VOLUME I - Energy Savings Improvement Plan
for the
Freehold Regional High School Board of Education

Prepared by

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In conjunction with

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Energy Consultant

September 27, 2013 - Rev.1 Final ESIP - January 30, 2014

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January 30, 2014

Mr. Sean Boyce
Business Administrator / Board Secretary
Freehold Regional High School District Board of Education
11 Pine Street
Englishtown, New Jersey 07726

RE: Energy Savings Improvement Plan for the
Freehold Regional High School Board of Education

Subject: Submission of Final Energy Savings Improvement Plan

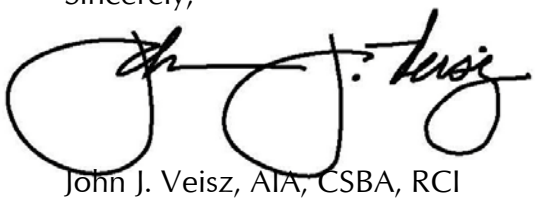
Dear Mr. Boyce,

Bound herewith you will find the Final Subject document dated 1/30/14. As you are aware, the District's ESIP and individual Energy Reduction Measure back-up documentation, prepare by Haglid Associates, has been independently reviewed by Steven Winter Associates who will be providing their Plan approval directly to the NJ Board of Public Utilities. The updated financial analysis, prepared by Phoenix Financials, has also been bound therein.

We will prepare additional bound copies for your distribution to the Board of Education and District Administration under separate cover upon request.

Please call if you have any questions or require additional information regarding the above.

Sincerely,



John J. Veisz, AIA, CSBA, RCI
Principal – President

c: Kevin Dwyer, PE – French & Parrello Associates
Klas Haglid, PE, RA, Haglid Engineering Associates

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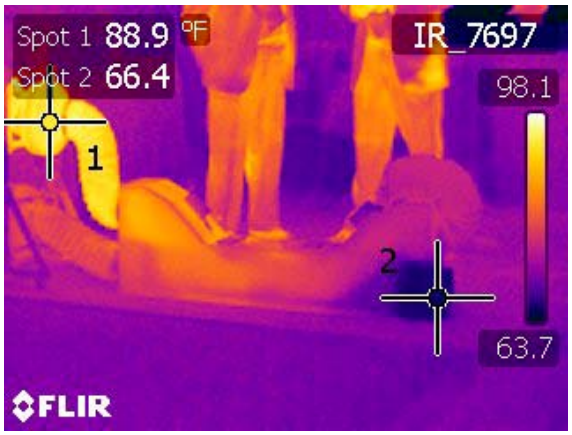


Thermographic Imaging performed by Haglid Engineering & Associates, Inc.

I. Introduction

Fraytak Veisz Hopkins Duthie, PC – Architects/Planners (FVHD) associated with French & Parrello Associates Inc. (FPA), Consulting Engineers and Haglid Engineering Associates, Inc. (HEA), Energy Consultant, is pleased to present this District Wide Energy Savings Improvement Plan (ESIP) to the Freehold Regional High School District (District), Board of Education (BOE). This "Self-Performing" ESIP includes the following District School Buildings:

- *Freehold Borough High School, 2 Robertsville Road, Freehold, NJ*
- *Freehold Township High School, 281 Elton Adelphia Road, Freehold Township, NJ*
- *Howell High School, 405 Squankum-Yellowbrook Road, Farmingdale, NJ*
- *Manalapan High School, 30 Church Lane, Englishtown, NJ*
- *Marlboro High School, 95 North Main Street, Marlboro, NJ*
- *Colts Neck High School, 59 Five Points Road, Colts Neck, NJ*

The District, in the interest of reducing building operating expenses and addressing deferred mechanical equipment replacement at the (6) High School Buildings, took action to pursue implementation of a "Do-It-Your-Self" ESIP program developed by the NJ Board of Public Utilities, Office of Clean Energy. This plan proposes specific Energy Conservation Measures (ECMs) at each high school building that are anticipated to reduce overall energy consumption based on objective engineering analysis.

In 2009 the New Jersey Legislature approved Energy Savings Improvement Program (ESIP) as an alternative method for New Jersey local government units, such as public school districts, to finance the implementation of energy conservation measures (P.L. 2009, c.4). Under the law, the District is permitted to enter into contracts for up to 15 years to finance building energy upgrades in a manner that ensures that annual payments are lower than the savings projected from the energy conservation measures.

This School District's "Do-It-Your-Self" ESIP proposes to ensure that the ESIPs are cash flow positive in year one, and every year thereafter consistent with the program parameters. The ESIP Law allows the School District to use "Energy Savings Obligations" (Bonds) as the financing method to pay for the costs (capital as well as soft costs) of these energy conservation measures (1). Under the law, the use of Energy Savings Obligations are not consider "new general obligation debt" of the District and don not count against debt limits or require voter approval. These obligations may be issued as refunding bonds or leases and will allow the implementation of energy conservation measures at no cost to the taxpayer.

(1) NJ Board of Public Utilities "How to Implement an Energy Savings Improvement Plan, Feb. 2013.

It is the District intent to utilize the design and construction administration services of the following professional firms in the preparation of this ESIP, construction / bid document preparation (after approval of the ESIP by the NJ Board of Public Utilities, Office of Clean Energy), publicly bid the projects in accordance with NJSA 18A:18A to solicit bid proposals from independent NJ DPMC

qualified contractors. The successful contractor(s) will be awarded the Construction Work Contracts to be performed within the project milestone schedules prepared by the Design Team reflective of the District's internal operational schedule.

The District's Professional Design Team, is as follows:

District Architect of Record – Project Coordinator
Fraytak Veisz Hopkins Duthie, PC – Architects / Planners
Trenton, New Jersey
John J. Veisz, AIA, CSBA, President – Principal

Consulting Mechanical / Electrical Engineer
French & Parrello Associates, Inc.
Wall, New Jersey
Lance Smith, PE, Project Engineer
Kevin Dwyer, PE, Project Engineer

Energy Consultants
Haglid Engineering and Associates, Inc.
Hillsdale, New Jersey
Klas Haglid, RA, PE – President – Principal

Energy Consulting Engineer Qualifications:

Haglid Engineering & Associates, Inc., our Team Energy Consultant, has provided thousands of energy audits and energy conservation plans for many different industrial and commercial building owners, including Atlantic Electric, Connective Energy Solutions and The United States Department of Energy for Ecolinks Projects providing energy efficient retrofit internationally. Haglid Engineers have served as past Chairman of ASHRAE Technical Committee 5.5 *Air to Air Energy Recovery* and past Chairman of ASHRAE Technical Committee 7.8 *Owning and Operating Costs*. As an active member of ASHRAE we have moderated forums, seminars and presented at several ASHRAE Annual Meetings and published extensively on issues surrounding energy recovery and building related HVAC issues. Klas Haglid, PE, Principal of Haglid Engineering, also holds a number of patents for systems combining energy recovery devices with innovative controls to make buildings work more efficiently and reduce owning and operating costs.

II. Executive Summary

The ESIP presented herein outlines the analysis and approach to establishing energy reduction measures (ERM) to reduce the District's energy consumption and operating expenses by replacing existing mechanical and electrical equipment with new energy efficient equipment. These improvements also create inherent benefits by reducing on-going maintenance due to older equipment / system inefficiency and operation failure. The proposed projects, with current defined building usage, are anticipated to save over $1.4M a year in a total energy and operation

& maintenance (O&M) savings; or, $21M over the 15 year Energy Savings Obligation Bond period if energy prices remain constant.

Implementing the selected projects is projected to yield an average simple payback in approximately 9 Years after the District's receipt of NJ Board of Public Utility, Office of Clean Energy Incentives and realized O&M savings.

Based on a projected financing term of 16.3 years (including anticipated 1.3) years of design/installation), Phoenix Advisors, LLC, the Board's financial advisor, projects savings at $4.6 million after taking into consideration financing costs, projected energy savings and incentives. Financing costs are based on current market rates of 3.2%

Energy Baseline and Reduction Summary

Haglid Engineering and Associates, Inc. performed an analysis of the District's energy consumption based on 12 months of utility bills. The building efficiencies were compared to the EPA Energy Star Rating guidelines. The following initial analysis obtained from the District's prior energy audit established the following utility utilization base line:

			Data from 2009-2010 Report						
High School Name	**Site Visit Date**	**Square Footage**	**Electric Consumption (kWh)**	**Annual Electric ($)**	**Price per kWh**	**Gas Consumption**	**Annual Gas ($)**	**Price per Therm**	**Energy Star Rating**
Colts Neck	4/25/13	220,000	3,635,786	$558,674	0.154	143,801	$217,191	1.51	2
Freehold Borough	4/1/13	203,000	2,366,100	$366,118	0.155	226,982	$337,128	1.49	5
Freehold Township	4/30/13	256,000	2,505,600	$395,173	0.158	114,940	$176,033	1.53	39
Howell	4/30/13	249,000	2,637,200	$414,416	0.157	142,441	$216,394	1.52	45
Manalapan	4/30/13	256,000	2,421,200	$377,524	0.156	127,507	$212,830	1.67	41
Marlboro	4/25/13	264,000	2,757,196	$425,088	0.154	142,751	$221,168	1.55	30

Table 1 - Haglid Engineering & Associates, Inc. 5-22-13

12 Months of current utility bills were also analyzed to determine any changes which may have occurred over the past 2 years resulting from equipment or operational changes in the high school buildings. The building efficiencies were again compared to the EPA Energy Star Rating guidelines. While in some cases the respective building Energy Star Rating improved, Howell HS exhibited a reduction from 45 to 20 apparently due to the installation of (38) new roof top HVAC units with

insufficient automatic temperature control. This resulted in increased energy consumption even though there was T-8 fluorescent lighting installed.

The changes in energy consumption and Energy Star Ratings can be observed on the following Table 2.

			Data from 2012-2013 Report						
High School Name	**Site Visit Date**	**Square Footage**	**Electric Consumption (kWh)**	**Annual Electric ($)**	**Price per kWh**	**Gas Consumption**	**Annual Gas ($)**	**Price per Therm**	**Energy Star Rating**
Colts Neck	4/25/13	220,000	3,622,182	$395,018	$0.109	89,378	$93,778	$1.049	2
Freehold Borough	4/1/13	203,000	2,049,600	$230,109	$0.112	160,178	$171,540	$1.071	17
Freehold Township	4/30/13	256,000	2,387,600	$270,040	$0.113	96,275	$101,043	$1.050	67
Howell	4/30/13	249,000	2,731,200	$308,866	$0.113	83,152	$86,726	$1.043	20
Manalapan	4/30/13	256,000	2,377,200	$290,327	$0.122	106,618	$111,434	$1.045	67
Marlboro	4/25/13	264,000	2,303,040	$280,207	$0.122	111,605	$117,034	$1.049	41
Totals			15,110,882	$1,774,568		647,206	$681,557		

Table 2 - Haglid Engineering & Associates, Inc. 5-22-13

The proposed Energy Reduction Measures, outlined in the Section VI of this Plan, proposes anticipates further reduction in energy consumption and operating expenses.

NJ BPU Project Management has confirmed with Haglid Engineering that they will render each High School Building in the Freehold Regional District as an independent entity thereby eliminating the $4M Entity Cap limitation on the District as a whole.

The NJ BPU OCE Smart Start incentives are not guaranteed and are "found money". Based on past projects of similar type and scope, we have every reason to expect them to be available as they are currently funded as presented. The anticipated savings, at this stage of project analysis, as presented here in, are not from a full computer model, but rather based on comparative project studies performed by Haglid Engineering on like-kind buildings of similar size and geographic location. The actual savings are based on energy reduction measures installed, the actual operating and weather conditions and occupancy and intensity of use, the manner in which the building is maintained and operated. We take no responsibility for the Work of others or changing

conditions to what is actually installed beyond the control of the Design Team which may affect the estimated incentives.

Societal Benefit: It is estimated that the District will potentially realize a net reduction of CO2 in green house gasses annually through the implementation of the ESIP as follows:

ERM Pollution Reduction Per Year of Operations					
Energy	**Savings per Year**	**CO_2 (lbs) Reduced**	**SO_2 (lbs) Reduced**	**Nox (lbs) Reduced**	**Cars* Removed**
Electric (Kwh)	9,042,481.77	5,000,492.46	14,970.97	12,371.99	436.72
Gas Savings (therms)	310,254.04	14,871,003.30	30,424.74	36,792.76	1,298.76
Total Savings (In BTUs)=	61,879,632,477	19,871,496	45,396	49,165	
				Total Pollution Reduction from Cars Removed from the Road =	*1,736

Table 3 - Haglid Engineering & Associates, Inc. 8-27-13

Note: * Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing and estimated 11, 450 pounds of CO_2 per year. Reference: EPA office for Transportation and Air Quality at www.epa.gov/otaq/consumer.f00013.htm

III. Project Approach

General: The Design Team performed the following services:

1. Project Team members performed on-site field studies of all existing high school buildings and existing gas and electric bills to establish current building energy utilization base line. The team also obtained basic understanding of the equipment / building system condition and functionality. Preliminary energy analysis and infrared surveys have been performed.

2. From the preliminary building / utility information from a 2009-2010 Report and 2012-2013 Report, the Team established a base line General Energy Data Report, documenting the current and proposed US Department of Energy Star Rating.

3. The Team identified proposed Energy Reduction Measures that would, if implemented, significantly reduce overall gas and electric consumption thereby generating financial savings for the District to consider creating the Energy Savings / Reduction Plan (ESIP).

4. Individual Energy Reduction Measures were proposed, estimated, evaluated and prioritized for each high school building. Each project has been assigned to an energy reduction method, described in more detail below: "Pay-4-Performance" (P4P), "Prescriptive Measure", or "Custom Measure". Preliminary possible energy reductions have been included to establish internal rate of return for evaluation to maximize annual potential NJ Office of Clean Energy Board of Public Utility (BPU) incentives ($1M for Electric Reductions, $1M for Gas Reductions with a maximum entity cap of $4M).

5. FVHD also performed a comprehensive roof survey and assessment at each high school building to identify selective roof replacement in all roof areas in poor condition, out of warranty and/or exhibiting deteriorated conditions. Proposed roof replacement project estimates were initially included as Priority 3 in Energy Savings Plan as an ERM. After evaluation of potential improved thermal performance in consideration of the required demand ventilation, the roof replacement projects were not deemed to significantly reduce energy consumption to be considered in a Pay-4-Performance incentive program.

   NOTE: Roof replacement projects are recommended for submission of a Regular Operating District (ROD) Grant at the respective buildings.

6. After preparation of the preliminary ESIP, a meeting was conducted with Ed Mercer, Manager – State Energy Office, Board of Public Utilities on Thursday, July 11. The Team was provided with guidance on methodologies to maximize incentives and recommendations for bundling projects.

7. The attendees discussed options for including the steam conversation to hot water project at Freehold Borough as an energy reduction measure to achieve anticipated energy savings while achieving BPU incentives. Projects are planned to be grouped into (2) separate applications and construction projects to manage District disruption and cash flow.

8. The Team coordinated transmission of the preliminary ESIP to the District independent Financial Consultant for analysis for plan compliance with regulatory requirements for self-sustainability for maximum 15 year financing through the use of Energy Savings Obligation Bonds.

9. The Team prepared an updated preliminary project schedule. Haglid Engineering, Team Energy Consultant, will commence with preparation of the Pay for Performance Applications while the District Energy Reduction Plan is reviewed by the independent auditor.

10. The Team will coordinate and issue the BOE approved ESIP to the District's independent energy auditing Firm, preliminary Steven Winter Associates, Inc. (the Firm responsible for preparation of the District's Energy Audit dated 9/18/10 under the Local Government Energy Program).

11. Project Planning: Based on confirmation by Haglid Engineering & Associates, the BPU Project Manager has stated in a recent discussion that the Office of Clean Energy will allow the submission of (3) High School Buildings in a single application. As such, the project Team will develop projects for competitive bidding under NJSA 18A:18A accordingly based on "like kind" work and geographic proximity of high school building to obtain the best economy of scale.

The District ESIP is prepared to take advantage of funding from one or more of the following incentive programs, as eligible, offered by the NJ Board of Public Utilities, Office of Clean Energy (NJBPU, OCE). A preliminary assessment of BPU Incentive Program is identified on the Energy Reduction Plan, bound in this document.

Clean Energy Program

New Jersey's Clean Energy Program supports energy efficiency through conservation efforts while promoting the development of renewable sources of energy. This program, directed by the Office of Clean Energy, presents many incentives to New Jersey customers based on energy audit services and energy conservation installations. Haglid Engineering is an approved Pay For Performance partner with The State of New Jersey.

Pay for Performance (P4P)

The Pay for Performance (P4P) Program, launched in March 2009, offers incentives to existing commercial, industrial, and institutional buildings with an average annual peak kW demand electric usage of over 200 kW. The goal is to address energy efficiency needs and reduce operating costs. To become an approved partner, indication of at least three commercial/industrial projects that which designate an energy efficiency scope of work is needed.

The following incentives of the program are attainable with a minimum 15% reduction of energy usage:

Incentive #1: Energy Reduction Plan

This incentive is granted to cover the cost of services associated with the development of the Energy Reduction Plan. Incentives between $5,000 and $50,000 are attainable based on $0.10 per sq. ft. of the building (not exceeding 50% of the customers annual energy cost)

Incentive #2: Installation Recommended Measures

This incentive is presented directly for projected energy savings of the project and pays 50% of the performance based incentive (not exceeding 25% of the total project cost). Electric and gas incentives are provided for up to $0.11 and $1.25 per projected kWh and Therms saved.

Incentive #3: Post-Construction Benchmarking Report

This incentive is given based on a post-construction report detailing the actual savings achieved on the project that which follows installation measures and surpasses its minimum performance measures(not exceeding 25% of the total project cost). Electric and gas incentives are provided for up to $0.11 and $1.25 per projected kWh and Therms saved. Additional incentives are available for CHP (Combined Heat and Power), Non Profits and Schools. Haglid Engineering will assist the

District evaluate these different programs to determine the best option(s) for eligible projects to maximize incentives allowed by the BPU OCE.

Our Team has taken a practical approach to the District's building needs and has perform a number of services to assist the District with identifying potential NJPBU OCE incentive programs Services provided to prepare this Energy Reduction Plan and to be provided to support documentation for submission of projects for a NJBPU OCE Incentive program, includes the following:

- Initial meeting and building walk-through Audits
- Field Survey
- Engineering analysis of all energy Usage
- Computer Model Existing Building Energy Usage
- Provide typed narrative report with ERPs (Energy Reduction Plans)
- Meet and discuss benefits and impacts of ERPs
- File P4P Incentive Application for Agreed Projects
- Provide assistance to implement ERPs
- Provide commissioning and monitoring and Verification for P4P

B. Initial meeting and walk through Audit

The Team has performed a walk-through audit at each High School Building in order to obtain an order of magnitude EEM (energy efficiency measures) savings potential. We have performed Energy Star Building Bench Marking to establish how each building compares to other buildings of the same type and use. We have reviewed 12 months contiguous electric and gas bills for this initial application.

We have conducted a meeting with representatives of the New Jersey Smart Starts State program can help to answer additional questions and to feel more comfortable with the incentives program. Based on this document, we will file initial applications to start work with the P4P program, on behalf of the District.

C. Records Survey

Our team has preformed:

- Take notes and agree on best way to access the site.
- Profile monthly energy usage and discuss any issues.
- Provide relative building efficiency and compare with other like kind buildings.
- Review Architectural Drawings
- Review Mechanical Electrical and Piping Drawings
- Review Relevant Engineering Drawings
- Review special process or system set points
- Review As Built Drawings
- Review prior energy or efficiency modeling
- Outline project players, stakeholders w/Roles and Responsibilities

D. Field Survey

Our Team has completed site visit with key on-site contacts and followed site visit protocols as agreed in the prior records surveys. We have interviewed key operating personnel and identify different areas for use, hours of operation, run times of equipment, goals for improved operation and how the building is currently being operated and maintained. Tools typically used during this phase of data collection, is as follows:

- Infrared photography to see heat loss
- Digital Temperature and humidity recorders
- Digital Light level and run time recorders
- 8 channel temperature recorders
- Non contacting temperature sensors
- In place temperature sensor
- Vane anemometers to detect air velocity and flow
- Portable Gas Sensor for CO
- Portable Gas Sensor for CO_2
- Satellite photos and site maps

Our Team has made several site visits to collect data recorders, verify operation of the following system(s):

- Building Envelope
- Wall Construction
- Windows
- Doors
- Building Controls & Timers
- Lighting
- HVAC Systems
- Chillers
- Motors
- Pumps
- Heaters
- Boilers
- Ventilation Systems
- Supply Fans
- Return Fans
- Exhaust Fans
- Process Equipment
- Night time or un-occupied set-back

E. Computer Model Existing Building Energy Usage

We use several energy engineering computer models for evaluating energy usage and how building modifications will change the subject energy usage. Haglid engineering has performed energy modeling for many Utility wide energy programs for over 20 years and has recognized as a leader in the field of Building Energy Modeling.

