NORTHERN AREA INTERNATIONAL HIGH SCHOOL
LANGLEY PARK-McCORMICK ELEMENTARY SCHOOL SITE

SITE SPECIFIC INFORMATION & RECOMMENDATIONS - CONCEPTS 01a-01c, & 02a-02c

PREPARED FOR:

OWNER

PRINCE GEORGE'S COUNTY PUBLIC SCHOOLS
5200 SILVER HILL ROAD
DISTRICT HEIGHTS, MD 20747

PREPARED BY:

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ARCHITECTURAL/ENGINEERING SERVICES FOR SITE FEASIBILITY TEST FIT LAYOUT
NORTHERN AREA INTERNATIONAL HIGH SCHOOL

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PART ONE – GENERAL INFORMATION

1. PROJECT HISTORY & GOALS

"PGCPS received a Carnegie Corporation Opportunity by Design grant to work with the International Network for Public Schools and Casa de Maryland to program and operate two innovative high schools to serve English Language Learners. Since 2004, the International Network has developed 14 similar schools across the country. Casa de Maryland will be a local catalyst to ensure that these schools have partners to open the school and provide opportunities for student and families to engage with the greater school community.

The District selected the Langley Park area for one of the schools because this community is 80% Hispanic with a high percentage of families in poverty. Eighty-one percent (81%) speak a language other than English at home and are isolated from the school. Many of the parents do not have a high school education and work low-skilled jobs. Currently, only 53% of the Langley Park students finish high school. The schools in the northern part of the County are crowded, and there is no room for a new school to co-locate. Therefore, a new site in this densely-developed part of the County will need to be identified." (From the PGCPS International High School Education Specifications)

INITIAL SITE STUDY & SELECTION

The Waldon Studio Architects team was contracted to evaluate and provide a recommendation on the site to see if it is suitable to meet the programmatic requirements and is able to achieve Net Zero Energy use, as well as, LEED Gold rating. This final report documents our analysis, incorporates information from the previous middle school site selection studies performed in the 2015-16 school year. It addresses comments from PGCPS / M-NCPPC Stakeholder Group, Facility Advisory Committee, Board of Education and community members for feedback that will be used to determine the final recommendation. After that process, it is anticipated that this report will be shared with the additional design team members selected to design the schools as a resource.

NEW INTERNATIONAL HIGH SCHOOL SUMMARY OF FACTS

- Proposed capacity for the school is **400 students.**
- Planning funding is requested in the FY18 CIP from the County to commence site acquisition and the architectural/engineering phase.
- Square footage for the high school is approximately **56,822 SF**
- To accomplish the dual benefits for initial cost and energy savings, the goal and objective is to design the school to achieve **LEED Gold certification**, with an option to achieve **net zero energy use after 12 months of occupancy.**

2. OVERVIEW OF HIGH PERFORMANCE BUILDING & ZERO ENERGY OVERVIEW

Net-zero energy building (NZEB), or net zero building, is a building with zero net energy consumption, meaning the total amount of energy used by the building on an annual basis is roughly equal to the amount of renewable energy created on the site, or in other definitions by renewable energy sources elsewhere. A key difference between LEED Certification and Net Zero Energy Building Certification is that LEED is based on the building design and is granted when the building construction is complete. Net Zero Energy Building Certification is a measure of energy efficiency and how well a building performs throughout its lifetime.

The following graphic describes the net zero energy concept:

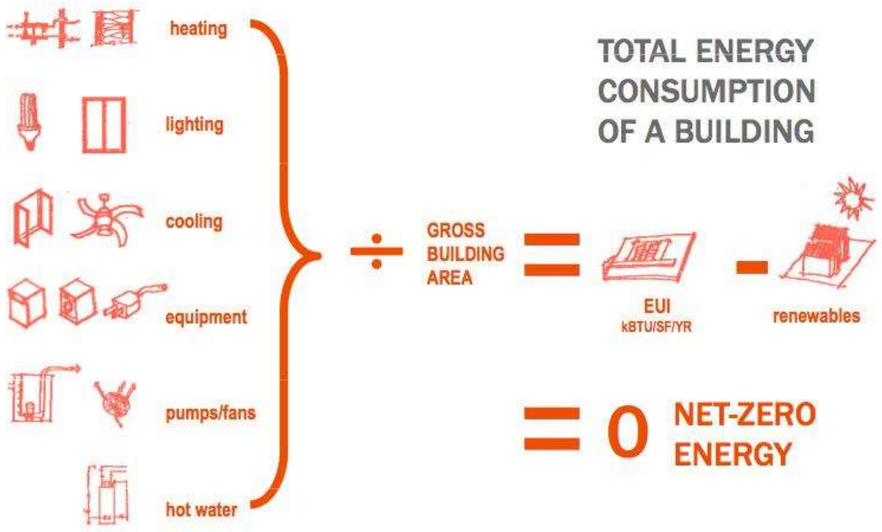


Image Credits: *VMDO Architects*

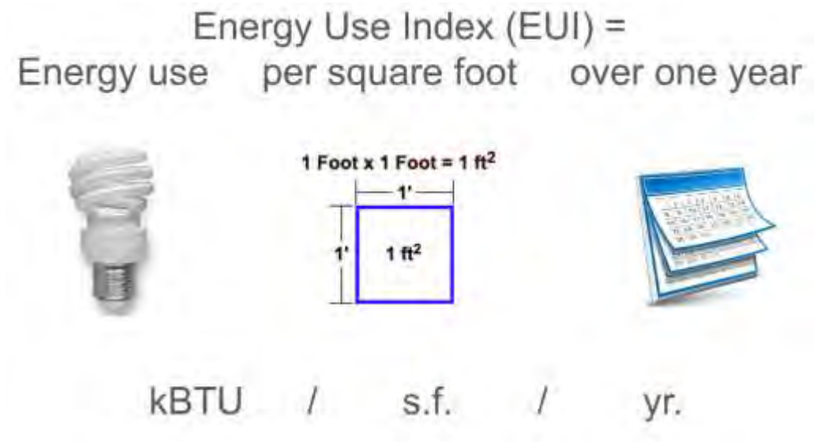
NET ZERO ENERGY BUILDING CERTIFICATION℠

The energy unit that is used when designing for a net zero energy facility is the Energy Use Index. When using EUI, energy use is expressed as a function of a building's total area or "footprint". EUI is typically expressed in energy used per square foot of building footprint per year. It is calculated by dividing the total gross energy consumed in a one-year period (expressed in kilowatt-hours) by the total gross square footage of the building. Generally, a low EUI indicated good energy performance.

Although energy use changes throughout the year, the goal of net-zero energy design is for energy consumption to equal energy generation. The graph on the right shows the ideal net zero energy curve over 12 months.

Other important things to look at when designing a Net Zero Energy school:

- How your power is purchased
- How food is cooked in the cafeteria
- How you procure and use information technology
- How testing is administered
- How you schedule your building systems (including IT and kitchen)
- How you clean your buildings

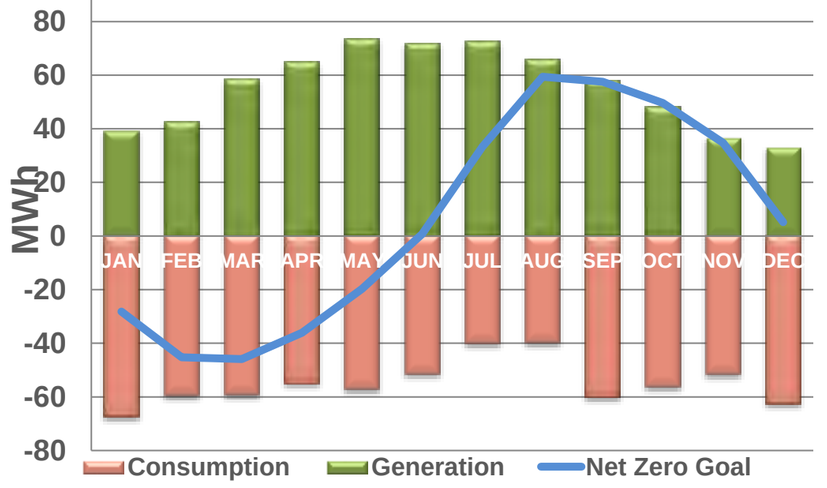


PGCPS - NET ZERO ENERGY BUILDING CERTIFICATION OPTION

Per the PGCPS RFP for this analysis, the objective is to analyze the feasibility and cost to design schools to achieve net zero energy within a reasonable amount of time (12-24 month) after occupancy. **The design objective is to create a healthy and comfortable environment that would encourage learning and create a resource and energy-efficient building that would reduce operating costs, leaving more funding available for classroom spending, and to make the design flexible and adaptable to accommodate any future programmatic changes.** The focus of this task will be on the selection of a site to achieve net zero energy use as an option. The project may include areas beyond the site necessary to incorporate net zero, based on the site selected and surrounding infrastructure. The international high school will be designed through a collaborative, integrated process that will include the architect, engineers, teachers, maintenance staff, and other stakeholders to inform key design decisions.

The following areas should be considered in the site selection and recommendation process to support the opportunity to achieve a net zero design, in particular, and sustainable design in the broadest sense:

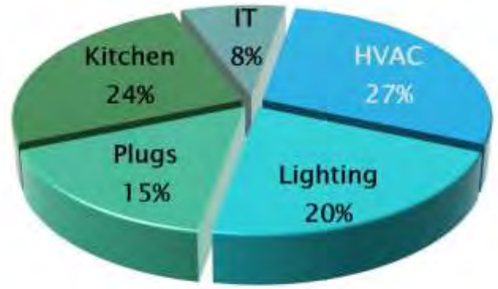
1. Sustainable Sites
2. Water Use and Efficiency
3. Energy and Atmosphere
4. Environmental Quality
5. Building Design Considerations
6. Education Initiatives
7. Materials and Resources



NET ZERO ENERGY EXECUTIVE SUMMARY FOR THE HIGH SCHOOL SITE

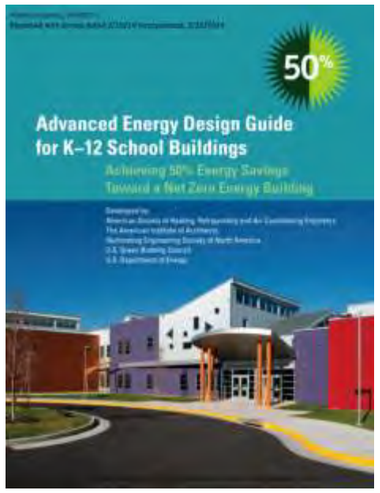
The zero energy site studies for the new international high school for Prince George's County Public Schools indicates the potential site options can yield a zero-energy high school with no significant cost increase when compared to other cost increases incurred due to site conditions. All six schemes yield a solar photovoltaic (PV) system comprised of a combination of roof mounted, ground mounted, and elevated arrays and a cost between approximately $600,000 - $900,000. Site conditions which change building design, orientation, solar PV array locations, etc. affect building energy use efficiency and result in a 29% increase or savings of the solar PV array first cost in creating a system sized for the net zero energy target. The best performing scheme, showed very little performance difference over the other schemes at less than 1.5%. These were not drastic energy use intensity differences. Site massing, efficiency of overall building design to reduce square footage and percentage of ground mounted array have a greater total impact on solar PV first costs. The spreadsheet of site comparisons is included at the end of this report.

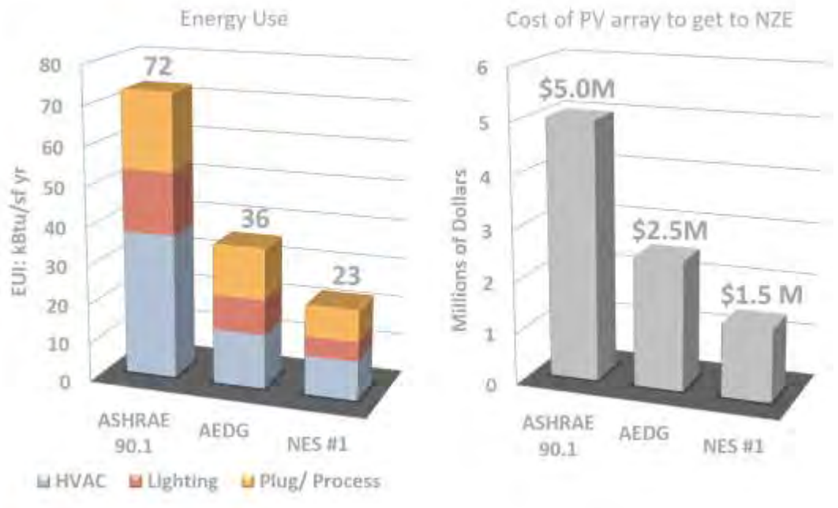
Efficient net zero energy design is most appropriately focused on drastic energy reduction as the most cost effective tool to reduce the first cost of the solar PV system. For comparison, a typical High School in Prince George's County may operate at an energy use per square foot number of 60, the target energy goal for a zero-energy school would be less than 25. The pie chart to the right shows how typical energy consumption would be distributed in a net zero school building with an EUI of 23 kBtu /sf. This would equate to a first cost savings for the PV System of $4,800,000. The energy study for this report assumes the ultra-low energy use design will attack energy use throughout the facility reduce energy consumption in the following main areas: HVAC, Lighting, Kitchen, Telecommunications and Plug Loads. These strategies, as a starter, are best industry practices as indicated in the Advanced Energy Design Guideline for K-12 Facilities. Also, collaboration amongst the design team and Prince George's County Public schools, teachers, students and district personnel will be crucial to shift operating procedures and use of energy consuming equipment to reach this goal. Similar success and energy use performance has been achieved locally and nationally on similar net zero energy projects. Design collaboration on building orientation, passive solar gains, massing, sizing, solar shading of PV array locations, and net zero energy practices were included in the design of these site studies and a drastic energy reduction performance target goal of an Energy Use Intensity (EUI) of less than 25 has been set.



Total EUI: 23 kBtu/sf yr

A Net Metering System would be incorporated into the design of each facility and the PV Array would be designed to produce more energy in a year than the building consumed. The push/pull of energy to the connected utility grid would balance so that the facility would generate more power in a year than it consumed. A graph of the yearly energy use of a typical net zero energy school's generation, production and resulting zero energy goal is indicated to the right.





3. PROJECT ASSUMPTIONS

The following topics and categories were studied by the design team in the analysis of the Langley Park site. These all weighed heavily on the final ranking scores of each scheme and were key factors in the way each scheme was designed.

a. BUILDING ORIENTATION

The ideal building orientation for sustainable and net zero design is to locate building along the east – west axis of the site. This is due to the annual sun path throughout the year, along the southern face of the building. Aligning the building along the east - west access of the site creates opportunity for even sun exposure on both the north and south faces, making these sides ideal for classrooms and other regularly occupied student spaces. Daylighting can be maximized and horizontal sun shades can be used on the exterior of the building to help control the sun in the summer. This orientation also helps provide a more even distribution of heat gain and loss, making systems function more efficiently. East and West facing windows can experience the most amount of glare from the sun, which is not ideal for classrooms. Kitchens, delivery zones, offices, and gym spaces can be placed along the east and west sides of building, where glass can be minimized and daylighting is less critical.

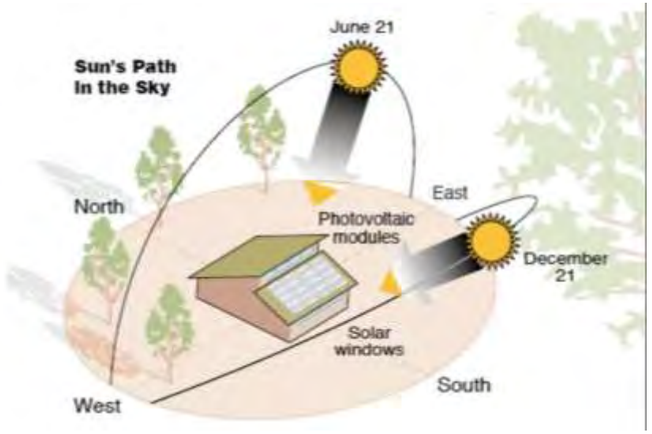


Image Credits: *Extension.org; Article "Designing Energy Efficient Homes for a Warm Climate"*

b. GEOTHERMAL

A geothermal heat pump or ground source heat pump (GSHP) is a central heating and/or cooling system that transfers heat to or from the ground. It uses the earth as a heat source (in the winter) or a heat sink (in the summer). This design takes advantage of the moderate temperatures in the ground to boost efficiency and reduce the operational costs of heating and cooling systems, and may be combined with solar heating to form a geosolar system with even greater efficiency.

