March 21, 2023

Vic Sabaliasuskas
The Village of Oak Park
123 Madison St.
Oak Park, IL 60302

Re: Property Condition Assessment Report Proposal

Dear Vic,

Thank you for the opportunity for Cordogan Clark (CC) to provide professional services for the Facility Condition Assessment of the two buildings (Village Hall/Police Station and the Public Works Facility) and Energy Audits of all eight Village of Oak Park buildings. Our experience related to Municipal work and providing Property Condition Assessments is quite extensive. We partner with a highly experienced consultant, Baumann Consulting to perform the energy audit. Their proposal and scope of services is described in the document included with this proposal.

Cordogan Clark is pleased to provide our professional Services Proposal as defined in the follow four parts:

- **Project Understanding**
- **Scope of Services**
- **Compensation**
- **Schedule**

PROJECT UNDERSTANDING
The Village of Oak Park (VOP) is seeking to have a Property Condition Assessment Report (PCAR) completed on the two buildings noted above (Task 1). The PCAR will encompass the following: A. identify structural and infrastructure deficiencies (HVAC, elevator, electrical, plumbing, etc.) B. Identify building envelope (roofs, masonry, windows etc.) deficiencies; C. Provide recommendations for replacement, updates or corrective measures for identified deficiencies and estimates for the recommended corrective measures and compile a 5-year capital outlay illustrating when the recommended improvements should be completed and the estimated capital outlay on an annual basis for these improvements.

Additionally requested is an Energy Audit (Task 2) of the eight VOP buildings; Public Works, Village Hall, 3 fire stations and 3 water pumping stations. This work will coincide with the PCAR. The Audit will evaluate the existing building from an energy use standpoint and include recommendations for improvements that reduce energy use and improve building utility efficiency. We have included a proposal from our partner who specializes in this type of work to assist with this task. Refer to the the attached proposal from Baumann Consulting for the scope of what is being proposed to accomplish the Energy Audit.

An added task for consideration is the development of building condition scans of the two buildings (Task 3). These scans provide detailed accurate usable CAD models of the existing conditions of the building which can be utilized by the village as backgrounds for compiling operating information and for planning and detailing future modifications to the buildings.

SCOPE OF SERVICES

CC proposes to structure the Property Assessment process that is intended to assist the VOP in determining the state of the two subject existing building conditions and the corrective measures or maintenance required over a 5-year period. The report will include the following:

Property Condition Assessment Report (Task 1)

The focus of this study area will be on the two primary physical condition components of the Village Hall and Public works – building assembly and building infrastructure. Our approach to this study area will be completed with a team of technically-focused architects, engineers and construction professionals. The process will include an initial kick-off meeting, research with building maintenance staff, visual investigations of each location and follow up review with the Administration and building maintenance staff. This study area will be supplemented with information the VOP has on file and current knowledge of the buildings.

Findings will be categorized using a rating system refined with the VOP for each building component's condition. The rating system will reflect the level of priority, condition and life expectancy. To assist with prioritizing by the VOP, observations may also be categorized into various criteria which may include: Building Enclosure, Building MEP/FP Infrastructures, Energy & Operational Efficiency, and Interior Finish Conditions.

Building MEP/FP and Architectural Systems Infrastructure Evaluations shall consist of:

- inspections, providing estimated remaining life, and estimated replacement costs of the all major building systems: HVAC Electrical/Low Voltage/Lighting Plumbing/Restrooms Fire protection/Life safety Architectural Systems (roofing, windows, building envelope, etc.) and Interior Finishes (flooring, walls, paint, etc.)
- Mechanical HVAC
  1. Field verify major HVAC systems (i.e. Chiller plant, boiler plant, Air distribution systems) and comment on damaged or worn out equipment. Provide recommendations on either replacement or practical life span remaining.
- Electrical, Low Voltage, Lighting Systems
  1. Field verify all equipment nameplate information, including panel manufacture, generator data, and panel schedules.
  2. Visual condition of all equipment, comment on damaged or worn-out equipment and recommend either replacement or practical life span remaining.
- Plumbing Systems and Restrooms
  1. Visual condition of all equipment, comment on damaged or worn out equipment and recommend either replacement or practical life span remaining.
- Fire Protection and Life Safety Systems
  1. Review visual condition of exposed sprinkler piping, Fire Pump, and back flow preventer. Provide recommendations on either replacement or practical life span remaining
  2. Review condition of fire alarm systems, evaluate age, remaining life, and estimated replacement cost.
- Architectural Systems
  1. Perform an architectural condition assessment on building envelope, including cladding and caulking.
  2. Assess the condition of the roofing, including the membrane, downspouts/gutters, and flashing.

3. Assess the condition of the interior borrowed light and door systems.
4. Identify deferred maintenance on above systems and provide correction pricing.

- Interior Finishes
    1. Visual condition of all interior finishes and systems, comment on damaged or worn out equipment and recommend either replacement or practical life span remaining.

Building Enclosure shall consist of the following:

- The scope of the exterior wall, window and door surveys will be based on visual assessments and will include:
- Exterior wall, window and door survey at each of the buildings
- Photographs of all elevations of the buildings
- Observations to determine the general appearance of the wall systems including defect items specific to walls using defined defect codes
- Observations to determine the general appearance of the window and door systems including defect items specific to Windows and Doors using defined defect codes
- Locating observed wall, window and door defect items on elevation plans and coded to correspond to an attached table
- Transcribing all observed defect items into a table by elevation and defect description with estimated unit cost for the recommended repairs and prioritized by severity if requested
- An Executive Summary will provide an opinion of probable cost for all repairs and by building

The exterior wall, window and door data will address the general condition of the walls and masonry and will present recommendations for any additional services that may be required which may include physical testing, water testing or the disassembly of wall elements, window, curtain wall or door assemblies or components. The survey is limited to the exterior masonry unless requested otherwise.

The scope of the roof survey will be based on visual assessments and will include:

- Development of a Roof Plan showing significant details and delineating roof areas with square footages, to be used in the survey
- Gathering relevant warranty and recent repair information from VOP records
- Observations to determine the roof's general appearance, surface conditions, and membrane characteristics and conditions
- Observations and notations of edge conditions of the roof, including base flashings, counter-flashing, coping, perimeter walls, and fascia
- Observations around equipment to including flashing, caulking, traffic patterns, drainage and contaminates
- Observations and notations of condition of pitch pans/pockets, vents, drains, and other roof penetrations
- Observation of building exterior/adjoining wall materials and penetrations, associated with the roof system, such as scuppers and overflow outlets
- Observations of expansion joints and control joints
- Observations of the general drainage characteristics of the roofs
- From the initial Roof Plan will be developed which will include coding and photos corresponding to the observed defects and noting recommended repairs.

The roof data gathered as the result of the roof survey, including condition photos, shall be provided in an electronic format. The scope of services will be limited to a visual survey and does not include actual testing of the roofs; therefore, if problems are suspected, additional services will be recommended.

If requested or deemed necessary to be studied, the following areas would require CC to engage outside specialized consultants or vendors to provide a more detailed, technical assessment. This would be provided at a cost outside our fee proposal, but would only be authorized following presentation to, and acceptance of, a proposal by the VOP. These areas could include:

- Public address, phone systems, clock and security systems
- Information technology equipment and communications systems
- Foodservice equipment
- Video inspection of sewer lines

Energy Audit (Task 2)
The energy audit process includes the review and analysis of existing utility information and the evaluation of the existing buildings systems as they impact energy usage. Refer to the detailed proposal from Baumann Consulting included with this proposal.

Building Scans (Task 3)
For consideration as an additional service, we propose scanning the two existing buildings with our FARO scanning tool to develop a 3-Dimensional building model. This process involves spending 8 – 12 hours in each building with a scanner and tripod, systematically moving through the building allowing the scanner to document every visible square inch of the building. The data gathered is then stitched together and then transferred by our team into a detailed model of the existing conditions of the building with an accuracy of better than 1/16 of an inch. These models will then be available to the VOP for use as accurate baseline information for room layout, planning future building modifications and various other uses.

COMPENSATION
We propose to provide the professional services described above for fixed fee amounts as outlined below.

Task 1 – Property Condition Assessment
We propose to provide the professional services described above for a fixed amount of Twenty Seven Thousand Seven Fifty Dollars ($27,750.00) for the two buildings. This is based on the following:

- $14,800.00 Property Condition Assessment
- $12,950.00 For developing reports, conducting review meetings, developing customized presentation graphics, and making formal presentations of findings

Task 2 – Energy Analysis
We propose to provide the professional services described above for a fixed amount of Eighty Four Thousand Seven Hundred Dollars ($84,700.00) for the eight buildings. This is based on the following, refer to attached Baumann Consulting proposal for detail:

- $18,000.00 Public Works Center
- $15,000.00 Village Hall
- $11,000.00 Main Fire Station

- $6,000.00 North Fire Station
- $8,000.00 South Fire station
- $11,000.00 Central Pumping Station
- $6,000.00 North Pumping Station
- $6,000.00 South Pumping Station
- $3,700.00 Coordination, management

Task 3 – Building Scan
We propose to provide the professional services described above for a fixed amount of Seventeen Thousand Seven Hundred Sixty Dollars ($17,760.00) for the two buildings. This is based on the following:

- $8,880.00 Scan, stitch, model - Village Hall
- $8,880.00 Scan, stitch, model – Public Works

If scope increases beyond what is described within this proposal, CC shall notify and discuss with the VOP possible additional compensation beyond the fixed fee amount. Reimbursable shall be provided at direct cost and it is recommended that an allowance of $1,500 be set aside for such items.

SCHEDULE
We understand the VOP anticipates that the project start in May and be completed by early July. We expect to have the majority of the information available early July and will submit the final draft by the end of July.

Thank you for this opportunity to serve the VOP on this project. Should you require any additional information or clarifications, please do not hesitate to contact me. If this proposal meets your satisfaction, please execute and email it to me at bkronewitter@cordoganclark.com

Respectfully submitted,

Cordogan Clark

Brian K. Kronewitter, AIA, DBIA
Executive Vice President

Upon approval of this agreement please forward a copy of the signed proposal letter back to our office.

Cordogan Clark & Associates	**Village of Oak Park**
BY:________________	BY:________________
Its representative	Its representative
DATE: 3/1/23	DATE:________________

March 13th, 2023

PROPOSAL

Village of Oak Park –
Public Works Center / Village Hall /
Main Fire Station / North Fire Station / South Fire Station /
Central Pumping Station / North Pumping Station / South Pumping Station

ASHRAE Level 2 Energy Audit Services

Proposal H.23-105a.U

Client Cordogan Clark

Discipline Existing Building Decarbonization

Created Ajit Naik, PE, BEMP, CCP | VP & Director of Building Performance Analytics

Reviewed Scott Emery, PE | SVP & Director of Existing Building Decarbonization

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1 Project Description

The Village of Oak Park, through their representative, Cordogan Clark, is seeking ASHRAE Level 2 energy audits to concurrently start in May and be completed by early July 2023, and for eight (8) Village-owned properties:

- Public Works Center
- Village Hall
- Main Fire Station
- North Fire Station
- South Fire Station
- Central Pumping Station
- North Pumping Station
- South Pumping Station

The Public Works Center is located at 201 South Blvd, Oak Park, IL. Built in 2007, this 100,000 SF building provides office space and a lower-level parking garage to the Village's Public Works Department, which oversees the Village's public infrastructure, urban forest, refuse, recycling collections, traffic signals and streetlights.