F. Provide typed narrative report with ERPs (Energy Reduction Plans)

We provide a living report that we will modify to meet the goals that your firm has for your building. The best ideas are the ones that save energy and meet business needs and help your business thrive and do better. If an ERP is too difficult and not attractive we can redact it to reduce issues down the road when these plans become implemented. We ask you what you are willing to do and what you want to do. As simple as possible, but not more simple!

G. File P4P Incentive Application for Agreed Projects

We have been working with the New Jersey Smart Starts program for over five years and have many clients with very good experience with the program. We have also assisted many other consultants and engineers in the program with their project too! This has given us a lot of experience and we know the people that administer the incentives programs.

H. Provide assistance to implement ERPs

We are a full service engineering and architectural firm and can work with your existing design team as support and guidance. We can also supply full engineering sealed drawings if needed. You are free to choose to work with us for the plans or the architects and engineers that you are already working with.

I. Provide commissioning and Monitoring and Verification for P4P

Once the ERP have been installed we can verify the equipment is installed and working and apply for the final post installation incentive and verify you are saving energy. We can also work with you building operating to provide an O&M Manual or on-site training as needed.

J. Basic Scope of Work

The existing building and energy usage will be entered into EPA Energy Star Portfolio Manager for comparative analysis. This will provide a budget cost (Means Estimating) and paybacks with some feedback on possible incentives. The following ERP (Energy Reduction Plans) will be evaluated for the Regional High School District and the budget costs and relative paybacks will be analyzed and provided as follows:

1. DOAS ERV with CO_2 sensors.
2. Electric heating to gas heating conversion.
3. Radiant hydronic heating and VRV HVAC.
4. Lighting – Day lighting dimming.
5. HVAC and BMX controls.
6. We will provide a type narrative report outlining the ERP's and the projected payback analysis.
7. Be available for additional work as mutually agreed.

8. **Energy Recovery Ventilation (ERV)** – Review outside fresh air supply to all the indoor spaces, including but not limited to, classrooms, offices and gymnasiums. The evaluation will include how and where the energy recovery ventilators may be used to temper and circulate fresh outside air into the space and use the stale exhaust air from the building to temper the incoming air.

9. **Lighting Controls** - Evaluate existing conditions and recommend upgrades with reference to day-lighting, lighting power densities (LPD), occupancy controls, light source system efficacy, and interior room surface average reflectance.

10. **HVAC Upgrades** – Evaluate existing equipment, ductwork, and motors and recommend upgrades as well as system controls for all hearing and cooling systems. Analyze benefits of economizers, split system incorporation, energy efficiency rating (EER), seasonal EER, ductwork alterations (including sealing and insulation), and demand side controls.

End of Part I

IV. High School Buildings Field Observations and Energy Reduction Measures

The following field observation and recommendation were provided by Klas Haglid, PE, RA, Haglid Engineering & Associates, Inc. in conjunction with representatives of French & Parrello Associates, Inc. and Fraytak Veisz Hopkins Duthie, PC. No destructive or invasive testing was performed during our observations.

For the purposes of this report, all directions (left, right, rear, etc.) are taken from the viewpoint of an observer standing in front of the building and facing it from the front.

References to the dates of original building and subsequent addition construction are based on existing construction drawing information made available by the School District.

STANDARD OF REFERENCE: For reference while reviewing the Field Observations report that follows, the following definitions may be helpful:

Excellent - Component or system is in "as new" condition, requiring no rehabilitation, and should perform in full accordance with expected performance.

Good - Component or system is sound and performing its function, although it may show signs of normal wear and tear. Some minor rehabilitation work may be required.

Fair - Component or system falls into one or more of the following categories: a) evidence of previous repairs not in compliance with commonly accepted standards, b) workmanship is not in compliance with commonly accepted standards, c) component or system is obsolete, d) component or system approaching end of expected performance. Repair or replacement is required to prevent further deterioration or to prolong expected life.

Poor - Component or system has either failed or cannot be relied upon to continue performing its original function as a result of having exceeded its expected performance, excessive deferred maintenance, or state of disrepair. Present condition could contribute or cause the deterioration of other adjoining elements or systems. Repair or replacement is required.

All ratings are determined by comparison to other buildings of similar age and construction type. Further, some details of workmanship and materials will be examined more closely in higher quality buildings where such details of workmanship and materials typically become more relevant.

Further evaluation/confirmation is required by the District to determine the presence of hazardous materials associated with the existing HVAC system that may be impacted if recommended reconstruction is implemented.

The observations contained in this report are based on a preliminary evaluation of existing conditions and information provided by District Facilities Personnel. They are not to be considered a guarantee of condition and no warranty is implied.

The observations provided below address assessment and recommendations for key existing building system components. In general, each school was also evaluated for opportunities to further reduce energy consumption by additional measures to reduce plug loads from vending machines, computers, appliances (coffee pots, etc.) and other uncontrolled power and lighting equipment.

Related to the above, the existing building roofs and window systems were generally evaluated to determine if required capital project replacement, due to age and/or poor energy performance, could produce substantive energy reductions. As the method of ventilation required for the type and size of each building and occupancy in conjunction with the age, inconsistency and lack of high wall thermal value of existing building envelope construction, (including remaining window units not yet replaced by the District, the high cost and long term simple pay back), it was determined to omit roof, window replace or wall reconstruction from the District's proposed ESIP.

Note: Required replacement of deteriorated roof areas at each school will be accomplished under other building capital project improvements. New roof assemblies will be reconstructed with a higher thermal value which may generally improve the overall building thermal performance during un-occupied periods when ventilation rates are lowest.

A comprehensive list of energy reduction measures can be found on the Energy Reduction Plan, bound in this report.

A. FREEHOLD BOROUGH HIGH SCHOOL

1. Site Observations:

A limited visual scoping energy audit of the property at Freehold Borough High School was performed on April 1, 2013. The original building was constructed in 1955 with additions constructed in 1956, 1988 and 2003. The total area of the current building configuration is approximately 256,000 SF.

Freehold Borough High School presents added challenges due to the age of the original high school building and the various heating systems provided in subsequent building additions over the years. The older building construction is heated with a high temperature steam boiler. The newer building additions are heated with hot water obtain from a heat exchanger connected to the existing steam boilers and other means (package DX roof top units). Refer to key floor plan contained in the reference section.

During our site visit through this High School, the main issue identified is that the original Cleaver Brooks steam boilers are no longer providing the heat and comfort needed in the building. The controls for the steam heating turn the system on at midnight which preheats the school before the staff and students arrive, and then shut the system off in the morning which is typically not run for the remainder of the day.

This schedule preheats the school before the students get in and typically does not run for the remainder of the day. In order to find a level of comfort in the classrooms for the student and teachers, windows are then opened or closed in order to comfort control the classroom. This can be expected to cause thermal discomfort.

One of the main challenges with a steam system, even with proper water chemistry and very good maintenance, is that there will remain issues with the control valves and other steam components. Due to the nature of steam systems these issues are going to require expensive repairs and retrofits of the different control systems. The controls for the school are driven off pneumatic controls. While these were "state of the art" 40 to 50 years ago, these are many issues with being able to maintain and properly calibrate these pneumatic systems.

Generally the replacement of outdated and non-functioning existing pneumatics controls with an updated DDC Systems (direct digital control) will reasonably be expected to improve overall control issues and reduce energy consumption. An equal challenge to occupant comfort however is the limitations of the existing steam heating systems.

The inherent nature of a steam boiler system is the required high operations temperature in order to deliver steam to the extreme ends of the supply lines to terminal equipment / convectors at high pressure. This high temperature operation has a tendency to overheat spaces due to the nature of steam, having a lot of potential heat, which also tends to leak through valves and control systems overheating classrooms. We observed the steam systems is currently operated during colder months with the steam heating system left operating longer towards mid-morning, overheating spaces, then turned off. Comfort is then achieved in the conditioned spaces by occupants opening windows to cool the overheated spaces thereby wasting energy.

Typical Classroom Steam Convector Unit and Perimeter Radiation. Occupant comfort is obtained by operable windows to control temperature and fresh air requirement.

Our team recommends replacement of the existing steam boiler system with a high efficiency hot water system modulating condensing boiler system with new terminal equipment and controls. In addition, we have explored an option to be for the building to utilize a variable refrigeration volume system (VFV) in some internal spaces, where heat is effectively moved back and forth between the warmer south facing classrooms and the cooler north facing classrooms.

The building occupant comfort and reduction in energy consumption would benefit from the incorporation of a Dedicated Outside Air System (DOAS). With proper calibration the dedicated outdoor air systems run based on occupant load and CO2 levels, introducing conditioned fresh air and ventilation when required which not only saves energy but also alleviates occupant comfort complaints and other problems associated with older a steam system. This system also offers the ability to reclaim energy through energy recovery in the return air stream.

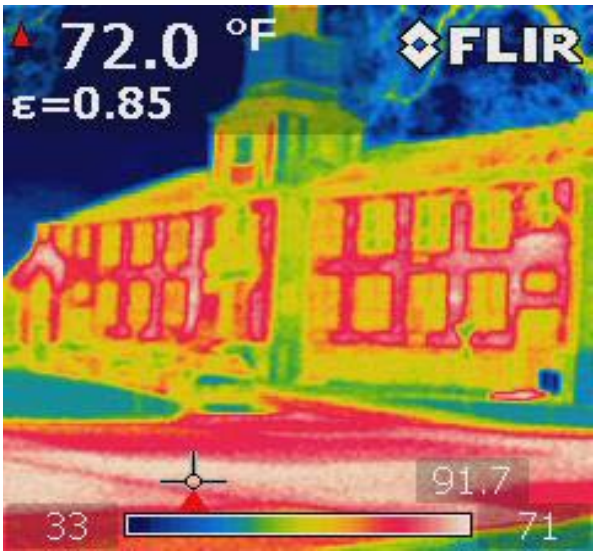
There is also a variety of AAON and TRANE rooftop HVAC components that currently are functioning well but are reaching the end of their useful lives and have been evaluated for possible replacement.

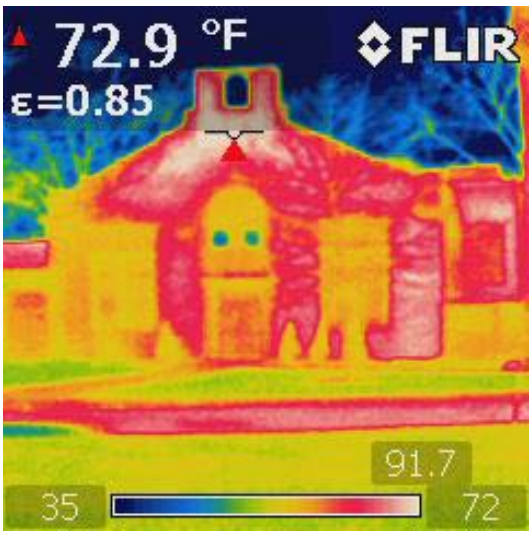
2. Energy Reduction Measures:

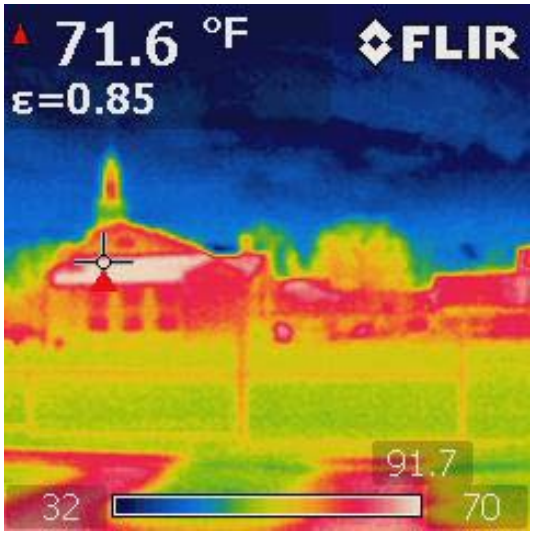
Based on our on-site observations, we have evaluated all the utilities and found that the energy performance rating is fairly low, in the single digits. This means that the building uses significantly more energy than most of the buildings of this type; therefore, there would be a substantial ability to reduce energy consumption. This is one of the first parameters we look at for incentives through the State Energy Programs discussed, for this high school facility. In short, this building uses more energy than ninety percent of the schools in this sampling group which covers all the schools throughout the United States and in our area.

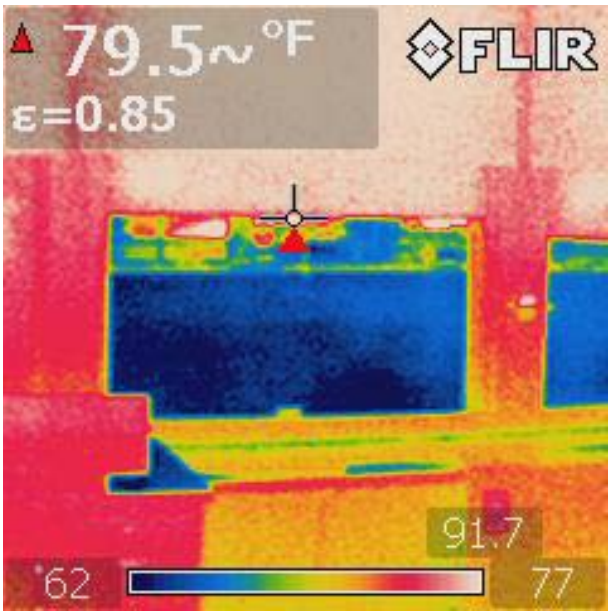
As such, the building would appear to qualify for and obtain substantial incentives through implementation of Energy Reduction Measures. In general, the incentives are based on 1) how much energy is currently be used and 2) how much energy consumption is proposed to be reduced at the facility. From our initial review we find that there is a large quantity of energy being used at this facility due to equipment deficiencies, inefficiency and District practices which provides the opportunity to reduce energy consumption over a 15 year period and obtain a large incentive to defray the cost of equipment / system improvements.

Sample thermo graphic images were taken around the school building with noted results; outside temperatures are noted in the upper left corner; color ranges indicated surface temperature. These images illustrate the extensive heat loss which is exacerbated by little or no thermal insulation in the exterior wall assemblies, air leakage and other thermal shorts.






71.6 °F
FLIR
ε=0.85
91.7
32
70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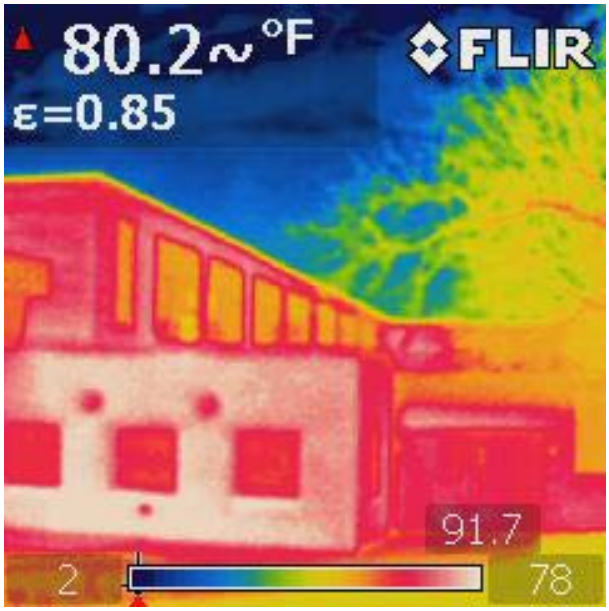
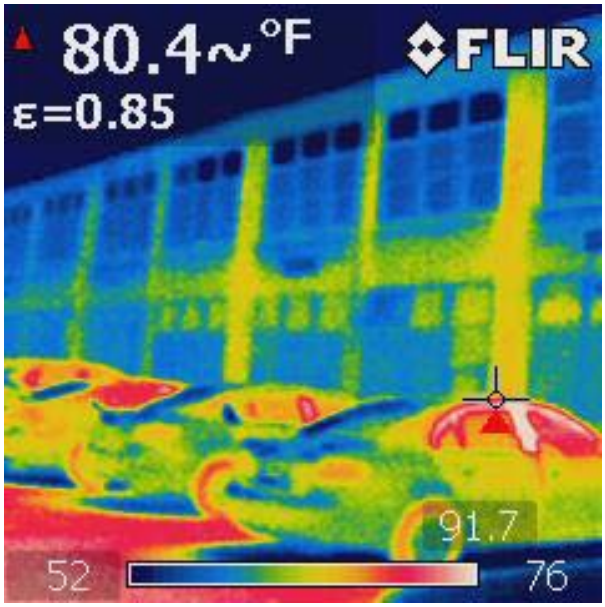
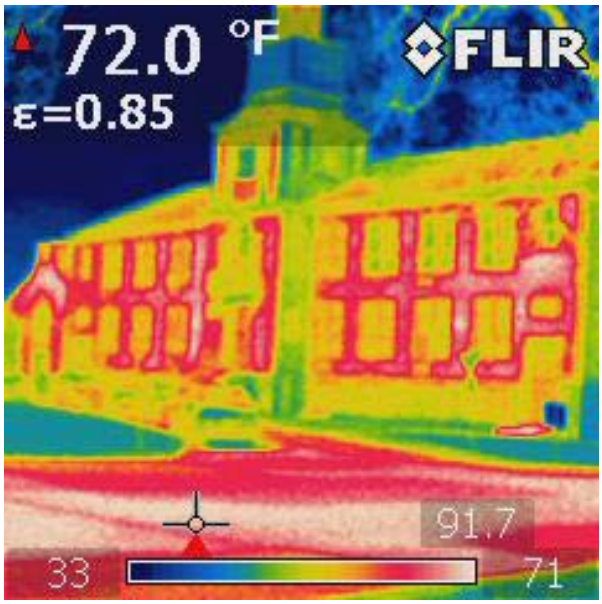
FLIR
ε=0.85
91.7
62
77


80.2 °F
FLIR
ε=0.85
91.7
2
78





3. **Recommendations:** A comprehensive list of proposed energy reduction measures in contained in the reference section of this report.

B. FREEHOLD TOWNSHIP HIGH SCHOOL

1. Site Observations:

Freehold Township High School was originally built in 1969 with additions constructed in 1988, 2001 and 2005. The total area of the current building configuration is approximately 256,000 SF. This facility has an Energy Star Rating of 67. The boilers are 92 thermally efficient Aero Benchmark 2.0 boilers along with (2) 250 HP Cleaver Brooks boilers. Generally the school operates more efficiently than most.

Only the newer areas, the main office, the media center and the auditorium have air conditioning. The rest of the school, roughly 60%, is heating only. There is an effort to provide "draw-through" ventilation under the Nesbit units but there have been complaints of comfort in the summer; it gets very hot and the maintenance staff says it is difficult to do heavy maintenance in the summer heat if the old unit ventilators stop functioning.

Observations on the roof indicated numerous rooftop mushroom cap ventilators and some make-up mechanical air units. It does not appear that the make-up air and/or air intake units are really ducted; they pull air through common plenum areas over the classrooms (which may be a violation of contemporary building codes).

2. Energy Reduction Measures:

Boiler replacement with high efficiency modulating boilers is recommended.

The majority of the ventilation is provided by drawing air through the roof top fan units which exhausts conditioned air. Classrooms would benefit from energy recovery tied to demand side ventilation which will 1) capture exhausted conditioned air to temper in-coming air and 2) provide fresh air based on occupancy demand conditions. An on-demand ventilation system is recommended.

The general approach here would be to have dedicated outdoor air for each classroom, CO2 sensors tied to a central control system. Not only would this approach save considerable energy but it would help with occupant comfort in cooler weather. For the areas of the building that are not air conditioned, there would be a comfort benefit in adding air conditioning; however, there would be no energy savings to do so.

While we believe this school is wasting a lot of heat; integrating energy recovery to the partially air conditioned portions of the building would provide little benefit for energy savings as it is currently configured.

There are some existing original T-12 fluorescent lighting fixtures remaining in the building; most of the fixtures have been retrofitted or replaced with new fixtures utilizing more efficient T-8 lamps. There is an opportunity for day light harvesting as several of the classrooms that we looked at have light fixtures located along the windows on one switch and the lights that were more protected or shielded from the day light on another. Were appropriate, selected lighting circuits could be tied into a daylight dimming apparatus thereby reducing energy until natural light levels diminish. In addition, providing automatic controls or occupancy sensors tied to existing lighting circuits, currently required by contemporary electrical codes, would also provide a benefit to reduce energy.

3. **Recommendations:** A comprehensive list of proposed energy reduction measures in contained in the reference section of this report.

C. HOWELL HIGH SCHOOL

1. Site Observations:

Howell High School was originally built in 1962 with additions constructed in 1966, 1980 and 2001. The total area of the current building configuration is approximately 249,000 SF. A large addition was constructed in 2005. Only the main office, the media center and the auditorium of this newer addition have air conditioning. The rest of the school is heating only.

2. Energy Reduction Measures:

The building is currently heated with (2) 7,500 MBH gas fired boilers that are fair to poor condition and are recommended to be replaced with new modulating condensing boilers.