Team assumptions for this study:

In order to serve the 56,000 sf International High School, we have calculated that approximately 50 geothermal wells will be needed on site, spaced approximately 15'-0" – 20'-0" on center. It is estimated that these will occupy about half the size of a soccer field. The ideal location for these wells would be near the building, either under the parking lot or playing fields. The wells would be approximately 500 feet deep. Although soil data is unavailable at this time, the team is assuming that most schemes in this study will be able to accommodate the capacity requirements for the wells. Putting the wells under the building or a parking deck is an option, however if any of the wells ever need to be replaced or repaired demolition could be costly.

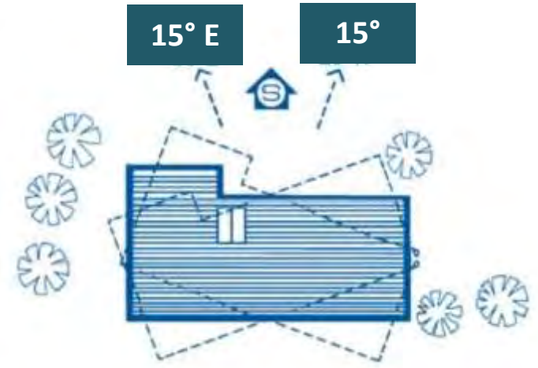


Image Credits: *Examiner.com; Article "The Basics of Solar Site Orientation"*

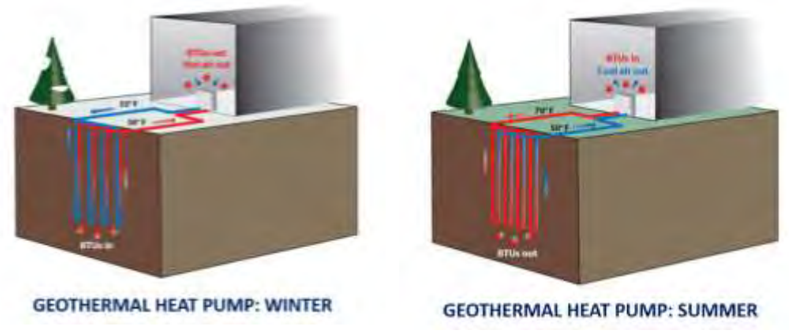


Image Credits: *NYSERDA.com; Article "Geothermal Heat Pumps"*
http://www.nyserda.ny.gov/Cleantech-and-Innovation/Power-Generation/Geothermal-Heat-Pumps

c. PHOTOVOLTAICS

Photovoltaics have been identified as the most efficient way to generate energy for the new international high school. Efficient net zero energy design is most appropriately focused on drastic energy reduction as the most cost effective tool to reduce the first cost of the solar PV system. All schemes in this study yield a solar photovoltaic (PV) system comprised of a combination of roof mounted and elevated arrays and a cost between approximately $600,000 - $900,000. The design team has estimated that the photovoltaics will most likely occupy approximately 60% - 70% of the building square footage for two-story schemes. Site conditions which change building design, orientation, solar PV array locations, etc. affect building energy use efficiency and result in a 29% increase or savings of the solar PV array first cost in creating a system sized for the net zero energy target.

The roof is the ideal location for solar panels, and it is important to design building stacking so that the building does not shade itself, however panels can be mounted on the ground or over parking structures/canopies for an increased cost. If possible, to maximize roof space, all other elements should be kept off the roof, including green space, mechanical penthouses, etc. Panels also must be kept approximately 10'-0" from the edge, reducing the allowable panel footprint. PV Parking canopies are often two times the cost of roof or ground mounted PV panels, but due to site size and constraints ground mounted arrays are difficult to achieve.

There is a possibility to use existing Langley Park-McCormick Elementary School's roof for additional space for Photovoltaics panels. However, due to the existing equipment and non-East-West orientation, this would need further research and study. There is a chance that the existing structure will not accommodate a self-ballasted PV racking system, which is typically 5 – 6 pounds per square foot. Also, the electric service of the existing building might not be able to accommodate a large PV array without some rework. It also hinders future changes and developments of the elementary school, and its possibility to become sustainable.

Bing Aerial Image of Existing Langley Park-McCormick Elementary School Roof

d. CLIMATE DATA

Climate data influences many elements of site development including area needed for storm water management, sports field orientation, building shading requirements and, selection of mechanical equipment. Prince Georges County Maryland is in the temperate – humid region of the country, where the temperature typically varies from 27degrees F to 91 degrees F annually. There are days in the summer when the temperature and humidity will have a combined effect of over 100 degrees F. For most of the school year, March – May and September through November, an outdoor learning area can be utilized when the temperatures are typically higher than 52 degrees F and lower than 81 degrees F.

The area has mostly clear sky for approximately seven months out of the year, which is adequate for gathering solar energy through the use of photovoltaic panels. Passive exterior sun shades on the south side of the buildings to reduce heat gain during the summer reducing cooling requirements. Exterior shading devices should be utilized to reduce glare on the sides of buildings when they are more on a East-West orientation.

The proximate wind direction is from the NW and N with the highest average wind speed of 13 mph occurring in February. Fortunately the area is not subject to high winds. In fact generally the wind speeds feels like a moderate breeze. The annual averages for the wind will have little impact on the ability to open doors. Locating outdoor activities and que lines on the south to southeast so that they are protected by the building during the winter would be advantageous but is not required. During the spring, summer and fall the wind direction is more distributed with a little more coming from the N, S and NW.

Rain and thunderstorms deliver the majority of the precipitation in the area historically falling between January through the end of October. There is a higher percentage of thunderstorms in June and July. Snow in the winter making up the balance of the annual 43.7 inches of presentation received. February general is the driest month with 2.91 inches of precipitation and July being the wettest with 4.85 inches. Six months of the year are in the 3.5 inches of precipitation range. The historic weather data is based on information from the College Park Airport in College Park, Maryland and from Maryland State Climatologist Office.

Image Credits: *CMTA Engineers*

e. STORM WATER MANAGEMENT (SWM)

This section considers the general requirements for and feasibility of providing SWM, Environmental Site Design (ESD) to the Maximum Extent Practicable (MEP), as well as, downstream analysis, as required by Maryland Department of Environment and Prince George's County, based on site layouts, availability of land, land use changes, soils, discharge points and outlets, topography, and site complexity (number of drainage areas). As useable site area is a premium, it is suggested that the use of micro-bioretention will be the most practical and cost effective way to meet ESD requirements. Where ESD to the MEP does not meet required water quality requirements, structural practices (e.g. underground sand filters) may be required. Department of Permitting, Inspections and Enforcement may also impose 100-year flood control requirements on the site if downstream problems exist. Scores for stormwater management are not as developed as some other assumptions, as they require detailed site planning to fully assess. Stormwater facilities will need to be carefully coordinated with setbacks for utilities and geothermal fields. No matter what scheme is favorable to the Board of Education, the site will struggle with Storm Water Management.

f. ATHLETIC FIELDS & SITE AMENITIES

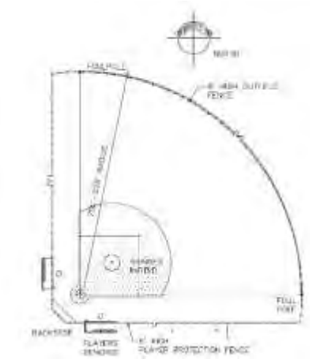
Per the RFP and PGCPS Draft Educational Specifications, the following athletic fields are to be accommodated on the International High School Site. Most, however not all, of the schemes are large enough to accommodate at least one large field (no football field was requested). This was taken into consideration when ranking the sites.

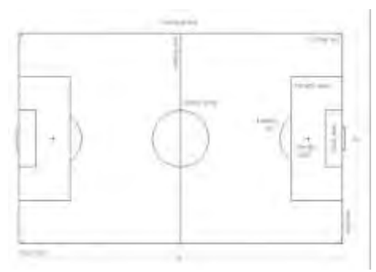
Required:

- (1) soccer field / lacrosse field
- tennis courts
- (1) outdoor running track

Requested (if there is space on the site):

- (1) baseball field – northeast orientation preferred
  (A large baseball field could not be accommodated, so a smaller softball field was provided instead)





COMMUNITY USE
It is assumed that the community will use the building for athletic events, recreation, meetings and educational functions. Security during these times is important. The design team has explored ways to zone each building for flexible after-hours use, and note both active and passive security measures.

OUTDOOR EDUCATIONAL SPACE
Consider the entire school grounds as a teaching opportunity, with a central space as the "outdoor learning area or classroom". An ideal location for garden plots would be to the north of the school (due to existing trails and creek). The art classroom should preferably be on the ground floor with an optimal north light orientation. An outside patio and seating area will offer additional work, display, and performance opportunities.

g. WATER / SEWER / PROJECT UTILITIES

This section considers availability of existing water and sanitary sewer and potential for extensions and/or relocations based on WSSC GIS information and recent field visits. All schemes have high ratings in this study, because they are expected to have readily available sanitary sewer where small or no mainline extensions are required and where existing utilities would not need to be relocated. Assessment on systems capacity is not included. Dry utilities around the site appear to be readily available; however, serviceability will need to be considered by an Electrical Engineer at design and upgrades required to support the Net Zero Building may be required. For this reason, the availability of the dry utilities is not considered in the analysis of providing a numerical rating.

h. SITE WORK

This section considers the general complexity and expense of grading and earthwork, retaining walls, developable area and site layout options. The site layouts all have different constraints making them difficult to develop, many based on site topography and/or the amount of usable space. Site work for almost all the schemes is expected to consume a large portion of the overall budget. General soils information available for the County Soil Survey is not considered in site work variables as geotechnical testing will be required to refine consideration of project costs. ADA Accessibility is required for all programmatic components proposed; therefore, the cost and complexity of developing the site to be ADA accessible is considered. Globally, many of the schemes will require additional improvements such as ramps and retaining walls to accommodate ADA accessible components.

i. ENVIRONMENTAL

This section considers the difficulty of developing the site from a permitting feasibility standpoint. The rating considers land use conditions, topography, wetlands, stream and stream buffers, floodplains and any other data available. Possible permits required include County floodplain, FEMA floodplain, USACE/MDE joint permits for wetlands and waterways, endangered species and forest conservation. Requirements for the permits will depend on how the site is developed. The assessments for the site assume that if a feature is present (e.g. floodplain), a permit for development of the site relative to the feature is required. It is unknown if the site contains contaminated soils or other environmental problems which may require additional remediation. A phase 1 environmental and archeological assessment should be conducted.

j. R.O.W. / TRAFFIC ACCESS

This section considers the location/availability of the site access and potential costs for public right-of-way (ROW) infrastructure development requirements (Per Prince George's County Master Plans) and additional studies. The site is located in an area where some level of ROW expansion and improvements are required per planning documentation and may include, streetscape, lighting, roadway expansion or trails. Development of the site could generate requirements for improving roads to the school and/or additional traffic signaling. Development of the site may generate peak traffic counts requiring more extensive traffic analysis and studies. No traffic studies were conducted as part of this report.

Image Credits: *VMDO Architects*

Existing Site Image Credits: *Waldon Studio Architects*

k. PARKING & TRAFFIC CIRCULATION

This section considers the feasibility of providing bus parking in accordance with Prince George's County Public Schools requirements for bus loading, as well as the additional parking spaces required for a typical school facility, fire access, and separated bus and parent drop-off areas. The campus layout is expected to be more difficult to develop in conjunction with programmatic uses. Other assumptions: a few more buses and 9'-0" x 19'-0" parking spaces, 24'-0" drive aisles.

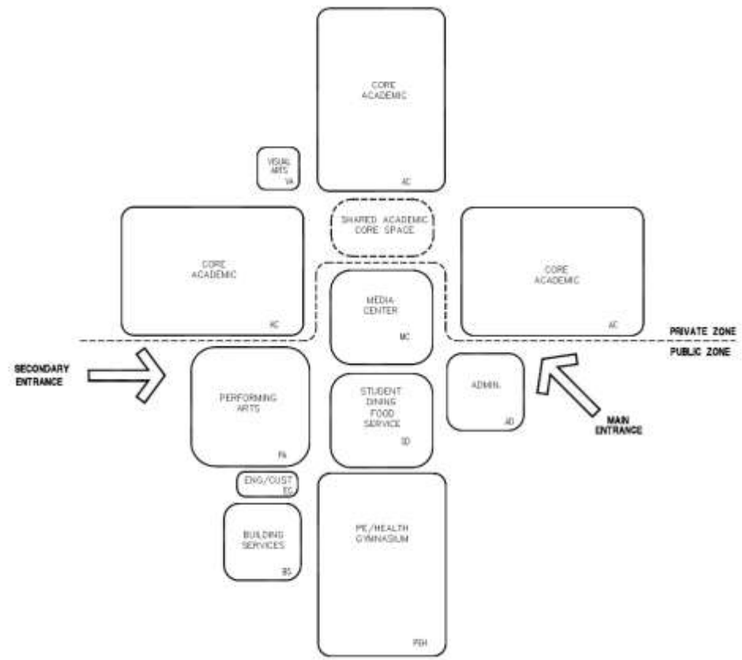
Per the PGCPS Draft Educational Specifications, site circulation will be organized for safety and efficiency. This cannot be accomplished in most schemes through separation of vehicular and pedestrian traffic. School bus loading and unloading areas are desired to be separated from parent drop-off areas and from staff and student parking, but the constraints of the site limit ability to separate parking areas and bus loops. Non-bus riders who walk and/or bike to school should be isolated from all types of vehicular traffic and provided adequate pathways to and from the school building. Adequate space is needed to load and unload students who have physical disabilities. Parking garages are shown in four of the schemes due to the fact that the site is so limited in parking already. It is possible to develop the site in a safe controlled way, but parking and circulation will be the critical issue for all schemes. Parking garage square footage does add to the energy consumption of the buildings. One EUI per square foot was added to each energy load for the schemes that added a parking garage.

l. BUILDING PROGRAM

LEARNING COMMUNITY CONCEPT

Per the PGCPS Draft Educational Specifications, small communities facilitate a variety of instructional strategies and provide a learning environment which is characterized by flexibility, a sense of community for the students and teachers, and a safe, well-supervised environment. Teachers will have the option and flexibility within a team to create and organize learning environments that work for students and their learning styles. Academic teams should be located in the quiet areas of the building. Corridors should be short and multi-use, offering opportunities for informal learning and student interaction. Students should be able to interact with a common core of adults for most of their school day. Electives, the media commons, physical education and dining should be centrally located. Noisier areas should be grouped near the parking and public areas and allow for after-hours access.

Image Credits: *Waldon Studio Architects*



The following charts indicate the program requirements for the new international high school, per the PGCPS Draft Educational Specifications.

Space Requirements Summary

Base Required Space	Square Footage
Core Academic/Science	22,600
Media Commons	2,800
PE/Indoor	5,280
Administration	4,280
Health Suite	1,210
Student Dining & Food Service	5,200
Engineering & Custodial Services	800
Building Support Areas [corridors, bathrooms, storage, stairwells, elevators]	14,652
TOTAL	**56,822**
Outdoor Educational and Support Spaces	**Square Footage**
Tennis Courts -3	
Multi-purpose practice field for football, soccer and lacrosse with track	
Baseball field	
Storage (Exterior Grounds Equipment) [secure – brick w/ roll-up door]	200 SF
Staff parking per zoning	
Bus parking/circulation (may be used as play space during the school day)	

Capacity Calculation

	Carn. Units Required	Classrooms Proposed	Capacity Proposed
English	4	4	88
Math	4	4	88
Social Studies/electives	4	4	88
Science/electives	4	4	88
Technology	1	1	22
PE/Health/electives	2	2	44
Arts/electives	2	2	44
TOTAL	**21**	**20**	**462**
		@85%	393

Image Credits: *Waldon Studio Architects*

Image Credits: *VMDO Architects*

Image Credits: *CMTA Engineers*

m. SITE PROS / CONS & RANKINGS CRITERIA

The design team used the following criteria categories to determine the rankings of each scheme. Each scheme was ranked with a score of 1 – 5, 1 being the highest / best and 5 being the lowest. The final ranking total score for each scheme is an average score of all 14 criteria categories.