The Village Hall is located at 123 Madison St, Oak Park, IL. Built in 1975, this 80,000 SF building contains government offices and the Village's main police station.

The Main Fire Station is located at 100 North Euclid Avenue (aka 680 North Boulevard), Oak Park, IL. Built in 1981, this 16,700 SF building contains the Village's main fire station.

The North Fire Station is located at 212 Augusta Street, Oak Park, IL. Built in 1917 and renovated in 1984, this 2,700 SF building contains the Village's northside fire station.

The South Fire Station is located at 900 South East Avenue, Oak Park, IL. Built in 1960, this 5,100 SF building contains the Village's southside fire station.

The Central Pumping Station is located at 102 North Lombard Avenue, Oak Park, IL. Built in 1920, this 12,300 SF building houses the central pumping operations of the Village of Oak Park.

The North Pumping Station (also known as the Roth Pump Station) is located at 1010 North Ridgeland Avenue, Oak Park, IL. Built in 1962, this 1,800 SF building houses the northern pumping operations of the Village of Oak Park.

The South Pumping Station is located at 207 Garfield Street, Oak Park, IL. Built in 1962, this 1,800 SF building houses the southern pumping operations of the Village of Oak Park.

On March 7th, 2023, David Allen of Cordogan Clark reached out to Kelly Adighije of Baumann Consulting to request a proposal for ASHRAE Level 2 energy audits for the Public Works Center and the Village Hall. On March 16th, 2023, Craig Welter of Cordogan Clark reached out to Kelly Adighije to include the three (3) Fire Stations and three (3) Pumping Stations listed above in the proposal.

The Public Works Center is currently upgrading its Siemens BAS to a Siemens Desigo BAS and this is scheduled for completion in a few months. The BAS is a standalone BAS just for this building.

The Village Hall has a separate/different BAS installed by Anchor Mechanical but not all of the AHUs are on the BAS. The Village Hall BAS is only for Village Hall equipment.

All other buildings have no BAS installed.

2 Qualifications

Baumann Consulting, with offices in Chicago, Washington D.C. and Frankfurt (Germany), provides consulting services for sustainable and innovative building solutions for the US, European, and international markets. Baumann specializes in sustainability and engineering consulting services for the entire life cycle of buildings and collaborates with its client partners to develop value-added solutions for high performance buildings that are durable, comfortable, and inexpensive to operate. As engineers, architects, planners and consultants, Baumann is driven to elevate high performance buildings from a niche segment of the market to the industry standard.

Over the past 15 years our work has included more than 500 projects ranging from commercial, educational, institutional, and industrial buildings to larger scale projects encompassing entire campuses, cities, and counties. Regardless of project size or scope, our mission is to positively impact the lives of our client partners and their communities.

The Baumann team brings the following unique qualifications to this project:

- **Unparalleled Energy Audit Expertise:** Our DNA is energy efficiency and high-performance buildings. We have successfully completed ASHRAE Level 1, 2 and 3 energy audits for a broad range of building types with complex and campus building systems. We have specific experience performing Level 1 and 2 energy audits in hotels, including several projects within the last 2 years, such as the London House Chicago, Cloud One New York Downtown, DoubleTree Downtown Salt Lake City, The Aster Los Angeles, and Le Merigot Santa Monica.
- **Solid Team:** Our team of experienced and certified engineers will bring a wealth of knowledge to the project. Each of our employees assigned to this project has relevant experience and one or more credentials as P.E., BEAP, BCxP, CCP, CBCP, ACP, EMIT, or CPHC. About 30% of our employees have been with the company for seven or more years and about 50% have 10-plus years professional experience.

3 Scope of Work – ASHRAE Level 2 Energy Audit

Baumann Consulting will complete an ASHRAE Level 2 Energy Audit for the Public Works Center and Village Hall as described above.

The following systems are included in the Energy Audit: envelope, lighting, HVAC, BAS, domestic water systems, The Energy Audit will be completed in accordance with ASHRAE Standard 211-2018 *Standard for Commercial Building Energy Audits*. All tasks described for the Level 1 Energy Audit are included in the Level 2 Energy Audit. Energy audit services will include the following tasks:

☒ **Level 1 Energy Audit**

1. Preliminary energy use analysis with verification of benchmarking.
2. Utility rate structure review.
3. Facility site survey.
   a. Off-site review of drawings, schedules, and building information.
   b. Site-visit/walk-through with facility manager/engineer.
   c. On-site operations and maintenance (O&M) observations.
   d. Owner, operator, and occupant interviews.
4. Identification of low-cost/no-cost energy efficiency measures (EEMs).
5. Identification of capital EEMs.

☒ **Level 2 Energy Audit**

A Level 2 Energy Audit includes items 1-5 of the Level 1 Energy Audit plus the following:

6. Energy cost by component if submetering is available.
7. Level 2 site visit, including review of mechanical, electrical, building envelope, and other systems using energy or otherwise impacting energy usage (this visit is in lieu of item 3b).
8. O&M procedures and documentation review.
9. Existing operating parameters audit and summary.
10. End-use energy breakdown by category – space heating, space cooling, lighting, etc.
11. Distributed and renewable energy resource opportunity assessment.
12. Initial EEMs list with preliminary cost and savings calculations.
13. Total potential energy savings calculation using RETScreen energy model with interactive and combined effects.
14. Estimated EEM costs for each practical measure.
15. EEM economic analysis.

Deliverables:

1) Final Report (incl. all required attachments).
2) Final Presentation.

4 Client Responsibility

The Client is responsible for providing Baumann with project information necessary for the completion of our work, including but not limited to:

- Facility access to the Project site.
- An on-site Project representative to participate in site walk-through(s) and provide information regarding facility operations.
- Access to building managers, operators, and occupants for interviews regarding operating conditions, including central plant.
- A minimum of twelve (12) concurrent months of utility bills for each meter serving the Project (or equivalent). Up to 36 months will be evaluated if available. Timeseries measured energy data (e.g., 15-minute interval) preferred if available.
- Project as-built drawings, controls sequences, operational schedules, building use types, and current and historic occupancy levels.
- Access to the Project's ENERGY STAR Portfolio Manager account (if available).
- Access to BMS (if applicable).

5 Project Team

Our team of experienced professionals is the backbone of our strength.

The following key team members are proposed for this project:

Project Manager and Primary Point of Contact:

⇨ Ajit Naik, PE, BEMP, CCP
VP, Director of Building Performance Analytics

Energy Engineer:

⇨ Hardik Miyani, PE, CEM, CRE, CPHC, LEED GA
Sr. Energy & Cx Engineer

The proposed **Project Manager** and single point of contact for this project is **Ajit Naik**. Ajit has 11 years of AEC industry experience and has been with Baumann since 2018 and serves as the Director of Building Performance Analytics. In this role, Ajit consults with clients to analyze building energy performance, develop innovative design solutions, and provide expertise on the development and implementation of energy efficient concepts and technical systems upgrades.

Hardik Miyani will serve as **Energy Engineer**. Hardik has 6 years of industry experience and has been with Baumann since 2020. He is currently serving as the Auxiliary Board Member & Sustainable Facilities Mentor with Illinois Green Alliance. In the past, he has also served as President of the ASHRAE UIC student chapter. Hardik has worked on relevant energy audits and retro-commissioning projects around the country, including hotels, assisted living, student residences, and multifamily residential properties.

Proposed team members have capacity to begin tasks immediately as necessary. Additional capacity and expertise are available and will be included in the project team as needed. All services provided by the proposed team will be performed by, and/or under the supervision of, experienced Senior Engineers with superior technical, organizational, and communication skills required by this demanding project.

6 Fees

For **ASHRAE LEVEL 2 ENERGY AUDIT SERVICES** as described in the above scope, Baumann Consulting will be compensated by the Client a lump sum fee of **$81,000**, based on the following breakdown by building and based on these audits been conducted concurrently between May and early July 2023:

- **Public Works Center: $18,000**
- **Village Hall: $15,000**
- **Main Fire Station: $11,000**
- **North Fire Station: $6,000**
- **South Fire Station: $8,000**
- **Central Pumping Station: $11,000**
- **North Pumping Station: $6,000**
- **South Pumping Station: $6,000**

7 Reimbursable Expenses

Travel and lodging expenses for the site visit described are included in the offered fees. If additional work is requested by the client, related reimbursable expenses will be charged at 1.1 x cost. Reimbursable expenses include travel and lodging expenses, printing of drawings or specifications, courier service, overnight mail, equipment rental, plotting performed by printing services and other charges incurred during the additional requested work, not directly provided by us.

8 Terms and Conditions

The Baumann Terms and Conditions given in Appendix A are incorporated by reference and apply to this signed agreement.

9 Signature Page

We appreciate the opportunity to offer our professional services and are prepared to provide all resources, experience and expertise which are required for the described tasks.

Please signify your acceptance of this proposal by signing below and returning this letter to us. If we are asked to execute a separate agreement, terms identified in this proposal letter will be incorporated.

This proposal is valid for 60 days after the date of this proposal.

March 17th,2023

Date

Ajit Naik, PE, BEMP, CCP
VP, Director of Building Performance Analytics
Baumann Consulting

10 Appendices

Appendix A Baumann Terms and Conditions

October 21, 2022

ASHRAE LEVEL 2 ENERGY AUDIT REPORT

[redacted]

Client	[redacted]
Project address	[redacted] Washington, DC 20006
Created	Anis Ben Ayed
Reviewed	Scott Emery, P.E., Adam Herzer

P.0800.U [redacted] Energy Audit L2 Report_221021

BAUMANN CONSULTING

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Abbreviations

BEPS – Building Energy Performance Standard

BEPS-1 – The current BEPS performance cycle (2020 – 2026)

BEPS-2 – The next BEPS performance cycle (2027 – 2032)

CW – Condenser Water

CHP – Combined Heat and Power

CHW – Chilled Water

DDC – Direct Digital Controls

DHW – Domestic Hot Water

DOEE – DC Department of Energy and Environment

ECx – Existing Building Commissioning

EEM – Energy Efficiency Measure

EUI – Energy Use Intensity

HW – Hot Water

NG – Natural Gas

OAT – Outside Air Temperature

RCx – Retro commissioning

TAB – Testing and Balancing

VAV – Variable Air Volume

VFD – Variable Frequency Drives

VRF – Variable Refrigerant Flow

1 Summary

This report summarizes the findings for the Level 1 and Level 2 Energy Audit of [redacted] ST in Washington, DC. It provides a summary of work performed through October 21, 2022. This report also addresses compliance with Washington DC's Building Energy Performance Standard (BEPS). The first compliance cycle (BEPS-1) began on January 1, 2021. Statements and assessments made in this report relative to BEPS are based on final regulations and guidelines published by the District's Department of Environment and Energy (DOEE).