There is evidence that (38) new roof top HVAC units were installed after 2010 which appear to have insufficient temperature control. As a result, our evaluation of the District's energy consumption between 2009 and 2012 indicate an increase thereby reducing the building's Energy Star Rating from 45 to 20.

Hot water at the school is provided by the existing boiler hot water exchange; replacement is recommended with self contained high efficiency hot water boiler.

Not all the rooftop fans are tied into controls, so many components run 24/7. The controls are currently functioning but not all components are tied in. In general, the Automatic Temperature Controls are fair to poor; replacement with new DDC Control System is recommended.

Additional cooling is recommended for selected spaces with variable refrigerant volume system, however, energy savings would prove minimal offset only by share heating from the system to selected spaces.

3. **Recommendations:** A comprehensive list of proposed energy reduction measures in contained in the reference section of this report.

D. MANALAPAN HIGH SCHOOL

1. Site Observations:

Site observations were performed at the building on April 30, 2013. Due to the milder weather conditions at the time, performing an IR Thermographic analysis was not practical. Manalapan High School was originally built in 1969 with additions constructed in 1988, 2000 (and, based on other projects in the District what appears to be) 2005. The total area of the current building configuration is approximately 256,000 SF.

Approximately 73% of the school is heating only with heat provided by (2) 10 MBH Boilers.
Only the newer areas, the main office, the media center and the auditorium have air conditioning.

This facility has a current Energy Star Rating of 67 out of 100 indicating that there is the potential for improvements for energy reduction and potential incentives through the NJDOE BPU OCE energy programs. As this facility is similar to Freehold Township High School, many of the same conditions and opportunities for energy reductions exist.

There is an effort to provide "draw-through" ventilation under the Nesbit units but there have been complaints of comfort in the summer; it gets very hot and the maintenance staff says it is difficult to do heavy maintenance in the summer heat if the old unit ventilators stop functioning.

Observations on the roof indicated numerous rooftop mushroom cap ventilators and some make-up mechanical air units. It does not appear that the make-up air and/or air intake units are really ducted; they pull air through common plenum areas over the classrooms (which may be a violation of contemporary building codes).

2. Energy Reduction Measures:

Replacement of the existing cast iron boilers is recommend with (3) new modular condensing, gas-fired boilers controlled by new Direct Digital Control ATC system.

The majority of the ventilation is provided by drawing air through the roof top fan units which exhausts conditioned air. Classrooms would benefit from energy recovery tied to demand side

ventilation which will 1) capture exhausted conditioned air to temper in-coming air and 2) provide fresh air based on occupancy demand conditions.

The general approach here would be to have dedicated outdoor air for each classroom, CO2 sensors tied to a central control system. Not only would this approach save considerable energy but it would help with occupant comfort in cooler weather. For the areas of the building that are not air conditioned, there would be a comfort benefit in adding air conditioning; however, there would be no energy savings to do so.

While we believe this school is wasting a lot of heat; integrating energy recovery to the partially air conditioned portions of the building would provide little benefit for energy savings as it is currently configured.

There are some existing original T-12 fluorescent lighting fixtures remaining in the building; most of the fixtures have been retrofitted or replaced with new fixtures utilizing more efficient T-8 lamps.

There is an opportunity for day light harvesting as several of the classrooms that we looked at have light fixtures located along the windows on one switch and the lights that were more protected or shielded from the day light on another. Selected lighting circuits could be tied into a daylight dimming apparatus thereby reducing energy until natural light levels diminish. In addition, providing automatic controls or occupancy sensors tied to existing lighting circuits, currently required by contemporary electrical codes, would also provide a benefit to reduce energy.

3. **Recommendations:** A comprehensive list of proposed energy reduction measures in contained in the reference section of this report.

E. MARLBORO HIGH SCHOOL

1. Site Observations:

Marlboro High School was originally built in 1967 with additions constructed in 1980 and 2000. The total area of the current building configuration is approximately 264,000 SF. Approximately 60% of the school is heating only. The building currently has an Energy Star rating of 41.

Only the newer areas, the main office, the media center and the auditorium have air conditioning. There is an effort to provide "draw-through" ventilation under the Nesbit units but there have been complaints of comfort in the summer; it gets very hot and the maintenance staff says it is difficult to do heavy maintenance in the summer heat if the old unit ventilators stop functioning.

As with other High School Buildings, our observations on the roof indicated numerous rooftop mushroom cap ventilators and some make-up mechanical air units. It does not appear that the make-up air and/or air intake units are really ducted; they pull air through common plenum areas over the classrooms (which may be a violation of contemporary building codes).

2. Energy Reduction Measures:

The majority of the ventilation is provided by drawing air through the roof top fan units which exhausts conditioned air. Classrooms would benefit from energy recovery tied to demand side ventilation which will 1) capture exhausted conditioned air to temper in-coming air and 2) provide fresh air based on occupancy demand conditions.

The general approach here would be to have dedicated outdoor air for each classroom, CO2 sensors tied to a central control system. Not only would this approach save considerable energy but it would help with occupant comfort in cooler weather. For the areas of the building that are not air conditioned, there would be a comfort benefit in adding air conditioning; however, there would be no energy savings to do so.

While we believe this school is wasting a lot of heat; integrating energy recovery to the partially air conditioned portions of the building would provide little benefit for energy savings as it is currently configured.

There are some existing original T-12 fluorescent lighting fixtures remaining in the building; most of the fixtures have been retrofitted or replaced with new fixtures utilizing more efficient T-8 lamps.

There is an opportunity for day light harvesting as several of the classrooms that we looked at have light fixtures located along the windows on one switch and the lights that were more protected or shielded from the day light on another. Selected lighting circuits could be tied into a daylight dimming apparatus thereby reducing energy until natural light levels diminish. In addition, providing automatic controls or occupancy sensors tied to existing lighting circuits, currently required by contemporary electrical codes, would also provide a benefit to reduce energy.

3. Recommendations: A comprehensive list of proposed energy reduction measures in contained in the reference section of this report.

F. COLTS NECK HIGH SCHOOL

1. Site Observations:

Colts Neck High School was originally built in 1993 with an addition constructed in 2000. The total area of the current building configuration is approximately 220,000 SF. The school feels very modern and it is very well maintained and clean; however, the building currently has an Energy Star Rating of only 2 due to improper building controls and equipment operation.

The building is heated with (3) original large cast iron hot water boilers. In 2000, the building provide provided with an additional Aerco condensing boiler to supplement heating the addition. All (4) boilers are installed in the same hot water header, allowing the newest boiler to provide supplemental heating capacity to the existing hot water piping servicing the entire building.

With proper maintenance, the original cast iron boilers should be expected to last an additional 20+/- years. The newer Aerco boiler would be expected to continue service life for an additional 15-20 +/- years with proper maintenance.

This school is generally 100% air conditioned all throughout and has larger than normal ventilation rates throughout. The building has (2) modern chillers but, as noted, is operating with a very low Energy Star Rating. The first unit is a water-cooled chiller with a Baltimore Air Cooling tower (BAC cooling tower).
The second unit is an air-cooled chiller located behind the rear of the school.

Both hot and chilled water is provided to terminal equipment via a 2-pipe system which reduces refined temperature control. The limitation of this type of systems could create occupant / thermal discomfort. If one section of the school requires cooling and another requires heating, only heat or cooling can be provided in a single mode. In other words, heating and cooling cannot be provided simultaneously with the current distribution and control system.

While the equipment is fairly modern and the controls are a Direct Digital Control (DDC) type, the controls are at least 10 years old. We were advised by the current facilities personnel that they find these controls difficult to work with and repair. There was only (1) individual in the facilities department who reported being able to access this program.

2. Energy Reduction Measures:

Based on development in DDC controls and integration, replacement of the existing control systems is recommended to provide a unified District-wide system.

Demand side ventilation could be added to the school building and the roof top HVAC equipment could be retrofitted with outdoor air dampeners that actually work. As such, indoor air quality would be maintained as a function of building/space occupancy and CO2 levels established by sensors. This approach will control the amount of outside air required to be provided and conditioned resulting in a reduction in energy and potential savings to the District.

While integration of an Energy Recovery System may provide some energy savings in a heating or cooling mode exclusively, it would not help rectify occupant comfort of required heating during a cooling mode or "Vice a Versa" based on limitation of the 2-pipe distribution system. Based on the method of HVAC system construction, most of the Indoor Air Quality and comfort upgrades would center on improving controls and functionality of the existing equipment at Colt Neck High School.

Some of the roof top equipment is nearing the end of its useful life and could be considered for modernization and upgrades. Generally these upgrades would not be great energy savings.

While generally considered comfortable, there are several rooms, especially rooms A-207, A-208, A-210 and A-213 that do not have any windows and are experiencing comfort issues. These areas would best be served by retro fitting with a Variable Refrigerant Volume (VRV) system that would move heat around from some of these windowless classrooms and allow them to be in a heating or cooling mode independently. The energy savings with this system, however, would be marginal at best.

There are generally just fluorescent light fixtures with T-8 and T-5 lamps in this school. Some of the lighting upgrades and potential energy savings would center on replacement of the fluorescent fixtures with an LED fixture upgrade.

3. Recommendations: A comprehensive list of proposed energy reduction measures in contained in the reference section of this report.

End of Observation Section

Proposed Energy Reduction Measures Plan - ESIP

	Priority 1 Projects			Priority 2 Projects			Priority 3 Projects			*All Priorities/School*		
High School Buildings	**Final Project Costs (Hard/Soft - After Incentive)**	**Conservative Estimated Incentive at 25%**	**Simple Payback (In Years)**	**Final Project Costs (Hard/Soft - After Incentive)**	**Conservative Estimated Incentive at 25%**	**Simple Payback (In Years)**	**Final Project Costs (Hard/Soft - After Incentive)**	**Conservative Estimated Incentive at 25%**	**Simple Payback (In Years)**	***Final Project Costs (Hard/Soft - After Incentive)***	***Conservative Estimated Incentive at 25%***	***Simple Payback (In Years)***
Freehold Borough High School	2,245,316	748,439	10.97	205,003	68,334	4.63	3,079	1,026	2.17	***2,453,398***	***817,799***	***5.92***
Freehold Township High School	1,961,602	653,867	8.69	10,046	3,349	1.80	603,887	201,296	17.00	***2,575,536***	***858,512***	***9.17***
Howell High School	867,608	289,203	5.87	207,017	69,006	9.88	793,221	264,407	11.84	***1,867,846***	***622,615***	***9.20***
Manalapan High School	1,579,588	526,529	5.86	599,796	199,932	31.83	673,537	224,512	7.33	***2,852,920***	***950,973***	***15.01***
Marlboro High School	2,091,635	697,212	8.21	442,723	147,574	7.74	6,467	2,156	2.13	***2,540,824***	***846,941***	***6.03***
Colts Neck High School	822,560	274,187	5.00	7,638	1,153	1.81	3,459	1,153	2.17	***833,656***	***276,492***	***2.99***
Total By Priority	**9,568,308**	**3,189,436**	**7.43**	**1,472,223**	**489,348**	**9.62**	**2,083,650**	**694,550**	**7.11**	***13,124,180***	***4,373,334***	***8.05***

Proposed Energy Reduction Measures Plan - ESIP

Projected Energy Savings Escalated
Gas **Electric**

Priority 1, 2 & 3 Projects							
High School Building Projects - Year "1"	**Final Project Costs (Hard/Soft)**	**Conservative Estimated Incentive at 25%**		**Final Project Costs (Hard/Soft) *After Incentive***	**Estimated Annual Savings**		**Simple Payback (In Years)**
Freehold Borough High School	3,271,197	817,799		2,453,398	239,029		10.26
Freehold Township High School	3,434,048	858,512		2,575,536	238,876		10.78
Manalapan High School	3,803,893	950,973		2,852,920	285,682		9.99
Subtotals Year (1) Projects	**10,509,138**	**2,627,285**		**7,881,854**	**763,587**		***10.34*** ***Average***

Priority 1, 2 & 3 Projects							
High School Building Projects - Year "2"	**Final Project Costs (Hard/Soft)**	**Conservative Estimated**		**Final Project Costs (Hard/Soft) *After***	**Estimated Annual Savings**		**Simple Payback (In Years)**
Howell High School	2,490,462	622,615		1,867,846	180,371		10.36
Marlboro High School	3,387,765	846,941		2,540,824	247,449		10.27
Colts Neck High School	1,111,542	277,885		833,656	169,969		4.90
Subtotals Priority	**6,989,769**	**1,747,442**		**5,242,327**	**597,789**		**8.51** ***Average***

High School Building Projects - Year "1" & "2" Totals	***17,498,907***	***4,374,727***		***13,124,180***	***1,361,376***		***9.43*** ***Average***

Freehold Borough High School			5.0%	GC Allowance	25.0%	Concervative Incentive	Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install. Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.
Number of Classrooms: 73	203,000	Gross SF Area	18.0%	Contingency & Soft Costs			

Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
VRF and VRV variable refrigeration volume	P4P	$302,400.00	$21,453.00	15,120.00	54,432.00	33,475.68	405,427.68	101,356.92	304,070.76	14.17	Past project pricing, based on 12 Classrooms
DOAS ventilation system	P4P	$525,600.00	$104,274.07	26,280.00	94,608.00	58,183.92	704,671.92	176,167.98	528,503.94	5.07	Past project pricing, based on 73 Classrooms
AV Equipment on off mode at night times power strips	P4P	$5,978.70	$4,184.48	298.94	1,076.17	661.84	8,015.64	2,003.91	6,011.73	1.44	Vendor pricing with delivery and Installation
Other ERMs - Controls Updrade	P4P	$792,000.00	$34,318.00	39,600.00	142,560.00	87,674.40	1,061,834.40	265,458.60	796,375.80	23.21	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
Building "A" - (3) 2,000 MBH Condensing Boilers, Pumps, Gas Serv	P4P	$303,500.00	$20,000.00	15,175.00	54,630.00	33,597.45	406,902.45	101,725.61	305,176.84	15.26	Work includes replacement of piping, pumps, valves, insulation and radient panels - see below.
Building "C" - (3) 2,000 MBH Condensing Boilers, Pumps, Gas Serv	P4P	$303,500.00	$20,000.00	15,175.00	54,630.00	33,597.45	406,902.45	101,725.61	305,176.84	15.26	Work includes replacement of piping, pumps, valves, insulation and radient panels - see below.
Subtotal		$2,232,978.70	$204,229.55	$111,648.94	$401,936.17	$247,190.74	$2,993,754.54	***$748,438.64***	$2,245,315.91	10.97	
Lighting upgrades, at least T-8 or LED	P4P	$201,883.50	$32,561.85	10,094.18	36,339.03	22,348.50	270,665.21	67,666.30	202,998.91	6.23	Construction numbers from other projects based on sqft with like kind T-8 light to LED upgrade.
Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	P4P	$1,540.00	$739.20	77.00	277.20	170.48	2,064.68	516.17	1,548.51	2.09	Vendor Pricing
Soda vending machines off at night or weekends	P4P	$453.00	$82.00	22.65	81.54	50.15	607.34	151.83	455.50	5.55	Vendor Pricing
Subtotal		$203,876.50	$33,383.05	$10,193.83	$36,697.77	$22,569.13	$273,337.22	***$68,334.31***	$205,002.92	4.63	
Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$3,062.35	$1,416.20	153.12	551.22	339.00	4,105.69	1,026.42	3,079.27	2.17	Purchase Energy Star rated PCs and printers
Subtotal		$3,062.35	$1,416.20	$153.12	$551.22	$339.00	$4,105.69	***$1,026.42***	$3,079.27	2.17	
Note: Replacement of Steam Piping with Hydronic Hot Water Piping to accommodate new high efficiency boiler system to be funded independently by the School District with NJDOE ROD Grant.											
TOTAL OF ALL PRIORITIES		**$2,439,917.55**	**$239,028.80**	**$121,995.88**	**$439,185.16**	**$270,098.87**	**$3,271,197.46**	**$817,799.36**	**$2,453,398.09**	**10.26**	

Freehold Township High School		
Number of Classrooms: 97	256,000	Gross SF Area

5.0% GC Allowance

18.0% Contingency & Soft Costs

25.0% Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
1	VRF and VRV variable refrigeration volume	P4P	$324,000.00	$28,173.91	16,200.00	58,320.00	35,866.80	434,386.80	108,596.70	325,790.10	11.56	Office RTU Replacement, based on 12 rooms, past project pricing
1	Lighting upgrades, at least T-8 or LED	P4P	$367,744.00	$54,887.16	18,387.20	66,193.92	40,709.26	493,034.38	123,258.60	369,775.79	6.74	Construction numbers from other projects based on SF with like kind T-8 light to LED upgrede.
1	DOAS ventilation system	P4P	$482,400.00	$79,081.96	24,120.00	86,832.00	53,401.68	646,753.68	161,688.42	485,065.26	6.13	Past project pricing, based on 67 Classrooms
1	Motor upgrades, standard efficiency to high efficiency	P4P	$69,600.00	$13,384.61	3,480.00	12,528.00	7,704.72	93,312.72	23,328.18	69,984.54	5.23	Recommended to be done with boiler upgrades
1	Other ERMs - Controls Updrade - Un-occupied Mode	CM OR P4P	$704,000.00	$34,960.00	35,200.00	126,720.00	77,932.80	943,852.80	235,963.20	707,889.60	20.25	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
1	Soda vending machines off at night or weekends	P4P	$3,080.00	$1,386.00	154.00	554.40	340.96	4,129.36	1,032.34	3,097.02	2.23	Vendor Pricing
	Subtotal		$1,950,824.00	$211,873.64	$97,541.20	$351,148.32	$215,956.22	$2,615,469.74	***$653,867.43***	$1,961,602.30	8.69	
2	Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	P4P	$2,046.70	$982.61	102.34	368.41	226.57	2,744.01	686.00	2,058.01	2.09	Cost to be Confirmed
2	Laser Points on off mode at night, times power strips	P4P	$7,944.30	$5,296.20	397.22	1,429.97	879.43	10,650.92	2,662.73	7,988.19	1.51	Vendor Pricing
	Subtotal		$9,991.00	$6,278.81	$499.55	$1,798.38	$1,106.00	$13,394.93	***$3,348.73***	$10,046.20	1.80	
3	Boiler Upgrades: Replace (2) 10 MBH Boilers with (3) MBH Modular Condensing Boilers	P4P	$596,500.00	$18,841.60	29,825.00	107,370.00	66,032.55	799,727.55	199,931.89	599,795.66	31.83	
3	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$4,069.15	$1,881.80	203.46	732.45	450.45	5,455.51	1,363.88	4,091.63	2.17	Purchase Energy Star rated PCs and printers
	Subtotal		$600,569.15	$20,723.40	$30,028.46	$108,102.45	$66,483.00	$805,183.06	***$201,295.76***	$603,887.29	17.00	
	TOTAL OF ALL PRIORITIES		**$2,561,384.15**	**$238,875.85**	**$128,069.21**	**$461,049.15**	**$283,545.23**	**$3,434,047.73**	**$858,511.93**	**$2,575,535.80**	**10.78**	

Howell High School		
Number of Classrooms: 104	249,000	Gross SF Area

5.0% GC Allowance

18.0% Contingency & Soft Costs

25.0% Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
1	VRF and VRV variable refrigeration volume	P4P	$340,200.00	$26,372.00	17,010.00	61,236.00	37,660.14	456,106.14	114,026.54	342,079.61	12.97	Office RTU Replacement, based on 12 rooms, past project pricing
1	Lighting upgrades, at least T-8 or LED	P4P	$201,883.50	$32,561.00	10,094.18	36,339.03	22,348.50	270,665.21	67,666.30	202,998.91	6.23	Construction numbers from other projects based on SF with like kind T-8 light to LED upgrede.
1	DOAS ventilation system	P4P	$309,600.00	$48,375.00	15,480.00	55,728.00	34,272.72	415,080.72	103,770.18	311,310.54	6.44	Past project pricing, based on 67 Classrooms
1	Laser Points on off mode at night, times power strips	P4P	$8,517.00	$5,678.60	425.85	1,533.06	942.83	11,418.74	2,854.69	8,564.06	1.51	Vendor Pricing
1	Soda vending machines off at night or weekends	P4P	$2,640.00	$1,200.00	132.00	475.20	292.25	3,539.45	884.86	2,654.59	2.21	Vendor Pricing
	Subtotal		$862,840.50	$114,186.60	$43,142.03	$155,311.29	$95,516.44	$1,156,810.26	***$289,202.56***	$867,607.69	5.87	
2	Replace (2) 7,500 MBH w/ (4) 2,856 MBH	P4P	$170,880.00	$18,316.85	8,544.00	30,758.40	18,916.42	229,098.82	57,274.70	171,824.11	9.38	Cost to be Confirmed
2	Motor upgrades, standard efficiency to high efficiency	P4P	$35,000.00	$3,390.00	1,750.00	6,300.00	3,874.50	46,924.50	11,731.13	35,193.38	10.38	Recommended to be done with boiler upgrades
	Subtotal		$205,880.00	$21,706.85	$10,294.00	$37,058.40	$22,790.92	$276,023.32	***$69,005.83***	$207,017.49	9.88	
3	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$4,362.80	$2,017.60	218.14	785.30	482.96	5,849.21	1,462.30	4,386.90	2.17	Purchase Energy Star rated PCs and printers
3	Replace Boiler HW Heat Exchanger with <500gal. Gas fired AO Smith HW Boiler	P4P	$102,500.00	$7,500.00	5,125.00	18,450.00	11,346.75	137,421.75	34,355.44	103,066.31	13.74	Haglid Engineering to confirm savings
3	Other ERMs - Controls Updrade - Un-occupied Mode	CM OR P4P	$682,000.00	$34,960.00	34,100.00	122,760.00	75,497.40	914,357.40	228,589.35	685,768.05	19.62	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
	Subtotal		$788,862.80	$44,477.60	$39,443.14	$141,995.30	$87,327.11	$1,057,628.36	***$264,407.09***	$793,221.27	11.84	
	TOTAL OF ALL PRIORITIES		**$1,857,583.30**	**$180,371.05**	**$92,879.17**	**$334,364.99**	**$205,634.47**	**$2,490,461.93**	**$622,615.48**	**$1,867,846.45**	**10.36**	

