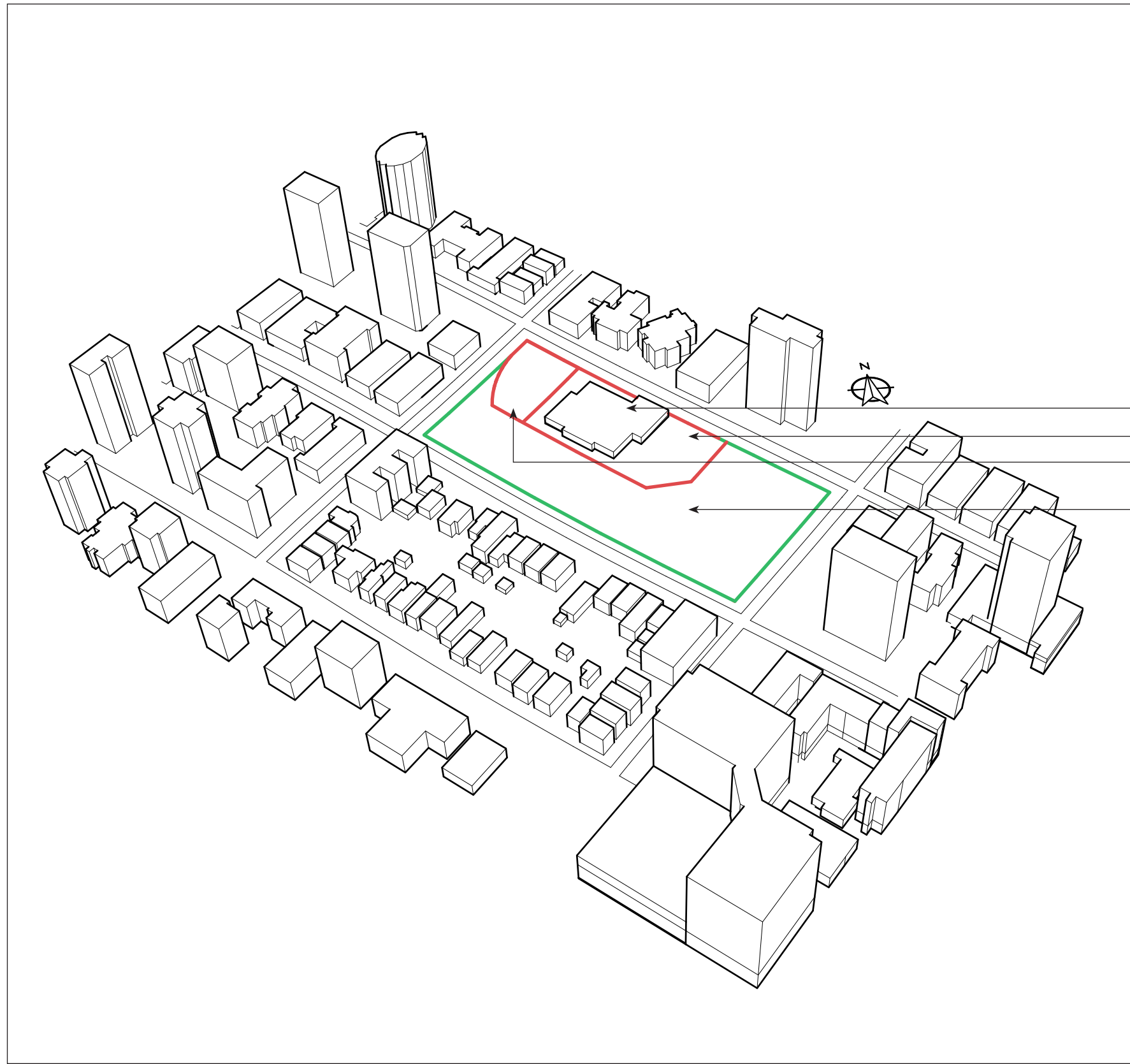
Nelson Street Site Diagrams: { 08-03-2017 }



Existing Site & Context

Stantec has been commissioned to work with BCHydro and Vancouver School Board to ensure that a 510 school plus 69 daycare could be realized on this site, along side the proposed substation. This has been done as a due diligence exercise for the Vancouver School Board so that they are not limited in the future if they agree to proceed with the SEED concept.