1 - Highest Quality / Best Conditions
2 - Good Quality / Good Conditions
3 - Adequate Quality and Conditions
4 - Poor Quality and Conditions
5 - Lowest Quality and Conditions

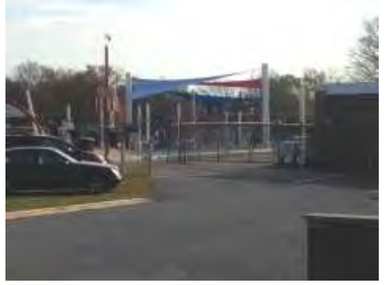
STORM WATER MANAGEMENT	• Environmental site design • Downstream analysis • Topography	• This section considers the general requirements for and feasibility of providing SWM (Environmental Site Design (ESD) to the Maximum Extent Practicable (MEP) as well as downstream analysis, as required by MDE and Prince George's County) based on site layout, availability of land, land use changes, soils, discharge points and outlets, topography and site complexity (number of drainage areas). As useable site area is a premium on the site considered, it is suggested that the use of micro-bioretention will be the most practical and cost effective way to meet ESD requirements.
WATER / SEWER / UTILITIES	• Water extensions and relocations • Sanitary sewer extensions and relocations	• This section considers availability of existing water and sanitary sewer and potential for extensions and/or relocations based on WSSC GIS information and recent field visits. The site in this study is expected to have readily available sanitary sewer where small or no mainline extensions are required and where existing utilities would not need to be relocated.
SITE WORK	• Earthwork • Retaining walls • Developable area	• This section considers the general complexity and expense of grading and earthwork, retaining walls, developable area and site layout options. The site schemes have different constraints making them difficult to develop, many based on site topography and/or the amount of usable space. Site work for almost all the schemes is expected to consume a large portion of the overall budget.
ENVIRONMENTAL	• Permit feasibility • Land use conditions • Topography • Wetlands, streams, floodplains	• This section considers the difficulty of developing the site from a permitting feasibility standpoint. The rating considers land use conditions, topography, wetlands, stream and stream buffers, floodplains and any other data available. Permitting requirements for the sites vary.
ROW / TRAFFIC / ACCESS	• Streetscape • Lighting • Roadway expansion	• This section considers the location/availability of the site access and potential costs for public right-of-way (ROW) infrastructure development requirements (Per Prince George's County Master Plans) and additional studies. The site is located in an area where some level of ROW expansion and improvements are required per planning documentation and may include, streetscape, lighting, roadway expansion or trails.
PARKING & CIRCULATION	• Separate bus drop-off and car parking	• This section considers the feasibility of providing bus parking in accordance with Prince George's County Public Schools requirements for bus loading, as well as the additional parking spaces required for a typical international high school facility, fire access, and separated bus and parent drop-off areas.
ADA ACCESS	• Ease of movement around and to/from the site	• The necessity of elevators, and connect to existing sidewalks surrounding the site, as well as distance to the existing and new parking lots, were considered for this category.
PUBLIC TRANSPORTATION / WALKABILITY	• Existing sidewalks and lighting • Public buses • Number of students that walk to school	• Consideration was given to existing bus routes, proposed purple line metro stations, and general walkability of the site layout.
CAMPUS & GROWTH POTENTIAL	• Combine with adjacent elementary school • Possibility of expanding in future	• While future growth of this site is practically impossible after adding an additional school, the site will be fully maximized and used to its full potential.
ATHLETIC FIELDS / SITE AMENITIES	• Baseball, soccer, tennis • Community use • Outdoor education space	• Fields - Soccer Field/Lacrosse Field, Baseball Field, and or Tennis Courts (with running track option) • Community Use - It is assumed that the community will use the building for athletic events, recreation, meetings and educational functions. Security during these times is important. The design team has explored ways to zone each building for flexible after-hours use, and note both active and passive security measures. • Outdoor Educational Space - Consider the entire school grounds as a teaching opportunity, with a central space as the "outdoor learning area or classroom". An ideal location for garden plots would be to the north of the school.
STAGING / PHASING	• Minimized disturbance during construction • Existing elementary schools still operating	• Due to Community Center and Elementary School staging will be difficult for all proposed schemes, but some affect the site more than others.
BUILDING ORIENTATION / LAYOUT	• East-West orientation; sun exposure • Learning community concept	• The ideal building orientation for sustainable and net zero design is to locate building along the east – west axis of the site. This is due to the annual sun path throughout the year, along the southern face of the building. Aligning the building along the east west access of the site creates opportunity for even sun exposure on both the north and south faces, making these sides ideal for classrooms and other regularly occupied student spaces. • Learning Community Concept - Small communities facilitate a variety of instructional strategies and provide a learning environment which is characterized by flexibility, a sense of community for the students and teachers, and a safe, well-supervised environment. Teachers will have the option and flexibility within a team to create and organize learning environments that work for students and their learning styles.
ENERGY CONSUMPTION	• Climate data • Geothermal wells • Photovoltaic panels	• Climate Data - Climate data influences many elements of site development including area needed for storm water management, sports field orientation, building shading requirements and, selection of mechanical equipment. • Geothermal Wells - In order to serve the 56,000 sf High School, we have calculated that approximately 60 geothermal wells will be needed on site, spaced approximately 15'-0" – 20'-0" on center. It is estimated that these will occupy about half the size of a soccer field. • Photovoltaic Panels - Photovoltaics have been identified as the most efficient way to generate energy for the new international school. Efficient net zero energy design is most appropriately focused on drastic energy reduction as the most cost effective tool to reduce the first cost of the solar PV system.
COST	• Estimated based on square footage and general assumptions	

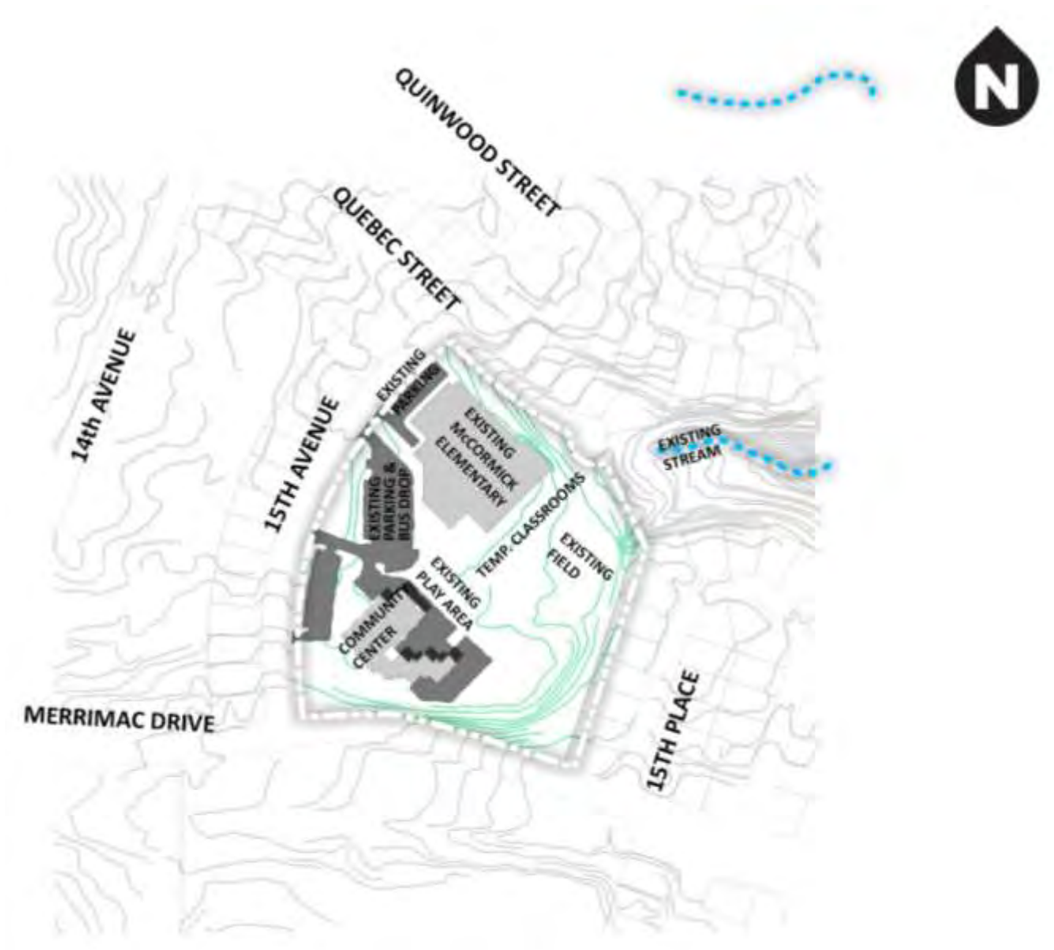
LANGLEY PARK SITE
(SAME SITE AS LANGLEY PARK COMMUNITY CENTER &
LANGLEY PARK – MCCORMICK ELEMENTARY SCHOOL)
1500 MERRIMAC DRIVE
HYATTSVILLE, MARYLAND, 20783

EXISTING SITE FEATURES & CONTOUR MAP





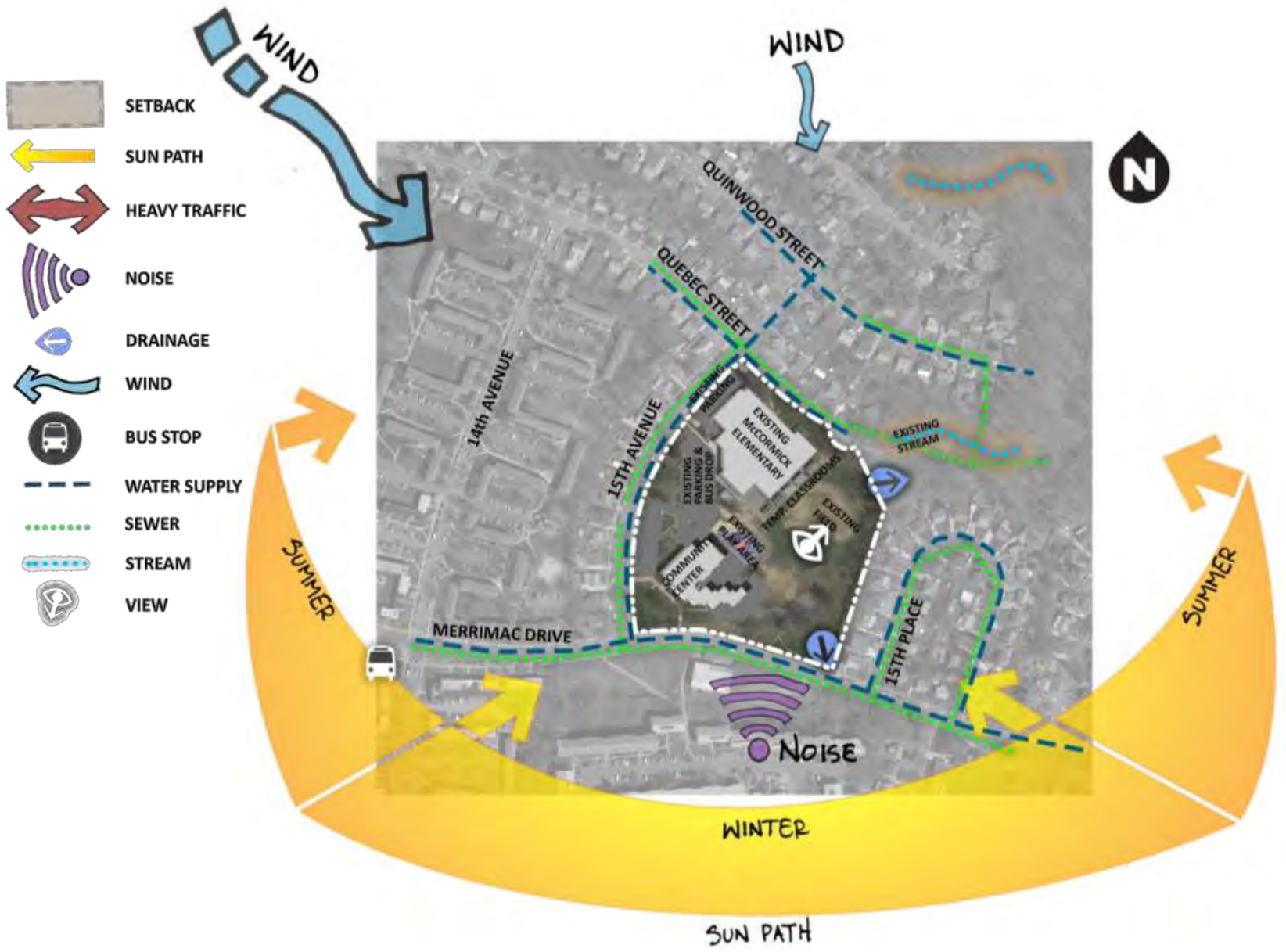



LANGLEY PARK SITE

EXISTING SITE INFORMATION & SITE FORCES

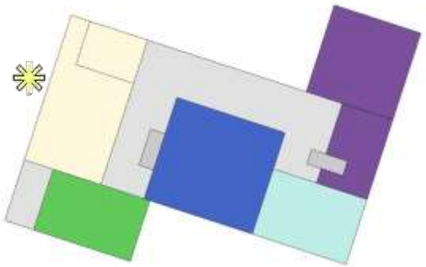
This property is located at the intersection of Merrimac Drive and 15th Ave and Quebec Street and is almost completely developed. The site is home to Langley Park-McCormick Elementary School and an M-NCPPC Senior Center/Office. In our first options, both facilities would need to remain operational during construction of the new facility. In our second options 2a and 2b, the Community Center will need to be demolished before the High School can be built. For option 2c, the existing Community Center could remain open during construction, but would need to be demolished for the field to be built. There are no known easements encumbering the site. Additional ROW dedication might be required along Merrimac Drive. There are no known environmental features to be considered during site layout. This site is relatively flat. Soils on the site consist of Christian-Downer complex and Beltsville urban land complex which are highly erodible and potentially hydric. A full geotechnical analysis of on-site soils is recommended prior to beginning design.

The site may require temporary relocation of existing facilities during construction. However, the first options seek to keep the existing elementary school and community center in place for the International School new construction. The options 2a and 2b look to include a new community center, and would disrupt the site more. Option 2c has the option of the community center being demolished and re-built at a later date. ADA requirements should be able to be incorporated into the site without too many issues or additional expense. Retaining walls will be needed in the southeast corner of the site for just about every option proposed. As the site is already developed - pending the time the design occurs - the site may qualify for redevelopment status as it relates to Storm Water Management (SWM) - resulting in reduced stormwater management requirements. Given the small size of the site, structural practices may need to be considered. Sanitary sewer and water already serve the site and are readily available. A full analysis of existing dry utilities should be assessed by a Mechanical and Electrical Engineer at the time that design begins. Access to the site already exists. Given the increased peak traffic that will be generated, a traffic study would likely be required and improvements to existing accesses and signaling may need to be considered. Several trails are planned for ROW surrounding the property.