Manalapan High School		
Number of Classrooms: 156	256,000	Gross SF Area

5.0% GC Allowance

18.0% Contingency & Soft Costs

25.0% Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
1	VRF and VRV variable refrigeration volume	P4P	$324,000.00	$26,776.00	16,200.00	58,320.00	35,866.80	434,386.80	108,596.70	325,790.10	12.17	Office RTU Replacement, based on 12 rooms, past project pricing
1	Lighting upgrades, at least T-8 or LED	P4P	$565,760.00	$79,684.00	28,288.00	101,836.80	62,629.63	758,514.43	189,628.61	568,885.82	7.14	Construction numbers from other projects based on SF with like kind T-8 light to LED upgrede.
1	DOAS ventilation system	P4P	$596,400.00	$96,193.54	29,820.00	107,352.00	66,021.48	799,593.48	199,898.37	599,695.11	6.23	Past project pricing, based on 67 Classrooms
1	Motor upgrades, standard efficiency to high efficiency - VFD (3) 25 HP	CM or P4P	$32,000.00	$6,224.00	1,600.00	5,760.00	3,542.40	42,902.40	10,725.60	32,176.80	5.17	Recommended to be done with boiler upgrades
1	Motor upgrades, standard efficiency to high efficiency - VFD (2) 10 HP	CM or P4P	$16,000.00	$2,256.00	800.00	2,880.00	1,771.20	21,451.20	5,362.80	16,088.40	7.13	Recommended to be done with boiler upgrades
1	400 CFM Wing ERV Upgrade	P4P	$22,000.00	$4,230.00	1,100.00	3,960.00	1,980.00	29,040.00	7,260.00	21,780.00	5.15	Recommended to be done with boiler upgrades
1	Laser Points on off mode at night, times power strips	P4P	$12,448.00	$8,299.00	622.40	2,240.64	1,377.99	16,689.03	4,172.26	12,516.78	1.51	Vendor Pricing
1	Soda vending machines off at night or weekends	P4P	$2,640.00	$1,108.00	132.00	475.20	292.25	3,539.45	884.86	2,654.59	2.40	Vendor Pricing
	Subtotal		$1,571,248.00	$224,770.54	$78,562.40	$282,824.64	$173,481.76	$2,106,116.80	***$526,529.20***	$1,579,587.60	5.86	
2	Boiler Upgrades: Replace (2) 10 MBH Boilers with (3) MBH Modular Condensing Boilers	P4P	$596,500.00	$18,841.60	29,825.00	107,370.00	66,032.55	799,727.55	199,931.89	599,795.66	31.83	Haglid to confirm energy savings
	Subtotal		$596,500.00	$18,841.60	$29,825.00	$107,370.00	$66,032.55	$799,727.55	***$199,931.89***	$599,795.66	31.83	
3	Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	P4P	$3,291.60	$1,580.28	164.58	592.49	364.38	4,413.05	1,103.26	3,309.79	2.09	
3	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$6,544.20	$3,026.40	327.21	1,177.96	724.44	8,773.81	2,193.45	6,580.36	2.17	Purchase Energy Star rated PCs and printers
3	Other ERMs - Controls Updrade - Un-occupied Mode	CM OR P4P	$660,000.00	$37,463.41	33,000.00	118,800.00	73,062.00	884,862.00	221,215.50	663,646.50	17.71	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
	Subtotal		$669,835.80	$42,070.09	$33,491.79	$120,570.44	$74,150.82	$898,048.86	***$224,512.21***	$673,536.64	7.33	
	TOTAL OF ALL PRIORITIES		**$2,837,583.80**	**$285,682.23**	**$141,879.19**	**$510,765.08**	**$313,665.13**	**$3,803,893.21**	**$950,973.30**	**$2,852,919.90**	**9.99**	

Marlboro High School		
Number of Classrooms: 102	264,000	Gross SF Area

5.0% GC Allowance

18.0% Contingency & Soft Costs

25.0% Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
1	Lighting upgrades, at least T-8 or LED	P4P	$262,548.00	$41,674.28	13,127.40	47,258.64	29,064.06	351,998.10	87,999.53	263,998.58	6.33	Construction numbers from other projects based on SF with like kind T-8 light to LED upgrede.
1	DOAS ventilation system	P4P	$734,400.00	$114,750.00	36,720.00	132,192.00	81,298.08	984,610.08	246,152.52	738,457.56	6.44	Past project pricing, based on 67 Classrooms
1	Motor upgrades, standard efficiency to high efficiency - VFD (4) 10 HP, (2) 5 HP Mug	CM or P4P	$32,000.00	$6,224.00	1,600.00	5,760.00	3,542.40	42,902.40	10,725.60	32,176.80	5.17	Recommended to be done with boiler upgrades
1	Switching out steam heating for HYDRONIC heating or gas fired - UPDATE	CM or P4P	$28,200.00	$4,692.10	1,410.00	5,076.00	3,121.74	37,807.74	9,451.94	28,355.81	6.04	Recommended to be done with boiler upgrades
1	Other ERMs - DDC Control Upgrades - UnOccupied Mode	P4P	$1,012,000.00	$34,434.78	50,600.00	182,160.00	112,028.40	1,356,788.40	339,197.10	1,017,591.30	29.55	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
1	Laser Points on off mode at night, times power strips	P4P	$8,353.80	$5,569.20	417.69	1,503.68	924.77	11,199.94	2,799.98	8,399.95	1.51	Vendor Pricing
1	Soda vending machines off at night or weekends	P4P	$2,640.00	$1,108.00	132.00	475.20	292.25	3,539.45	884.86	2,654.59	2.40	Vendor Pricing
	Subtotal		$2,080,141.80	$208,452.36	$104,007.09	$374,425.52	$230,271.70	$2,788,846.11	***$697,211.53***	$2,091,634.58	8.21	
2	VRF and VRV Variable Regrigeration Volume	P4P	$438,400.00	$35,354.84	21,920.00	78,912.00	48,530.88	587,762.88	146,940.72	440,822.16	12.47	Cost to be Confirmed
2	Plug Loads on Timers, Reduce Plug Loads, Vending Machines (10 +/-)	P4P	$1,890.00	$630.00	94.50	340.20	209.22	2,533.92	633.48	1,900.44	3.02	Vendor Pricing
	Subtotal		$440,290.00	$35,984.84	$22,014.50	$79,252.20	$48,740.10	$590,296.80	***$147,574.20***	$442,722.60	7.74	
3	Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	P4P	$2,152.20	$1,033.26	107.61	387.40	238.25	2,885.45	721.36	2,164.09	2.09	Confirm Costs
3	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$4,278.90	$1,978.80	213.95	770.20	473.67	5,736.72	1,434.18	4,302.54	2.17	Purchase Energy Star rated PCs and printers
	Other											
	Subtotal		$6,431.10	$3,012.06	$321.56	$1,157.60	$711.92	$8,622.18	***$2,155.54***	$6,466.63	2.13	

	TOTAL OF ALL PRIORITIES		**$2,526,862.90**	**$247,449.26**	**$126,343.15**	**$454,835.32**	**$279,723.72**	**$3,387,765.09**	**$846,941.27**	**$2,540,823.82**	**10.27**	

Colts Neck High School		
Number of Classrooms: 82	220,000	Gross SF Area

5.0% GC Allowance

18.0% Contingency & Soft Costs

25.0% Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
1	Lighting upgrades, at least T-8 or LED	P4P	$486,200.00	$99,000.00	24,310.00	87,516.00	53,822.34	651,848.34	162,962.09	488,886.26	4.94	Construction numbers from other projects based on SF with like kind T-8 light to LED upgrede.
1	Motor upgrades, standard efficiency to high efficiency - VFD, HW Circ. Pump, Chilled Water	CM or P4P	$35,000.00	$7,280.00	1,750.00	6,300.00	3,874.50	46,924.50	11,731.13	35,193.38	4.83	Recommended to be done with boiler upgrades
1	Other ERMs - DDC Control Upgrades - UnOccupied Mode	CM or P4P	$296,840.00	$57,200.00	14,842.00	53,431.20	32,860.19	397,973.39	99,493.35	298,480.04	5.22	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
	Subtotal		$818,040.00	$163,480.00	$40,902.00	$147,247.20	$90,557.03	$1,096,746.23	***$274,186.56***	$822,559.67	5.00	
2	Laser Points on off mode at night, times power strips	P4P	$6,715.80	$4,477.20	335.79	1,208.84	743.44	9,003.87	2,250.97	6,752.90	1.51	Vendor Pricing
2	(4) Soda / vending machines off at night or weekends	P4P	$880.00	$421.00	44.00	158.40	97.42	1,179.82	294.95	884.86	2.10	Vendor Pricing
	Subtotal		$7,595.80	$4,898.20	$379.79	$1,367.24	$840.86	$10,183.69	***$2,545.92***	$7,637.77	1.81	
3	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$3,439.90	$1,590.80	172.00	619.18	380.80	4,611.87	1,152.97	3,458.91	2.17	Purchase Energy Star rated PCs and printers
	Other											
	Subtotal		$3,439.90	$1,590.80	$172.00	$619.18	$380.80	$4,611.87	***$1,152.97***	$3,458.91	2.17	

	TOTAL OF ALL PRIORITIES		**$829,075.70**	**$169,969.00**	**$41,453.79**	**$149,233.63**	**$91,778.68**	**$1,111,541.79**	**$277,885.45**	**$833,656.34**	**4.90**	

				Data from 2012-2013 Report								Data from 2009-2010 Report						
	Energy Star Rating	Site Visit Date	Square Footage	Electric Consumption (kWh)	Annual Electric ($)	Price per kWh	Gas Consumption	Annual Gas ($)	Price per Therm	Total Cost	$ Cost/sqft	Electric Consumption (kWh)	Annual Electric ($)	Price per kWh	Gas Consumption	Annual Gas ($)	Price per Therm	Energy Star Rating
Colts Neck	2	4/25/2013	220,000	3,622,182	$395,018.79	$0.109	89,378	$93,778.64	$1.049	$488,797	$2.22	3,635,786	$558,674	0.154	143,801	$217,191	1.51	2
Freehold Borough	17	4/1/2013	203,000	2,049,600	$230,109.35	$0.112	160,178	$171,540.93	$1.071	$401,650	$1.98	2,366,100	$366,118	0.155	226,982	$337,128	1.49	5
Freehold Township	67	4/30/2013	256,000	2,387,600	$270,040.24	$0.113	96,275	$101,043.01	$1.050	$371,083	$1.45	2,505,600	$395,173	0.158	114,940	$176,033	1.53	39
Howell	20	4/30/2013	249,000	2,731,200	$308,866.43	$0.113	83,152	$86,726.42	$1.043	$395,593	$1.59	2,637,200	$414,416	0.157	142,441	$216,394	1.52	45
Manalapan	67	4/30/2013	256,000	2,377,200	$290,326.50	$0.122	106,618	$111,433.59	$1.045	$401,760	$1.57	2,421,200	$377,524	0.156	127,507	$212,830	1.67	41
Marlboro	41	4/25/2013	264,000	2,303,040	$280,207.07	$0.122	111,605	$117,034.22	$1.049	$397,241	$1.50	2,757,196	$425,088	0.154	142,751	$221,168	1.55	30

NOTES:
1. Howell HS exhibited reduction in Energy Star Rating from 45 to 20 apparently due to installation of (38) new roof top units with insufficient automatic temperature control. Resulted in increased energy comsumption even though T8 lighting was installed.

VII. Financial Analysis – Detailed Summary

Freehold Regional Board of Education
Annual Cash-Flow for ESIP - Level Benefit
ESIP Cash-Flow

	Energy/Main. Savings (1/2 in 2015)	ESIP Incentives 10%/45%/45% Boro, Twp, Man	Howell, Marl, CN	ESIP Payments	ESIP Annual Balance
6/30/2015	640,733	229,893			870,625
6/30/2016	1,281,465	1,034,517	207,441	(2,356,661)	166,761
6/30/2017	1,281,465	1,034,517	933,483	(3,078,400)	171,064
6/30/2018	1,281,465		933,483	(2,034,560)	180,388
6/30/2019	1,281,465			(1,108,544)	172,921
6/30/2020	1,281,465			(1,108,352)	173,113
6/30/2021	1,281,465			(1,107,392)	174,073
6/30/2022	1,281,465			(1,106,648)	174,817
6/30/2023	1,281,465			(1,107,072)	174,393
6/30/2024	1,281,465			(1,106,632)	174,833
6/30/2025	1,281,465			(1,106,312)	175,153
6/30/2026	1,281,465			(1,105,096)	176,369
6/30/2027	1,281,465			(1,104,952)	176,513
6/30/2028	1,281,465			(1,104,832)	176,633
6/30/2029	1,281,465			(1,103,720)	177,745
6/30/2030	1,281,465			(1,103,584)	177,881
6/30/2031	1,281,465			(1,103,376)	178,089
Total	21,144,173	2,298,926	2,074,406	(21,846,133)	3,671,371

Assumptions:

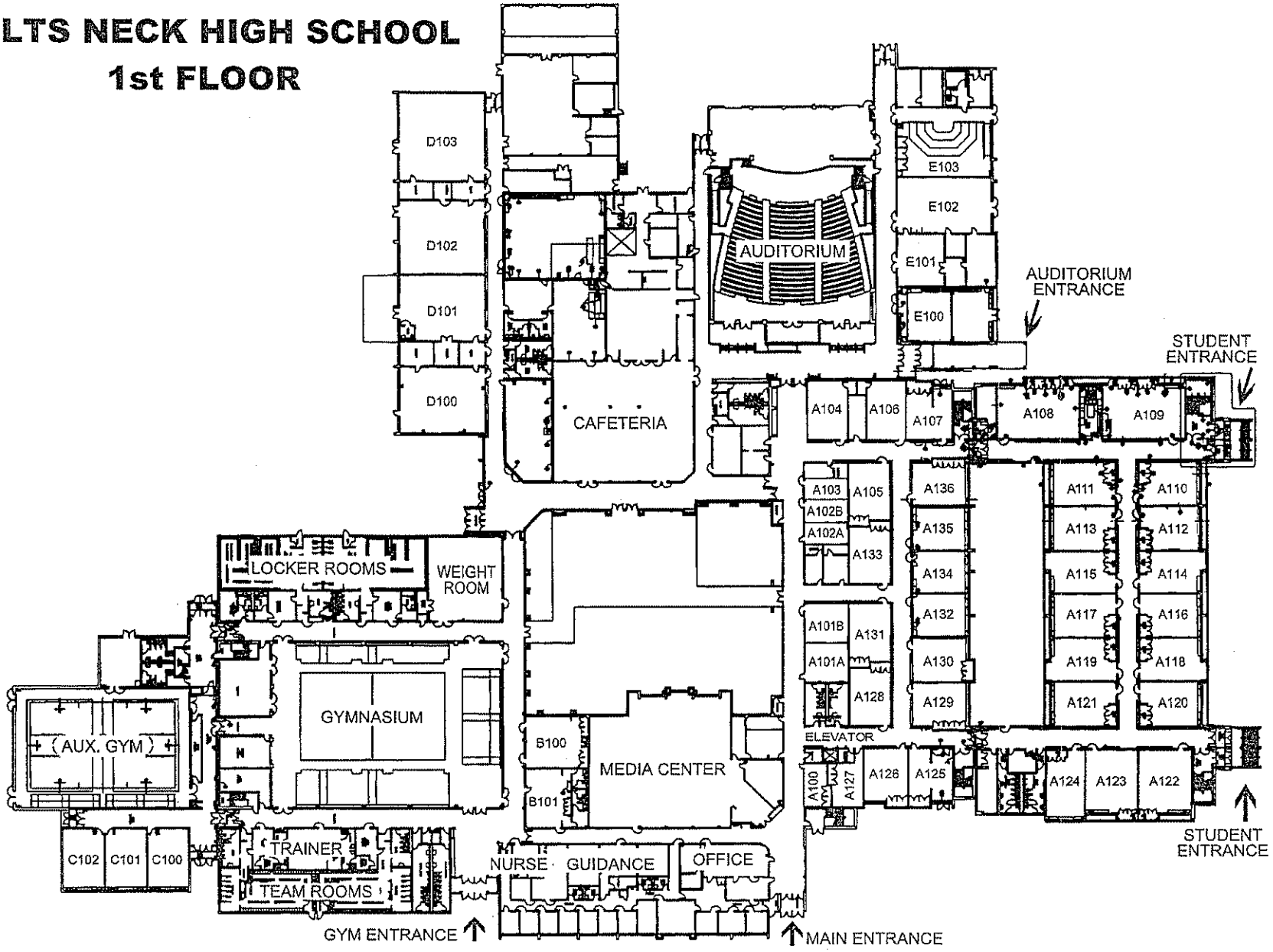
ESIP Total to Finance	$ 17,498,000
Issue Date	June, 2014
First Payment Due	July, 2015
Last Payment Due	July, 2030
Interest Rate Assumed	3.20%