Note: If SEED proceeds, detailed design and collaboration between BCHydro, Vancouver School Board, City of Vancouver and Vancouver Parks Board would be required as well as comprehensive public consultation.



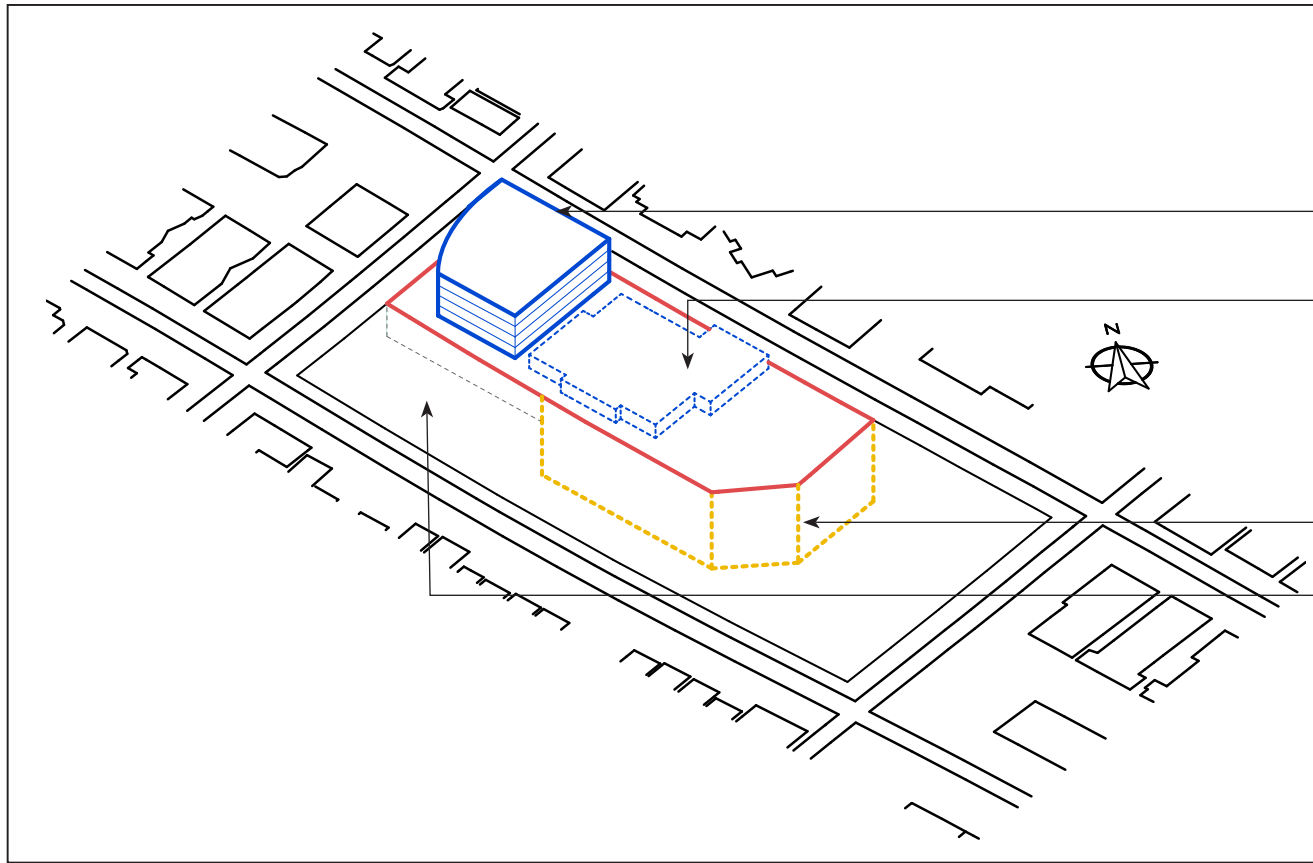
- Existing School (+156 Students)
- Location of Future Underground Substation
- Location of Future Elementary School
- Nelson Park

Summary:

- The diagrams and images in the following appendix describe the basic spatial organizational and design parameters for the proposed school on the Vancouver School Board property at Nelson, between Thurlow and Bute, next to Nelson Park. They are not a school design and must be read in conjunction with associated reports and documents which fully describe the project.
- In conjunction with a new school in Coal Harbour, the existing 156 student Lord Roberts Annex school building is to be demolished and the site is to contain a new substation below grade and with a new building at the westerly end of the property containing a school for up to 510 students and a possible child care facility.
- This concept was first illustrated in the “Seed” document of January 2017. The Nelson street location illustrated is one of the elements of an alternate substation concept for Vancouver which is different from the usual way of doing business. Through consultation and refinement, the concept has been developed beyond the original seed document layout. This process sought possible ways to minimize the requirements for technical structures associated with the substation above grade and are subject to further discussions with stakeholders.

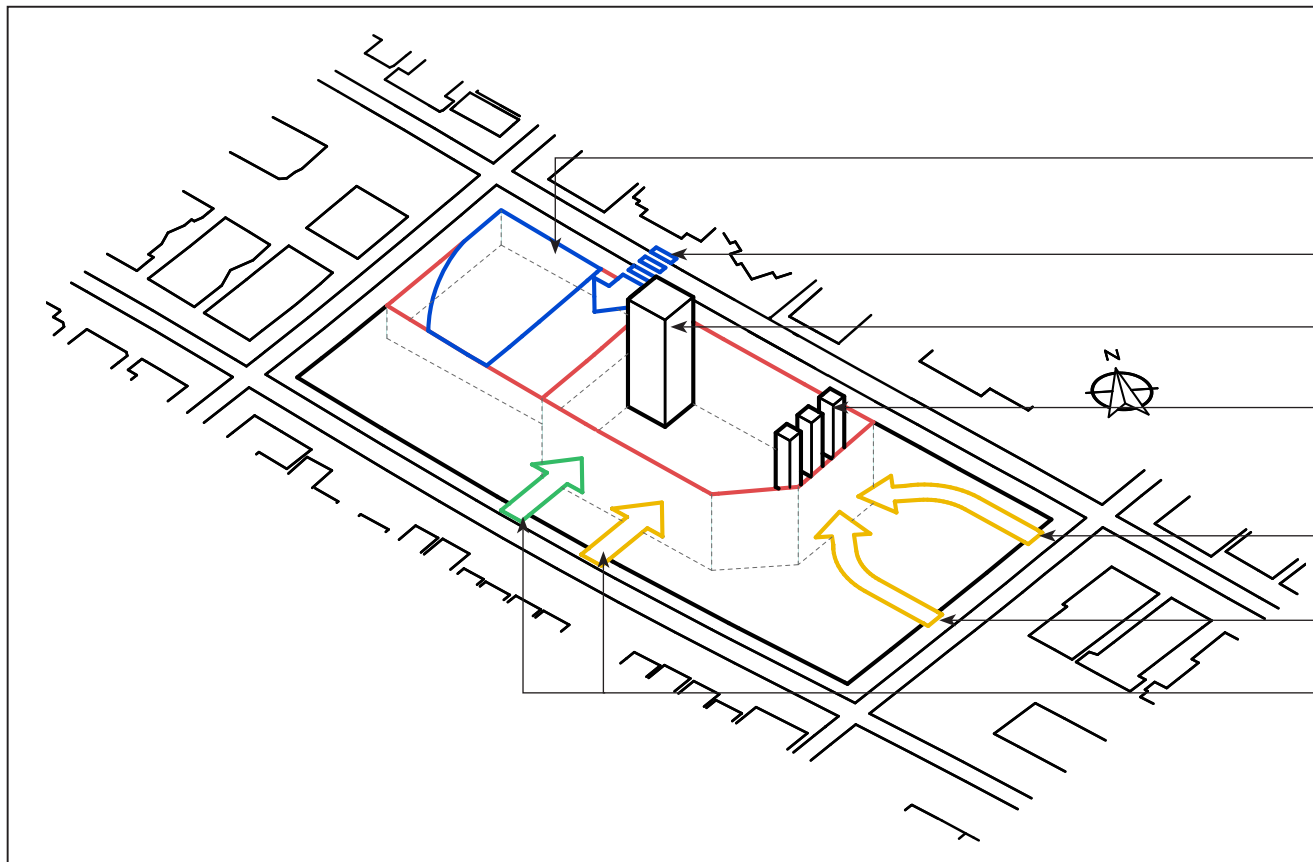
West End Location Massing

Diagrams



Volumes

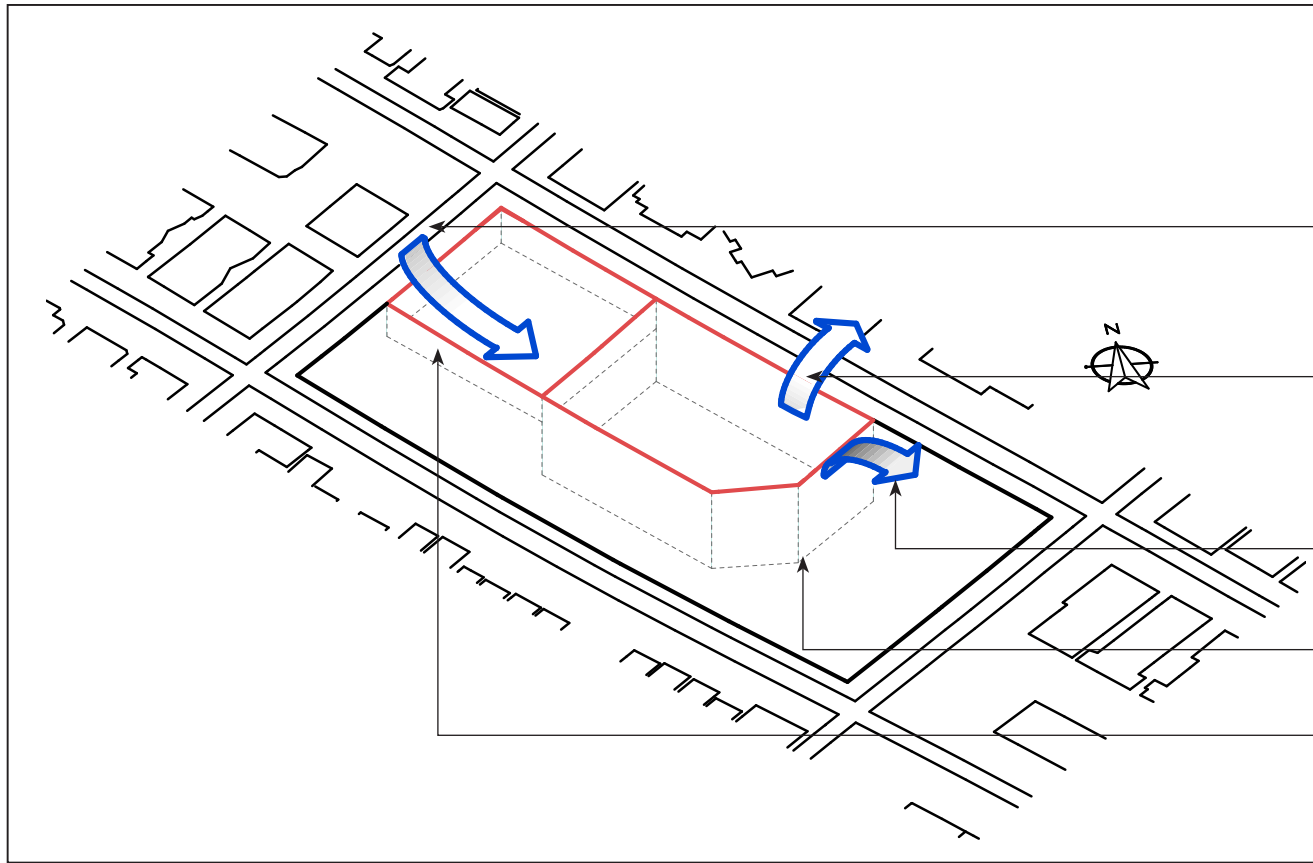
- Volume Available for the New Elementary School 510 students plus Childcare
- Existing School (156 Pupils)
- Underground Substation
- Parking Garage



Original SEED Document Layout

- Site for New Elementary School
- Entrance to underground school parking and substation
- Elevator entrance and Intake vents above grade
- Exhaust Vents above grade
- Underground Cables