<u>Energy Use and BEPS</u>

As shown in **Table 1**, 1725 I ST's 2019 Energy Star Score was 50, as reported to the DC Department of Energy and Environment (DOEE). It is noted that Energy Star Portfolio Manager (ESPM) currently shows a 2019 Energy Star score of 53.[1] The difference between the two values is due to updates made to the property details[2]. In ESPM, for the year 2019, the reported weather normalized source energy use intensity (EUI) was 215.9 kBtu/ft2 and the reported weather normalized site energy use intensity was 77.1 kBtu/ft2.

[redacted]'s Energy Star score is slightly above the national median and below the current BEPS required Energy Star Score of 71 for office buildings. Therefore, [redacted] does not meet BEPS for the current cycle. Because the building falls below BEPS, it faces a maximum compliance penalty of $2,668,400. This penalty can be reduced or eliminated by implementing measures that reduce the building's energy use. In general, BEPS requires a reduction in site energy of 20% or more to eliminate a compliance penalty. To bring the building's Energy Star Score up to 71, we estimate that energy use would need to be reduced by 20% or more compared to 2019 energy use. To achieve an Energy Star Score of 75, which we expect would position the property for BEPS-2 compliance, a 25% reduction in site energy use is needed.[3]

Based on 2019 data, [redacted] spends around $836,000 per year on energy.

1725 I ST uses energy in ways typical to office buildings including for heating, cooling, ventilation, lighting, plug loads (computers, screens, printers etc.), and domestic hot water. The building's only energy source is electricity.

As shown in **Figure 1**, more than 60% of the energy used by [redacted] is for space conditioning and ventilation. According to the Commercial Buildings Energy Consumption

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[1] The score has increased from 53 in 2019 to 57 in 2022, which indicates that the building is currently performing better than 2019.
[2] Details such as GFA, Number of Workers on Main Shift, Weekly Operating Hours, etc. were changed.
[3] BEPS-2 requirements are not set and unknown at this time. Statements regarding future BEPS compliance are speculative. There is no guarantee of future compliance even if the results predicted here-in are realized.

Survey (CBECS) data typically 55% of office building energy use is for space conditioning and ventilation. This suggests that [redacted]'s energy use for heating, cooling, and ventilation is high and that measures that address these demands have the most potential for reducing overall energy use.

Table 1. 1725 I ST's Energy use Metrics

Energy Use Metric	DOEE 2019	BEPS 1 ***	BEPS 1 Recommended Target ****	BEPS 2 Recommended Target ****
Energy Star Score (1-100)	50*	71	74	79
Weather Normalized Source EUI (kBtu/ft2)	214.7*	171.76	164.8	150.29
Weather Normalized Site EUI (kBtu/ft2)	76.7*	61.36	57.8	53.69
Weather Normalized Source Energy Use (kBtu)	57,193,074**	45,754,459	43,171,682	40,035,152
Weather Normalized Site Energy Use (kBtu)	20,431,806**	16,345,445	15,418,460	14,302,264
Reduction in site energy use (%) required with 2019 score (50) as base.	-	20%	25%	30%

* Values taken from https://buildingperformancedc.org/
** Values Calculated based on GFA
*** All Values are Calculated using Target Finder – Values under BEPS 1 are NOT Weather Normalized
**** All Values are Calculated using Target Finder

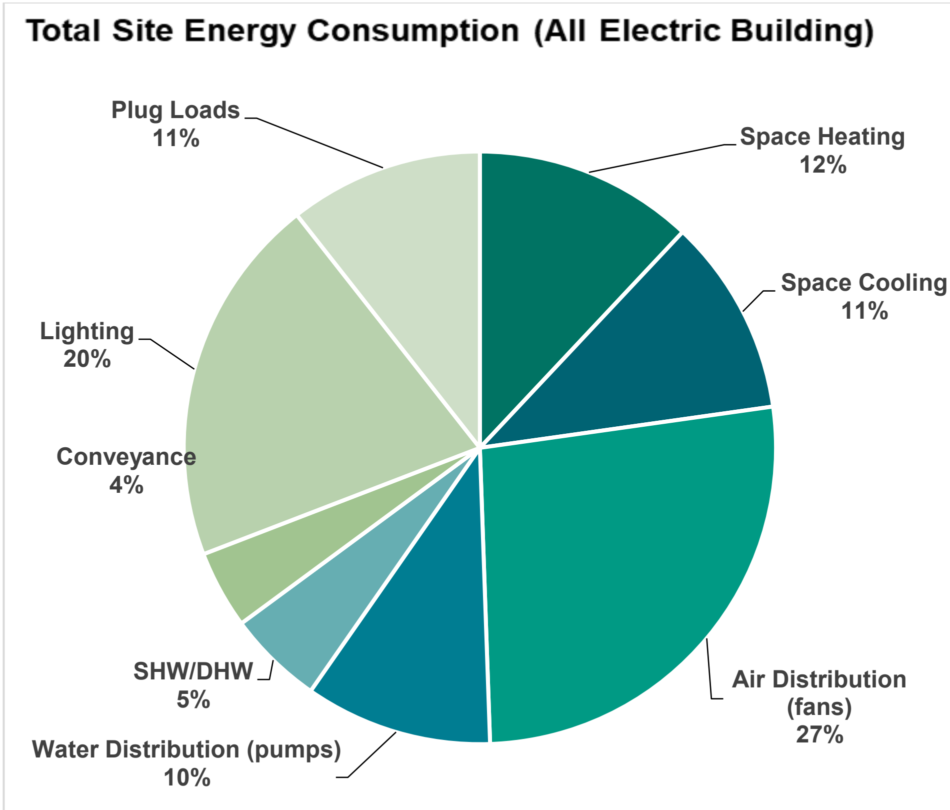

Figure 1. Site Energy Consumption Breakdown

BEPS Compliance Options

Baumann recommends that [redacted] ownership establish a base goal to reduce **site** energy use by no less than 25% by the end of 2025 to comply with the current BEPS cycle.[4] We also recommend that a secondary goal of reducing **site** energy use by no less than 30% compared to 2018 / 2019 levels be considered. This latter reduction would result in an expected Energy Star Score of 79, which would exceed the DC median for office buildings for the current BEPS cycle. With these goals in mind, we then recommend that [redacted] begin the process of selecting, planning, and implementing energy efficiency improvement measures. BEPS compliance options are discussed in detail in section 2.

[4] This is the 20% required to meet the Performance Pathway requirement plus 5% to account to uncertainties.

Energy Efficiency Measures

As summarized in Table 2 below, Baumann identified and evaluated 16 energy efficiency measures (EEMs). The estimated costs for individual EEMs range from $0 to $8,928,000.

Without considering avoided BEPS penalties, 11 of the identified low-cost and capital EEMs have simple paybacks of less than 5 years. These measures include installing lighting occupancy sensors in the garage, adjusting the AHU schedule, installing VFDs and enabling RCx strategies like duct static pressure reset and supply air temperature resets. These 11 EEMs are estimated to have implementation costs between $0 - $80,100.

3 of the identified low-cost and capital EEMs have simple paybacks of more than 5 years. These measures include replacing stairway lighting, installing occupancy sensors in corridors, and replacing the atrium lighting with LED. These 3 EEMs are estimated to have implementation costs between $14,200 - $36,800.

2 Deep energy retrofit measure have been identified. These measures include installing solar PV and retrofitting the building HVAC system with Variable Refrigerant Flow (VRF). These 2 EEMs are estimated to have implementation costs between $114,400 and $8,927,500, respectively.

With respect to [redacted]'s potential energy use reduction, we estimate that at most a 25% to 30% reduction in site energy could be achieved without upgrading the building's HVAC system. A 25% reduction would bring the property's Energy Star Score to 74. In this case, virtually all the recommended EEMs except upgrading the building HVAC system to Variable Refrigerant Flow (VRF), must be adopted. Expected savings for this scenario are approximately $260,500 per year at an estimated initial cost of at least $270,500.

If VRF upgrades are included in the implemented measures, we project the maximum achievable site energy reduction to be 30% to 35%. This would result in an Energy Star Score of 79 or higher, which would better position the property for future BEPS compliance. Savings from these measures are estimated to be approximately $300,000 per year at an estimated initial cost of $8,900,000.

Table 2. Energy Efficiency Measures Summary

	Measure Description	Financial			Energy	BEPS 1		BEPS 2	
		Measure Cost	Annual Cost Savings	Simple Payback (yrs)[5]	% Of Site Energy Savings	% Of recommended 25% Target[6]	Avoided BEPS Penalty[7]	Simple Payback after avoided Penalty (yr)	% Of 30% Recommended Target Cycle 2
Low-Cost and No-Cost Recommendations									
5.1.1	For new tenant fit outs upgrade the lighting from fluorescent to LEDs	-	$100	Immediate	< 1%	0%	$1,700	Immediate	0%
5.1.2	Replace stairway lighting with dual dimming occupancy-based LED lighting fixtures	$14,200	$1,000	13.9	< 1%	0%	$15,900	Immediate	0%
5.1.3	Install 1.0 GPM aerators in the bathroom faucets	$800	$8,700	Immediate	1%	4%	$135,800	Immediate	3%
5.1.4	Adjust the AHU schedule to match building occupancy	-	$40,700	Immediate	5%	20%	$635,200	Immediate	16%
5.1.5	Adjust the garage schedule to match building	-	$7,600	Immediate	1%	4%	$119,100	Immediate	3%

[5] Does not account for avoided BEPS fines.
[6] This is the percentage of the recommended energy use reduction to reach a 25% site energy reduction. For example, a value of 40% indicates a site energy reduction of 10% (0.4 x 0.25).
[7] This reduction is based on the percentage of energy use reduction achieved, compared to the required 20% reduction for BPES-1 compliance. For example, if the site energy use is reduced by 10% by 2026, 50% of the compliance payment will be waived.