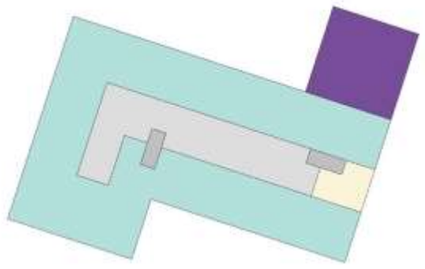


LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01a

RECOMMENDED NEW FLOOR PLANS



FIRST FLOOR PLAN

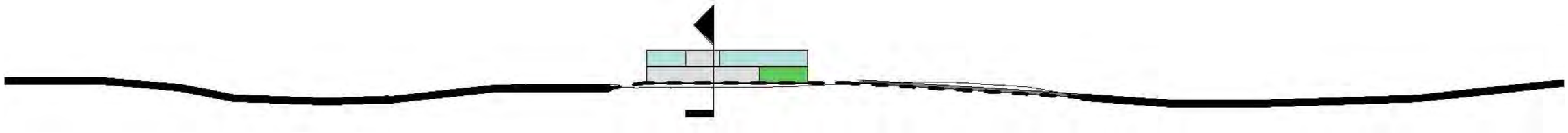


SECOND FLOOR PLAN

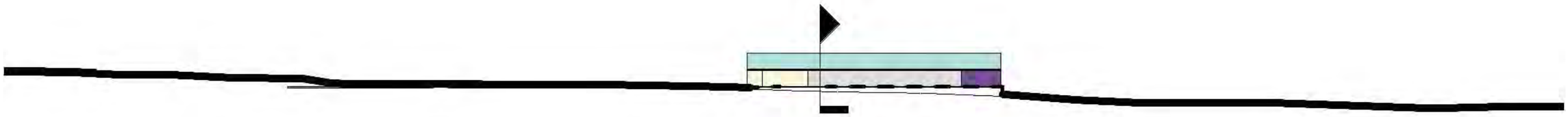
RECOMMENDED NEW SITE PLAN

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01a

SITE SECTIONS



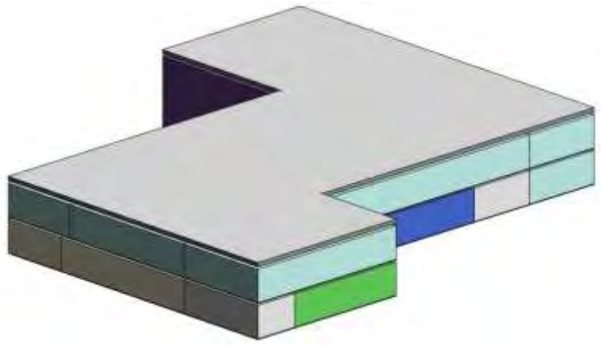
NORTH - SOUTH SITE SECTION



EAST – WEST SITE SECTION

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01a

ENERGY INFORMATION



The Northern Area International High School 01a massing model Energy Use Intensity is 22.3. Its total floor area is 55,925sf. This concept currently has an overall annual utility cost of $45,642. Total utility cost per square foot is approximately 81¢. Increased occupancy and after hours' activities have the largest overall impact on the EUI of this massing model. Net zero energy could still be achieved without difficulty.

This is a two-story massing model which generally performed a bit worse than three story models in Sefaira Systems likely due to somewhat increased overall exposed envelope area and solar heat gain. The two story design and therefore increased roof space should accommodate an increased quantity of photovoltaic panels for renewable energy generation. Roughly 20% of the total PV panels will need to be located off the roof. Due to site constraints, these panels will most likely be on an elevated array. This concept has a moderate amount of East-West glass exposure which is slightly increased by current site orientation.

SEFAIRA SYSTEMS ENERGY MODELING OUTPUT

Download Grid to Excel

	HVAC System Type	EUI	Annual Electricity De...	Annual Gas Use	Annual Energy Cost
01a 55,925 ft² Clone Downloads:	Water Source Heat Pump Fan Coil	22 kBTU/ft²/yr	368,379 kWh	0 therms	$45,642
01b	Water Source Heat Pump Fan Coils	22 ↓1%	321,816 ↓12%	0 ··· 0%	$39,873 ↓12%
01c	Water Source Heat Pump Fan Coils	23 ↑2%	323,189 ↓12%	0 ··· 0%	$40,043 ↓12%
02a	Water Source Heat Pump Fan Coils	21 ↓5%	347,987 ↓5%	0 ··· 0%	$43,116 ↓5%
02b	Water Source Heat Pump Fan Coils	22 ↓2%	348,196 ↓5%	0 ··· 0%	$43,142 ↓5%
02c	Water Source Heat Pump Fan Coils	22 ↓1%	387,462 ↑5%	0 ··· 0%	$48,007 ↑5%

Envelope | Shading | Space Use | Air-side | Water-side | Nat Vent | PV | Zoning | Peak Loads | Zone Sizing | Energy Breakdown | Plant Sizing

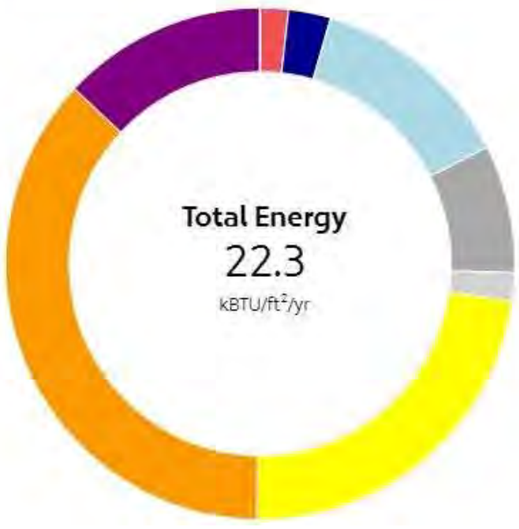
Zoning

Zoning Strategy: One zone/floor

Floor 2	WSHP Fan Coil	Space Use Tab Valu...
Floor 1	WSHP Fan Coil	Space Use Tab Valu...

Energy | Cost | CO_{2e} — Area weighted

Annual Energy Demand — Show comparison



Heating
- AHU
- Zones
- Humidification

Cooling
- AHU
- Heat Rejection
- Zones

Fans
- AHU
- Zones

Interior
- Lighting
- Equipment

- Pumps
- Other Gas

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01a

COST SUMMARY

	COST SUMMARY	1a	NOTES
1	**Building Sq. Ft.**	55,925	
2	**Cost per sq. ft.** (Includes GC OH, Insurance)	$261.80	Estimate based on Nov 2016 data
3	**Building Cost**	$14,641,165.00	
4	**Environmental** (Abatement allowance)	-	Assume not required
5	**Demolition**	$175,848.75	
6	**Site Work Percentage** (Cost as a % will vary)	25.00%	Varies between 25-35%, based on extent of work
7	**Site Work Cost**	$3,660,291.25	
8	**Parking Garage Sq. Ft.**	-	
9	**Cost per sq. ft.**	-	
10	**Parking Cost**	-	
11	**PV Panels Wattage**	307,000	Estimate based on energy model
12	**Cost per watts** (Roof or ground mounted)	$2.15 (80%)	Estimate based on Nov 2016 data
13	**Cost per watts** (Elevated array)	$3.50 (20%)	Estimate based on Nov 2016 data
14	**PV Panels Cost**	$742,940.00	
15	**Subtotal**	$4,579,080.00	Demo + Site Work + Parking Garage + PV Panels
16	**Design Contingency Percentage**	15.00%	Estimate based on Nov 2016 data
17	**Contingency Cost**	$2,883,036.75	
18	**SUBTOTAL**	$22,103,281.75	
19	**Inflation Adjustment Percentage** (mid-2018)	9.00%	Add additional 3% for every 6 months
20	**Escalation Cost**	$1,989,295.36	
21	**TOTAL CONSTRUCTION**	**$24,092,577.11**	

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01a

PROS / CONS & OVERALL SITE SCORES

	PROS	CONS	RANK
STORM WATER MANAGEMENT	•Flat areas to accommodate SWM •Redevelopment Site	•May need to outfall SD onto adjacent property •Additional cost for underground storm water storage on site •No green roof for storm water collections due to PV panels on roof	4*
WATER / SEWER / UTILITIES	•Water – Readily Available •Sewer – Readily Available •PEPCO service available	•Services will need to be run to North East corner of the site	1*
SITE WORK	•Not a lot of site work / infill needed •Majority of building site is flat	•Landscaping needed. •Steep slope along South side of site will require retaining walls for athletic fields •Have to increase parking and add bus loop •Less than 15 usable acres, 10+ Acreage	3*
ENVIRONMENTAL	•No Stream. •No known wetlands/water bodies. •No 100-year floodplain on-site •Existing neighborhood is compatible up to site •Site has environmental garden plots	•Soil could be highly erodible and potentially hydric	2
ROW / TRAFFIC / ACCESS	•Good access to Merrimac Drive and 15th Ave. •Planned new trails	•ROW dedication may be required. •Public Improvements to street trees may be required. •Traffic Study needed •Traffic signal and signage may be required	3
PARKING & CIRCULATION	•Shared parking in the middle of site •Extended bus loop shared with Elementary school •Expanded surface parking could add 40 spaces	•Surface parking insufficient to support all three structures •Elementary and High School circulation directly adjacent	5*
ADA ACCESS	•Access to public is close by and already provided.	•Steep slope on Merrimac Drive making access difficult •School far from parking	4*
PUBLIC TRANSPORTATION / WALKABILITY	•Existing sidewalks in surrounding area •Existing sidewalks curb cuts to site •Existing Bus routes walkable (Merrimac St & 14th Ave)	•Planned MTA Purple Line station 1 mile away, not easily walkable •Street lights and road improvements required	2
CAMPUS & GROWTH POTENTIAL	•Potential of sharing campus resources with existing ES and community center maximizing site potential	•Site fully occupied	2
ATHLETIC FIELDS / SITE AMENITIES	•Shared site amenities •Outdoor learning spaces opportunities •Softball, tennis courts, and outdoor track	•New playground would need to be relocated •Soccer/lacrosse field cannot be accommodated •Baseball field cannot be accommodated •Softball field on street, will required fences	5*
STAGING / PHASING	•Both existing buildings to remain	•Staging would be difficult and unsuccessful in avoiding interruptions of Elementary School & Community Center operations	5*
BUILDING ORIENTATION / LAYOUT	•East / West orientation achievable •Daylighting achievable •Views to student occupied spaces	•Very dense site layout •Views limited on South East side to backyards •Possible need to move temporary classrooms	3*
ENERGY CONSUMPTION	•$0.81 per square foot •With further study PV panels could be located on all roofs; take advantage of a complete “net zero site”		4*
COST	•$24.1M This scheme has less of an impact on the surrounding site.		*
			43

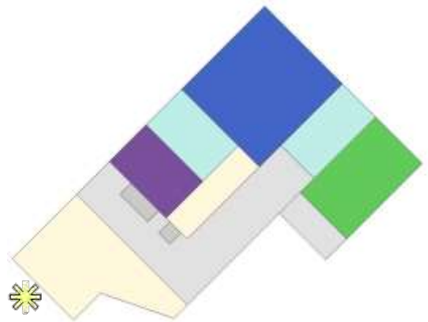
* - Number differs between schemes

1 - Highest Quality / Best Conditions
2 - Good Quality / Good Conditions
3 - Adequate Quality and Conditions
4 - Poor Quality and Conditions
5 - Lowest Quality and Conditions

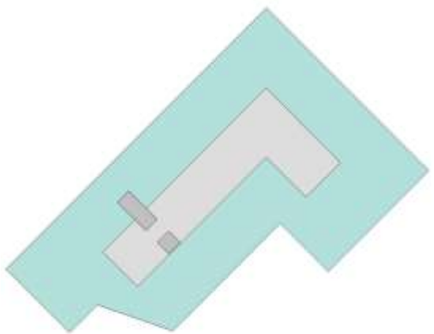
LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01b

RECOMMENDED NEW FLOOR PLANS

LOWER LEVEL PLAN (PARKING)



GROUND FLOOR PLAN

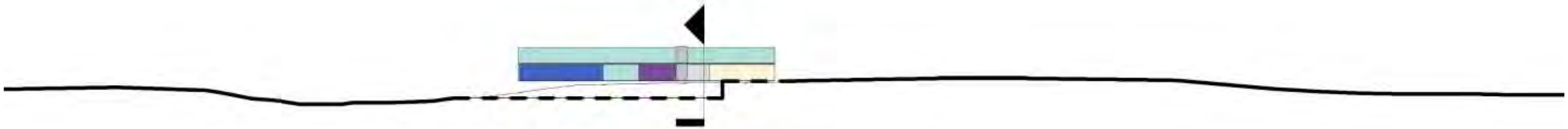


SECOND FLOOR PLAN

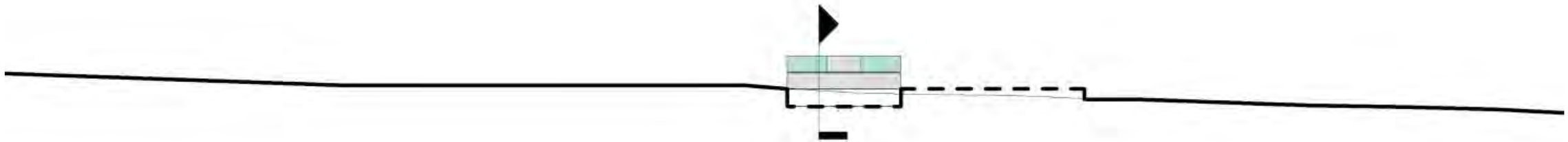
RECOMMENDED NEW SITE PLAN

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01b

SITE SECTIONS



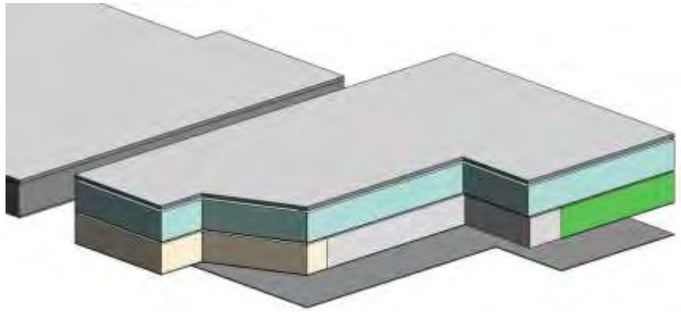
NORTH - SOUTH SITE SECTION



EAST – WEST SITE SECTION

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01b

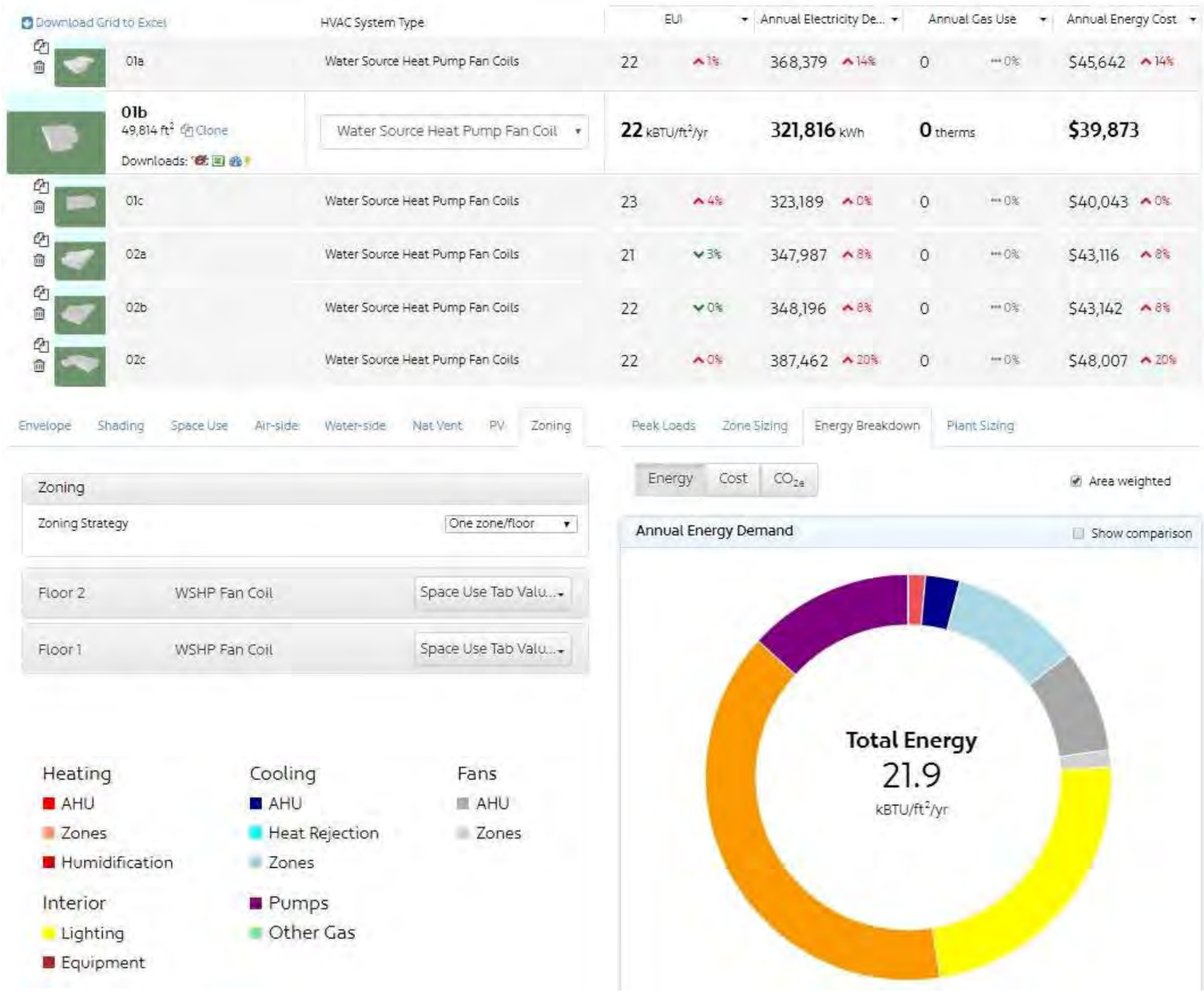
ENERGY INFORMATION



The Northern Area International High School 01b massing model Energy Use Intensity is 21.9. Its total floor area is small at 49,814sq. ft. Due to the school being directly adjacent to the Elementary School the gym has been removed from the floor plan shrinking the square footage, thus affecting energy costs. Sharing the gym would mean the cost of utilities for the Elementary school would rise. This concept currently has an overall annual utility cost of $39,873. Total utility cost per square foot is approximately 80¢. Increased occupancy and afterhours activities have the largest overall impact on the EUI of this massing model. Net zero energy could still be achieved but with difficulty due to small roof size, and building orientation.