Diagrams



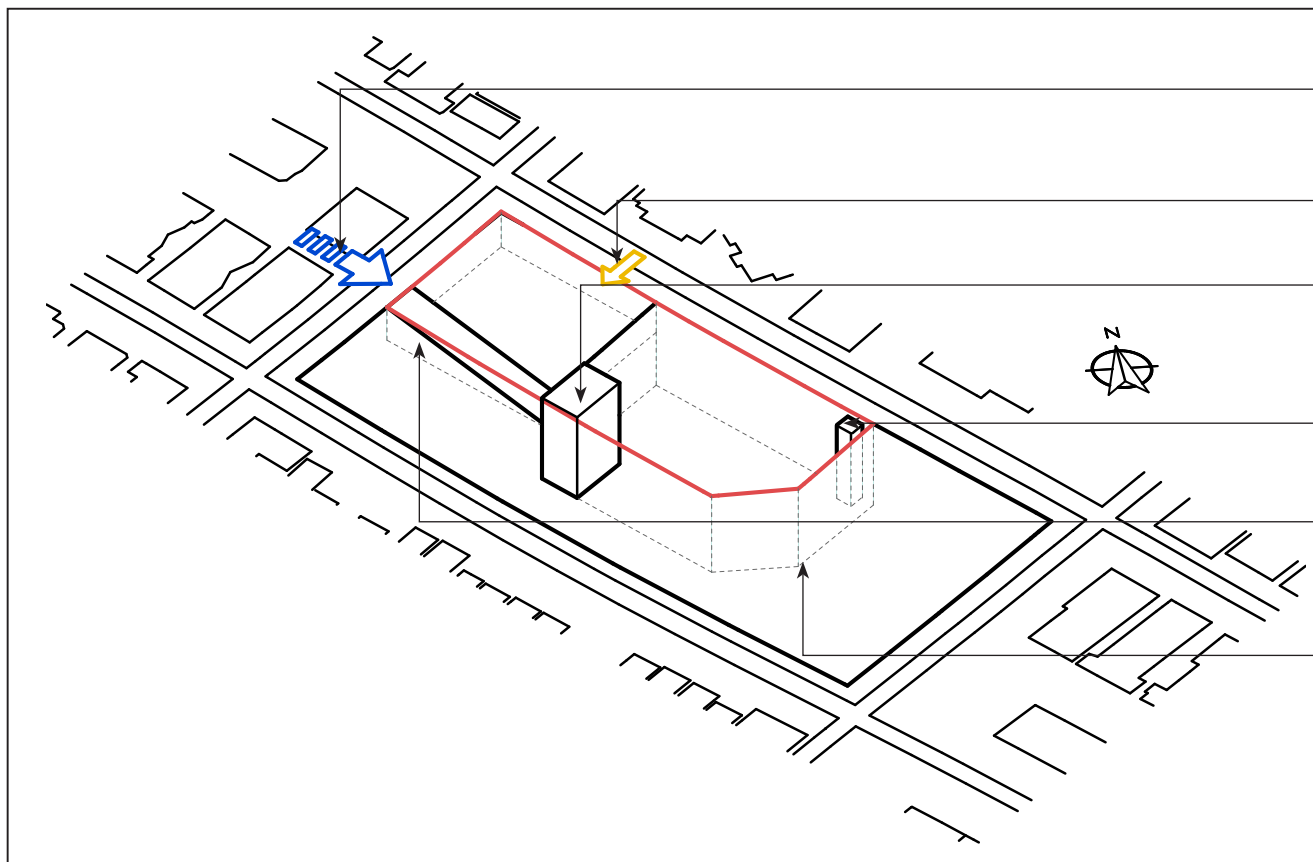
Direction of Intake ventilation underground

Proposed Exhaust ventilation relocated to the edges of the Site

Underground substation

Parking Structure

Air Ventilation for Underground Substation



Vehicle entrance to underground school parking and substation (subject to detailed discussions with City of Vancouver and Vancouver Park Board) Service elevator below grade.