	Measure Description	Financial			Energy	BEPS 1		BEPS 2	
		Measure Cost	Annual Cost Savings	Simple Payback (yrs)[5]	% Of Site Energy Savings	% Of recommended 25% Target[6]	Avoided BEPS Penalty[7]	Simple Payback after avoided Penalty (yr)	% Of 30% Recommended Target Cycle 2
	occupancy								
5.1.6	Modify the BMS to have static pressure reset on the AHUs	$2,700	$27,800	Immediate	3%	13%	$434,500	Immediate	11%
5.1.7	Modify the BMS to have supply air temperature reset on the AHUs	$6,500	$77,500	Immediate	9%	37%	$1,210,400	Immediate	31%
5.1.8	Install timers on water cooler compressors to turn the compressors off during off hours	$1,800	$6,600	0.3	1%	3%	$103,800	Immediate	3%
5.1.9	Install timers on domestic water heaters	$1,000	$21,700	Immediate	3%	10%	$339,500	Immediate	9%
Capital Energy Efficiency Measures									
5.2.1	Install occupancy sensors in the corridor lighting	$36,800	$2,500	14.5	< 1%	1%	$39,500	Immediate	1%
5.2.2	Install Occupancy Sensors in the Parking Garage to turn OFF lights when the space is unoccupied	$26,400	$21,000	1.3	3%	10%	$328,000	Immediate	8%
5.2.3	Install Garage Fan VFDs	$80,100	$26,900	3.0	3%	13%	$419,900	Immediate	11%
5.2.4	Install VFDs on the condenser water system Pumps and control based	$56,300	$34,700	1.6	4%	17%	$541,900	Immediate	14%

	Measure Description	Financial			Energy	BEPS 1		BEPS 2	
		Measure Cost	Annual Cost Savings	Simple Payback (yrs)[5]	% Of Site Energy Savings	% Of recommended 25% Target[6]	Avoided BEPS Penalty[7]	Simple Payback after avoided Penalty (yr)	% Of 30% Recommended Target Cycle 2
	off temperature reset								
5.2.5	Replace the atrium lighting with LED fixtures	$43,900	$1,400	30.8	< 1%	1%	$22,300	15.2	1%
Deep Energy Retrofit									
5.3.1	Install solar PV panels on the roof	$114,400	$7,900	14.5	1%	4%	$123,600	Immediate	3%
5.3.2	Replace fan powered boxes with VRF fan coils	$8,927,500	$211,400	42.2	25%	102%	$2,600,000	29.9	85%

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Conclusion

[redacted] has the potential to reduce energy use to a level that will comply with BEPS-1 and potentially comply with BEPS-2 through measures that do not include major retrofits of existing systems. Through effective implementation of EEMs and ongoing attention to operational details, [redacted] should be able to achieve an Energy Star Score in the range of 74 or higher. We expect that this shold be sufficient for BEPS-2 compliance, but given the overall long-term goals of the BEPS program, we are less certain that it will be sufficient from compliance beyond BEPS-2.

To better ensure compliance beyond BEPS-2, a major system upgrade such as a conversion to VRF would be required. However, given this measure's estimated costs, we only recommend pursuing this measure if it is part a larger whole-building rennovation and retrofit project.

This report provides a basis for developing an action plan for [redacted] to reduce energy use and comply with BEPS. Some measures can be undertaken right away. However, full implementation for some of the measures requires additional analysis and planning prior to implementation. The next steps in this process are to select measures to implement and develop specific plans for implementing them.

2 BEPS Compliance and Implementation Planning

Under BEPS regulations, [redacted] will have to select a BEPS compliance pathway and **submit this to** DOEE **for no later than April 1, 2023**. The compliance options and how the EEMs identified in this report might enable [redacted] to meet their requirements are discussed in the following sections.

The presented savings and energy use reductions are based on operational and engineering assumptions. Actual conditions and results will vary and may be lower or higher than the values shown here. In addition, due to inter-dependence of some measures, the realized energy savings when implementing multiple measures will not necessarily equal the sum of the individual measures. Hence, it is recommended that further detailed engineering analysis of groups of measures be conducted once specific measures are selected for implementation. In addition, it is recommended that measures be implemented as quickly as possible and that the resulting changes in energy use be closely evaluated.

2.1 BEPS Compliance Pathway Options

Under BEPS, properties that do not meet the current standard enter a compliance cycle during which they take steps to reduce building energy use. For [redacted], based on the published regulations[8], *Building Energy Performance Standards Compliance and Enforcement Guidebook for* Compliance *Cycle 1*, and based on [redacted]'s 2019 Energy Star Score, the property has three compliance pathway options for BEPS-1 that are summarized below and discussed in more detail in section 2.3.

- **Performance Pathway** – The property achieves a 20% reduction in site EUI, demonstrated by a decrease in energy use from the beginning of the Compliance Cycle (based on the average of 2018 and 2019 site energy use) to the end of the Compliance Cycle (based on 2026 site energy use), assuming that [redacted] follows the allowed one-year delay due the COVID-19 Public Health emergency for BEPS-1.

- **Standard Target Pathway** – The property increases its Energy Star score to the level established as the BEPS for the applicable BEPS Period in 2026, assuming that ADA follows the allowed one-year delay due the COVID-19 Public Health emergency for BEPS-1.

- **Prescriptive Pathway** – The Property must successfully complete specific actions agreed to with the DC Department of Energy and Environment (DOEE)

[8] Chapter 35, GREEN BUILDING REQUIREMENTS, of Title 20 DCMR, ENVIRONMENT adopted November 1, 2021

and meet reporting/verification requirements as defined by DOEE. The agreed to actions will include one or more recommended EEMs designed to achieve energy savings comparable to the Performance Pathway. The draft rules indicate that the agreed to actions (EEMs) must target a minimum of 25% in Site EUI savings.

We recommend selecting either the Standard Target or Performance Pathways because there are sufficient EEM options available to meet the requirements of either of these two pathways. These pathways also provide the most autonomy for the [redacted] with respect regulatory requirements and reporting. The Prescriptive Pathway may also be an option, but that would be contingent on the DOEE agreeing to a package of measures that would list total 25% savings in accordance with their guidelines and review procedures.

2.2 Measure Selection, Staging and Implementation

2.2.1 Measures Recommended for Immediate Implementation

We recommend first implementing the EEMs listed in Table 3. These measures reliably reduce energy demand, have reasonable payback periods, and are easily implemented without a significant level of additional engineering or analysis being done. Furthermore, they are not likely to be made obsolete by future measures or their estimated costs are low enough that being overridden by future measures would be acceptable.

Implementation of the measures listed in Table 3 is projected to yield an estimated site energy reduction of 23% (accounting for interactive effects of combining measures). This is above the required 20% reduction of the Performance and Standard Target Pathways. It is below the 25% site EUI savings required to pursue the Prescriptive Pathway option. Furthermore, the impacts of these measures could be evaluated within the next 12 – 18 months and provide additional opportunity to evaluate the property's compliance options if the expected energy savings are not realized.[9]

[9] These savings assume that major retrofit measures such as upgrading the building HVAC system are not implemented. In some cases, implementing other retrofits may reduce the direct savings realized from these measures by reducing the overall building energy demand.

Table 3. EEMS recommended for immediate implementation.

Measure Description	Net Measure Cost	Cost Savings	% Of Site Energy	Estimated BEPS fine reduction potential[10]	Simple Payback w/o BEPS (years)	Simple Payback w/ BEPS (years)
For new tenant fit outs upgrade the lighting from fluorescent to LEDs	-	$100	< 1%	$1,700	Immediate	Immediate
Replace stairway lighting with dual dimming occupancy-based LED lighting fixtures	$14,200	$1,000	< 1%	$15,900	13.9	Immediate
Install 1.0 GPM aerators in the bathroom faucets	$800	$8,700	1 %	$135,800	Immediate	Immediate
Adjust the AHU schedule to match building occupancy	-	$40,700	5%	$635,200	Immediate	Immediate
Adjust the garage schedule to match building occupancy	-	$7,600	< 1%	$119,100	Immediate	Immediate
Modify the BMS to have static pressure reset on the AHUs	$2,700	$27,800	3%	$434,500	Immediate	Immediate
Modify the BMS to have supply air temperature reset on the AHUs	$6,500	$77,500	9%	$1,210,400	Immediate	Immediate
Install timers on water cooler compressors to turn the compressors off during off hours	$1,800	$6,600	< 1%	$103,800	0.3	Immediate
Install timers on domestic water heaters	$1,000	$21,700	3%	$339,500	Immediate	Immediate
Install occupancy sensors in the corridor lighting	$36,800	$2,500	< 1%	$39,500	14.5	Immediate
Install Occupancy Sensors in the Parking Garage to turn OFF lights when the space is unoccupied	$26,400	$21,000	3%	$328,000	1.3	Immediate
Total / Combined	$90,200	$192,700	26% / 23%	$2,600,000	0.5	Immediate

[10] Assumes that maximum potential penalty is $2,668,400 and that project follows the Standard Target Pathway.

2.2.2 Measures Recommended for Near-Term Implementation

To further improve [redacted] Energy Star Score and better position the property for future BEPS compliance or to pursue compliance via the Prescriptive Pathway, we recommend adding the measures shown in Table 4. These measures will require some minor engineering and specification work to be done prior to implementation.

We project that the combination of the measures listed in Table 3 and Table 4 will provide site energy savings of just over 30%, which accounts for interactive effects. If projected savings are realized, they are projected to result in an Energy Star Score of 79, which would qualify the building to be Energy Star Certified and position the property for longer term BEPS compliance.

Table 4. Additional Recommended EEMS for BEPS-1 Compliance.

Measure Description	Net Measure Cost	Cost Savings	% of Site Energy	Estimated BEPS fine reduction potential	Simple Payback w/o BEPS (years)	Simple Payback w/ BEPS (years)
Install Garage Fan VFDs	$80,100	$26,900	3%	$419,900	3.0	Immediate
Install VFDs on the condenser water system Pumps and control based off temperature reset	$56,300	$34,700	4%	$541,900	1.6	Immediate
Replace the atrium lighting with LED fixtures	$29,100	$1,500	< 1%	$22,300	20.4	4.8
Total / Combined	$180,300	$62,600	7.6% / 7.5%	$977,800	2.9	Immediate

3 Project description

[redacted] is a 14-story, 370,757 ft^2 commercial office building consisting of 266,840 ft^2 of office space and 103,917 ft^2 garage space.[11] The building was built in 2001 and is located at [redacted] Washington, DC 20006.

In recent years, the following studies and system upgrades took place:

- Lighting has been replaced with LED throughout the building except for the 9th Floor. All future tenant spaces will be outfitted with LED lights.
- Water source Heat pumps serving Retail are believed to have been added during tenant fit out, but are not reflected in the base building drawings.

3.1 Building Envelope

Based on project documentation and drawings, the building's exterior walls are made up of a curtain wall system with a spandrel section including a 1 ¼" Stone, a 3" semi-rigid insulation, an air gap and a 1" foil faced fiberglass insulation. The estimated Total R-Value for the spandrel section is R-23. The exterior wall area is approximately 21,590 SF.

The Roof is a built-up roof with pavers on a 3" Rigid insulation with an R-11 on top of an 8" roof slab. The Roof Area is approximately 26,896 SF.

The windows are made up of a curtain wall system with double-Pane glazing with aluminum framing throughout the building. Storefront windows are mainly used on the ground floor. The estimated assembly U-Value and Solar Heat Gain Coefficient for the windows is 0.56 Btu/h·ft^2·°F of 0.66.

3.2 HVAC

3.2.1 Heating / Cooling

The property's HVAC system is comprised of two TRANE CVHF 485-ton centrifugal chillers and three cooling towers. Two 450-ton cooling towers are serving the main chiller plant and the third cooling tower is serving the commercial condenser loop that serves multiple water source heat pumps (WSHPs). WSHPs provide heating and cooling to individual spaces including retail, lobbies, and conference rooms.

Primary cooling, and ventilation are provided by two air handling units (AHUs) located in the penthouse, serving the east and west sides of the building. Individual zones are

[11] For benchmarking and calculating energy use intensity, only the non-garage area is considered.

conditioned by fan powered boxes with electric heating coils for zone-level heating, cooling, and ventilation.

3.2.2 Ventilation and Exhaust

Outdoor air is provided by AHU-1 and AHU-2. Fresh Air is about 16% of the total AHUs capacity.