VIII. Drawing References

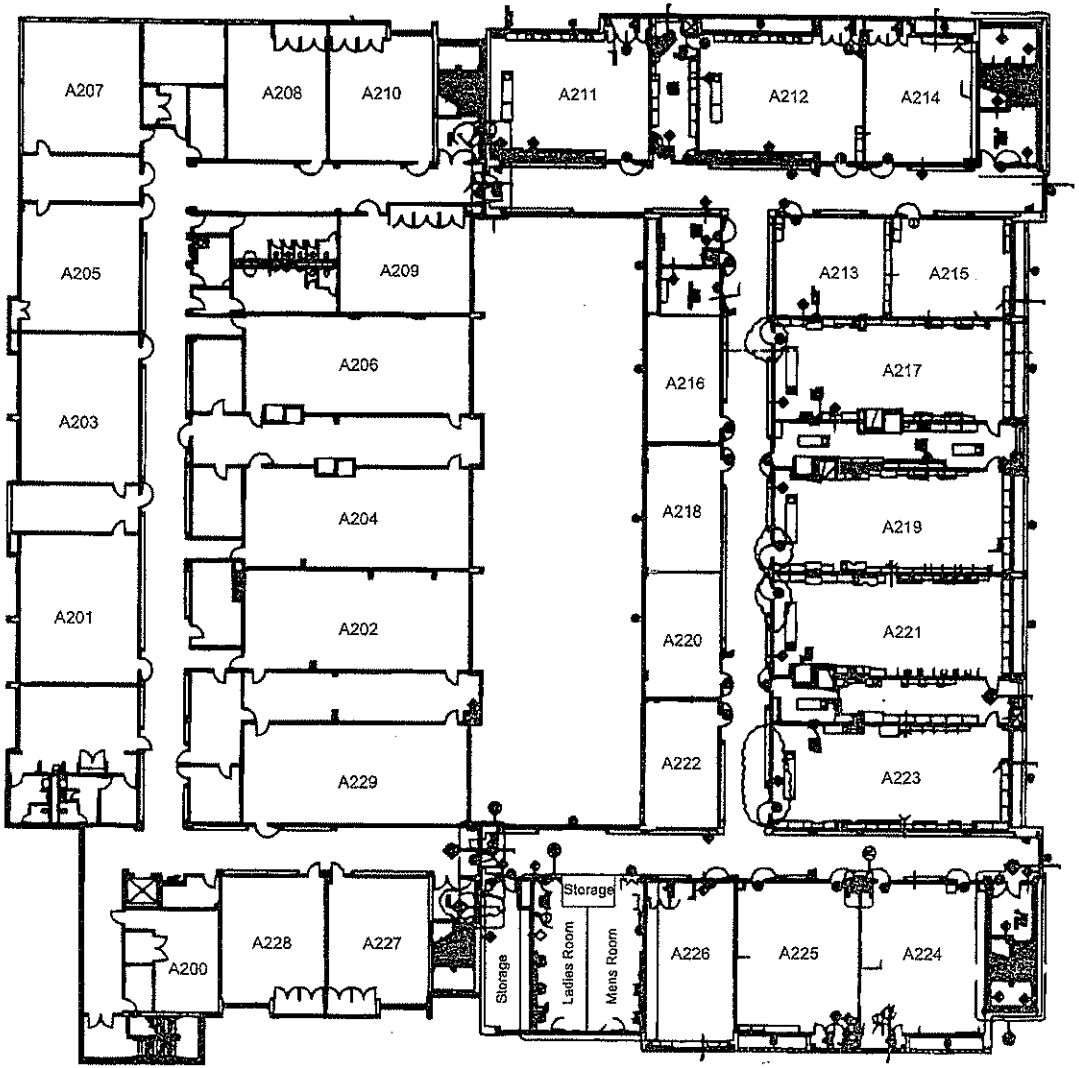
APPENDIX H

FLOOR PLANS

COLTS NECK HIGH SCHOOL
1st FLOOR

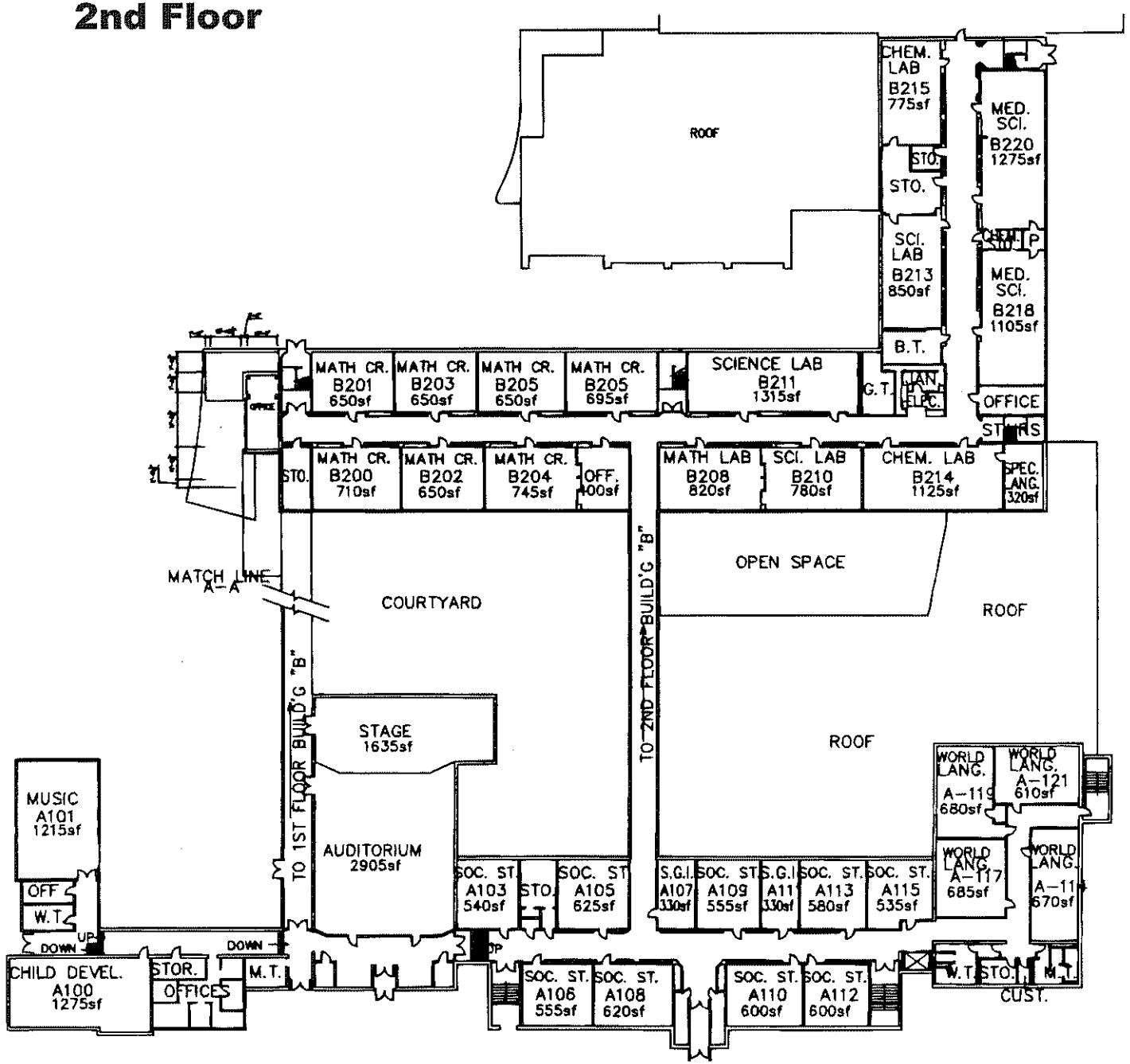


COLTS NECK HIGH SCHOOL
2nd FLOOR



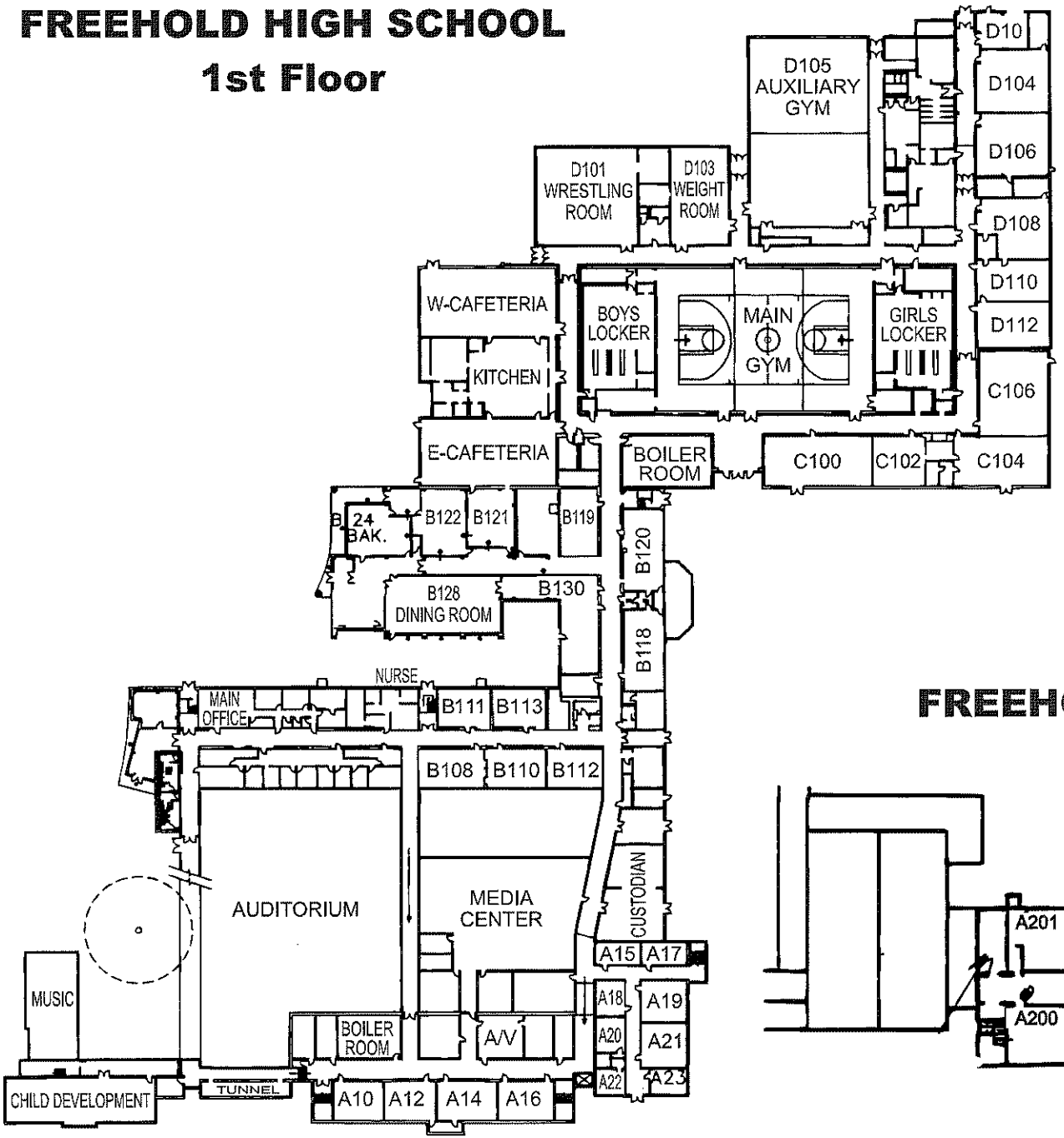
FREEHOLD HIGH SCHOOL

2nd Floor



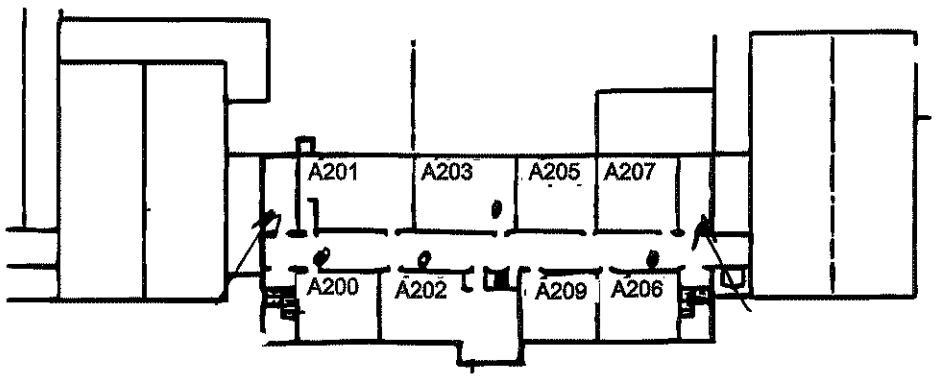
FREEHOLD HIGH SCHOOL

1st Floor



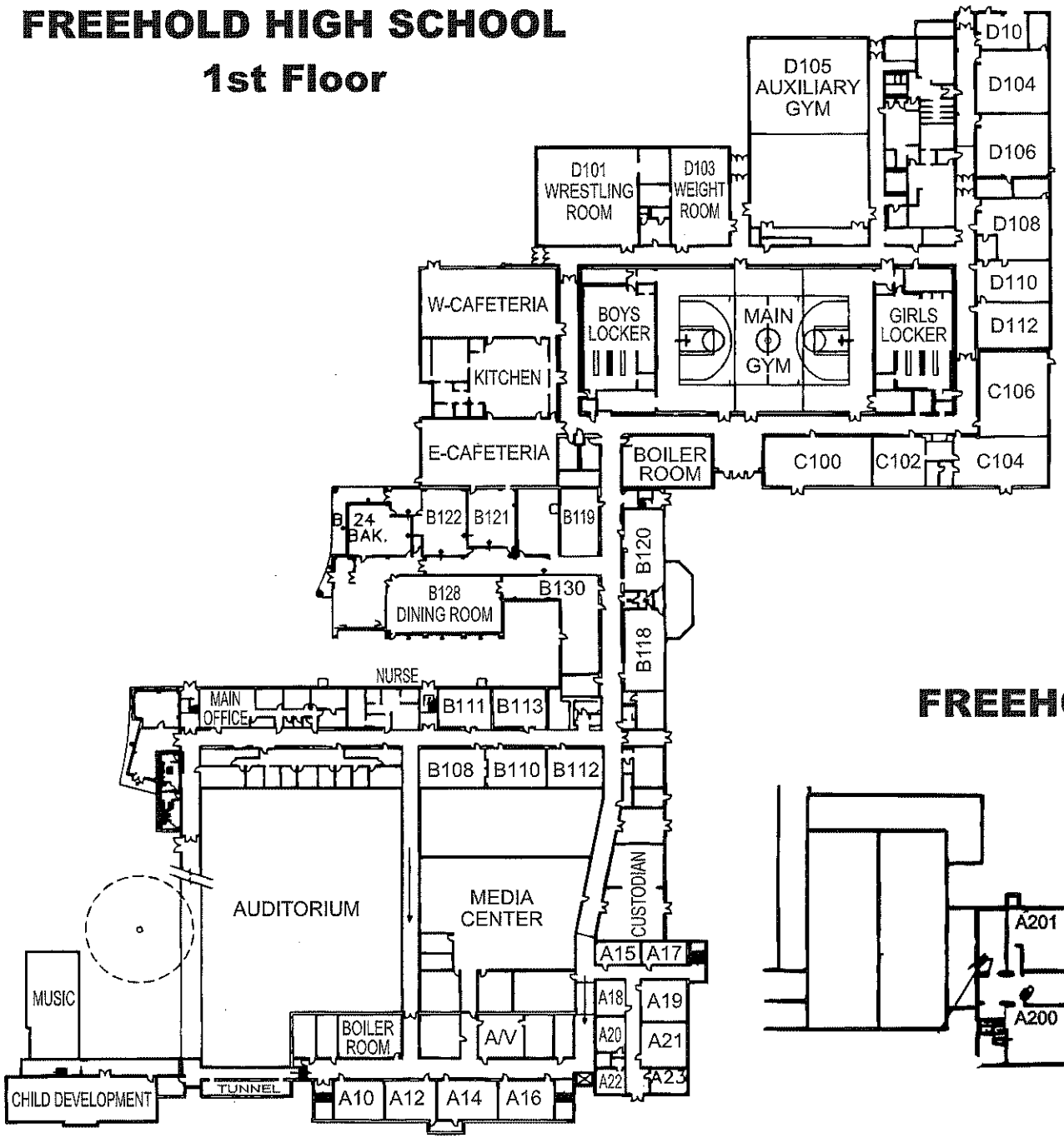
FREEHOLD HIGH SCHOOL

3rd Floor



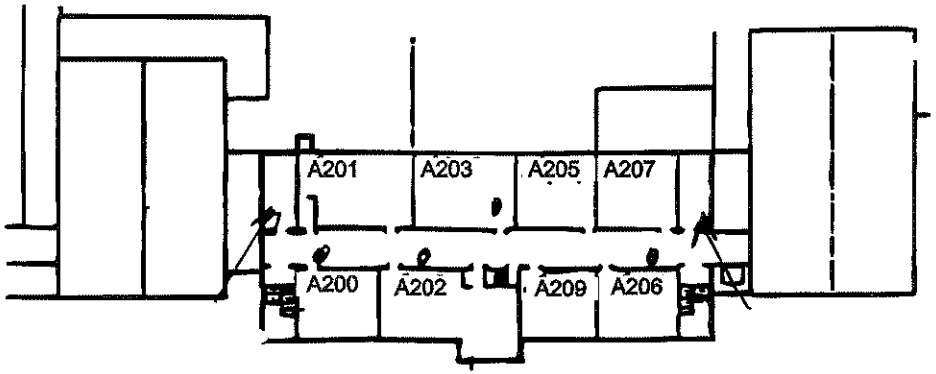
FREEHOLD HIGH SCHOOL

1st Floor



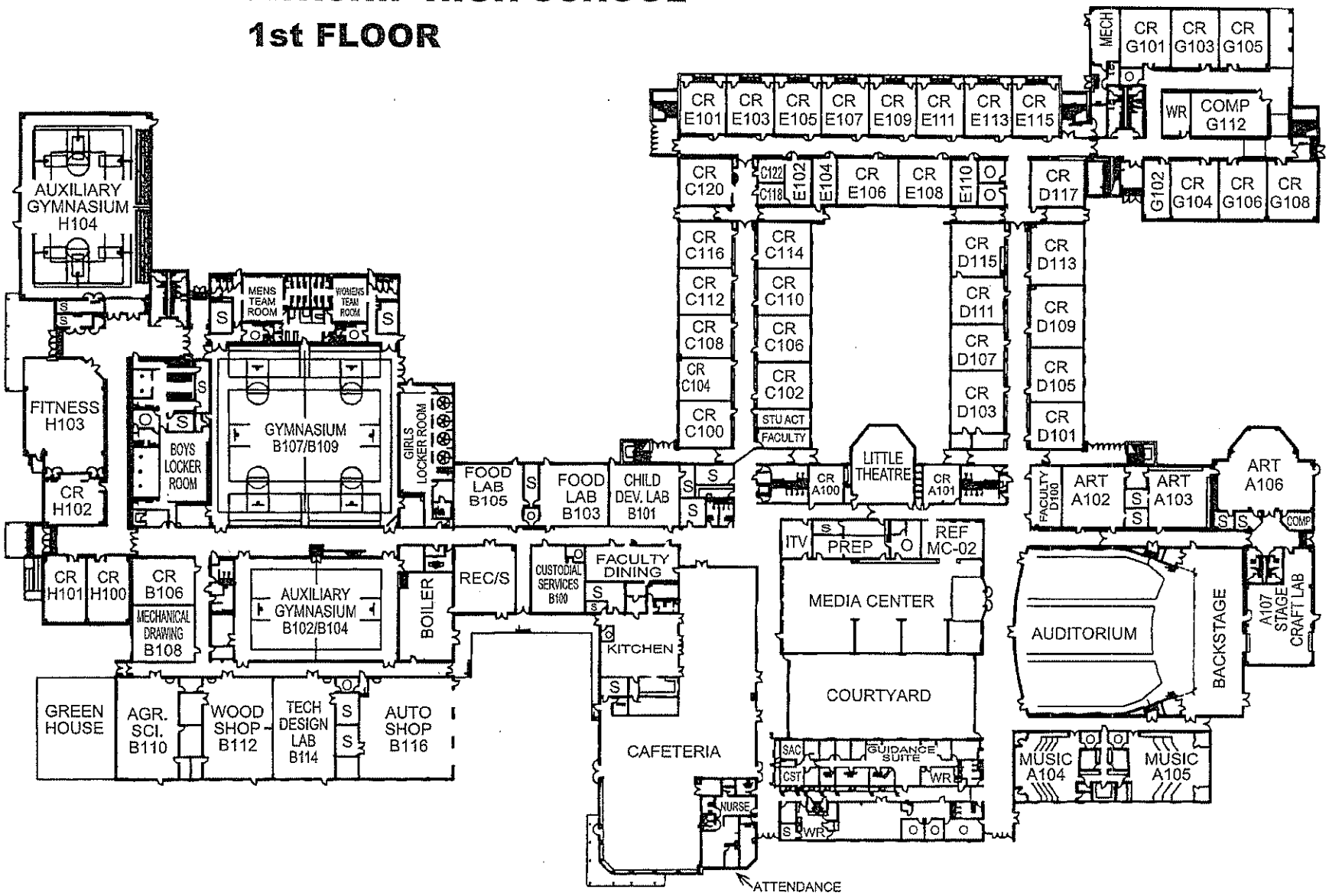
FREEHOLD HIGH SCHOOL

3rd Floor

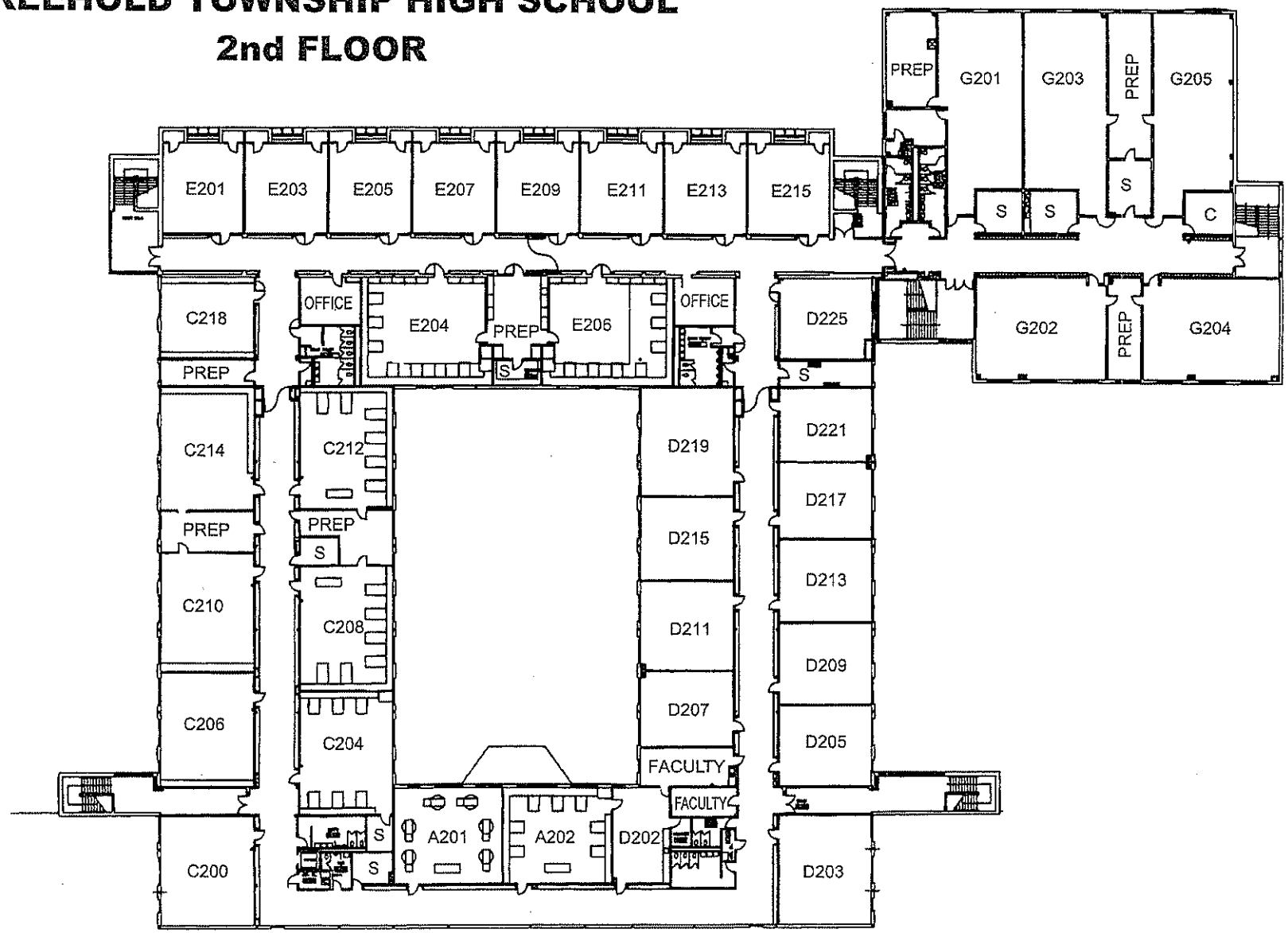


FREEHOLD TOWNSHIP HIGH SCHOOL

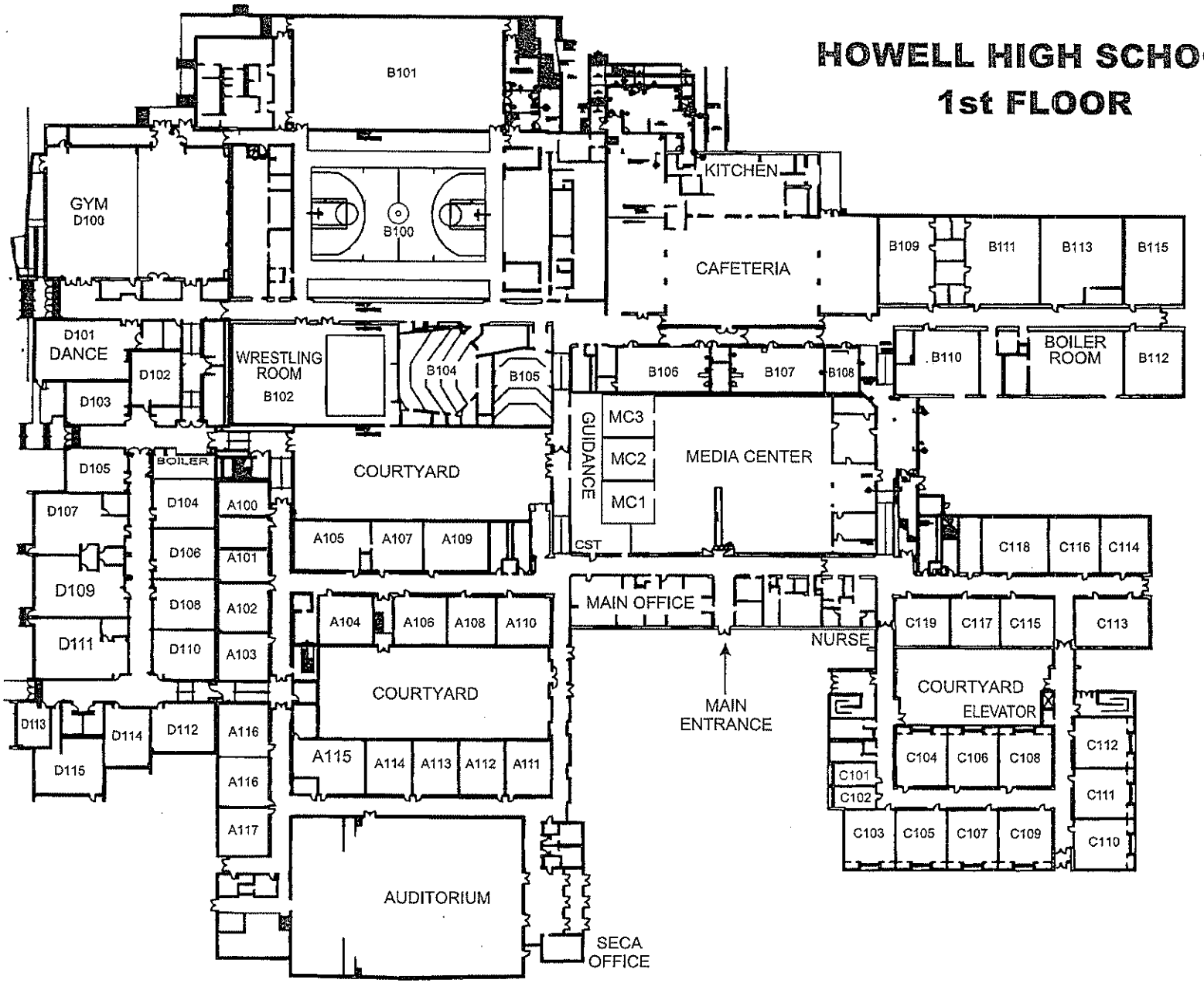
1st FLOOR



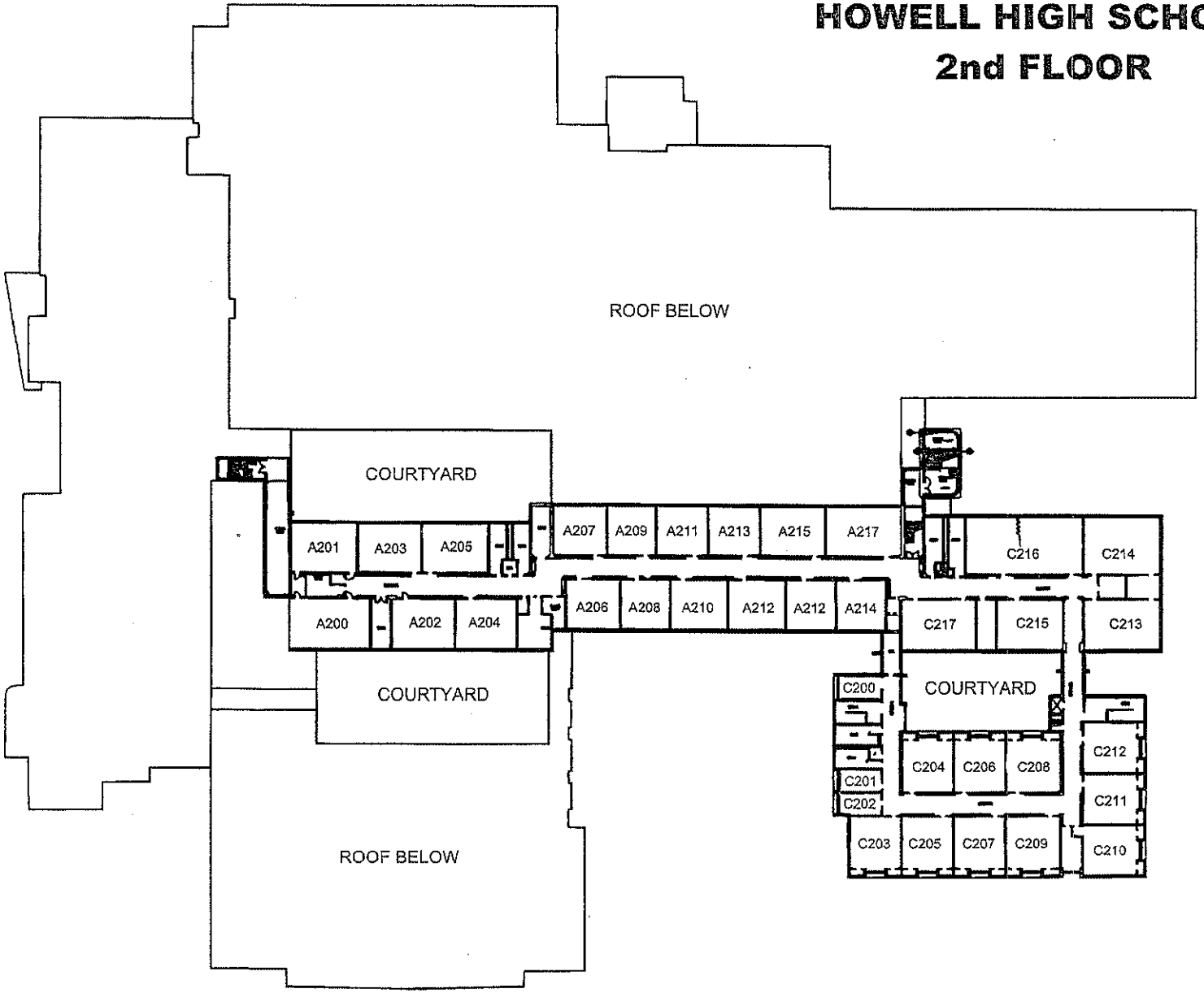
FREEHOLD TOWNSHIP HIGH SCHOOL
2nd FLOOR



HOWELL HIGH SCHOOL
1st FLOOR

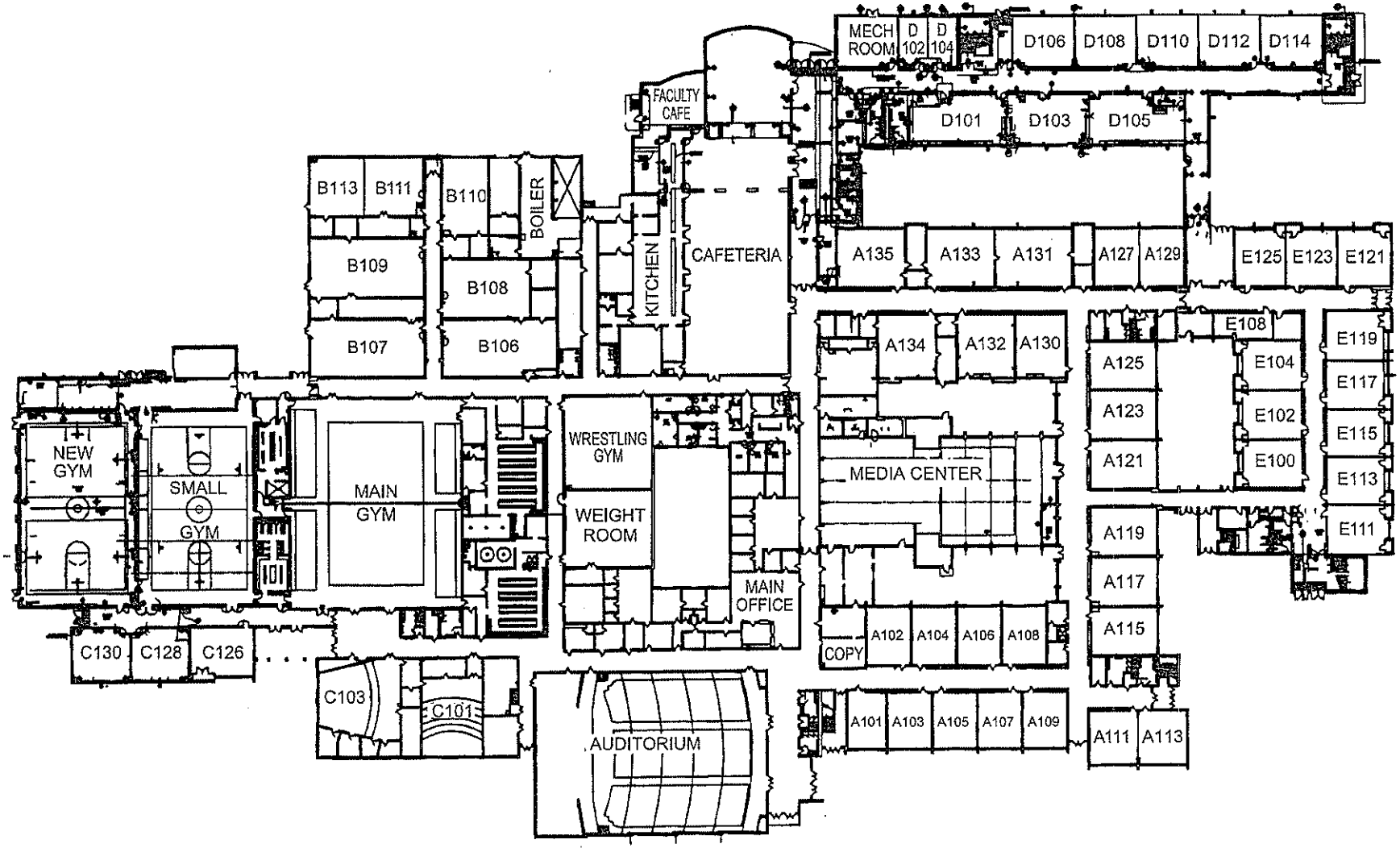


HOWELL HIGH SCHOOL
2nd FLOOR

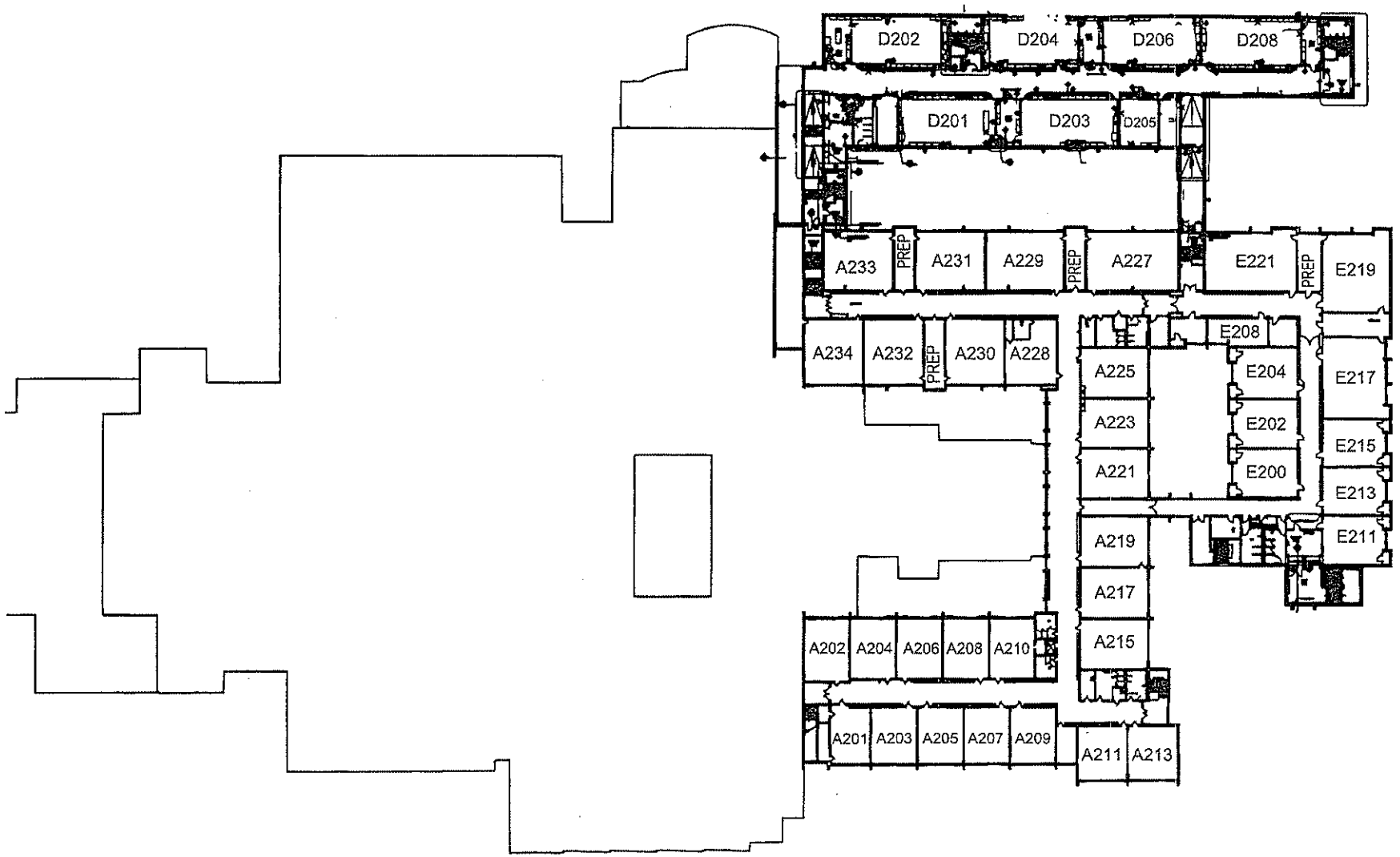


MARLBORO HIGH SCHOOL

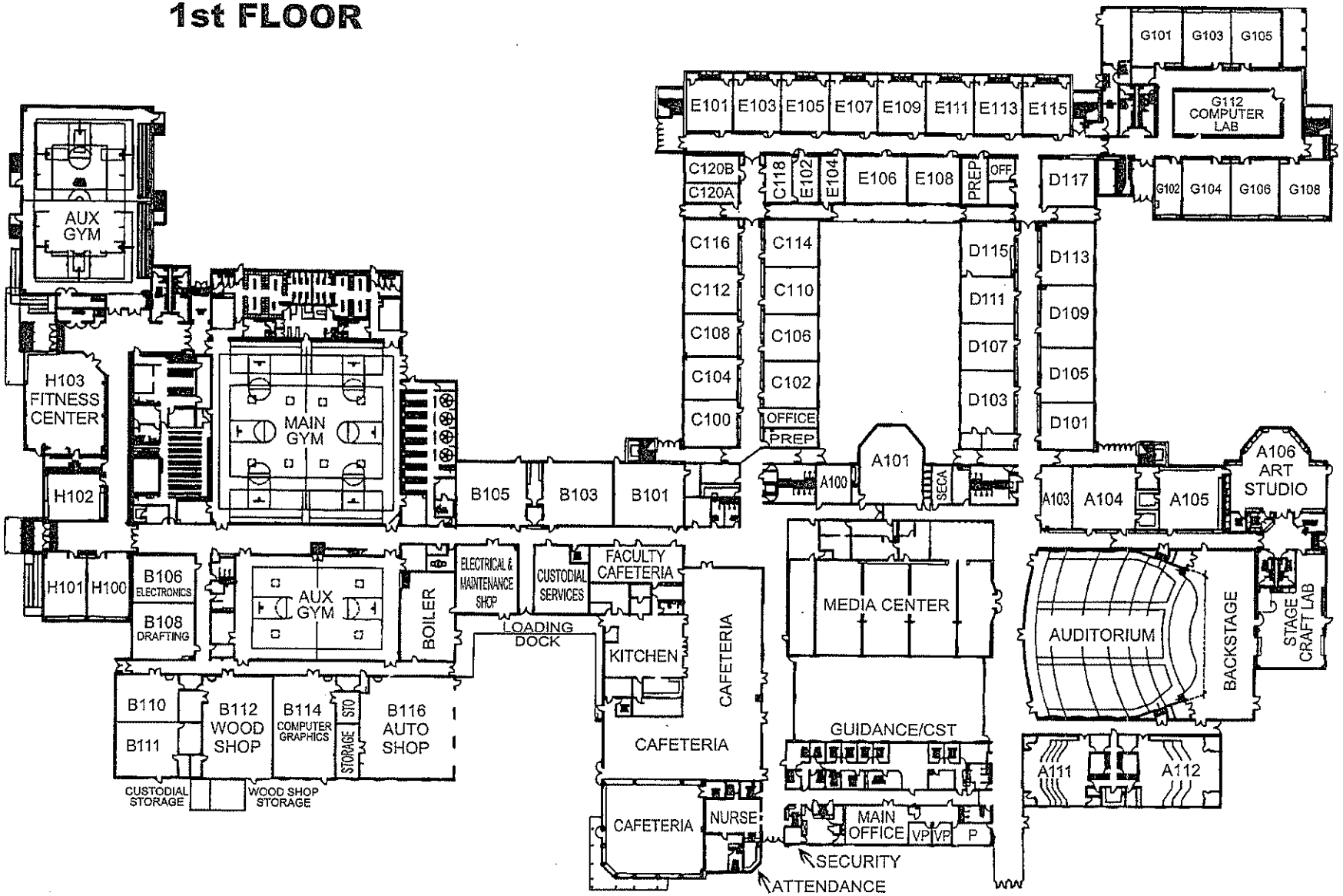
1st FLOOR



MARLBORO HIGH SCHOOL
2nd FLOOR

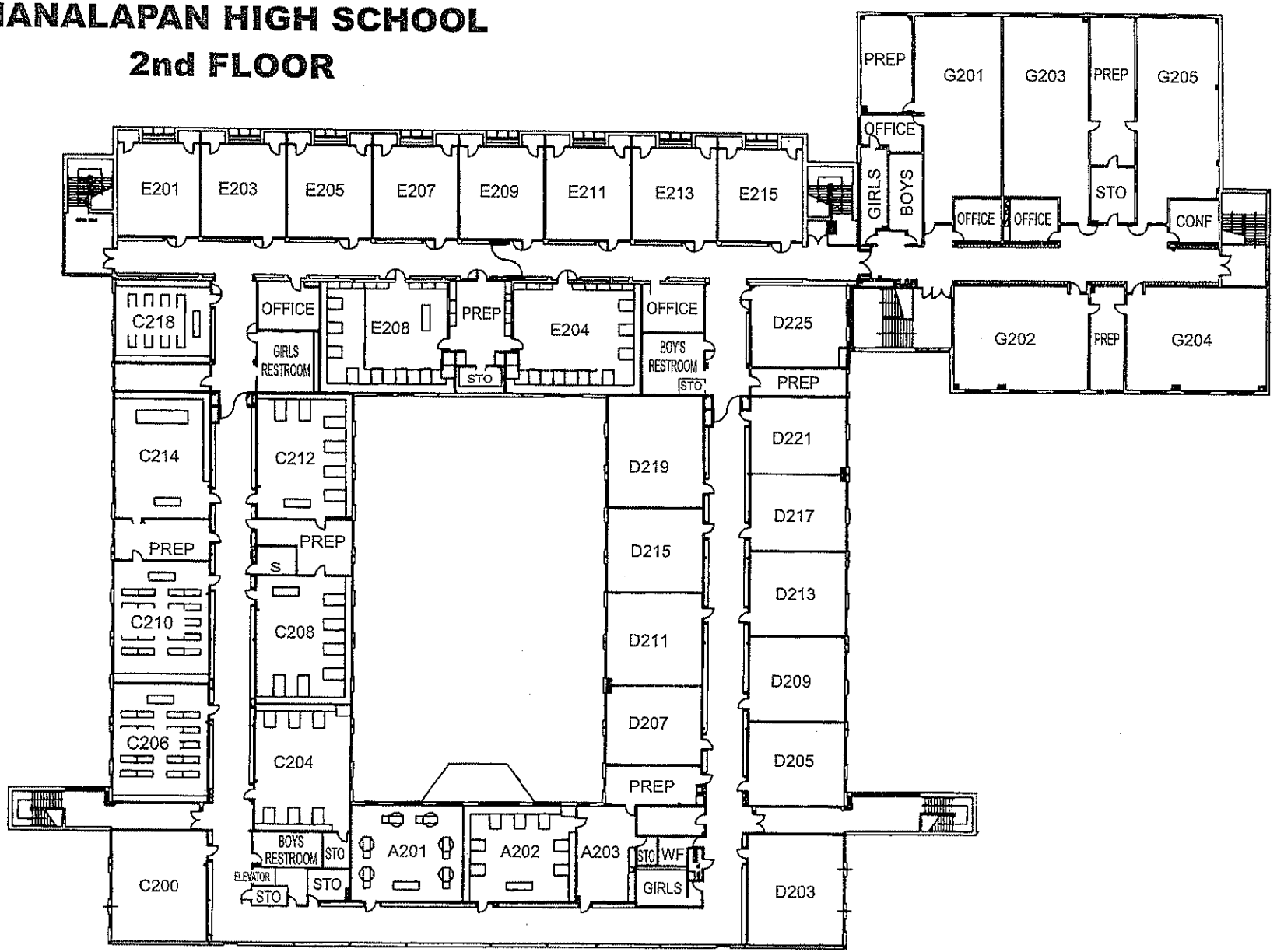


MANALAPAN HIGH SCHOOL
1st FLOOR



MANALAPAN HIGH SCHOOL

2nd FLOOR



VOLUME II - Energy Savings Improvement Plan

Energy Reduction Measure Descriptions for the Freehold Regional High School Board of Education

Prepared by

Fraytak Veisz Hopkins Duthie, PC Architects – Planners

In conjunction with

French & Parrello Associates, Inc.
Consulting Engineers

Haglid Engineering Associates
Energy Consultant

September 27, 2013 - Rev.1 Final ESIP - January 30, 2014

VOLUME II

VI. Energy Reduction Measure Descriptions

A. Freehold Borough High School

B. Freehold Township High School

C. Howell High School

D. Manalapan High School

E. Marlboro High School

F. Colts Neck High School

Preliminary ESMs

Prepared for:

Freehold High School

65 Broadway

Freehold, NJ 07728

Prepared by:

Haglid Engineering and Associates, Inc.
80 Broadway
Hillsdale, NJ 07642
Telephone: (201) 722-1233
Fax: (201) 722-0999

Engineer: Klas C. Haglid, P. E.

Assumptions	
$/kWh	0.112
$/Therm	1.071

	Energy Use	Expense
Current Electric Usage (kWh)	2,049,600.00	$229,555.20
Current Gas Usage (Therms)	160,178.00	$171,550.64
Total kBtu	23,011,322.14	$401,105.84

Total Annual Savings	$217,377.12
% savings of Current Utility Bill	54.19%

Freehold Borough High School			5.0%	GC Allowance	25.0%
Number of Classrooms: 73	203,000	Gross SF Area	**18.0%**	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.
Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**VRF and VRV variable refrigeration volume**	P4P	$302,400.00	$18,439.02	15,120.00	54,432.00	33,475.68	405,427.68	101,356.92	304,070.76	16.49

Cost Basis:	Estimated installed cost of $302,400 for 12 offices or classrooms ($25,200 per class) based on installed costs for Public High School installations on previous projects in the last two years in central NJ. This includes union labor and other typical installation costs.
Saving Projection:	A Trane Trace model for a "like kind" school in the same geographic area was modeled for adding VRV to 26 classrooms/offices at $46,483/year. See attached Trace model. This $46,483/year was divided by 26 = $1,787.80/classroom, the savings was projected for 12 classrooms therefore multiplied by 12 classrooms x $1,787.80/classroom = $21,453.69. Below is a table elaborating more detail on the breakdown between gas and electric savings.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	88,386.00	$9,899.23	48,877.46	146.33	120.93	4.27
Gas (Therms)	10788.46	$11,554.44	517,109.21	1,057.96	1,279.39	45.16
Total Savings Kbtu	1,380,431.55	$21,453.67	565,986.67	1,204.29	1,400.32	
					Total Pollution Reduction in Cars Removed from the Road =	**49.43**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	This VRV system will have an EER rating of 13 or better with reheat and the ability to recover heat energy from one classroom to another. The existing HVAC system has an EER of less than 9.0.		
Energy Savings Safety Factor	1.16	Estimated annual savings with Energy Savings Factor of Safety =	$18,439.02