Pedestrian entrance to school

Proposed service elevator located below grade accessed via ramp

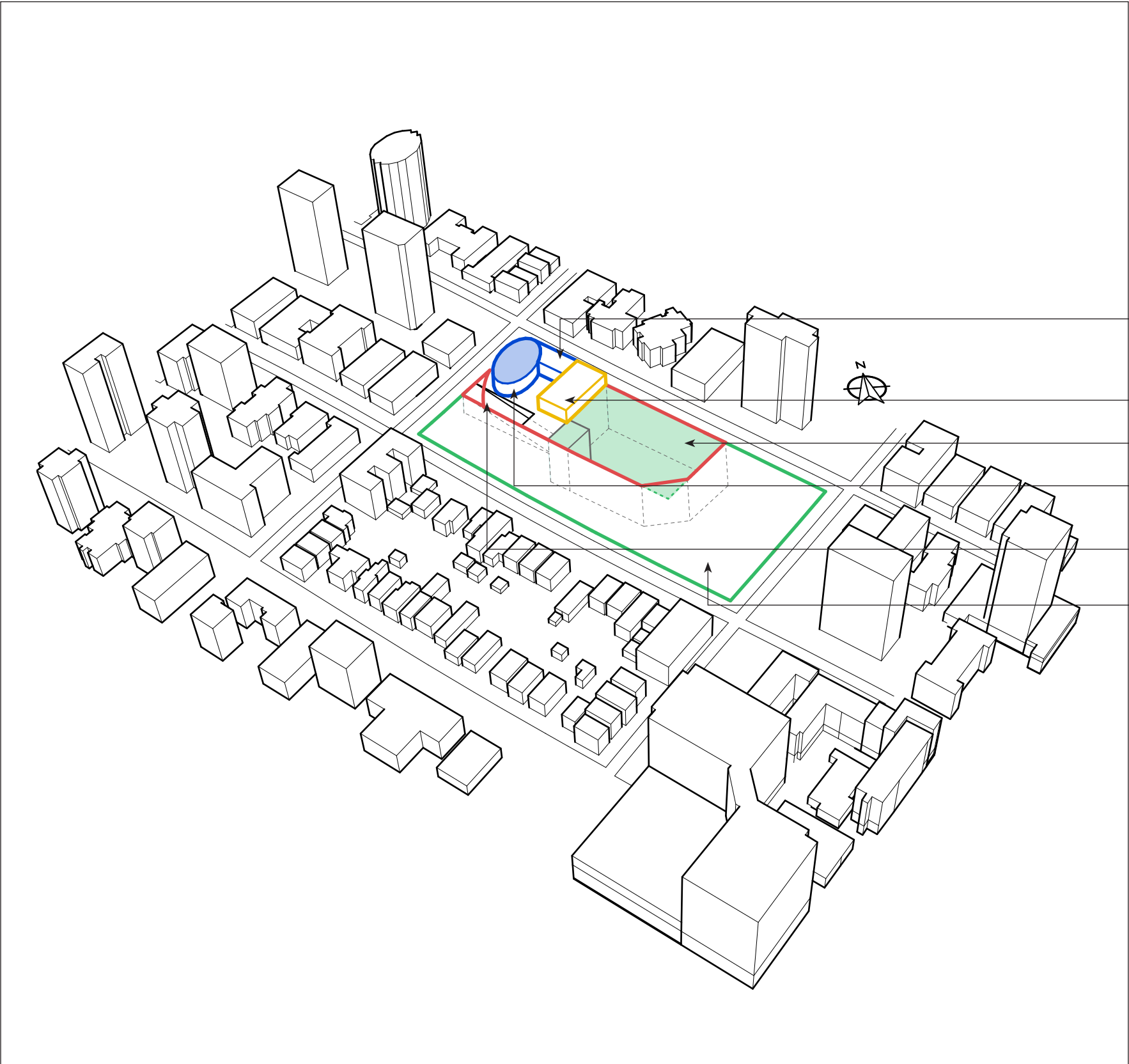
Egress Stair

Ramp to parking and service elevator

Underground substation

Access to underground: Substation & School Parking

New Site Elements & Principles

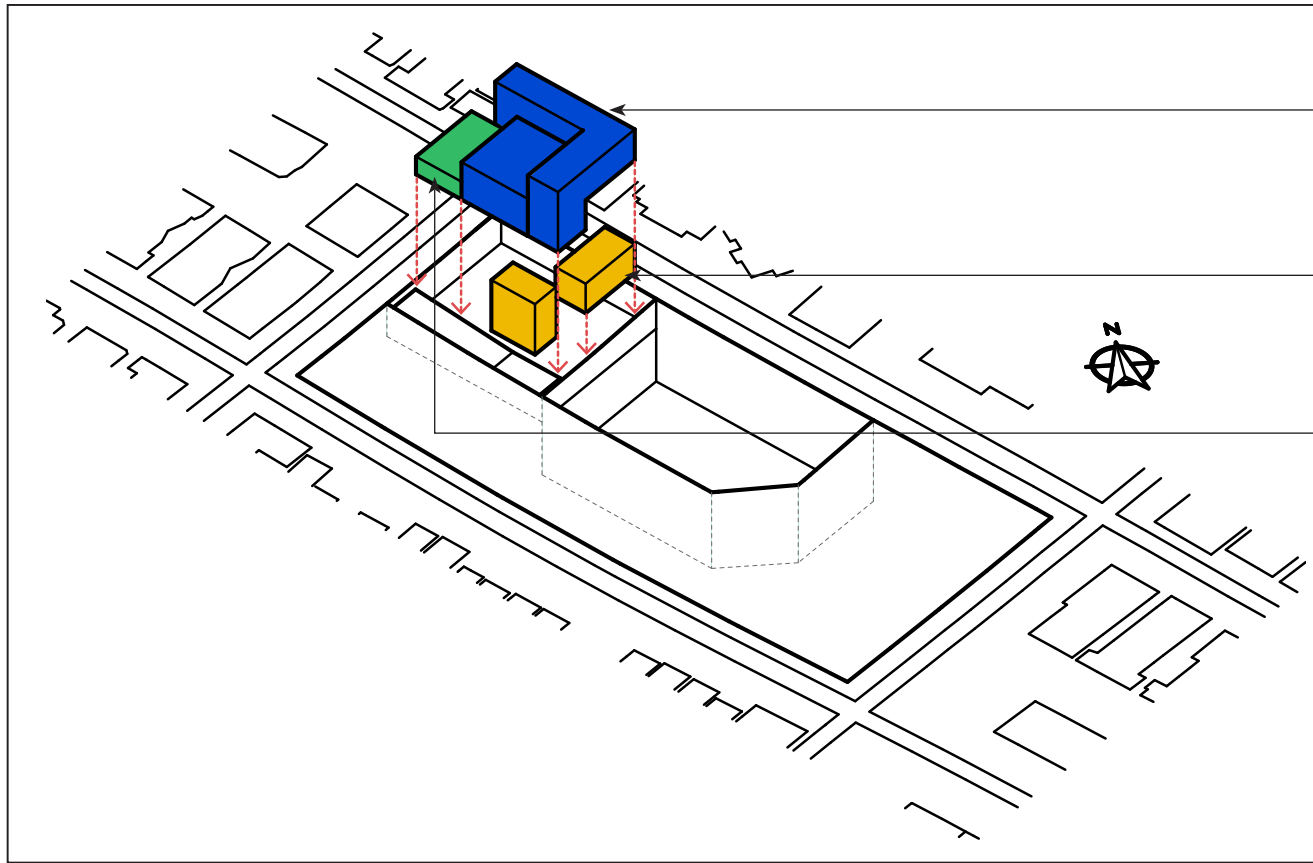


- Active School Programs along Nelson and Bute streets
- New Gym & Program interface with the Sports Field
- Artificial Sport Field
- Open Play areas on the sunny side, unobstructed by building
- Shaded access ramp to maximize structures above grade.
- Nelson Park

Summary:

- Several opportunities influence the concept, layouts, and forms of the elements of the project on site. The substation below grade provides an opportunity to re-imagine the out-door area of the school district property, in this case proposing an artificial playing surface to address the desire for this amenity in the community. Shared access to parking and loading below grade affords an opportunity to minimize the extent of substation technical structures above grade. The colonnade of trees on the site perimeter are maintained.
- The volumetric diagram of the school begins with an intent to provide adequate open interior space at grade to accommodate the comings and goings of 510 students on a daily basis and with respect to school events. In this context the active school community spaces such as the gym and multi-purpose areas are placed adjacent to the field. Actively occupied school program areas such as administration and classrooms are placed along the street edges at grade. Open play areas are distributed up through the building on its sunny sides. Connecting these and internal common areas and teaching spaces are open area stairs, elevators, and perimeter exits.