AHU-1 has a capacity of 135,000 CFM with 21,875 CFM of outside air.

AHU-2 has a capacity of 96,600 CFM with 15,640 CFM of outside air.

Exhaust is provided at the main air handling units in addition to exhaust fans serving the garage, toilet, and atrium.

3.3 Building Automation System (BAS) / Controls

The building has a Siemens Insight Direct Digital Controls system with Apogee controllers in use. Primary HVAC systems are controlled or monitored by a Direct Digital Control System.

3.4 Domestic Hot Water

The facility’s domestic hot water (DHW) is currently provided by two A.O Smith Electric Water Heaters with 80 and 50-gallons storage tanks. DHW is not recirculated.

The DHW heater was observed to be in fair condition. The DHW supply temperature is 130°F.

3.5 Lighting

As observed during the site visit, interior lighting has been retrofitted from fluorescent to LED for new tenant fit outs. The atrium lighting is halogen. The 9th floor was vacant during the site visit and will also be retrofitted with LEDs.

Lighting is mainly controlled by manual switches. The assumption is that the building has no occupancy sensors and/or Daylight harvesting as part of the current lighting system.

Exterior lighting is provided on the roof while entrance lighting is provided by street poles.

3.6 Process, Plug Loads, and Conveyance

3.6.1 Power Density

The building is a typical office, with office equipment as expected: Laptop computers, desktop computers, screens, printers, kitchen equipment, etc. Typical plug loads for offices were used for the energy simulation. Simulation results were compared to the actual building electricity consumption to establish reasonableness.

3.6.2 Elevators

Six geared traction elevators serve the entire building. They were observed to be clean, in proper working order, provided smooth, quiet operation, and appeared sufficient for the typical traffic.

3.7 Operations & Maintenance (O&M) Procedure Review

The spaces are currently used as intended: office space, lobbies/lounges, restrooms, parking, etc. All spaces are kept neat and tidy. Regular operations and maintenance were indicated to be in place and routine repairs are made as needed.

4 Energy Consumption

4.1 Data Summary

This section provides the analysis of the building's energy data. The calculations and analysis given in this report are taken from data provided by the building staff and from national building databases.

4.2 Rate Structure

The building's only metered utility is electricity. Electricity is metered via three meters as reported in portfolio Manager.

Electricity supply (generation) and transmission are provided by WGL Energy Svcs and distribution at the local level is provided by PEPCO. In 2019, WGL Energy Svcs provided electricity under the rate structure at a base rate of $0.06975 per kWh. PEPCO's demand charges were $11.88 per kW. However, PEPCO charges include adjustments, credits, and additional fees that impact the effective cost of electricity. For this audit, the average effective rate for electricity used in EEM calculations is $0.13/kWh. This was calculated from the provided utility bills and excludes fixed charges, late fees, and other non-demand related charges.

There is no onsite generation from renewables. The rates for electricity were calculated from the information provided in 2019 Utility Bills. Based on these rates, Baumann estimates the total utility costs to be between $801,600 and $886,000 annually. Effective rates were calculated excluding fixed charges, demand charges and taxes and are used to calculate potential savings resulting from EEM implementations.

Table 6. 1725 I ST Meter Summary 2019

Utility	Demand Charges	Total Charge	Effective Rate
Electricity	11.88 per kW	$0.14/kWh	$0.13/kWh

4.3 Seasonal Energy Use Assessment

Figure 3 shows the monthly electricity use versus the average outside temperature from 2018 - 2019. Electricity use variation relative to outside temperatures is consistent though the shoulder months between 50F and 60F and increases non-linearly over the winter and summer months.

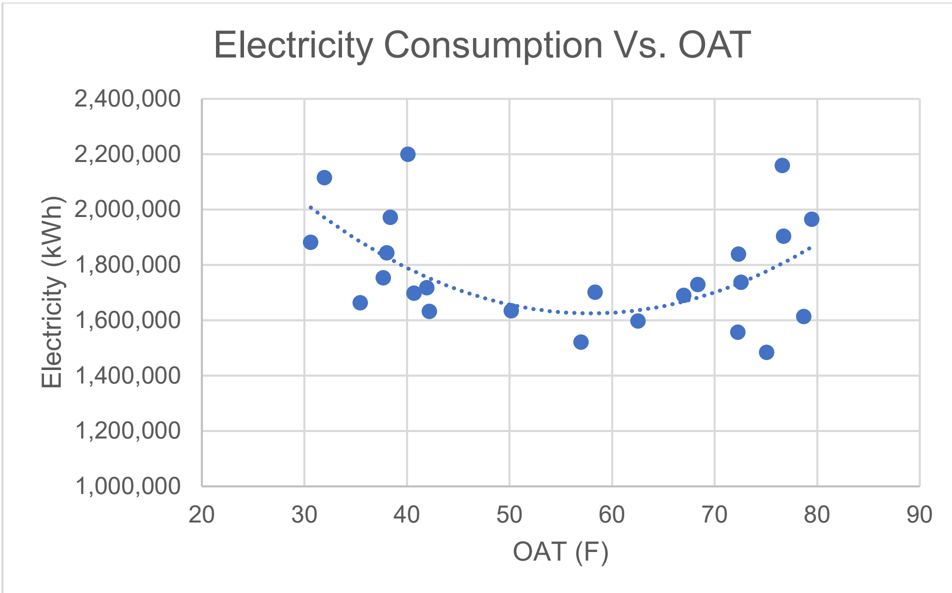

Figure 2. Electricity Use versus Average Monthly Temperature 2018-2019

4.4 End-Use Consumption Breakdown

The end use consumption breakdown was estimated for the entire building based on the energy simulation run in RETScreen. This simulation was calibrated to match actual building energy consumption.

As shown in **Figure 4**, Air Distribution is the largest end use category. Lighting energy is the next biggest end use, followed by Heating and Cooling and Water Distribution. This breakdown shows that EEMs that reduce demand for Fans, Lighting, Heating, Cooling and Water Distribution will have the largest potential in terms of reducing overall energy use.

The demand for fan energy could be reduced significantly by implementing EEMs that reduce heating and cooling loads and by implementing VFD controls and reset strategies that reduce fan speed, which in turn reduces power consumption and results in significant energy savings. The same applies for pumps as VFDs on pumps will considerably reduce water distribution energy. According to the Affinity Laws, lower Fan or Pump motor speed equals less energy consumption. For example, slowing a Fan or Pump to 80% of its original speed will decrease the energy consumption by 50%. Lighting energy must also be reduced by implementing EEMs that reduce lighting levels using occupancy sensors.

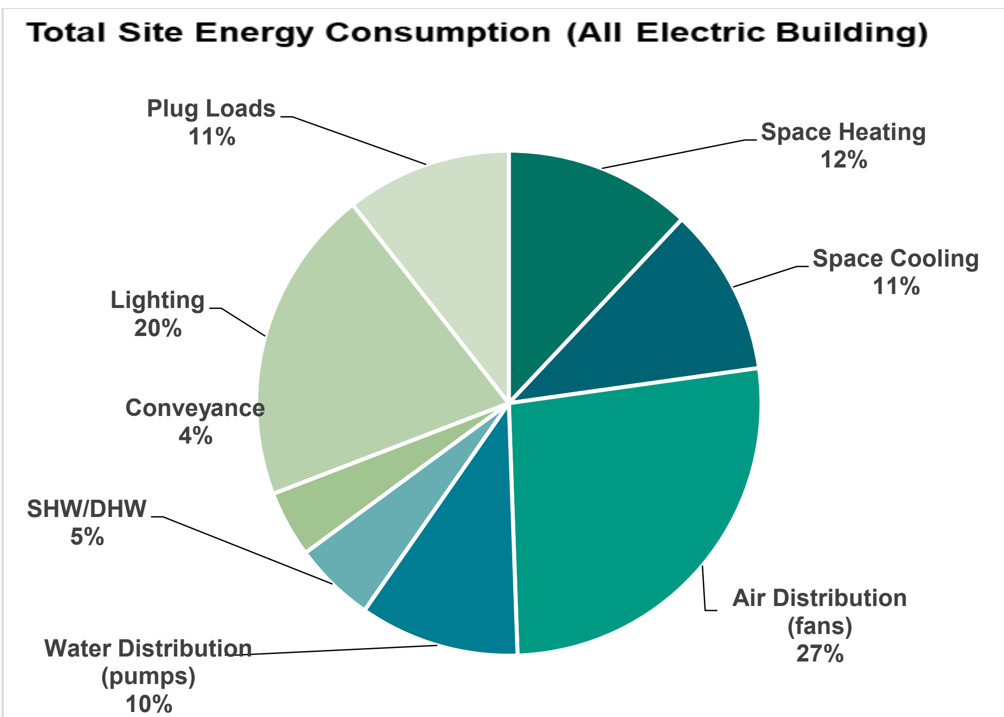

Figure 3. Site Energy Consumption Breakdown

5 Energy Efficiency Measures

Based on the data and observations collected during the walk-through, documentation review, and subsequent analyses, Baumann Consulting identified the following energy efficiency measures (EEMs) to lower energy and operating costs, improve occupant comfort, and increase sustainability. In Table 7, EEMs are broken into No or Low-Cost, Capital Improvement, and deep energy retrofit measures. For this Energy Audit, Capital Improvement Measures are any measure with an estimated cost greater than $25,000. Since the building systems are relatively old, it is generally recommended to replace equipment that reached the end of its service life with new, more efficient equipment.

Not all recommended measures are stand-alone or independently functioning technical solutions. Some of the individual measures can be combined with others to optimize the use of resources. Other measures cannot be combined but will still provide energy reduction. A comprehensive technical system solution must be developed with all stakeholders involved.

Preliminary calculations were carried out to assess the value of each measure. The energy analysis software RETScreen Expert created by Natural Resources Canada was used to perform the calculations, as well as resources from the U.S. Environmental Protection Agency (EPA), the National Renewable Energy Lab (NREL), RSMeans construction cost data, and engineering calculations. The given costs and savings are estimates provided to aid with decisions and planning with respect to which EEMs should be further considered. Depending on the nature of the EEM, some may be implemented without further analysis while others may require a Level 3 Energy Audit or detailed design and engineering work. For all EEMs, final decisions should be based on contractor quotes and not solely on the cost estimates provided herein.

Table 7. Recommended Energy Efficiency Measures.