This is a two story massing model which generally performed a bit worse than three story models in Sefaira Systems likely due to somewhat increased overall exposed envelope area and solar heat gain. The roof of the existing Elementary School could allow for more surface area for PV Panels, but does not possess the desired east-west orientation. There is also existing mechanical equipment on the roof, diminishing surface area for photovoltaics. Roughly 20% of the total PV panels will need to be located off the new school's roof. Due to site constraints, these panels will most likely be on an elevated array.

SEFAIRA SYSTEMS ENERGY MODELING OUTPUT



LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01b

COST SUMMARY

	COST SUMMARY	1b	NOTES
1	**Building Sq. Ft.**	49,814	
2	**Cost per sq. ft.** (Includes GC OH, Insurance)	$261.80	Estimate based on Nov 2016 data
3	**Building Cost**	$13,041,305.20	
4	**Environmental** (Abatement allowance)	-	Assume not required
5	**Demolition**	$175,848.75	
6	**Site Work Percentage** (Cost as a % will vary)	30.00%	Varies between 25-35%, based on extent of work
7	**Site Work Cost**	$3,912,391.56	
8	**Parking Garage Sq. Ft.**	23,000	
9	**Cost per sq. ft.**	$100.00	Estimate based on Nov 2016 data
10	**Parking Cost**	$2,300,000.00	
11	**PV Panels Wattage**	268,000	Estimate based on energy model
12	**Cost per watts** (Roof or ground mounted)	$2.15 (80%)	Estimate based on Nov 2016 data
13	**Cost per watts** (Elevated array)	$3.50 (20%)	Estimate based on Nov 2016 data
14	**PV Panels Cost**	$648,560.00	
15	**Subtotal**	$7,036,800.31	Demo + Site Work + Parking Garage + PV Panels
16	**Design Contingency Percentage**	15.00%	Estimate based on Nov 2016 data
17	**Contingency Cost**	$3,011,715.83	
18	**SUBTOTAL**	$23,089,821.34	
19	**Inflation Adjustment Percentage** (mid-2018)	9.00%	Add additional 3% for every 6 months
20	**Escalation Cost**	$2,078,083.92	
21	**TOTAL CONSTRUCTION**	**$25,167,905.26**	

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01b

PROS / CONS & OVERALL SITE SCORES

	PROS	CONS	RANK
STORM WATER MANAGEMENT	•Flat areas to accommodate SWM •Redevelopment Site	•May need to outfall SD onto adjacent property •Additional cost for underground storm water storage on site •No green roof for storm water collections due to PV panels on roof	4*
WATER / SEWER / UTILITIES	•Water – Readily Available •Sewer – Readily Available •PEPCO service available	•Services will need to be run to North East corner of the site	1*
SITE WORK	•Not a lot of site work / infill needed •Majority of building site is flat	•Excavation needed for underground parking garage •Steep slope along south side of site will require retaining walls for athletic fields •May require increased parking for community center and add bus loop •Less than 15 usable acres, 10+ Acreage	4*
ENVIRONMENTAL	•No known stream/wetlands/water bodies. •No 100-year floodplain on-site •Existing neighborhood is compatible up to site •Site has environmental garden plots	•Soil could be highly erodible and potentially hydric	2
ROW / TRAFFIC / ACCESS	•Good access to Merrimac Drive and 15th Ave. •Planned new trails	•ROW dedication may be required. •Public Improvements to street trees may be required. •Traffic Study needed •Traffic signal and signage may be required	3
PARKING & CIRCULATION	•Shared parking in the middle of site •Parking garage could add 50 spaces •Expanded surface parking could add 40 spaces •Extended bus loop shared with Elementary school	•Surface parking insufficient to support all three structures •Parking garage provided to supply more parking •Elementary and High Schools' circulation is directly adjacent	4*
ADA ACCESS	•Access to public is close by and already provided.	•Steep slope on Merrimac Drive making access difficult	3*
PUBLIC TRANSPORTATION / WALKABILITY	•Existing sidewalks in surrounding area •Existing sidewalks curb cuts to site •Existing Bus routes walkable (Merrimac St & 14th Ave)	•Planned MTA Purple Line station 1 mile away, not easily walkable •Street lights and road improvements required	2
CAMPUS & GROWTH POTENTIAL	•Sharing campus resources with existing ES and community center maximizing site potential	•Site fully occupied •Required to share gym with Elementary school	2
ATHLETIC FIELDS / SITE AMENITIES	•Shared site amenities •Outdoor learning spaces opportunities •Soccer field, basketball or tennis courts, and outdoor track	•New playground would need to be relocated •Baseball field cannot be accommodated •Soccer/Lacrosse field on street, will require fences	4*
STAGING / PHASING	•Both existing buildings to remain	•Staging would be difficult and unsuccessful in avoiding interruptions of Elementary School and Community Center operations	5*
BUILDING ORIENTATION / LAYOUT	•Access to Elementary School gym	•Very dense site layout •Need to move temporary classrooms •East / West orientation unachievable •Daylighting limited on North West side •Views limited on North West / North East sides to Elem. School maintenance areas	5*
ENERGY CONSUMPTION	•$0.80 per square foot •PV panels could be located on all roofs; take advantage of a complete "net zero site"		3*
COST	•$25.2M This scheme is less of an impact on the surrounding site.		*
			42

* - Number differs between schemes

1 - Highest Quality / Best Conditions
2 - Good Quality / Good Conditions
3 - Adequate Quality and Conditions
4 - Poor Quality and Conditions
5 - Lowest Quality and Conditions

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01c

RECOMMENDED NEW FLOOR PLANS

GROUND FLOOR PLAN

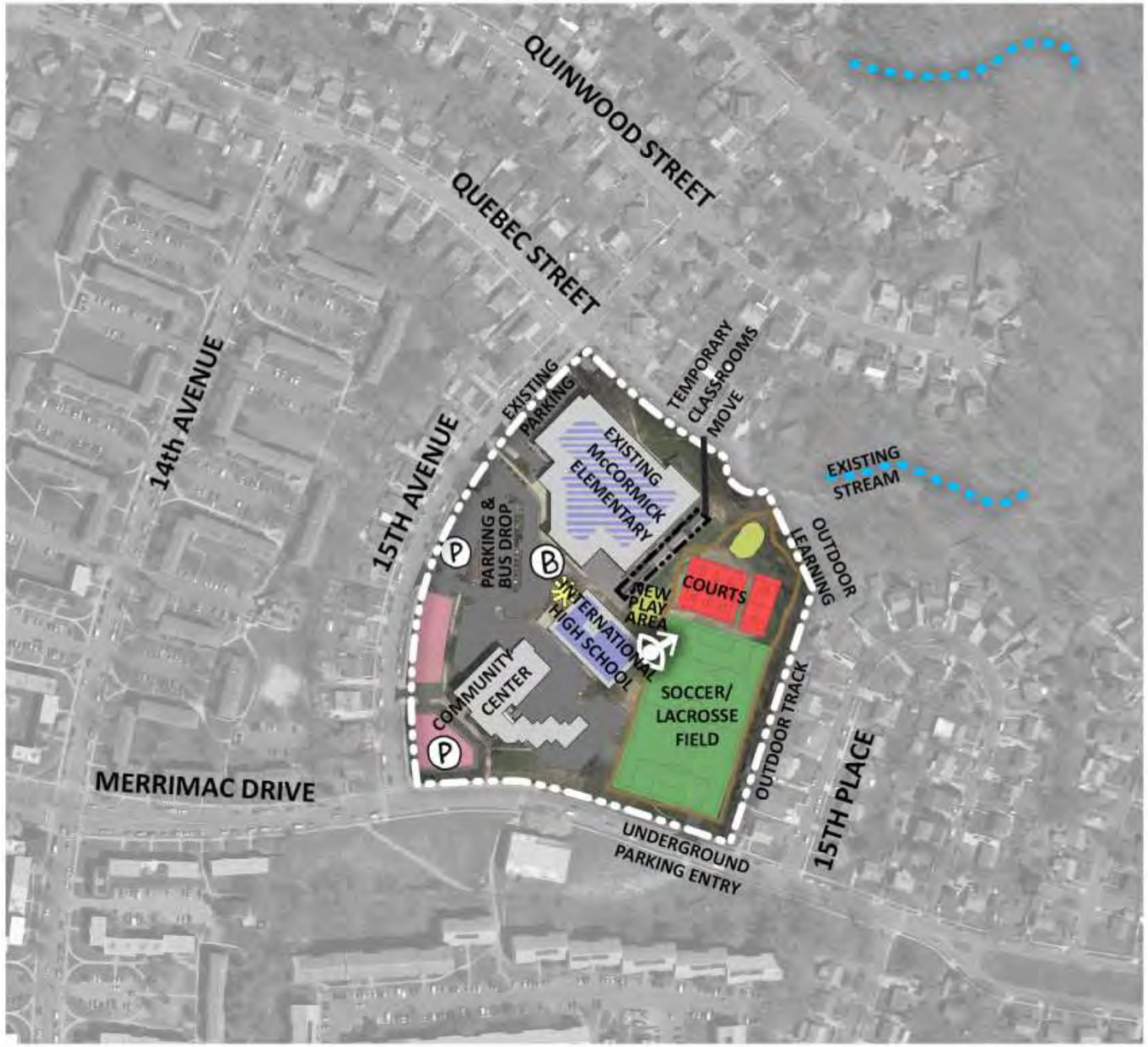
LOWER LEVEL PLAN (PARKING)

SECOND FLOOR PLAN

THIRD FLOOR PLAN

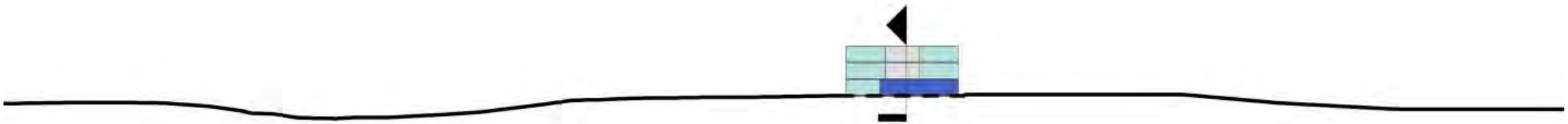
- ACADEMIC / SCIENCE
- ADMIN / GUIDANCE / HEALTH
- STUDENT DINING & FOOD SERVICES
- MAINTENANCE & CUSTODIAL
- MEDIA CENTER
- PE / INDOOR
- MAIN ENTRY
- PHOTOVOLTAICS
- POSSIBLE PHOTOVOLTAICS
- PHOTOVOLTAICS (ELEVATED ARRAY)
- VIEW
- BUS DROP-OFF
- PARKING

RECOMMENDED NEW SITE PLAN

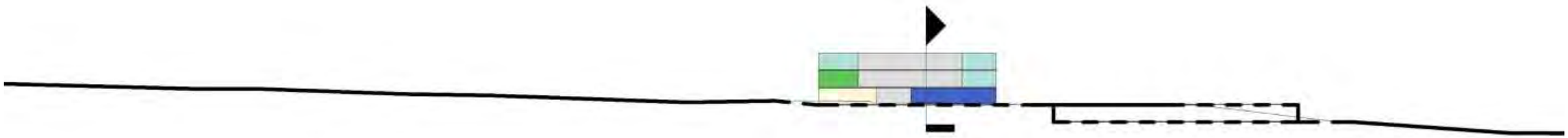


LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01c

SITE SECTIONS



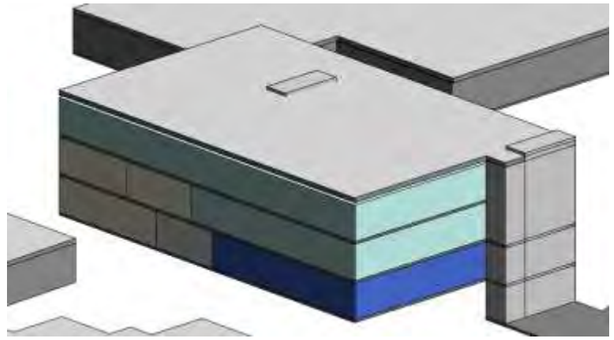
NORTH - SOUTH SITE SECTION



EAST – WEST SITE SECTION

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01c

ENERGY INFORMATION



The Northern Area International High School 01c massing model Energy Use Intensity is 23.1. Its total floor area is very small at 47,850 sq. ft. Due to the school being directly adjacent to the Elementary School the gymnasium was removed from the program resulting in a smaller square footage. Sharing the gym would mean the cost of utilities for the Elementary school would rise. This concept currently has an overall annual utility cost of $40,043. Total utility cost per square foot is approximately 83¢/sf. Increased occupancy and afterhours activities have the largest overall impact on the EUI of this massing model. Net zero energy could still be achieved, but with difficulty due to small roof size, and building orientation.

This is a three story-massing model, which generally performed a bit better than two story models in Sefaira Systems likely due to somewhat decreased overall exposed envelope area and solar heat gain. The roof of the existing Elementary School could allow for more surface area for PV Panels, but the building does not possess the desired east-west orientation. There is also existing mechanical equipment on the roof, diminishing surface area for photovoltaics. Roughly 50% of the total PV panels will need to be located off the new roof. Due to site constraints, these panels will most likely be on an elevated array.