Discussion:	There are parts of this high school that would benefit from this system, especially administrative offices. These calculations are based on installing VRV Heat pumps in 12 offices or classrooms. This is not a school wide application but strictly meant for office areas, critical use and areas that typically would have use during the summer months. While we have seen these VRV systems have very good savings compared to heating and cooling areas in other schools, we believe that for FH Borough this can likely be expected to be used in areas that do not have air conditioning or functional air conditioning. Therefore, the savings will not be great compared to the cost of this project. This can be something that we evaluate as this project goes forward. Another interesting note is that in Freehold Borough High School there is an excessive amount of ventilation and the idea would be to address some of the runaway exhaust fans and other issues in tandem with installing the HVAC upgrades.		

EEMs for Freehold Boro HS

Location	**Freehold Boro**
Building owner	**Freehold Regional High School District**
Program user	**Employee**
Company	**Haglid Engineering & Associates**
Comments	**Energy Evaluation for Freehold HS**
By	**Haglid Engineering & Associates, Inc.**
Dataset name	**C:\Documents and Settings\Klas Haglid\My Documents\TRACE 700 Projects\Bear Tavern\Freehold Boro VRV & Lt.trc**
Calculation time	**01:12 PM on 12/16/2013**
TRACE® 700 version	**6.2.6.5**
Location	**McGuire AFB, New Jersey**
Latitude	**40.0 deg**
Longitude	**74.0 deg**
Time Zone	**5**
Elevation	**133 ft**
Barometric pressure	**29.8 in. Hg**
Air density	**0.0757 lb/cu ft**
Air specific heat	**0.2444 Btu/lb·°F**
Density-specific heat product	**1.1098 Btu/h·cfm·°F**
Latent heat factor	**4,885.3 Btu·min/h·cu ft**
Enthalpy factor	**4.5402 lb·min/hr·cu ft**
Summer design dry bulb	**89 °F**
Summer design wet bulb	**76 °F**
Winter design dry bulb	**11 °F**
Summer clearness number	**0.99**
Winter clearness number	**0.99**
Summer ground reflectance	**0.20**
Winter ground reflectance	**0.20**
Carbon Dioxide Level	**400 ppm**
Design simulation period	**January - December**
Cooling load methodology	**TETD-TA1**
Heating load methodology	**UATD**

Economic Summary

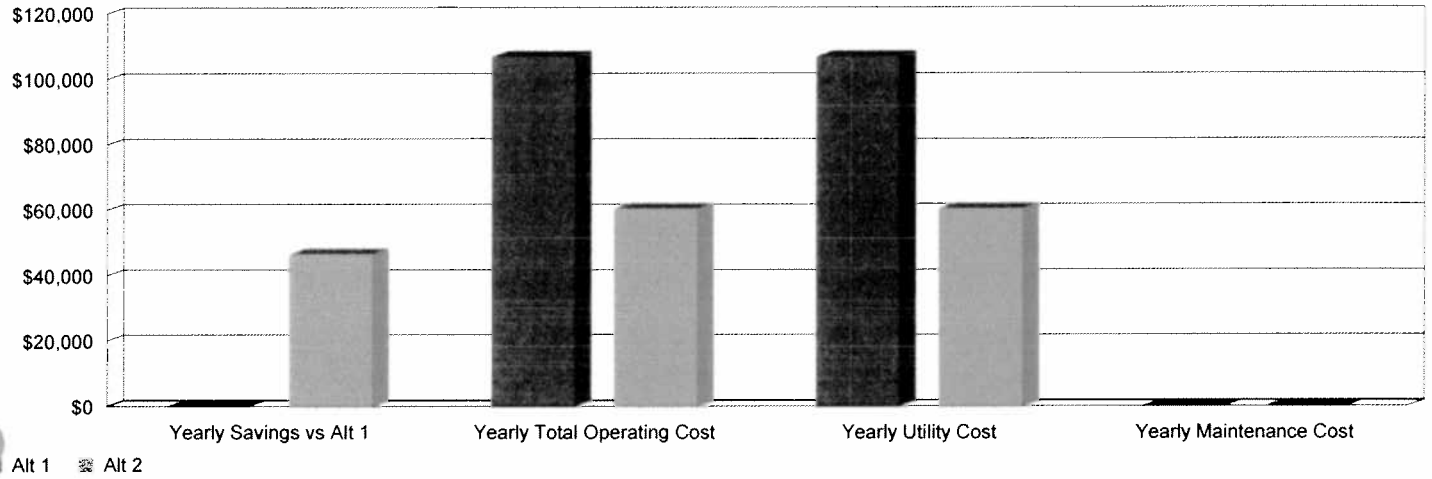
Project Information

Location	Freehold Boro	Study Life:	20 years
Project Name	EEMs for Freehold Boro HS	Cost of Capital:	10 %
	Employee	Alternative 1:	Freehold Boro HS
Company	Haglid Engineering & Associates	Alternative 2:	VRV Upgrades
Comments	Energy Evaluation for Freehold HS		

Economic Comparison of Alternatives

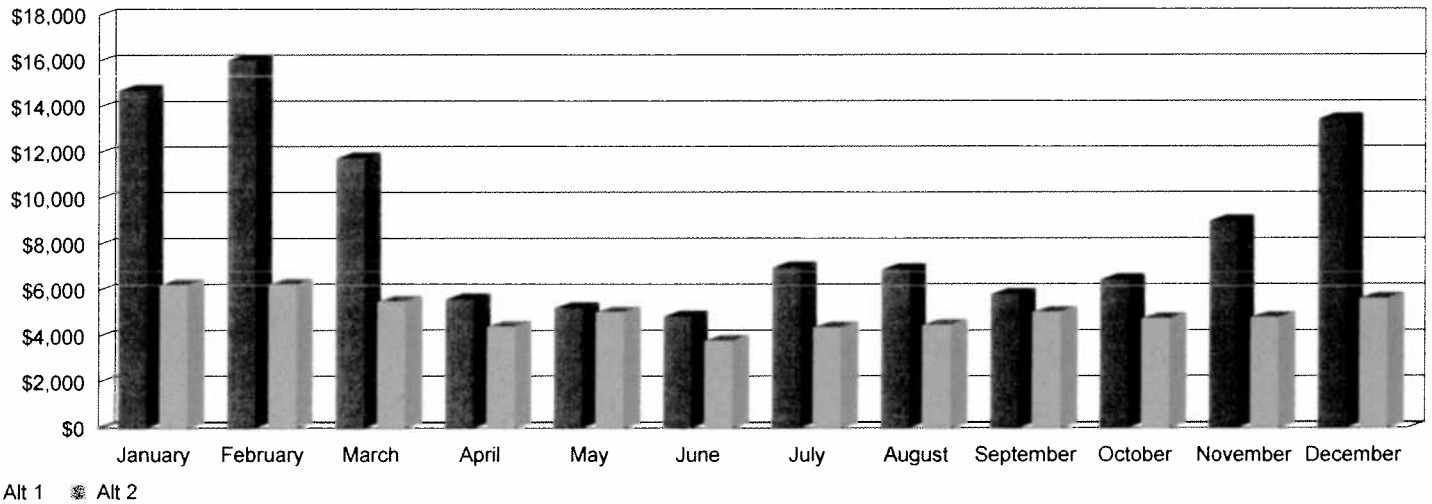
	Yearly Savings ($)	First Cost Difference ($)	Cumulative Cash Flow Difference ($)	Simple Payback (yrs.)	Net Present Value ($)	Life Cycle Payback (yrs.)	Internal Rate of Return (%)	Life Cycle Cost
Alt 2 vs Alt 1	46,483	0	929,663	No Payback	395,737	No Payback	1,000.0	0.00

Annual Operating Costs



	Yearly Savings vs Alt 1	Yearly Total Operating Cost ($)	Yearly Utility Cost ($)	Yearly Maintenance Cost ($)
Alt 1	0	106,819	106,819	0
Alt 2	46,483	60,336	60,336	0

Monthly Utility Costs



MONTHLY ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1	**Freehold Boro HS**												
Electric													
On-Pk Cons. (kWh)	73,542	73,348	62,780	41,818	46,560	43,297	62,363	61,631	51,994	45,885	53,539	68,444	685,201
On-Pk Demand (kW)	211	220	193	180	235	325	366	362	278	177	190	206	366
Gas													
On-Pk Cons. (therms)	6,042	7,293	4,410	870	6	0	0	0	0	1,235	2,823	5,403	28,083
On-Pk Demand (therms/hr)	18	20	13	6	1	0	0	0	0	7	10	15	20

Energy Consumption

Building	69,281	Btu/(ft2-year)
Source	134,238	Btu/(ft2-year)
Floor Area	74,290	ft2

Environmental Impact Analysis

CO2	1,074,911 lbm/year
SO2	2,921 gm/year
NOX	1,507 gm/year

MONTHLY ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2 VRV Upgrades													
Electric													
On-Pk Cons. (kWh)	45,374	43,779	42,932	37,906	44,932	33,828	39,079	39,974	44,954	39,983	38,511	42,446	493,697
On-Pk Demand (kW)	271	268	264	204	198	214	234	234	210	208	242	270	271
Gas													
On-Pk Cons. (therms)	1,076	1,262	664	155	2	0	0	0	0	268	453	826	4,708
On-Pk Demand (therms/hr)	9	10	7	4	0	0	0	0	0	4	4	7	10

Energy Consumption	
Building	29,018 Btu/(ft2-year)
Source	74,721 Btu/(ft2-year)
Floor Area	74,290 ft2

Environmental Impact Analysis	
CO2	450,224 lbm/year
SO2	1,223 gm/year
NOX	631 gm/year

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Freehold Boro HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Lights													
Electric (kWh)	20,618.1	18,645.4	22,021.4	19,726.6	21,319.7	6,169.7	6,316.3	6,381.2	19,726.7	21,319.8	20,428.3	19,916.5	202,589.6