Measure Description	Annual Energy and Cost Savings			Payback with Incentive		
	Energy Cost Savings	Electricity (kWh)	Potential Incentives	Net Measure Cost	Simple ROI	Simple Payback (yr)
Low-Cost and No-Cost Recommendations						
For new tenant fit outs upgrade the lighting from fluorescent to LEDs	$100	700		-	immediate	-
Replace stairway lighting with dual dimming occupancy-based LED lighting fixtures	$1,000	6,800		$14,200	7%	13.9
Install 1.0 GPM aerators in the bathroom faucets	$8,700	57,800		$800	1115%	0.1
Adjust the AHU schedule to match building occupancy	$40,700	270,200		-	immediate	-
Adjust the garage schedule to match building occupancy	$7,600	50,700		-	immediate	-
Modify the BMS to have static pressure reset on the AHUs	$27,800	184,800		$2,700	1019%	0.1
Modify the BMS to have supply air temperature reset on the AHUs	$77,500	514,900		$6,500	1192%	0.1
Install timers on water cooler compressors to turn the compressors off during off hours	$6,600	44,200		$1,800	365%	0.3
Install timers on domestic water heaters	$21,700	144,400		$1,000	2090%	0.0
Potential Capital Recommendations						
Install occupancy sensors in the corridor lighting	$2,500	16,800		$36,800	7%	14.5
Install Occupancy Sensors in the Parking Garage to turn OFF lights when the space is unoccupied	$21,000	139,500		$26,400	80%	1.3
Install Garage Fan VFDs	$26,900	178,600		$80,100	34%	3.0
Install VFDs on the condenser water system Pumps and control based off temperature reset	$34,700	230,500		$56,300	62%	1.6
Replace the atrium lighting with LED fixtures	$1,400	9,500		$43,900	3%	30.8
Deep Energy Retrofit						
Install solar PV panels on the roof	$7,900	52,600		$114,400	7%	14.5
Replace fan powered boxes with VRF fan coils	$211,400	1,404,600		$8,927,500	2%	42.2

5.1 Low-Cost Energy Efficiency Measures

5.1.1 For new tenant fit outs upgrade the lighting from fluorescent to LEDs

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$100	1.0	800	3	0	-	-

Area of Improvement

During the site visit, it was observed that some tenant spaces were vacant and have fluorescent lighting.

Baseline Assumptions

The Baseline reflects fluorescent lighting and was modeled with a lighting power density (LPD) assumption of 0.82 W/SF per ASHRAE 90.1-2013.

Proposed Measure

According to conversations with the chief engineer, new tenant fit outs are required to be LED lighting per the lease agreements. We include this measure for quantitative evaluation only. However, lighting schedules were limited to two hours per day to keep savings very minimal so that total energy and cost savings are not over estimated. This measure has only been applied to the 9th floor. The Proposed LPD was reduced form 0.82 W/SF to 0.78 W/SF to match rest of the building

The savings potential above is solely based on energy savings through LED lighting.

The Net Measure Cost is not calculated as this measure is required per the lease agreement.

Next Steps

- Ensure all future tenants install LED per lease agreement.
- Ensure that lighting in vacant tenant areas is Always OFF.

5.1.2 Replace stairway lighting with dual dimming occupancy-based LED lighting fixtures.

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$1,000	1.5	7,350	25	2	$14,170	13.9

<u>Area of Improvement</u>

During the site visit, it was observed that the stairway lighting is LED type. However, the fixtures do not have integral occupancy sensors.

<u>Baseline Assumptions</u>

The Baseline does not include occupancy sensors and stairway lighting is ON for 24 Hours.

<u>Proposed Measure</u>

Replace the stairway lighting fixtures with dual dimming occupancy-based LED lighting fixtures.

The savings potential above is solely based on energy savings through occupancy sensors which assumes a 50% reduction on stairway lighting due to occupancy sensors.

The Net Measure Cost assumes 28 occupancy-based LED lighting plus labor.

<u>Next Steps</u>

- Evaluate the stairways lighting and select the appropriate dual dimming occupancy-based LED lighting fixtures type and quantity.

5.1.3 Install 1.0 GPM aerators in the bathroom faucets

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$8,700	7	63,000	215	20	$800	0.1

Area of Improvement

During the site visit, it was observed that bathroom faucets are not low flow rated.

Baseline Assumptions:

Bathroom faucets in the Baseline model are assumed to be standard fixtures.

Proposed Measure

Install 1.0 GPM aerators in the bathroom faucets to reduce hot water demand, water heater and pumping energy.

The savings potential above is solely based on reduced hot water demand.

The Net Measure Cost assumes 70 X 1.0 GPM aerators for the building and includes labor.

Next Steps

- Evaluate and select the appropriate type and quantity of aerators for the bathroom faucets.

5.1.4 Adjust the AHUs' schedule to match the building occupancy schedule.

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$40,700	250	294,700	1,00	93	None	Immediate

Area of Improvement

During the site visit, it was observed that AHU-1 and AHU-2 are scheduled to turn ON at 3 am and OFF at 6 pm (15 Hours).

Baseline Assumptions:

AHU-1 and AHU-2 are assumed to be ON for 15 Hours per day.

Proposed Measure

Adjust the AHUs schedule to match the building occupancy schedule for the building to reduce energy consumption during unoccupied hours.

The savings potential above is solely based on energy savings through reduced AHUs' schedule by adjusting the BMS to reflect a 12 hours ON schedule for the AHUs instead of 15 hours.

The Net Measure Cost is not calculated as this is a No Cost energy efficiency measure.

Next Steps

- Evaluate the BMS and adjust AHUs' schedule to be ON for 12 hours.

5.1.5 Adjust the garage Fan schedule to match the building occupancy schedule.

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$7,600	46	55,250	189	18	-	-

Area of Improvement

During the site visit, it was observed that the garage fans are scheduled to turn ON /OFF based on perceived transient times i.e., when the building engineer anticipates personnel arriving and leaving the garage at certain times of the day.

Baseline Assumptions

Garage Fans are assumed to be ON for 15 Hours per day.

Proposed Measure

Adjust the garage Fan schedule to match the building occupancy schedule for the building to reduce energy consumption during unoccupied hours.

The savings potential above is solely based on energy savings through reduced garage Fan schedule by adjusting the BMS to reflect 12 hours ON schedule for the garage fans instead of 15 hours.

The Net Measure Cost is not calculated as this is considered to be a “No Cost Measure.”

Next Steps

- Evaluate the BMS and adjust garage Fan schedule to be ON for 12 hours.

5.1.6 Modify the BMS to have static pressure reset on the AHUs.

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$56,500	228	409,000	1,400	130	$2,730	0.0

Area of Improvement

During the site visit, it was observed that the Powers Process Control Language (PPCL) program did not include a reset-schedule for the duct static pressure on AHU-1 and AHU-2.

Baseline Assumptions

AHU-1 and AHU-2 do not include a reset-schedule for duct static pressure.

Proposed Measure

Modify the BMS to include static pressure reset for AHU-1 and AHU-2 to reduce energy consumption.

The savings potential above is solely based on energy savings through an assumption of 30% Reduction on supply air flow, based on documented studies[12].

The Net Measure Cost assumes that 2 static pressure sensors are required for this measure and includes labor.

Next Steps

- Evaluate the BMS and acquire duct static pressure sensors as required.
- Evaluate the BMS and include a reset-schedule for the duct static pressure for AHU-1 and AHU-2.

[12] A study on static pressure reset and instability in variable air volume HVAC systems https://core.ac.uk/download/pdf/38924264.pdf

5.1.7 Modify the BMS to have supply air temperature reset on the AHUs.

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$77,500	111	561,500	1,900	178	$6,500	0.1

Area of Improvement

During the site visit, it was observed that the Powers Process Control Language (PPCL) program did not include a reset-schedule for supply temperature on AHU-1 and AHU-2.

Baseline Assumptions

AHU-1 and AHU-2 do not include a reset-schedule for supply air temperature.

Proposed Measure

Program the BMS to include supply air temperature reset (SATR) for AHU-1 and AHU-2 to reduce energy consumption.

The savings potential above is solely based on energy savings through an assumption of 15.6% Reduction on Total HVAC Site energy, based on a PNNL study[13].

Total HVAC Site energy = 3,300,670 kWh

SATR Savings = 514,904 kWh

The Net Measure Cost is not calculated as this is considered to be a “No Cost Measure.”

Next Steps

- Evaluate the BMS and include a reset-schedule for supply air temperature for AHU-1 and AHU-2.

[13] Energy Savings Modeling of Standard Commercial Building Retuning Measures: Large Office Buildings https://buildingretuning.pnnl.gov/documents/pnnl_21569.pdf

5.1.8 Install timers on water cooler compressors to turn the compressors off during OFF hours.

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$6,650	10	48,200	164	15	$1,820	0.3

Area of Improvement

During the site visit, it was observed that there are water coolers on every floor.

Baseline Assumptions

Water cooler compressors are ON for 24 hours.

Proposed Measure

Install timers to turn OFF water cooler compressors during unoccupied hours.

The savings potential above is solely based on energy savings through reduced cooler compressor schedule by installing timers to reflect a 12 hours ON schedule for the cooler compressors instead of 24 hours.

The Net Measure Cost assumes 28 Plug-in Digital Timer Switches plus labor.

Next Steps

- Evaluate the water coolers and select the appropriate Plug-in Digital Timer Switches type and quantity to turn the coolers OFF when the building is unoccupied.

5.1.9 Install timers on domestic water heaters.

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$21,750	33	157,490	537	50	$1,040	0.0

Area of Improvement

During the site visit, it was observed that there are two domestic water heaters that appear to be ON for 24 hours.

Baseline Assumptions

Domestic water heaters are ON for 24 hours.

Proposed Measure

Install timers to turn OFF domestic water heaters during unoccupied hours.

The savings potential above is solely based on energy savings through reduced domestic water heater schedule by installing timers to reflect 12 hours ON schedule for DWHs instead of 24 hours.

The Net Measure Cost assumes 2 Domestic Water Heater Timer plus labor.

Next Steps

- Evaluate the domestic water heaters and select the appropriate Domestic Water Heater Timer type and quantity to turn the domestic water heaters OFF when the building is unoccupied.

5.1.10 Install Occupancy Sensors in the Parking Garage to turn OFF lights when the space is unoccupied

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$21,000	32	152,200	519	48	$26,400	1.3

Area of Improvement

During the site visit, it was observed that garage lights have been retrofitted with LED tube replacements but are ON 24/7. i.e., garage lighting is not controlled to turn OFF when the space is unoccupied.

Baseline Assumptions:

Garage lighting in the Baseline model is assumed to be ON for 24 hours.

Proposed Measure

Install occupancy sensor to turn garage lighting OFF when the space is unoccupied.

The savings potential above is solely based on energy savings through reduced garage lighting schedule by installing occupancy sensors.

The Net Measure Cost assumes 98 occupancy sensors with 1 Sensor per 1,000 SF and includes labor.

Next Steps

- Evaluate the garage lighting system and select the appropriate type and quantity of occupancy sensors to turn the lights OFF when the space is unoccupied.

5.1.11 Install occupancy sensors in the corridor lighting.

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$2,550	4	18,350	63	6	$36,800	14.5

<u>Area of Improvement</u>

During the site visit, it was observed that the corridor lighting did not have occupancy sensors.

<u>Baseline Assumptions:</u>

Corridor lighting in the Baseline model is assumed to be ON for 12 Hours.

<u>Proposed Measure</u>

Install occupancy sensor to turn corridor lighting OFF when the space is unoccupied.

The savings potential above is solely based on energy savings through reduced corridor lighting schedule by installing occupancy sensors.

The Net Measure Cost assumes 140 occupancy sensors with 1 Sensor every 20 Feet and includes labor.

<u>Next Steps</u>

- Evaluate the corridor lighting system and select the appropriate type and quantity of occupancy sensors to turn the lights OFF when the space is unoccupied.