SEFAIRA SYSTEMS ENERGY MODELING OUTPUT

Download Grid to Excel	HVAC System Type	EUI	Annual Electricity De...	Annual Gas Use	Annual Energy Cost
01a	Water Source Heat Pump Fan Coils	22 ↓2%	368,379 ↑13%	0 ···0%	$45,642 ↑13%
01b	Water Source Heat Pump Fan Coils	22 ↓4%	321,816 ↓0%	0 ···0%	$39,873 ↓0%
01c 47,850 ft² Clone Downloads:	Water Source Heat Pump Fan Coil	**23** kBTU/ft²/yr	**323,189** kWh	**0** therms	**$40,043**
02a	Water Source Heat Pump Fan Coils	21 ↓7%	347,987 ↑7%	0 ···0%	$43,116 ↑7%
02b	Water Source Heat Pump Fan Coils	22 ↓5%	348,196 ↑7%	0 ···0%	$43,142 ↑7%
02c	Water Source Heat Pump Fan Coils	22 ↓3%	387,462 ↑19%	0 ···0%	$48,007 ↑19%

Envelope | Shading | Space Use | Air-side | Water-side | Nat Vent | PV | Zoning | Peak Loads | Zone Sizing | Energy Breakdown | Plant Sizing

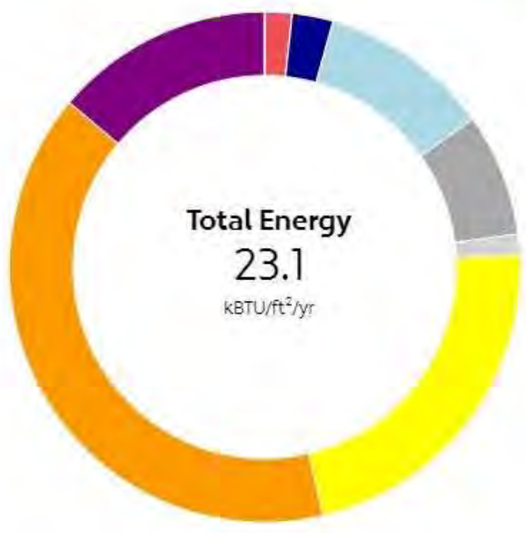
Energy | Cost | CO_{2e} — Area weighted

Zoning

Zoning Strategy: One zone/floor

Floor 3	WSHP Fan Coil	Space Use Tab Valu...
Floor 2	WSHP Fan Coil	Space Use Tab Valu...
Floor 1	WSHP Fan Coil	Space Use Tab Valu...

Annual Energy Demand — Show comparison



Heating: AHU, Zones, Humidification
Cooling: AHU, Heat Rejection, Zones
Fans: AHU, Zones
Interior: Lighting, Equipment
Pumps, Other Gas

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01c

COST SUMMARY

	COST SUMMARY	1c	NOTES
1	**Building Sq. Ft.**	47,850	
2	**Cost per sq. ft.** (Includes GC OH, Insurance)	$261.80	Estimate based on Nov 2016 data
3	**Building Cost**	$12,527,130.00	
4	**Environmental** (Abatement allowance)	-	Assume not required
5	**Demolition**	$175,848.75	
6	**Site Work Percentage** (Cost as a % will vary)	35.00%	Varies between 25-35%, based on extent of work
7	**Site Work Cost**	$4,384,495.50	
8	**Parking Garage Sq. Ft.**	59,000	
9	**Cost per sq. ft.**	$100.00	Estimate based on Nov 2016 data
10	**Parking Cost**	$5,900,000.00	
11	**PV Panels Wattage**	269,000	Estimate based on energy model
12	**Cost per watts**	$2.15 (50%)	Estimate based on Nov 2016 data
13	**Cost per watts** (Elevated array)	$3.50 (50%)	Estimate based on Nov 2016 data
14	**PV Panels Cost**	$759,925.00	
15	**Subtotal**	$11,220,269.25	Demo + Site Work + Parking Garage + PV Panels
16	**Design Contingency Percentage**	15.00%	Estimate based on Nov 2016 data
17	**Contingency Cost**	$3,562,109.89	
18	**SUBTOTAL**	$27,309,509.14	
19	**Inflation Adjustment Percentage** (mid-2018)	9.00%	Add additional 3% for every 6 months
20	**Escalation Cost**	$2,457,855.82	
21	**TOTAL CONSTRUCTION**	**$29,767,364.96**	

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 01c

PROS / CONS & OVERALL SITE SCORES

	PROS	CONS	RANK
STORM WATER MANAGEMENT	•Flat areas to accommodate SWM •Redevelopment Site	•May need to outfall SD onto adjacent property •Additional cost for underground storm water storage on site •No green roof for storm water collections due to PV panels on roof	4*
WATER / SEWER / UTILITIES	•Water – Readily Available •Sewer – Readily Available •PEPCO service available	•Services will need to be run to the middle of the site	1*
SITE WORK	•Not a lot of site work / infill needed •Majority of building site is flat	•Major excavation needed for underground parking garage with field above •Have to increase parking and add bus loop •Less than 15 usable acres, 10+ Acreage	4*
ENVIRONMENTAL	•No known stream/wetlands/water bodies. •No 100-year floodplain on-site •Existing neighborhood is compatible up to site •Site has environmental garden plots	•Soil could be highly erodible and potentially hydric	2
ROW / TRAFFIC / ACCESS	•Good access to Merrimac Drive and 15th Ave. •Planned new trails	•ROW dedication may be required. •Public Improvements to street trees may be required. •Traffic Study needed •Traffic signal and signage may be required	3
PARKING & CIRCULATION	•Shared parking in the middle of site •Expanded surface parking could add 40 spaces •Parking garage could add +/-150 parking spaces	•Current Elementary School bus loop may be insufficient for both schools •Surface parking insufficient to support all three structures •Largest parking garage provided to supply more parking •Elementary and High Schools' circulation is directly adjacent	3*
ADA ACCESS	•Access to public is close by and already provided. •School directly adjacent to parking lot/garage for easy access	•Steep slope on Merrimac Drive making street access difficult, but garage access possible	2*
PUBLIC TRANSPORTATION / WALKABILITY	•Existing sidewalks in surrounding area •Existing sidewalks curb cuts to site •Existing Bus routes walkable (Merrimac St & 14th Ave)	•Planned MTA Purple Line station 1 mile away, not easily walkable •Street lights and road improvements required	2
CAMPUS & GROWTH POTENTIAL	•Sharing campus resources with existing ES and community center maximizing site potential	•Site fully occupied •Required sharing of gym with Elementary School	2
ATHLETIC FIELDS / SITE AMENITIES	•Shared site amenities •Outdoor learning spaces opportunities •Soccer field, basketball or tennis courts, and outdoor track	•New playground would need to be relocated •Baseball field cannot be accommodated •Soccer/Lacrosse field on street, fences needed	3*
STAGING / PHASING	•Both existing buildings to remain	•Staging would be difficult and unsuccessful in avoiding interruptions of Elementary School and Community Center operations	5*
BUILDING ORIENTATION / LAYOUT	•Access to Elementary School gym	•Very dense site layout •East / West orientation unachievable •Views limited (back of community center, Elem.) •Quality daylighting limited	4*
ENERGY CONSUMPTION	•$0.83 per square foot •PV panels could be located on all roofs; take advantage of a complete "net zero site"		5*
COST	•$29.8M This scheme is less of an impact on the surrounding site.		*
			40

* - Number differs between schemes

1 - Highest Quality / Best Conditions
2 - Good Quality / Good Conditions
3 - Adequate Quality and Conditions
4 - Poor Quality and Conditions
5 - Lowest Quality and Conditions

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02a

RECOMMENDED NEW FLOOR PLANS

FIRST FLOOR PLAN

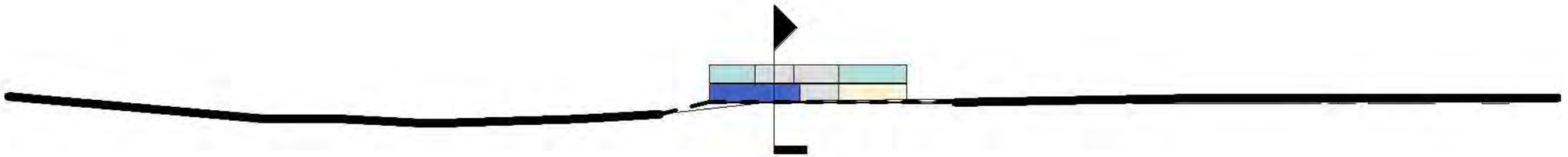
SECOND FLOOR PLAN

- ACADEMIC / SCIENCE
- ADMIN / GUIDANCE / HEALTH
- STUDENT DINING & FOOD SERVICES
- MAINTENANCE & CUSTODIAL
- MEDIA CENTER
- PE / INDOOR
- MAIN ENTRY
- PHOTOVOLTAICS
- POSSIBLE PHOTOVOLTAICS
- PHOTOVOLTAICS (ELEVATED ARRAY)
- VIEW
- BUS DROP-OFF
- PARKING

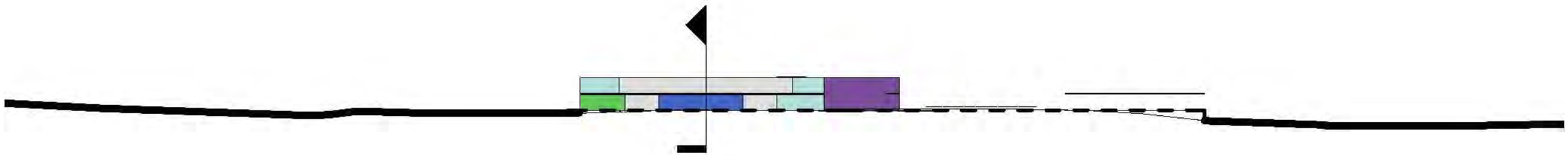
RECOMMENDED NEW SITE PLAN

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02a

SITE SECTIONS



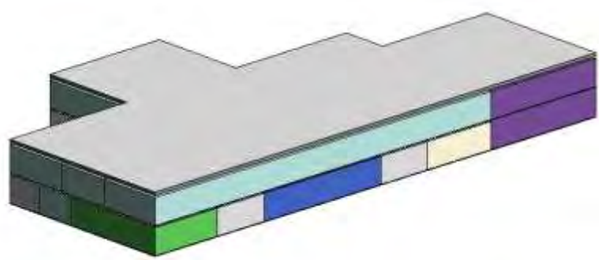
NORTH - SOUTH SITE SECTION



EAST – WEST SITE SECTION

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02a

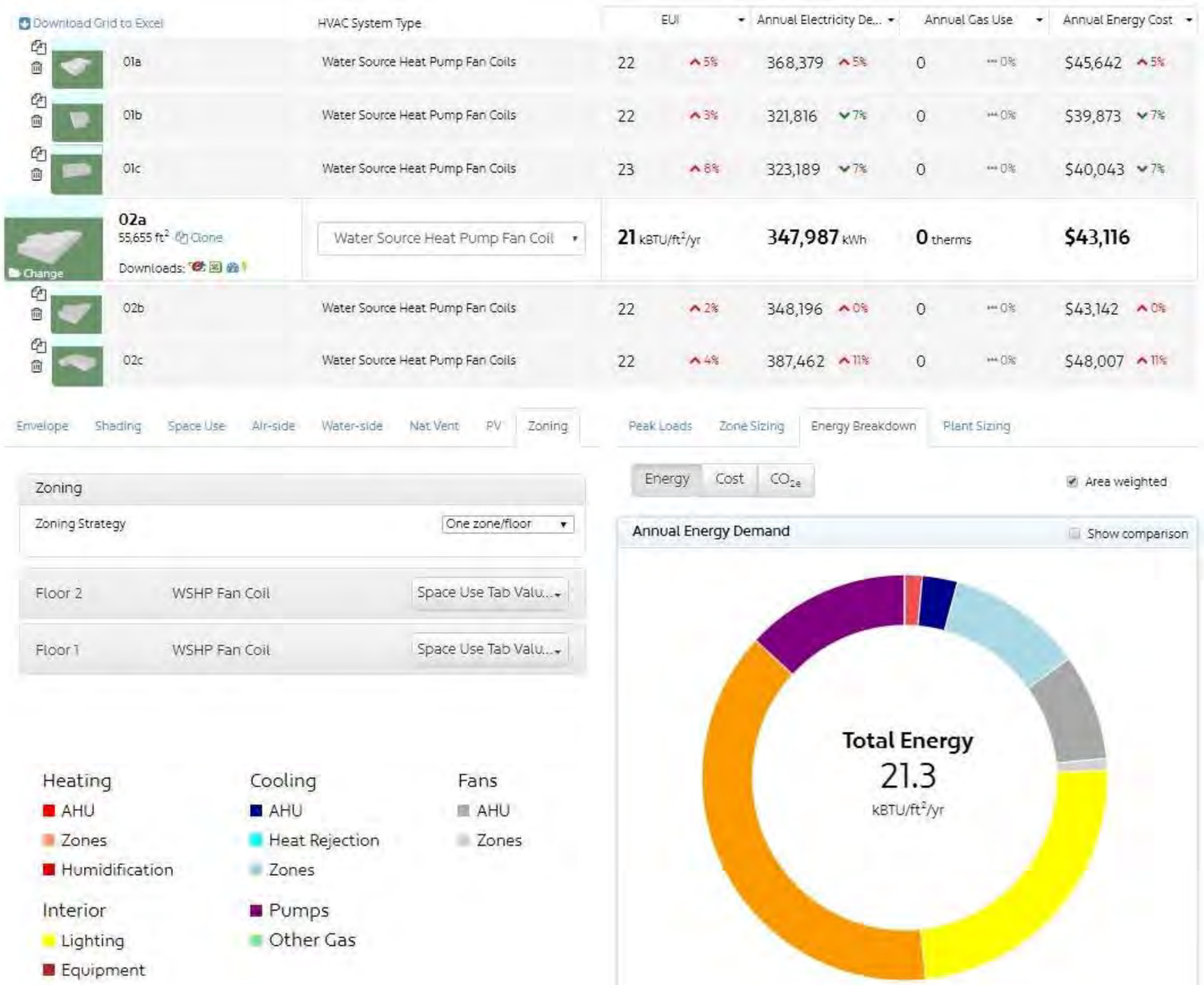
ENERGY INFORMATION



The Northern Area International High School 02a massing model Energy Use Intensity is 21.3. Its total floor area is 55,655sf. This concept currently has an overall annual utility cost of $43,116. Total utility cost per square foot is approximately 77¢. Increased occupancy and afterhours activities have the largest overall impact on the EUI of this massing model. Net zero energy could still be achieved without difficulty.

This is a two story massing model which generally performed a bit worse than three story models in Sefaira Systems likely due to somewhat increased overall exposed envelope area and solar heat gain. The two story design and therefore increased roof space should accommodate an increased quantity of photovoltaic panels for renewable energy generation. The horizontal axis of this concept is lined up East-West which is ideal in order to achieve the most favorable tilt and azimuth angle for the roof mounted PV system. This will increase solar yield and decrease number of panels required. Roughly 10% of the total PV panels will need to be located off the new roof. Due to site constraints, these panels will most likely be on an elevated array. This concept has a moderate amount of East-West glass exposure.