Peak (kW)	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
Misc. Ld													
Electric (kWh)	12,690.5	11,462.3	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	149,420.0
Peak (kW)	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Cooling Coil Condensate													
Recoverable Water (1000gal)	0.0	0.0	0.0	0.7	1.5	7.3	12.8	15.3	6.0	0.6	0.0	0.0	44.1
Peak (1000gal/Hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=66.94 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=66.94 tons / 89.69 kW] [Orig F.L.Rate=89.69 kW] (Cooling Equipment)**													
Electric (kWh)	0.0	0.0	0.0	561.1	3,718.2	6,642.7	13,094.1	12,817.5	5,936.0	0.0	0.0	0.0	42,769.6
Peak (kW)	0.0	0.0	10.0	29.9	44.1	69.4	85.1	83.9	52.1	21.7	0.4	0.0	85.1
Condenser fan for Heat Pump [Design Heat Rejection/F.L.Rate=92.45 tons / 11.09 kW]													
Electric (kWh)	0.0	0.0	0.0	82.6	534.4	934.2	1,787.4	1,760.7	837.0	0.0	0.0	0.0	5,936.2
Peak (kW)	0.0	0.0	1.5	4.3	6.1	9.4	10.9	10.9	7.1	3.1	0.1	0.0	10.9
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	10.0	27.0	48.8	74.4	74.4	40.0	0.0	0.0	0.0	274.6
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=55.23 tons]													
Air-cooled unitary - 002 [Clg Nominal Capacity/F.L.Rate=55.23 tons / 74.00 kW] [Orig F.L.Rate=74.00 kW] (Cooling Equipment)**													
Electric (kWh)	0.0	0.0	0.0	951.5	3,020.3	8,714.0	14,679.8	14,770.8	6,716.4	602.3	0.0	0.0	49,455.2
Peak (kW)	0.0	0.0	0.0	13.9	22.8	54.8	70.2	69.2	42.5	13.4	0.0	0.0	70.2
Condenser fan for Heat Pump [Design Heat Rejection/F.L.Rate=76.27 tons / 9.15 kW]													
Electric (kWh)	0.0	0.0	0.0	141.5	440.2	1,244.6	2,023.6	2,046.6	966.3	90.1	0.0	0.0	6,952.9
Peak (kW)	0.0	0.0	0.0	2.0	3.2	7.4	9.0	9.0	5.8	2.0	0.0	0.0	9.0
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	19.0	39.5	63.2	74.4	74.4	64.0	9.0	0.0	0.0	343.5
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=28.44 tons]													

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Freehold Boro HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------ Monthly Consumption ------												
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=28.44 tons]													
Air-cooled unitary - 003 [Clg Nominal Capacity/F.L.Rate=28.44 tons / 37.55 kW] [**Orig F.L.Rate=37.55 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	691.2	2,547.1	4,794.9	7,101.6	6,741.9	3,742.9	184.9	0.0	0.0	25,804.4
Peak (kW)	0.0	0.0	0.0	10.9	18.6	32.5	35.2	34.3	25.8	6.7	0.0	0.0	35.2
Condenser fan for Heat Pump [Design Heat Rejection/F.L.Rate=39.12 tons / 4.69 kW]													
Electric (kWh)	0.0	0.0	0.0	103.7	374.6	690.7	988.5	942.4	541.4	28.1	0.0	0.0	3,669.3
Peak (kW)	0.0	0.0	0.0	1.6	2.6	4.4	4.6	4.5	3.6	1.0	0.0	0.0	4.6
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	20.0	47.0	72.0	74.4	74.4	68.0	5.4	0.0	0.0	361.2
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Cpl 4: Cooling plant - 008 [Sum of dsn coil capacities=13.98 tons]													
Air-cooled unitary - 004 [Clg Nominal Capacity/F.L.Rate=13.98 tons / 18.46 kW] [**Orig F.L.Rate=18.46 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	14.9	370.9	1,397.8	2,973.7	2,794.3	784.8	0.0	0.0	0.0	8,336.4
Peak (kW)	0.0	0.0	0.0	2.1	6.1	14.1	17.5	17.0	10.3	0.0	0.0	0.0	17.5
Condenser fan for Heat Pump [Design Heat Rejection/F.L.Rate=19.23 tons / 2.31 kW]													
Electric (kWh)	0.0	0.0	0.0	2.2	54.1	198.6	410.1	387.1	112.1	0.0	0.0	0.0	1,164.3
Peak (kW)	0.0	0.0	0.0	0.3	0.9	1.9	2.3	2.2	1.4	0.0	0.0	0.0	2.3
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	4.0	23.5	44.4	74.4	74.4	37.0	0.0	0.0	0.0	257.7
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=781.1 mbh]													
Boiler - 004 [Nominal Capacity/F.L.Rate=781.1 mbh / 9.64 Therms] (Heating Equipment)													
Gas (therms)	1,219.8	1,554.1	906.0	135.6	0.0	0.0	0.0	0.0	0.0	201.5	556.1	1,137.2	5,710.3
Peak (therms/Hr)	4.1	4.7	3.2	2.0	0.0	0.0	0.0	0.0	0.0	2.2	2.8	3.6	4.7
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	669.6	604.8	545.4	145.8	0.0	0.0	0.0	0.0	0.0	226.8	477.9	669.6	3,339.9
Peak (kW)	0.9	0.9	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.9	0.9	0.9	0.9
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	581.1	524.9	473.3	126.5	0.0	0.0	0.0	0.0	0.0	196.8	414.8	581.1	2,898.7
Peak (kW)	0.8	0.8	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.8	0.8