5.2 Capital Improvement Energy Efficiency Measures

5.2.1 Install Garage Fan VFDs

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$26,900	33	194,800	665	62	$80,100	3.0

Area of Improvement

During the site visit, it was observed that the garage fans are turned on/off based on perceived transient times i.e., when the building engineer anticipates personnel arriving and leaving the garage at certain times of the day.

Baseline Assumptions

Garage ventilation in the Baseline model is assumed to be ON for 15 Hours per day with Fans running at a constant speed using 6 X (3 HP) Supply Fans and 7 X (5 HP) Exhaust Fans.

Proposed Measure

Install VFDs on garage Supply and Exhaust Fans and provide CO/N2O sensors to monitor the parking for unsafe levels of CO/N2O gases. This system would only engage when CO or N2O levels approach unsafe levels.

The savings potential above is solely based on energy savings through reduced fan speed and operation by implementing VFDs on Supply and Exhaust Garage Fans.

The Net Measure Cost assumes 20 X (CO/N2O) Sensors with 1 Sensor per 5,000 SF and 13 VFDs for Supply and Exhaust Fans and includes labor.

Next Steps

- Evaluate the garage ventilation and select the appropriate type and quantity of VFDs and CO/N2O monitoring system.

5.2.2 Install VFDs on the condenser water system and control based off temperature reset

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$34,690	91.5	251,400	858	80	$56,290	1.6

Area of Improvement

During the site visit, it was observed that both the standard and commercial condenser water pumps are running at constant speed and do not control for system diversity.

Baseline Assumptions

The Baseline does not include VFDs on condenser water pumps.

Proposed Measure

Install VFDs on the condenser water pumps and program the BMS to reset the pumps' speeds based on return temperature and system diversity to maximize energy efficiency.

The savings potential above is solely based on energy savings through Variable Frequency Drives on condenser water pumps.

The Net Measure Cost assumes 4 VFDs for the condenser water pumps and includes labor.

Next Steps

- Evaluate the condenser water system and select the appropriate VFDs.

5.2.3 Replace the atrium lighting with LED fixtures

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$1,400	1.1	10,350	35	3	$29,100	20.4

Area of Improvement

During the site visit, it was observed that the atrium lighting is halogen.

Baseline Assumptions

The Baseline reflects halogen lighting fixtures. The lighting power density for the atrium is assumed to be 1 W/SF per ASHRAE 90.1-2016 allowance for decorative halogen lighting.

Proposed Measure

Replace the atrium lighting fixtures with LED to reduce energy consumption. The proposed LPD is assumed to save approximately 25% on Atrium lighting and was modeled as 0.77 W/SF.

The savings potential above is solely based on energy savings through LED lighting.

The Net Measure Cost assumes 56 X 4FT LED Light Bars. Labor, scaffolding, …etc are not included.

Next Steps

- Evaluate the atrium lighting and select the appropriate lighting fixtures type and quantity.
- Evaluate installation costs as required.

5.2.4 Install solar PV panels on the roof.

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$7,900	-	57,300	196	18	$114,400	14.5

Area of Improvement

During the site visit, it was observed that the roof has ample space for solar PV panels to be installed. In addition, with current prices for solar renewable energy credits (SRECS) payback for solar PV systems is short.

Baseline Assumptions

The Baseline does not include photovoltaic (PV) system.

Proposed Measure

Install a photovoltaic (PV) system to maximize on-site renewable energy production, which will help improve the building Energy Star Score.

The savings potential above is solely based on energy savings through on-site renewable energy production.

The Net Measure Cost assumes a 40 kW PV system at $2,100 per kW plus labor.

Next Steps

- Evaluate the roof space and select the appropriate PV System type, capacity and PV panels quantity to maximize the building on-site renewable energy production potential.

5.2.6 Replace fan powered boxes with Variable Refrigerant Flow (VRF) fan coils

Energy Cost Savings	Demand Savings (kW)	Electricity Savings (kWh)	Total MMBtu Savings	CO_2 Reduction (tons)	Net Measure Cost	Simple Payback (years)
$193,400	-	1,401,400	4,780	444	$8,927,500	46.2

Area of Improvement

During the site visit, it was observed that the primary heating source for the building is electric resistance. Resistive heating has an efficiency of 100% which is considered a low heating efficiency when compared with Heat Pumps. VRFs for example have an average COP between 3.7 and 4.2 which is very efficient when compared with resistive heating.

Baseline Assumptions

The Baseline reflects a Variable Air Volume (VAV) system with electric heating coils.

Proposed Measure

Replace the fan powered boxes with heat recovery VRF fan coil units to take advantage of VRF high efficiency and energy savings.

A heat recovery VRF has a higher efficiency than a standard VRF systems by taking heat from one space and redistributing it to another. It also has the capability to simultaneously heat and cool different zones in a building, which provides increased comfort to the occupant while reducing energy consumption.

For ventilation purposes, we recommend replacing the AHUs with Dedicated Outdoor Air System (DOAS) with sensible and latent heat recovery, and heat pump for heating and cooling. The DOAS unit filters and pre-conditions the ventilation air before it is delivered to the space. DOAS can either be ducted directly to the indoor VRF FCU or it can be decoupled. Further investigation will be required to assess the feasibility of this measure.

The savings potential above is solely based on energy savings through system replacement.

The Net Measure Cost assumes the following:

- 271 X Indoor Ducted, Concealed, Units - 3 tons
- 55 X Outdoor Units - 15 tons
- 28 X Isolation Rails - Pair

- 8,886 Ft of Refrigerant Piping
- 55 X Branch Controller
- VAV Demolition
- DOAS: Rooftop air conditioner, multizone, cool/heat, variable volume distribution, 90 ton cooling, includes, standard controls, curb and economizer
- 40,000 lbs of Duct Work for DOAS
- 195,000 lbs Ductwork for VRF

Next Steps

- Evaluate the building HVAC system for Retrofit with VRFs
- Perform design, sizing and equipment selection as required.
- Evaluate installation costs as required.

6 Next Steps

With respect to BEPS, we recommend that [redacted] develop an energy improvement plan for the property that identifies measures to be pursued, steps for measure implementation, expected timing, and an overall budget for implementing the plan.

The following high-level roadmap for next steps is recommended:

1. Set site and source energy reduction goals.
2. Review EEMs and categorize measures as ‘go’, ‘no-go’, or ‘maybe.’
3. Initiate implementation of low and no-cost measures as soon as possible (unless identified as no-go).
4. Evaluate the potential of measures categorized as ‘go’ or ‘maybe’ to meet energy reduction goals. Selected measures should be sufficient so that the projected reductions exceed the selected energy reduction goals to account for uncertainty. This step may require more in-depth assessment of the measures in the form of an ASHRAE Level 3 energy audit or engineering analysis and design work.
5. Select measures to implement and develop a project plan and timing for implementation.
6. Monitor progress in terms of ongoing energy use reductions. As needed, adjust plan to ensure that energy reduction goals are achieved.

The following key BEPS dates should be kept in mind:

- April 1, 2023 – Pathway Selection for BEPS-1 due to DOEE
- April 1, 2024 – Prescriptive Pathway Action Plan due to DOEE
- January 1, 2026 – BEPS-1 Evaluation Year Begins
- April 1, 2026 – Prescriptive Pathway Implementation Report due to DOEE
- December 31, 2026 – BEPS-1 ends; End of BEPS-1 Evaluation Year
- January 1, 2027 – BEPS-2 begins
- April 1, 2027 – Benchmarking for 2026 (BEPS-1 Evaluation Year) due to DOEE; Prescriptive Pathway Evaluation, Monitoring, and Verification Report due to DOEE
- Mid-2027 – BEPS-1 compliance is evaluated, and alternative compliance penalties are assessed.

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Revision History

Version	Date	Description
Original	10/21/22	First Report Issue

7 Appendices

7.1 ASHRAE 211 Annex A – Compliance Form

A. NORMATIVE ANNEX A COMPLIANCE FORM

Form A—Compliance with Standard 211					
Name of Facility	[redacted]				
Street Address	[redacted]				
City	Washington	State	DC	Zip Code	20006
Building Owner or Representative, Title, Affiliation: Borger					
Name of *qualified energy auditor*:	Scott Emery				
Street Address	1424 K St, NW				
City	Washington	State	DC	Zip Code	20005
Telephone No.	(202) 608-1334				
Qualifying Certification: Professional Engineer, VA					
Has the Preliminary Energy Use Analysis been completed? [X] Yes [ ] No					
Have the requirements of **Section 5** been met? [X] Yes [ ] No					
Have the requirements of **Section 6** been met? [X] Yes [ ] No					
Date the Level 1 Audit was completed.	05/23/2022				
Date the Level 2 Audit was completed.	October 21, 2022				
Date the Level 3 Audit was completed.	N/A				
I state that the attached Energy Audit Report complies with ANSI/ASHRAE Standard 211: Signature of *qualified energy auditor*: ______________________ Date: October 21, 2022 Signature of *Authority Having Jurisdiction*: Compliance ___________________________________ Date: ___________					

7.2 Level 2 Forms Annex C

7.2.1 Annual Fuel Summary

All Audit Levels - Annual Summary

Summary for Existing Building

user input
calculated

Imported Energy (E_{imp})

Energy Type	Total Annual Use*	Units	Conversion Multiplier	Thousands BTU (kBtu)	Total Annual Cost ($)
Electricity	6,030,871	kWh	3.412	20,577,334	$ 832,260
Natural Gas	-	therms	100	0	$ -
Purchased Steam	-	lbs District Steam	1.194	0	$ -
Purchased Hot Water	-	kWh	3.412	0	$ -
Purchased Chilled Water	-	MMBtu	1000	0	$ -
Oil	-	gallons (Fuel Oil #2)	139	0	$ -
Propane	-	gallons (Propane)	92	0	$ -
Coal	-	short ton (coal)	19622	0	$ -
			E_{imp} Total	**20,577,334**	**$ 832,260**

On-Site Renewable Energy Production (E_g)

Energy Type	Total Annual Use*	Units	Conversion Multiplier	Thousands BTU (kBtu)	Total Annual Cost ($)
On-Site Generated - Thermal	-	MMBtu	1000	0	$ -
On-Site Generated - Electricity	-	kWh	3.412	0	$ -
			E_g Total	**-**	**$ -**

Exported Energy (E_{exp})

Energy Type	Total Annual Use*	Units	Conversion Multiplier	Thousands BTU (kBtu)	Total Annual Cost ($)
Exported - Thermal	-	MMBtu	1000	0	$ -
Exported - Electricity	-	kWh	3.412	0	$ -
			E_{exp} Total	**-**	**$ -**
			E_S Total		*[if applicable]*

Existing Building EUI/ECI

Building Name	[redacted]
Gross Conditioned Square Feet	266,840
EUI_{BLD} (kBtu/sf/yr)	77.1
EUI_{SITE} (kBtu/sf/yr)	77.1
Site ECI (energy cost index or $/sf/yr)	$ 3.12