SEFAIRA SYSTEMS ENERGY MODELING OUTPUT



LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02a

COST SUMMARY – NORTHERN AREA INTERNATIONAL HIGH SCHOOL

	COST SUMMARY	2a	COMMUNITY CENTER	NOTES
1	**Building Sq. Ft.**	55,655	20,000	
2	**Cost per sq. ft.** (Includes GC OH, Insurance)	$261.80	$285.00	Estimate based on Nov 2016 data
3	**Building Cost**	$14,570,479.00	$5,700,000.00	
4	**Environmental** (Abatement allowance)	-	-	Assume not required
5	**Demolition**	$422,037.00	$0.00	
6	**Site Work Percentage** (Cost as a % will vary)	25.00%	25.00%	Varies between 25-35%, based on extent of work
7	**Site Work Cost**	$3,642,619.75	$1,425,000.00	
8	**Parking Garage Sq. Ft.**	-	-	
9	**Cost per sq. ft.**	-	-	
10	**Parking Cost**	-	-	
11	**PV Panels Wattage**	290,000	0	Estimate based on energy model
12	**Cost per watts** (Roof or ground mounted)	$2.15	$2.15	Estimate based on Nov 2016 data
13	**Cost per watts** (Elevated array)	$3.50	$3.50	Estimate based on Nov 2016 data
14	**PV Panels Cost**	$662,650.00	$0.00	
15	**Subtotal**	$4,727,306.75	$1,425,000.00	Demo + Site Work + Parking Garage + PV Panels
16	**Design Contingency Percentage**	15.00%	15.00%	Estimate based on Nov 2016 data
17	**Contingency Cost**	$2,894,667.86	$1,068,750.00	
18	**SUBTOTAL**	$22,192,453.61	$8,193,750.00	
19	**Inflation Adjustment Percentage** (mid-2018)	9.00%	9.00%	Add additional 3% for every 6 months
20	**Escalation Cost**	$1,997,320.83	$737,437.50	
21	**TOTAL CONSTRUCTION**	**$24,189,774.44**	**$8,931,187.50**	

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02a

PROS / CONS & OVERALL SITE SCORES

	PROS	CONS	RANK
STORM WATER MANAGEMENT	•Flat areas to accommodate SWM •Redevelopment Site	•May need to outfall SD onto adjacent property •Additional cost for underground storm water storage on site •No Green roof for storm water collections due to PV panels on roof	4*
WATER / SEWER / UTILITIES	•Water – Readily Available •Sewer – Readily Available •PEPCO service available	•Services will need to be run to South East corner of the site	1*
SITE WORK	•Not a lot of site work / infill needed •Majority of building site is flat	•Building demolition required •Steep slope along south side of site will require retaining walls for athletic fields •Have to increase parking and add bus loop •Less than 15 usable acres, 10+ Acreage	3*
ENVIRONMENTAL	•No Stream. •No known wetlands/water bodies. •No 100-year floodplain on-site •Existing neighborhood is compatible up to site •Site has environmental garden plots	•Soil could be highly erodible and potentially hydric	2
ROW / TRAFFIC / ACCESS	•Good access to Merrimac Drive and 15th Ave. •Planned new trails	•ROW dedication may be required. •Public Improvements to street trees may be required. •Traffic Study needed •Traffic signal and signage may be required	3
PARKING & CIRCULATION	•Shared parking in the middle of site •Extended bus loop shared with Elementary school •Expanded surface parking could add 50 spaces	•Surface parking insufficient to support all three structures	5*
ADA ACCESS	•Access to public is close by and already provided.	•The Community Center is further away from parking and access	2*
PUBLIC TRANSPORTATION / WALKABILITY	•Existing sidewalks in surrounding area •Existing sidewalks curb cuts to site •Existing Bus routes walkable (Merrimac St & 14th Ave)	•Planned MTA Purple Line station 1 mile away, not easily walkable •Street lights and road improvements required	2
CAMPUS & GROWTH POTENTIAL	•Potential of sharing campus resources with existing ES and community center maximizing site potential	•Site fully occupied	2
ATHLETIC FIELDS / SITE AMENITIES	•Shared site amenities •Outdoor learning spaces opportunities •Softball field, basketball or tennis courts, and outdoor track	•New playground would need to be relocated •Desired Soccer/Lacrosse field cannot be accommodated •Baseball field cannot be accommodated	5*
STAGING / PHASING	•Removal of Community Center means staging is further away from Elementary School	•Staging would be difficult in completely avoiding interruptions of Elementary School operations	4*
BUILDING ORIENTATION / LAYOUT	•East / West orientation achievable •Daylighting achievable •Views achievable	•Very dense site layout •Possible need to move existing temporary classrooms	2*
ENERGY CONSUMPTION	•$0.77 per square foot •PV panels could be located on all roofs; take advantage of a complete “net zero site”		1*
COST	•$24.2M •(+$8.93M Community Center)		*
			36

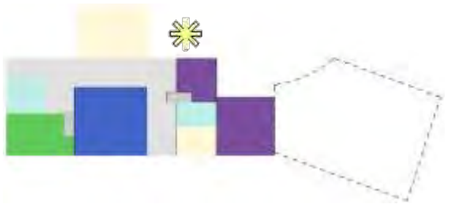
* - Number differs between schemes

1 - Highest Quality / Best Conditions
2 - Good Quality / Good Conditions
3 - Adequate Quality and Conditions
4 - Poor Quality and Conditions
5 - Lowest Quality and Conditions

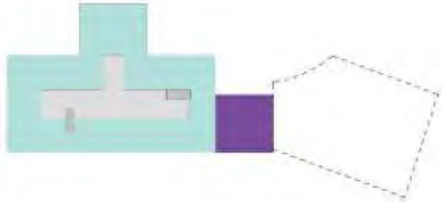
LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02b

RECOMMENDED NEW FLOOR PLANS

LOWER LEVEL PLAN
(PARKING)



FIRST FLOOR PLAN

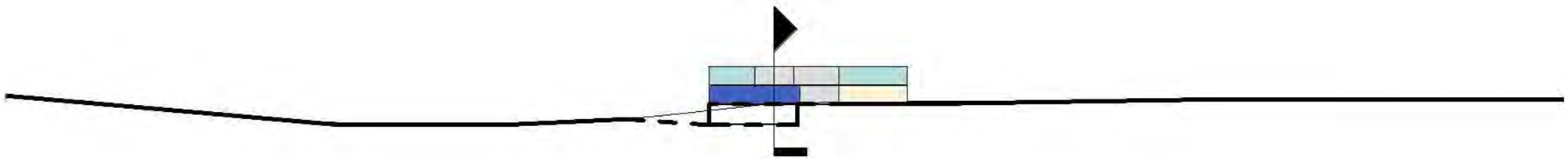


SECOND FLOOR PLAN

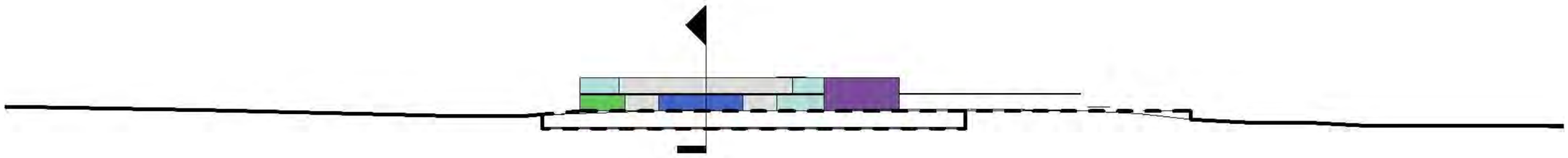
RECOMMENDED NEW SITE PLAN

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02a

SITE SECTIONS



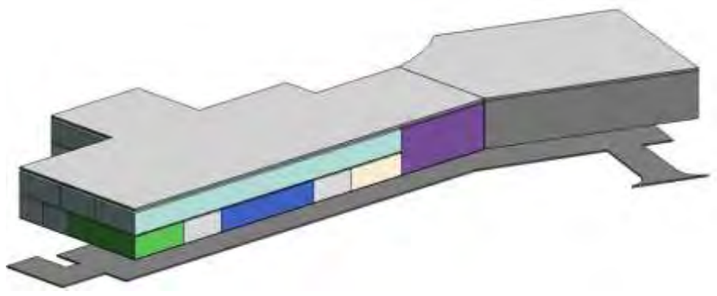
NORTH - SOUTH SITE SECTION



EAST – WEST SITE SECTION

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02b

ENERGY INFORMATION



The Northern Area International High School 02b massing model Energy Use Intensity is 21.8. Its total floor area is 54,336sf, but combined with the Community Center it would be closer to 75,000sf. This concept currently has an overall annual utility cost of $43,142 (not including Community Center). Total utility cost per square foot is approximately 79¢. Increased occupancy and afterhours activities have the largest overall impact on the EUI of this massing model. Net zero energy could still be achieved without difficulty.

This is a two story massing model which generally performed a bit worse than three story models in Sefaira Systems likely due to somewhat increased overall exposed envelope area and solar heat gain. The two story design and therefore increased roof space should accommodate an increased quantity of photovoltaic panels for renewable energy generation. The horizontal axis of this concept is lined up East-West which is ideal in order to achieve the most favorable tilt and azimuth angle for the roof mounted PV system. This will increase solar yield and decrease number of panels required. Roughly 10% of the total PV panels will need to be located off the new roof. Due to site constraints, these panels will most likely be on an elevated array. This concept has a moderate amount of East-West glass exposure.

This scheme gives the option of raising the entire building one level and having parking underneath for a cost. This makes building access more difficult, but decreases the already constrained site.

SEFAIRA SYSTEMS ENERGY MODELING OUTPUT

Download Grid to Excel	HVAC System Type	EUI	Annual Electricity De...	Annual Gas Use	Annual Energy Cost
01a	Water Source Heat Pump Fan Coils	22 ▲2%	368,379 ▲5%	0 ⋯0%	$45,642 ▲5%
01b	Water Source Heat Pump Fan Coils	22 ▲0%	321,816 ▼7%	0 ⋯0%	$39,873 ▼7%
01c	Water Source Heat Pump Fan Coils	23 ▲5%	323,189 ▼7%	0 ⋯0%	$40,043 ▼7%
02a	Water Source Heat Pump Fan Coils	21 ▼2%	347,987 ▼0%	0 ⋯0%	$43,116 ▼0%
02b 54,336 ft² Clone Downloads:	Water Source Heat Pump Fan Coil	**22** kBTU/ft²/yr	**348,196** kWh	**0** therms	**$43,142**
02c	Water Source Heat Pump Fan Coils	22 ▲1%	387,462 ▲11%	0 ⋯0%	$48,007 ▲11%

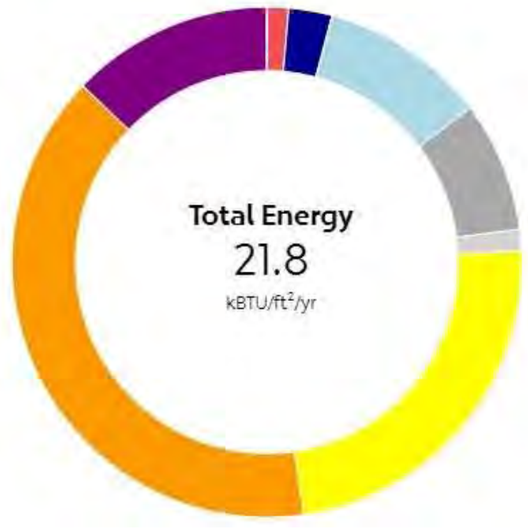
Envelope | Shading | Space Use | Air-side | Water-side | Nat Vent | PV | Zoning | Peak Loads | Zone Sizing | Energy Breakdown | Plant Sizing

Zoning

Zoning Strategy		One zone/floor
Floor 2	WSHP Fan Coil	Space Use Tab Valu...
Floor 1	WSHP Fan Coil	Space Use Tab Valu...

Energy | Cost | CO_{2e} ☑ Area weighted

Annual Energy Demand ☐ Show comparison



Heating
- AHU
- Zones
- Humidification

Cooling
- AHU
- Heat Rejection
- Zones

Fans
- AHU
- Zones

Interior
- Lighting
- Equipment

- Pumps
- Other Gas

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02b

COST SUMMARY

	COST SUMMARY	2b	COMMUNITY CENTER	NOTES
1	**Building Sq. Ft.**	54,336	20,000	
2	**Cost per sq. ft.** (Includes GC OH, Insurance)	$261.80	$285.00	Estimate based on Nov 2016 data
3	**Building Cost**	$14,225,164.80	$5,700,000.00	
4	**Environmental** (Abatement allowance)	-	-	Assume not required
5	**Demolition**	$422,037.00	$0.00	
6	**Site Work Percentage**	30.00%	30.00%	Varies between 25-35%, based on extent of work
7	**Site Work Cost**	$4,267,549.44	$1,710,000.00	
8	**Parking Garage Sq. Ft.**	28,000	-	
9	**Cost per sq. ft.**	$100.00	-	Estimate based on Nov 2016 data
10	**Parking Cost**	$2,800,000.00	-	
11	**PV Panels Wattage**	290,000	0	Estimate based on energy model
12	**Cost per watts** (Roof or ground mounted)	$2.15 (90%)	$2.15	Estimate based on Nov 2016 data
13	**Cost per watts** (Elevated array)	$3.50 (10%)	$3.50	Estimate based on Nov 2016 data
14	**PV Panels Cost**	$662,650.00	$0.00	
15	**Subtotal**	$8,152,236.44	$1,710,000.00	Demo + Site Work + Parking Garage + PV Panels
16	**Design Contingency Percentage**	15.00%	15.00%	Estimate based on Nov 2016 data
17	**Contingency Cost**	$3,356,610.19	$1,111,500.00	
18	**SUBTOTAL**	$25,734,011.43	$8,521,500.00	
19	**Inflation Adjustment Percentage** (mid-2018)	9.00%	9.00%	Add additional 3% for every 6 months
20	**Escalation Cost**	$2,316,061.03	$766,935.00	
21	**TOTAL CONSTRUCTION**	**$28,050,072.45**	**$9,288,435.00**	

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02b

PROS / CONS & OVERALL SITE SCORES

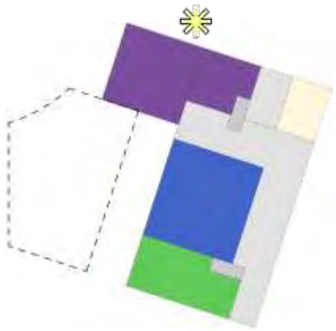
	PROS	CONS	RANK
STORM WATER MANAGEMENT	•Flat areas to accommodate SWM •Redevelopment Site	•May need to outfall SD onto adjacent property •Additional cost for underground storm water storage on site •No Green roof for storm water collections due to PV panels on roof	4*
WATER / SEWER / UTILITIES	•Water – Readily Available •Sewer – Readily Available •PEPCO service available	•Services will need to be run to new Community Center of the site	1*
SITE WORK	•Not a lot of site work / infill needed •Majority of building site is flat	•Existing building demolition required •Excavation needed for underground parking garage •Have to increase parking and add bus loop •Less than 15 usable acres, 10+ Acreage	4*
ENVIRONMENTAL	•No Stream •No known wetlands/water bodies •No 100-year floodplain on-site •Existing neighborhood is compatible up to site •Site has environmental garden plots	•Soil could be highly erodible and potentially hydric	2
ROW / TRAFFIC / ACCESS	•Good access to Merrimac Drive and 15th Ave. •Planned new trails	•ROW dedication may be required. •Public Improvements to street trees may be required. •Traffic Study needed •Traffic signal and signage may be required	3
PARKING & CIRCULATION	•Shared parking in the middle of site •Expanded surface parking could add 40 spaces •Parking garage could add +/-80 parking spaces •Extended bus loop shared with Elementary school	•Surface parking insufficient to support all three structures •Parking garage provided to supply more parking	4*
ADA ACCESS	•Access to public is close by and already provided •School and Community Center close to parking lot	•Steep slope on Merrimac Drive making street access difficult but garage access is possible	2*
PUBLIC TRANSPORTATION / WALKABILITY	•Existing sidewalks in surrounding area •Existing sidewalks curb cuts to site •Existing Bus routes walkable (Merrimac St & 14th Ave)	•Planned MTA Purple Line station 1 mile away, not easily walkable •Street lights and road improvements required	2
CAMPUS & GROWTH POTENTIAL	•Potential of sharing campus resources with existing ES •Community center directly connected, maximizing site potential	•Site fully occupied •Coordination of shared space with Community Center	2
ATHLETIC FIELDS / SITE AMENITIES	•Shared site amenities •Outdoor learning spaces opportunities •Soccer field, basketball or tennis courts, and outdoor track	•New playground would need to be relocated •Athletic fields are tightly packed together •Baseball field cannot be accommodated	4*
STAGING / PHASING	•Removal of Community Center means staging is further away from Elementary School	•Staging would be difficult in completely avoiding interruptions of Elementary School operations	4*
BUILDING ORIENTATION / LAYOUT	•East / West orientation achievable •Daylighting achievable •Views achievable	•Very dense site layout •Need to move temporary classrooms	2*
ENERGY CONSUMPTION	•$0.79 per square foot •PV panels could be located on all roofs; take advantage of a complete “net zero site”		2*
COST	•$28.1M •(+$9.28M Community Center)		*
			36

* - Number differs between schemes

1 - Highest Quality / Best Conditions
2 - Good Quality / Good Conditions
3 - Adequate Quality and Conditions
4 - Poor Quality and Conditions
5 - Lowest Quality and Conditions

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02c

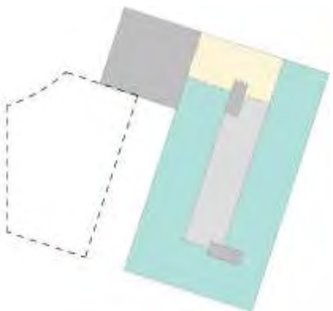
RECOMMENDED NEW FLOOR PLANS



FIRST FLOOR PLAN

LOWER LEVEL PLAN
(PARKING)

SECOND FLOOR PLAN

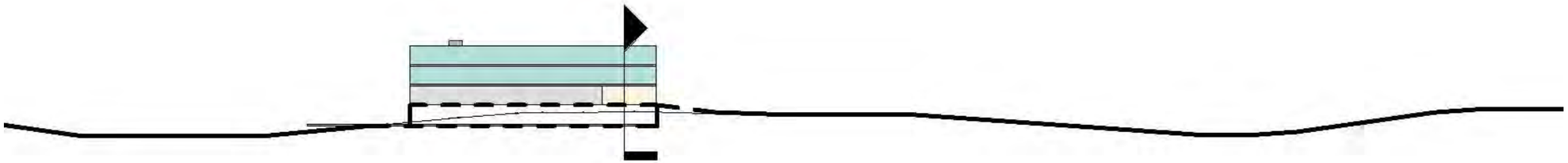


THIRD FLOOR PLAN

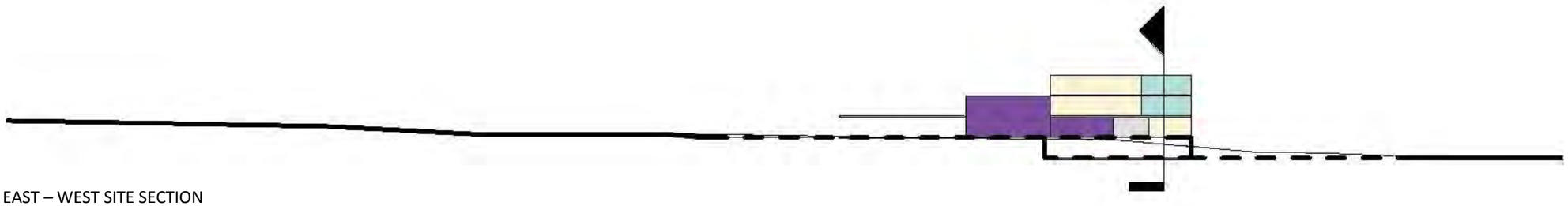
RECOMMENDED NEW SITE PLAN

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02c

SITE SECTIONS



NORTH - SOUTH SITE SECTION



EAST – WEST SITE SECTION

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02c

ENERGY INFORMATION

The Northern Area International High School 02c massing model Energy Use Intensity is 22.2. Its total floor area is 59,418sf, but combined with the Community Center it would be closer to 80,000sf. This concept currently has an overall annual utility cost $48,007 (not including the Community Center). Total utility cost per square foot is approximately 80¢. Increased occupancy and afterhours activities have the largest overall impact on the EUI of this massing model. Net zero energy could still be achieved without difficulty.