First Principles for Basic Planning

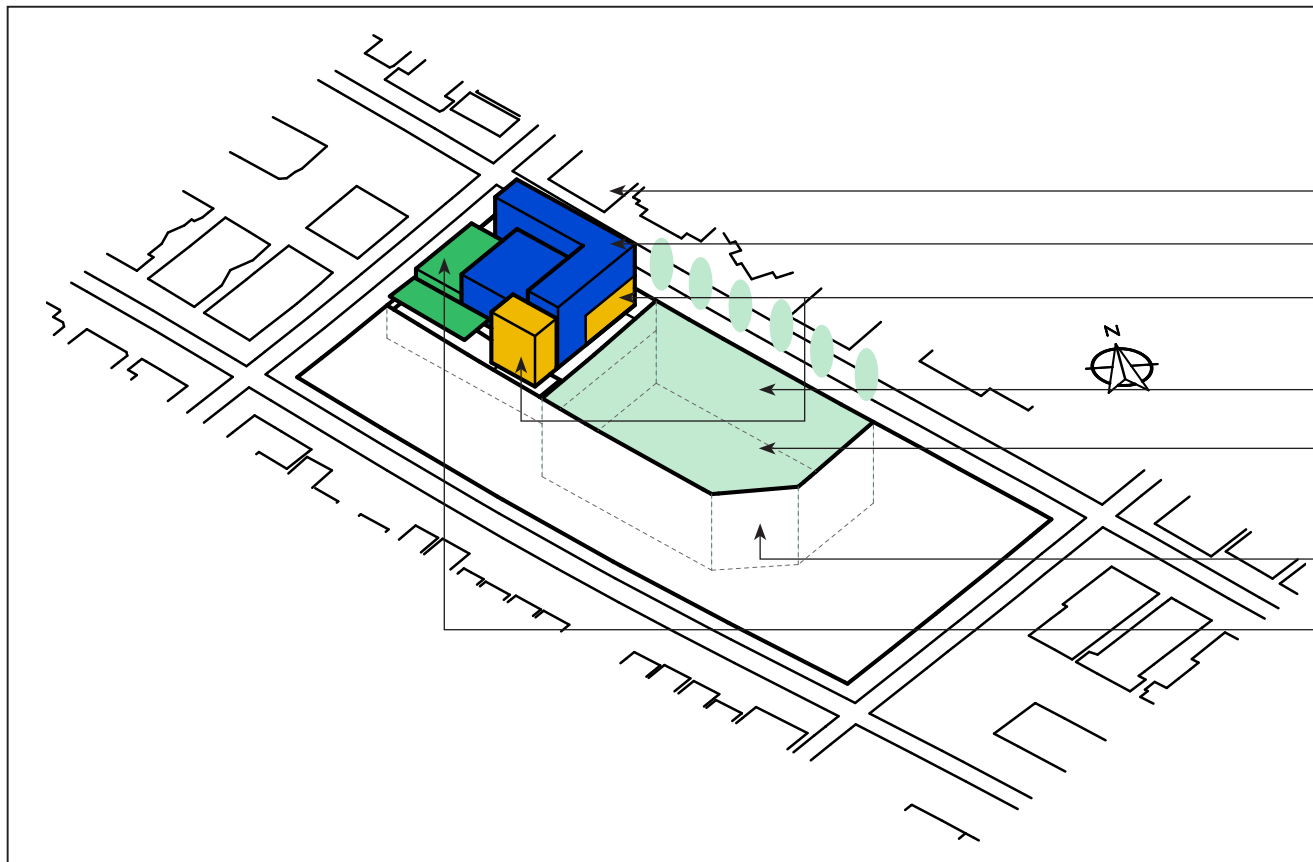


Classroom Program along active urban edges

Gym & Multi-purpose spaces neighbouring sports field

Outdoor Play-spaces on staggered levels on south side of building

School Program for 510 School - Exploded Axonometric



Classroom Program along active edges

Child care and associated outdoor space on the roof

Gym & Multi-purpose spaces neighboring sports field

Retention of street trees

Sports field

Underground substation

Outdoor Play-spaces on staggered levels on south side of building

School Program for 510 School Axonometric