*EUI: Energy Use Intensity

Benchmarking & Target EUI/ECI

Benchmark Source	Energy Star	
Benchmark EUI (kBtu/sf)	76.7	
Target EUI_{BLD} (kBtu/sf)	61.5	Establish either an EUI or ECI target in consultation with building owner.
Target EUI_{SITE} (kBtu/sf)		
Target ECI_{SITE} ($/sf)		
Annual Energy Savings to Reach Target	4,166,674	kBTU
Annual Cost Savings to Reach Target		(if available)

Notes

7.2.2 Building Envelope Characteristics

Level 2 Audit - Building Envelope Characteristics

Total exposed above grade wall area	54,136	sq ft	Insulation level (R-value)	R-23
Below grade wall area	2,066	sq ft	Insulation level (R-value)	R-16
Roof area	26,896	sq ft	Insulation level (R-value)	R-12
Cool Roof (Y/N)	N			
Roof condition	Good			
Fenestration Seal Condition	Good			
Overall Enclosure Tightness Assessment	Medium Tight			
Description of Exterior doors**	Storefronts and Garage Rolling Door			

Cool Roof: Yes = White, not asphalt shingle; No = Other, including all asphalt shingles

Glazing area, approx % of exposed wall area [10, 25, 50, 75, 90, 100]*	69%
Above grade wall common area with other conditioned buildings (ft2)	16,987

General Building Shape*	Rectangular

Construction Properties (check all that apply)

Roof Construction*	Floor Construction*	Wall Construction(s)*
☐ Built up with metal deck	☑ Concrete (above unconditioned space)	☐ Brick/stone on steel frame
☑ Built up with concrete deck	☐ Slab on grade	☐ Brick/stone on masonry
☐ Built up with wood deck	☐ Steel joist	☐ Brick/stone on wood frame
☐ Metal surfacing	☐ Wood frame	☑ Metal panel / Curtain wall
☐ Shingles/Shakes	☐ Other	☐ Sliding on steel frame
☐ Other		☐ Sliding on wood frame
		☐ Other
Fenestration Frame Type(s)*	**Fenestration glass type(s)***	**Foundation Type***
☑ Metal	☐ Single pane	☐ Slab on Grade
☐ Metal with thermal breaks	☑ Double pane	☐ Crawlspace
☐ Wood/Vinyl/Fiberglass	☐ Double pane with low e	☑ Basement
☐ Exterior Glass Doors***	☐ Triple pane	☐ Unknown
☐ Other	☐ Triple pane with low e	☐ Other
	☐ Other	

* Cells shown with an asterisk are required inputs for the Asset Score tool.
** only necessary when doors in aggregate represent more than 5% of the gross wall area
*** Doors where glazing of door area exceeds 50% of total door area shall be treated as windows.
NOTE - R-values or U-values of the walls and roof are required, where it can be established with non-invasive methods. If they cannot be established through non-invasive methods, it is valid to enter "N/A" into the Insulation Level field.

NOTE- To provide additional details for building dimentions and glazing area, use tab 'Asset Score Inputs (optional)'

7.2.3 HVAC Systems

Level 2 Audit - HVAC System

HVAC Properties (check all that apply)

Zone Controls	☑ Direct Digital (DDC) ☐ Pnuematic ☐ Progammable tstats ☐ Manual tstats	**Central Plant Controls**	☑ Building Automation System (BAS) ☐ Direct Digital (DDC) ☐ Pnuematic ☐ Other
Outside Air*	☑ Temperature Economizer ☐ Enthalpy Economizer ☐ No Functioning Economizer ☐ Dedicated OA System	**Heat Recovery**	☐ Enthalpy ☐ Sensible (Temp Only)
Exhaust Fans	☐ No Mechanical Exhaust (natural only, i.e. windows, doors or gravity shafts) ☑ Exhaust Fans Only ☐ Supply and Exhaust Fans		
Cooling Distribution Equipment Type*	☑ Air Handler Unit (AHU) ☐ Constant Volume ☑ VAV ☐ Hydronic to zone equipment (e.g. fan coil units, packaged terminal units or radiators) ☐ Refrigerant to zone equipment (e.g. fan coil units, packaged terminal units or radiators) ☑ Hydronic AHU ☐ DX AHU ☐ Other ☐ None (i.e. electrically driven PTAC, baseboards)		
Heating Distribution Equipment Type*	☐ Air Handler Unit (AHU) ☐ Constant Volume ☑ VAV ☐ Hydronic to zone equipment (e.g. fan coil units, packaged terminal units or radiators) ☐ Steam to zone equipment (e.g. fan coil units, packaged terminal units or radiators) ☐ None (i.e. electrically driven PTAc, baseboards) ☐ Other		
Cooling Source*	☐ No cooling ☐ DX cooling ☐ Central plant ☑ Chiller ☐ District chilled water ☐ Water-side Economizer ☐ Other (specify) ____________	**Chiller Input***	☑ Electricity ☐ Gas Absorption ☐ Gas ☐ Steam Absortion ☐ Oil (specify grade) ☐ Steam Turbine ☐ Other
		Compressor*	☐ Reciprocating ☐ Scroll/Screw ☑ Centrifugal ☐ Other
		Condenser*	☐ Air ☑ Water ☐ Ground ☐ Indirect Evaporative ☐ Direct Evaporative
Heating Source*	☐ No heating ☐ Central furnace ☐ Heat pump ☐ Central plant ☐ District steam or hot water ☑ Other (specify) Electric VAV	**Heating fuel***	☑ Electricity ☐ Gas ☐ Oil (specify grade)________________ ☐ Other
		Boiler Type*	☐ Steam boiler ☐ Forced draft ☐ Hydronic boiler ☐ Other Draft Type
SHW/DHW Source*	☐ No DHW ☐ Indirect fired ☐ Storage ☐ Instantaneous ☐ Direct fired ☐ Storage ☐ Instantaneous ☐ Heat pump ☑ Other	**SHW/DHW fuel***	☑ Electricity ☐ Gas ☐ Oil (specify grade) ______________ ☐ Other: ________________________

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7.2.4 Equipment Inventory

Level 2 Audit - Equipment Inventory

Inventory of equipment
The equipment inventory below shall include equipment that represents, in aggregate, 80% or more of the energy use allocated to HVAC & SHW/DHW in the end-use allocation

ID	Description	Location	Area/System Served	Type	Rated efficiency (as applicable)	Output Capacity	Units	Approx Year Installed	Condition (excellent, good, average, poor)
1	AHU-1 & 2	Roof / Penthouse	Offices	VAV	-	AHU-1: 135,000 CFM AHU-2: 96,600 CFM	CFM	2001	Average
2	Chiller-1 & 2	Mechanical Room	AHU-1 & 2	Centrifugal	0.614 kW/ton	490 x 2	ton	2001	Average
3	AC/L - Water Source Heat Pumps	B-1 Level Mechanical Room	Lobby	WSHP	COP = 2.31 EER = 8.52	411 MBH Total (275 MBH Sensible) 9,000 CFM	MBH / CFM	2001	Average
4	EMR-AC1 - Water Source Heat Pumps	B-1 Level Mechanical Room	Conference	WSHP	COP = 2.31 EER = 8.52	124 MBH Total (86.6 MBH Sensible) 4,000 CFM	MBH / CFM	2001	Average
5	Water Source Heat Pumps	B-1 Level Mechanical Room	Retail	WSHP	COP = 2.31 EER = 8.52	29.5	ton	2001	Average
6	2 x WH-1 - Domestic Water Heater	Mechanical Room	Offices	Electric Domestic Hot Water Heater	80%	24	kW	2001	Average

7.2.5 Lighting, Electrical, & Plug Loads

Level 2 Audit - Lighting, Electrical, & Plug Loads

(group by lighting types / fixtures that collectively make up the largest fraction of gross floor area)

Lighting Source Type(s)	Ballast Type(s)	Control(s)	Space Type(s)*	Approx % Area Served
LED	N/A	BAS	Offices	90
Fluorescent T5/High output T5	Electronic	Manual	9th Floor	10

Major Process/Plug Load Type(s)**	Key Operational Details***
Computers	365 Watts each X 376 @ 33% Duty Cycle
Refrigerators	450Watts each X 20 @ 46% Duty Cycle
Coffee Maker	1165 Watts each X 20 @ 5% Duty Cycle
Photocopier	300 Watts each X 20 @ 10% Duty Cycle
Water Cooler	1000 Watts each X 28 @ 50% Duty Cycle

* e.g., Office, hallways, mechanical spaces, exterior, etc.
** e.g., Computers, Walk-in freezers, hydraulic press, etc.
***Describe approximate connected load, operating schedule, and other key parameters, where available

7.3 EEM Summary

Measure Description	Energy Cost Savings	Electricity Savings (kWh)	Measure Cost	Simple ROI	Simple Payback (yr)
Low-Cost and No-Cost Recommendations					
For new tenant fit outs upgrade the lighting from fluorescent to LEDs	$ 100	700	$ -	immediate	-
Replace stairway lighting with dual dimming occupancy-based LED lighting fixtures	$ 1,000	6,800	$ 14,200	7%	13.9
Install 1.0 GPM aerators in the bathroom faucets	$ 8,700	57,800	$ 800	1115%	0.1
Adjust the AHU schedule to match building occupancy	$ 40,700	270,200	$ -	immediate	-
Adjust the garage schedule to match building occupancy	$ 7,600	50,700	$ -	immediate	-
Modify the BMS to have static pressure reset on the AHUs	$ 27,800	184,800	$ 2,700	1019%	0.1
Modify the BMS to have supply air temperature reset on the AHUs	$ 77,500	514,900	$ 6,500	1192%	0.1
Install timers on water cooler compressors to turn the compressors off during off hours	$ 6,600	44,200	$ 1,800	365%	0.3
Install timers on domestic water heaters	$ 21,700	144,400	$ 1,000	2090%	0.0
Potential Capital Recommendations					
Install occupancy sensors in the corridor lighting	$ 2,500	16,800	$ 36,800	7%	14.5
Install Occupancy Sensors in the Parking Garage to turn OFF lights when the space is unoccupied	$ 21,000	139,500	$ 26,400	80%	1.3
Install Garage Fan VFDs	$ 26,900	178,600	$ 80,100	34%	3.0
Install VFDs on the condenser water system Pumps and control based off temperature reset	$ 34,700	230,500	$ 56,300	62%	1.6
Replace the atrium lighting with LED fixtures	$ 1,400	9,500	$ 43,900	3%	30.8
Deep Energy Retrofit					
Install solar PV panels on the roof	$ 7,900	52,600	$ 114,400	7%	14.5
Replace fan powered boxes with VRF fan coils	$ 211,400	1,404,600	$ 8,927,500	2%	42.2
	$ -	-	$ -	N/A	N/A
Package 2 - 11 Low Cost + Cap Cost - < 5 year payback	$ 257,000	1,707,800	$ 175,600	146%	0.7
Package 1 - All EEMs Except PV and VRF	$ 260,500	1,731,300	$ 270,500	96%	1.0
VRF Package	$ 290,900	1,932,700	$ 8,927,500	3%	30.7
Table 3	$ 192,700	1,280,700	$ 90,200	214%	0.5
Table 4	$ 62,600	416,000	$ 180,300	35%	2.9