This is a three-story massing model which generally performed a bit better than two-story models in Sefaira Systems likely due to somewhat decreased overall exposed envelope area and solar heat gain. The three-story design and therefore decreased roof space won't accommodate an increased quantity of photovoltaic panels for renewable energy generation. The horizontal axis of this concept is not lined up East-West which is not ideal in order to achieve the most favorable tilt and azimuth angle for the roof mounted PV system. This will decrease solar yield and increase number of panels required, which could be placed on the adjacent Community Center. However, the Community Center and gym are only two-story spaces, therefore the rest of the building will be casting a shadow on itself, decreasing the space available to PV panels. Roughly 50% of the total PV panels will need to be located off the new roof. Due to site constraints, these panels will most likely be on an elevated array. This concept has an inadequate amount of East-West glass exposure.

This scheme is a raised building by having parking underneath for a cost. This makes building access more difficult, but decreases the already constrained site.

SEFAIRA SYSTEMS ENERGY MODELING OUTPUT

Download Grid to Excel	HVAC System Type	EUI	Annual Electricity De...	Annual Gas Use	Annual Energy Cost
01a	Water Source Heat Pump Fan Coils	22 ↑1%	368,379 ↓4%	0 ⋯0%	$45,642 ↓4%
01b	Water Source Heat Pump Fan Coils	22 ↓0%	321,816 ↓16%	0 ⋯0%	$39,873 ↓16%
01c	Water Source Heat Pump Fan Coils	23 ↑3%	323,189 ↓16%	0 ⋯0%	$40,043 ↓16%
02a	Water Source Heat Pump Fan Coils	21 ↓4%	347,987 ↓10%	0 ⋯0%	$43,116 ↓10%
02b	Water Source Heat Pump Fan Coils	22 ↓1%	348,196 ↓10%	0 ⋯0%	$43,142 ↓10%
02c 59,418 ft² Clone Downloads:	Water Source Heat Pump Fan Coil	22 kBTU/ft²/yr	387,462 kWh	0 therms	$48,007

Envelope | Shading | Space Use | Air-side | Water-side | Nat Vent | PV | Zoning | Peak Loads | Zone Sizing | Energy Breakdown | Plant Sizing

Zoning

Zoning Strategy: One zone/floor

Floor 3	WSHP Fan Coil	Space Use Tab Valu...
Floor 2	WSHP Fan Coil	Space Use Tab Valu...
Floor 1	WSHP Fan Coil	Space Use Tab Valu...

Energy | Cost | CO_{2e} — Area weighted

Heating: AHU, Zones, Humidification

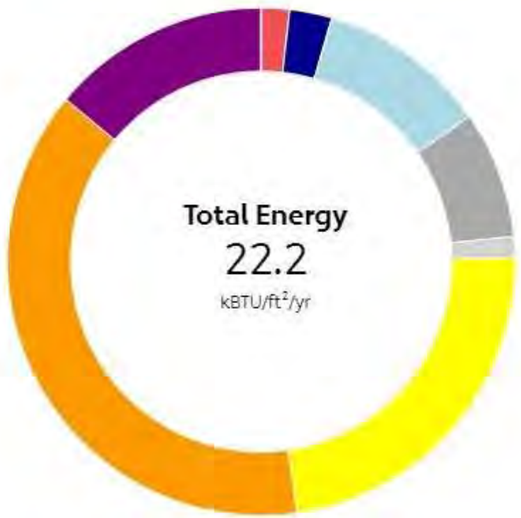
Cooling: AHU, Heat Rejection, Zones

Fans: AHU, Zones

Interior: Lighting, Equipment

Pumps, Other Gas

Annual Energy Demand — Show comparison



LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02c

COST SUMMARY

	COST SUMMARY	02c	Community Center	Notes
1	**Building Sq. Ft.**	59,418	20,000	
2	**Cost per sq. ft.** (Includes GC OH, Insurance)	$261.80	$285.00	Estimate based on Nov 2016 data
3	**Building Cost**	$15,555,632.40	$5,700,000.00	
4	**Environmental** (Abatement allowance)	-	-	Assume not required
5	**Demolition**	$422,037.00	$0.00	
6	**Site Work Percentage** (Cost as a % will vary)	30.00%	30.00%	Varies between 25-35%, based on extent of work
7	**Site Work Cost**	$4,666,689.72	$1,710,000.00	
8	**Parking Garage Sq. Ft.**	21,505	-	
9	**Cost per sq. ft.**	$100.00	-	Estimate based on Nov 2016 data
10	**Parking Cost**	$2,150,500.00	-	
11	**PV Panels Wattage**	323,000	0	Estimate based on energy model
12	**Cost per watts** (Roof or ground mounted)	$2.15 (50%)	$2.15	Estimate based on Nov 2016 data
13	**Cost per watts** (Elevated array)	$3.50 (50%)	$3.50	Estimate based on Nov 2016 data
14	**PV Panels Cost**	$912,475.00	$0.00	
15	**Subtotal**	$8,151,701.72	$1,710,000.00	Demo + Site Work + Parking Garage + PV Panels
16	**Design Contingency Percentage**	15.00%	15.00%	Estimate based on Nov 2016 data
17	**Contingency Cost**	$3,556,100.12	$1,111,500.00	
18	**SUBTOTAL**	$27,263,434.24	$8,521,500.00	
19	**Inflation Adjustment Percentage** (mid-2018)	9.00%	9.00%	Add additional 3% for every 6 months
20	**Escalation Cost**	$2,453,709.08	$766,935.00	
21	**TOTAL CONSTRUCTION**	**$29,717,143.32**	**$9,288,435.00**	

LANGLEY PARK SITE – NORTHERN AREA INTERNATIONAL HIGH SCHOOL 02c

PROS / CONS & OVERALL SITE SCORES

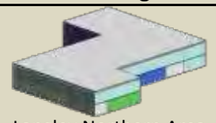
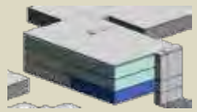
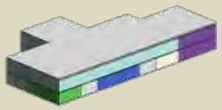
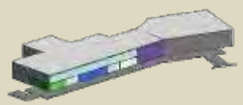
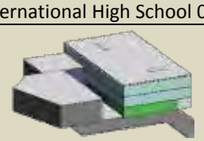
	PROS	CONS	RANK
STORM WATER MANAGEMENT	•Flat areas to accommodate SWM •Redevelopment Site	•May need to outfall SD onto adjacent property •Additional cost for underground storm water storage on site •No Green roof for storm water collections due to PV panels on roof	3*
WATER / SEWER / UTILITIES	•Water – Readily Available •Sewer – Readily Available •PEPCO service available	•Services will need to be run to South East of the site •Existing Community Center utilities need to be capped or moved from field area	2*
SITE WORK	•Not a lot of site work / infill needed •Majority of building site is flat	•Building demolition required with construction of soccer field •Excavation needed for underground parking garage •Steep slope along south side of site will require retaining walls for field •Have to increase parking and adjust existing bus loop •Less than 15 usable acres, 10+ Acreage	4*
ENVIRONMENTAL	•No Stream. •No known wetlands/water bodies. •No 100-year floodplain on-site •Existing neighborhood is compatible up to site •Site has environmental garden plots	•Soil could be highly erodible and potentially hydric	2
ROW / TRAFFIC / ACCESS	•Good access to Merrimac Drive and 15th Ave. •Planned new trails	•ROW dedication may be required. •Public Improvements to street trees may be required. •Traffic Study needed •Traffic signal and signage may be required	3
PARKING & CIRCULATION	•Shared parking in the middle of site •Smallest parking garage could add +/- 40 spaces •Extended bus loop shared with Elementary school	•Loss of 20 surface parking spaces making surface parking insufficient to support both structures •Smallest parking garage provided to supply more parking	4*
ADA ACCESS	•Access to public is close by and already provided.	•Surface parking lot far from building	2*
PUBLIC TRANSPORTATION / WALKABILITY	•Existing sidewalks in surrounding area •Existing sidewalks curb cuts to site •Existing Bus routes walkable (Merrimac St & 14th Ave)	•Planned MTA Purple Line station 1 mile away, not easily walkable •Street lights and road improvements required	2
CAMPUS & GROWTH POTENTIAL	•Potential of sharing campus resources with existing ES •Community center directly connected, maximizing site potential	•Site fully occupied •Coordination of shared space with Community Center	2
ATHLETIC FIELDS / SITE AMENITIES	•Shared site amenities •Outdoor learning spaces opportunities •Soccer field, basketball or tennis courts, and outdoor track	•New playground would need to be relocated to accommodate soccer field •Soccer field on street, fences needed •Baseball field cannot be accommodated	3*
STAGING / PHASING	•Removal of Community Center means staging is further away from Elementary School	•Staging would be difficult in completely avoiding interruptions of Elementary School operations	4*
BUILDING ORIENTATION / LAYOUT	•Daylighting achievable	•Very dense site layout •East / West orientation unachievable •Views limited on North West / South East sides to rooftops and backyards	4*
ENERGY CONSUMPTION	•$0.80 per square foot •PV panels could be located on all roofs; take advantage of a complete “net zero site”		3*
COST	•$29.7M •(+$9.28M Community Center)		*
			38

* - Number differs between schemes

1 - Highest Quality / Best Conditions
2 - Good Quality / Good Conditions
3 - Adequate Quality and Conditions
4 - Poor Quality and Conditions
5 - Lowest Quality and Conditions

FINAL SITE RECOMMENDATIONS

OVERALL ENERGY DATA COMPARISON

	Building	SF	% of Roof Mounted Solar PV ($2.15 per Watt)	% of Elevated Solar PV ($3.50 per Watt)	Solar PV System Cost	Energy Use % Difference	Annual Energy Cost Difference	Remarks
01a	 Langley Northern Area International High School 01a	55,925	80%	20%	$ 742,940	-2%	$0	2 Floors, moderate east-west glass exposure, sufficient roof space for PV
01b	 Langley Northern Area International High School 01b	49,814 (Parking 23,000)	80%	20%	$ 648,560	-4%	-$5,769	2 Floors with parking below, less envelope area, sufficient roof space for PV, low square footage
01c	 Langley Northern Area International High School 01c	47,850 (Parking 59,000)	50%	50%	$ 759,925	0%	-$5,599	3 Floors (with parking below field), less envelope area, less roof space for PV, least square footage
02a	 Langley Northern Area International High School 02a	55,655	90%	10%	$ 662,650	-7%	-$2,526	2 Floors, less east-west glass exposure, most roof space for PV
02b	 Langley Northern Area International High School 02b	54,336 (Parking 28,000)	90%	10%	$ 662,650	-5%	-$2,500	2 Floors with parking below, less east-west glass exposure, most roof space for PV
02c	 Langley Northern Area International High School 02c	59,418 (Parking 21,505)	50%	50%	$ 912,475	-3%	-$2,365	3 Floors with parking below, less roof space for PV, highest square footage

Energy Use % Difference is the difference, in percentage, of each scheme's annual energy use per square foot. The lower the percentage the better. Less energy usage means less cost per square foot.

Annual Energy Cost Difference is a rough estimate in cost to run the buildings systems for a year. This does not include the Community Center or detached gym (where applicable). The building with the lowest energy use per square foot is not necessarily the building with the lowest energy cost.

FINAL SITE RECOMMENDATIONS

OVERALL SITE RANKINGS

NORTHERN AREA INTERNATIONAL HIGH SCHOOL

RANK	Scheme		Preliminary Cost (+/-) surface parking	Parking Garage (+) garage parking	Subtotal	Community Center	TOTAL	SITE SCORE
#1	2a	Cost	$24.19	$0.00	$24.19	$8.93	**$33.12 million**	**2.77**
		Parking Spaces	+50 spaces	0 spaces			+50 spaces	
#2	2b	Cost	$25.25	$2.80	$28.05	$9.29	**$37.34 million**	**2.77**
		Parking Spaces	+40 spaces	+80 spaces			+120 spaces	
#3	2c	Cost	$27.57	$2.15	$29.72	$9.29	**$39.01 million**	**2.92**
		Parking Spaces	-20 spaces	+80 spaces			+60 spaces	
#4	1c	Cost	$23.87	$5.90	$29.77	$0.00	**$29.77 million**	**3.08**
		Parking Spaces	+40 spaces	+150 spaces			+190 spaces	
#5	1b	Cost	$22.87	$2.30	$25.17	$0.00	**$25.17 million**	**3.23**
		Parking Spaces	+40 spaces	+50 spaces			+90 spaces	
#6	1a	Cost	$24.09	$0.00	$24.09	$0.00	**$24.09 million**	**3.31**
		Parking Spaces	+40 spaces	0 spaces			+40 spaces	

	Storm Water Management	Water / Sewer / Utilities	Site Work	Environmental	ROW / Traffic / Access	Parking & Circulation	ADA Access	Public Transportation /	Campus & Growth Potential	Athletic Fields / Site Amenities	Staging / Phasing	Building Orientation / Layout	Energy Consumption	Cost	Total	Site Score
Scheme 01a	4	1	3	2	3	5	4	2	2	5	5	3	4		43	3.31
Scheme 01b	4	1	4	2	3	4	3	2	2	4	5	5	3		42	3.23
Scheme 01c	4	1	4	2	3	3	2	2	2	3	5	4	5		40	3.08
Scheme 02a	4	1	3	2	3	5	2	2	2	5	4	2	1		36	2.77
Scheme 02b	4	1	4	2	3	4	2	2	2	4	4	2	2		36	2.77
Scheme 02c	3	2	4	2	3	4	2	2	2	3	4	4	3		38	2.92

1 - Highest Quality / Best Conditions
2 - Good Quality / Good Conditions
3 - Adequate Quality and Conditions
4 - Poor Quality and Conditions
5 - Lowest Quality and Conditions

The final ranking for each site is an average of all 13 criteria categories listed in the Pros and Cons chart.

Scheme 01a

Scheme 01b

Scheme 01c

Scheme 02a

Scheme 02b

Scheme 02c