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Freehold Boro HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------ Monthly Consumption ------												
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=781.1 mbh]													
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	303.0	81.0	0.0	0.0	0.0	0.0	0.0	126.0	265.5	372.0	1,855.5
Peak (kW)	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=2,639 mbh]													
Boiler - 007 [Nominal Capacity/F.L.Rate=2,639 mbh / 31.69 Therms] (Heating Equipment)													
Gas (therms)	4,326.1	5,209.1	3,181.0	712.3	6.0	0.0	0.0	0.0	0.0	983.6	2,063.9	3,831.6	20,313.6
Peak (therms/Hr)	12.0	13.6	8.8	4.4	1.1	0.0	0.0	0.0	0.0	5.4	7.4	10.5	13.6
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	186.0	127.5	6.5	0.0	0.0	0.0	0.0	186.0	180.0	186.0	1,226.0
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	1,963.8	1,773.8	1,963.8	1,346.2	68.6	0.0	0.0	0.0	0.0	1,963.8	1,900.5	1,963.8	12,944.4
Peak (kW)	2.6	2.6	2.6	2.6	2.6	0.0	0.0	0.0	0.0	2.6	2.6	2.6	2.6
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	372.0	255.0	13.0	0.0	0.0	0.0	0.0	372.0	360.0	372.0	2,452.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 3: Heating plant - 006 [Sum of dsn coil capacities=239.0 mbh]													
Boiler - 006 [Nominal Capacity/F.L.Rate=239.0 mbh / 2.87 Therms] (Heating Equipment)													
Gas (therms)	496.6	529.5	323.1	22.5	0.0	0.0	0.0	0.0	0.0	50.1	203.0	434.2	2,058.9
Peak (therms/Hr)	1.6	1.7	1.2	0.6	0.0	0.0	0.0	0.0	0.0	1.0	1.1	1.4	1.7
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	144.8	15.0	0.0	0.0	0.0	0.0	0.0	27.5	118.0	186.0	845.3
Peak (kW)	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	177.8	160.6	138.4	14.3	0.0	0.0	0.0	0.0	0.0	26.3	112.8	177.8	808.0
Peak (kW)	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	289.5	30.0	0.0	0.0	0.0	0.0	0.0	55.0	236.0	372.0	1,690.5
Peak (kW)	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Freehold Boro HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 4: Heating plant - 007 [Sum of dsn coil capacities=618.7 mbh]													
Electric Resistance - 005 [Nominal Capacity/F.L.Rate=618.7 mbh / 181.3 kW] (Heating Equipment)													
Electric (kWh)	35,353.0	38,832.0	23,652.0	5,067.7	1,265.2	0.0	0.0	0.0	140.2	7,774.6	16,764.3	30,956.4	159,805.6
Peak (kW)	73.9	82.6	57.2	25.9	8.8	0.0	0.0	0.0	1.4	39.5	52.8	69.3	82.6

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption ------												
Lights													
Electric (kWh)	20,618.1	18,645.4	22,021.4	19,726.6	21,319.7	6,169.7	6,316.3	6,381.2	19,726.7	21,319.8	20,428.3	19,916.5	202,589.6
Peak (kW)	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
Misc. Ld													
Electric (kWh)	12,690.5	11,462.3	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	149,420.0
Peak (kW)	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Cooling Coil Condensate													
Recoverable Water (1000gal)	1.0	0.3	2.4	6.2	11.2	14.5	15.8	17.0	12.7	5.6	3.1	1.2	90.9
Peak (1000gal/Hr)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=40.67 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=40.67 tons / 39.66 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	103.5	40.2	228.2	1,240.0	2,793.2	3,904.2	5,217.4	6,046.8	3,546.6	1,268.9	424.3	118.8	24,932.1
Peak (kW)	1.5	1.5	3.1	19.9	24.1	28.5	34.9	35.2	29.4	19.3	12.5	1.9	35.2
Air-cooled unitary - 001 [Htg Nominal Capacity/F.L.Rate=549.1 mbh / 40.31 kW] (Cooling Equipment - Heating Mode)													
Electric (kWh)	451.1	895.9	152.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	343.1	1,842.7
Peak (kW)	19.4	22.2	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	22.2
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=51.95 tons / 2.55 kW]													
Electric (kWh)	320.7	234.2	468.4	468.4	514.2	560.0	733.1	707.7	516.8	516.8	481.1	399.7	5,921.0
Peak (kW)	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	75.5	68.0	103.5	92.0	101.0	110.0	144.0	139.0	101.5	101.5	94.5	88.5	1,219.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=36.36 tons]													
Air-cooled unitary - 002 [Clg Nominal Capacity/F.L.Rate=36.36 tons / 35.45 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	66.9	20.2	234.7	1,039.0	3,381.3	5,185.1	6,621.8	6,902.5	4,404.0	753.4	339.8	94.3	29,043.1
Peak (kW)	3.7	1.6	5.0	17.8	20.1	28.8	34.5	33.5	26.9	17.8	13.9	4.4	34.5
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=46.45 tons / 2.28 kW]													
Electric (kWh)	430.2	173.0	471.1	578.1	826.2	910.4	1,204.0	994.6	901.3	546.2	439.3	371.0	7,845.2
Peak (kW)	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------ Monthly Consumption ------												
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=36.36 tons]													
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	94.5	38.0	103.5	127.0	181.5	200.0	264.5	218.5	198.0	120.0	96.5	81.5	1,723.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=18.60 tons]													
Air-cooled unitary - 003 [Clg Nominal Capacity/F.L.Rate=18.60 tons / 18.13 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	51.1	19.3	170.7	725.6	1,728.0	2,398.1	3,119.8	3,159.1	1,774.6	579.7	192.3	62.1	13,980.4
Peak (kW)	1.4	1.3	2.6	9.4	11.8	13.9	17.3	16.9	13.5	9.5	8.5	1.6	17.3
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=23.75 tons / 1.16 kW]													
Electric (kWh)	142.0	62.9	214.2	214.2	279.3	367.8	481.8	426.0	273.5	230.4	220.0	136.2	3,048.1
Peak (kW)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	61.0	27.0	92.0	92.0	120.0	158.0	207.0	183.0	117.5	99.0	94.5	58.5	1,309.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 4: Cooling plant - 008 [Sum of dsn coil capacities=8.33 tons]													
Air-cooled unitary - 004 [Clg Nominal Capacity/F.L.Rate=8.33 tons / 11.00 kW] [**Orig F.L.Rate=11.00 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	265.4	838.8	1,364.7	1,803.5	1,844.1	956.3	192.8	0.0	0.0	7,265.5
Peak (kW)	0.0	0.0	2.0	5.3	6.8	9.3	10.0	10.0	9.1	4.4	2.6	0.0	10.0
Condenser fan for Heat Pump [Design Heat Rejection/F.L.Rate=11.46 tons / 1.38 kW]													
Electric (kWh)	0.0	0.0	0.0	39.7	123.2	197.4	250.5	257.0	138.2	28.9	0.0	0.0	1,034.9
Peak (kW)	0.0	0.0	0.3	0.8	1.0	1.3	1.3	1.3	1.3	0.7	0.4	0.0	1.3
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	12.0	19.8	22.0	25.1	23.8	18.0	11.0	0.0	0.0	131.7
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=407.2 mbh]													
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=1,206 mbh]													
Boiler - 007 [Nominal Capacity/F.L.Rate=1,206 mbh / 14.49 Therms] (Heating Equipment)													
Gas (therms)	1,007.9	1,177.1	641.7	155.5	2.0	0.0	0.0	0.0	0.0	268.2	453.4	783.0	4,488.9
Peak (therms/Hr)	7.4	8.6	5.2	3.8	0.4	0.0	0.0	0.0	0.0	3.9	3.9	5.4	8.6

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=1,206 mbh]													
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	186.0	36.0	2.0	0.0	0.0	0.0	0.0	50.8	130.5	186.0	945.3
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	897.7	810.9	897.7	173.8	9.7	0.0	0.0	0.0	0.0	245.0	629.9	897.7	4,562.3
Peak (kW)	1.2	1.2	1.2	1.2	1.2	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	372.0	72.0	4.0	0.0	0.0	0.0	0.0	101.5	261.0	372.0	1,890.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 3: Heating plant - 006 [Sum of dsn coil capacities=201.3 mbh]													
Boiler - 006 [Nominal Capacity/F.L.Rate=201.3 mbh / 2.42 Therms] (Heating Equipment)													
Gas (therms)	68.5	85.2	21.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.2	218.8
Peak (therms/Hr)	1.7	2.2	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	2.2
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	12.5	15.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	43.3
Peak (kW)	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	10.1	12.1	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	34.8
Peak (kW)	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	25.0	30.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	86.5
Peak (kW)	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
Hpl 4: Heating plant - 007 [Sum of dsn coil capacities=381.8 mbh]													
Electric Resistance - 005 [Nominal Capacity/F.L.Rate=381.8 mbh / 111.9 kW] (Heating Equipment)													
Electric (kWh)	8,765.2	10,720.3	4,503.4	722.9	0.0	0.0	0.0	0.0	0.0	1,127.0	2,398.0	6,591.6	34,828.4
Peak (kW)	111.9	111.9	111.3	29.1	0.0	0.0	0.0	0.0	0.0	31.7	82.3	111.9	111.9

Table 14. Recommended Measures - Cost and Energy Savings

	Measure Name	Installed Cost (incl. design)	Annual Energy Savings		Demand Savings	Annual O&M Savings	Annual Cost Savings	Measure Life	Simple Payback	Life Cycle Savings	IRR
		$	kWh	Gas MMBtu	kW	$	$	years	years	$	%
1	Energy Recovery Ventilation	$242,370	175,245	2,436	88.0	$0	$49,560	15	4.89	$349,269	18.9%
2	Roofing Upgrade - R-30 + Energy Star Reflective Coating	$98,304	28,605	787	50.0	$0	$12,205	18	8.05	$69,561	10.3%
3	Window Film for Classrooms 101, 103, 105, 107, 111	$2,500	-44,966	166	12.0	$0	-$4,363	10	-0.57	-$39,721	#DIV/0!
4	HVAC VRV Upgrades with DDC	$204,000	112,736	-279	-34.0	$0	$12,386	15	16.47	-$56,138	-1.1%
5	Lighting Upgrade	$18,000	100,680	-55	35.0	$0	$13,115	15	1.37	$138,564	72.8%
	CM Fees	$0	*Overall project management, all fees associated with specific measures should be noted above.*								
	Partner Fees	$8,000	*Per Partner Contract*								
	TOTALS	$573,174.00	372,300	3,056	151.0	$0	$82,902		6.91	$453,534	12.1%
Advanced Measure:											
	CHP Unit	$0	0	0	0.0	$0	$0	0	0.00	$0	0.0%

Note: CHP energy savings are not included in totals.

Freehold Borough High School			5.0%	GC Allowance	25.0%
Number of Classrooms: 73	203,000	Gross SF Area	**18.0%**	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled,

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**DOAS ventilation system**	P4P	$525,600.00	$104,274.07	26,280.00	94,608.00	58,183.92	704,671.92	176,167.98	528,503.94	5.07

Cost Basis:

The cost basis of the $525,600 is based on 73 classrooms and known construction numbers from other high schools in this central part of NJ. We believe that this will cover a large number of the classrooms in Freehold Borough School and will provide additional benefits in the form of thermal comfort. The cost is based on a direct counter flow high efficiency heat exchanger that can move up to 500 cubic feet per minute. These would be tied to two high performance fans that would use 0.2 Watts per CFM and provide an energy efficiency rating of above 60. These units would be individually controlled, there would be one energy recovery module per classroom and it would be tied to a self calibrating CO2 sensor that would come on at a prescribed part per million concentration of CO2.

Saving Projection:

Projected Savings of 1385 Therms per classroom X 73 classrooms for a total projected savings = 101,105 therms. The saving is modeled using a bin method where within a NJ Weather bin temperature range the hours at a certain temperature are modeled using 30 year weather data for the central area of NJ. Also this is based on full Pay for Performance projects where these units have been installed monitored and verified and evaluated for energy savings and this has been used to provide the estimated annual savings. We believe this number is conservative and with careful installation and preparation, this number can be exceeded.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	99,831.90	$11,181.17	55207.04	165.28	136.59	4.82
Gas (Therms)	101105	$108,283.46	4846134.40	9914.76	11989.96	423.24
Total Savings Kbtu	10,451,140.58	$119,464.63	4901341.44	10080.04	12126.55	
					Total Pollution Reduction in Cars Removed from the Road =	**428.06**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions

The current system is poorly controlled and has an existing fan consumption of 691 watts. The new system is to have an 87% thermally efficient BPE direct counter flow air to air energy system. Proposed fans would use 123 watts of power and be controlled with GE CO2 sensor running only with classroom occupancy of 6 hours for 5 days. Existing system is 700 cfm and new system is 700 cfm, typically switch from dilution ventilation to displacement ventilation can reduce ventilation needs by 2.5 times. in other schools the 700 cfm can be reduced to below 300cfm with improved IAQ. This will produce additional savings that is currently not modeled.

Assumptions Details	Quantity	CFM	%OA	% Run time	Heating eff. (%)	Cooling Eff. (EER)	Comments
	(73) BPE-XE-MIR 500	16000	100%	18%	65%	9	

Energy Savings Factor of Safety	1.15	Estimated annual savings with energy savings factor of safety =	$104,274.07

Discussion:

Currently Freehold Borough High School, with talking with onsite Maintenance and Building management, we find that there is an awful lot of outdoor air being brought in throughout all weather conditions taken through unit ventilators and different HVAC equipment and in a single pass being exhausted up to the roof. We were also able to look at some of these and found that they are not controllable by the building automation or control systems. When we asked how these are shut down during weekends or holidays, we found that they are left to basically run which means that there is a lot of outdoor air running through the building for 8,760 run hours per year. The idea would be to illuminate some of these exhaust fans all together and replace them with the dedicated outdoor air system and in other places, tie these exhaust fans into a building automation system or a timer and only have them running during occupied times of the school year where there are people in the school. This will also reduce the amount of moisture being brought through the building and will help with thermal comfort and the cost of owning and operating this high school.

BPE Payback Calculator

Enter in the requested information below. If you are not sure of a value, See our recommendations in the comment boxes (red arrows).

Thank you for using BPE, Inc.®
For more specific engineering analysis, please see the BPE Performance Calculator at: **www.LowKWH.com**

SYSTEM GENERAL INFO		
Heating System Type	Gas Fired	
Cooling System Type	DX	
Outdoor Air Flow (OA)	700	scfm
Percent Outdoor Air (OA/SA, %)	100	%
Building Type	Commercial (> 5,000 SF)	
Nearest Location	Newark, NJ	

Number of Units

2000	1000	500	200
0	0	1	0

UTILITY INFORMATION	
Electric Rate ($/kWh)	0.112
Peak Demand Charge ($/kW)	
Months of Peak Demand Charge	0
Gas Rates ($/Therm)	1.071

COST ASSUMPTIONS		
Installed Cost per Ton ($/Ton)	0	*Use for New Construction or Major Retrofits
ERV Installed Cost	$ 7,200	
Maintenance Savings	$ -	
Total Incentives	$ -	

SYSTEM EFFICIENCIES		
Heating Efficiency	65	%
Cooling Efficiency	9	EER
BPE Effectiveness	83	%

CONTROLS AND SET-POINTS		
CO_2 Controller	Yes	
Percent Run-time	18	%
Summer (Cooling)	74	°F (db)
Winter (Heating)	70	°F (db)

BPE Payback Calculator

20 Years of Savings!

BPE Energy Recovery Ventilators are guaranteed for 20 years not to become unusable for providing breathable air as a result from rust, rot, or corrosion. This does not apply to other gases other than breathable air. See Limited Lifetime Warranty for more details.

ENERGY ANALYSIS		
BPE Cooling Capacity	1.23	TONS
BPE Heating Capacity	42.35	MBH
Peak Demand Reduction	1.64	KW
Annual Electric Energy Saved	3,810	MBTU
Annual Thermal Energy Saved	138,481	MBTU
TOTAL Savings	142,291	MBTU

OPERATING COST ANALYSIS		
Maintenance Savings	$	-
Cooling Cost Savings	$	(53)
Peak Demand Cost Savings	$	-
Heating Cost Savings (Gas or HP)	$	(1,483)
Electrical Cost Savings (ER+Fans)	$	(100)
Electric Resistive Savings		0
Reduced Supply + Exhaust Fan Savings		(100)
BPE Parasitic Fan Cost		28
TOTAL Savings	$	(1,636.31)

CAPITAL EXPENSE ANALYSIS		
HVAC Initial Cost Avoidance	$	-
Added Cost of ERV	$	7,200
Total Incentives/Funding	$	-
Net Capital Expenditure	$	7,200
Simple Payback (Years)		4.40
Internal Rate of Return (IRR)		22%
Net Present Value (20 Yr Life Cycle)		$35,623.80
Emission Reduction (Cars/yr)		5.85

	200	500	1000	2000
Products:	0	1	0	0

All Weather Air Management

Ex Eff	83%
Evaporative Eff	Not Used
Winter SP T3	70
Summer SP T3	74

Equipment Operation and Efficiencies					System Air Flow Profile			
Del. Heat Eff	65%	Gas	0	KWh Elect/Thm	Nominal CFM	Actual CFM	Supply CFM	Exhaust CFM
	1.07	$/Therm	0.11	$/kWh	500	700	700	700
Del. Cool Eff	NA	Gas	1.33	KWh Elect/Ton				
	1.07	$/Therm	0.11	$/kWh				
		Demand Savings	0.00	$/kW				

Profile of Energy Savings

Time of Year	Mid-Pts	DB (F)	Total	OA Temp DB (F)	OA Supply Temp DB (F)	Space Temp DB (F)	Exhaust Temp DB (F)	Recovered BTU/H	Annually Saved BTUs	OPERATE BPE?
Summer Cooling	117.5	115 to 120	0	117.5	81.4	74	110.1	-	-	NO
	112.5	110 to 115	0	112.5	80.5	74	106.0	-	-	NO
	107.5	105 to 110	0	107.5	79.7	74	101.8	-	-	NO
	102.5	100 to 105	0	102.5	78.8	74	97.7	-	-	NO
	97.5	95 to 100	6	97.5	78.0	74	93.5	14,746	88,475	YES
	92.5	90 to 95	40	92.5	77.1	74	89.4	11,608	464,335	YES
	87.5	85 to 90	122	87.5	76.3	74	85.2	8,471	1,033,460	YES
	82.5	80 to 85	500	82.5	75.4	74	81.1	5,334	2,666,790	YES
	77.5	75 to 80	620	77.5	74.6	74	76.9	2,196	1,361,632	NO
	72.5	70 to 75	847	72.5	73.7	74	72.8	-	-	NO
Free Cooling	67.5	65 to 70	671	67.5	72.9	74	71.3			NO
	62.5	60 to 65	927	62.5	72.0	74	64.5			NO
	57.5	55 to 60	600	57.5	71.2	74	60.3			NO
	52.5	50 to 55	730	52.5	67.0	70	55.5			YES
	47.5	45 to 50	634	47.5	66.2	70	51.3			YES
Winter Heating	42.5	40 to 45	513	42.5	65.3	70	47.2	(17,256)	(8,852,174)	YES
	37.5	35 to 40	1023	37.5	64.5	70	43.0	(20,393)	(20,862,141)	YES
	32.5	30 to 35	734	32.5	63.6	70	38.9	(23,531)	(17,271,387)	YES
	27.5	25 to 30	391	27.5	62.8	70	34.7	(26,668)	(10,427,149)	YES
	22.5	20 to 25	195	22.5	61.9	70	30.6	(29,805)	(5,812,034)	YES
	17.5	15 to 20	125	17.5	61.1	70	26.4	(32,943)	(4,117,838)	YES
	12.5	10 to 15	47	12.5	60.2	70	22.3	(36,080)	(1,695,765)	YES
	7.5	5 to 10	34	7.5	59.4	70	18.1	(39,218)	(1,333,395)	YES
	2.5	0 to 5	1	2.5	58.5	70	14.0	(42,355)	(42,355)	YES
	-2.5	-5 to 0	0	-2.5	57.7	70	9.8	-	-	YES
	-7.5	-10 to -5	0	-7.5	56.8	70	5.7	-	-	YES

	ERV Operating Hours =	917	Fan Power (kWh) = 251
	All Operating Hours =	8,760	Fan Power Cost = $ 28.14
	% Cooling =	24%	Total Cooling Saved (BTU) = 4,253,059
	% Heating =	35%	Total Peak Demand kW saved = 1.64
Operational Hours	% Free =	25%	**Peak Energy Savings ($ for kW) =** $ -

Supply	
Fan HP/1,000 cfm*	1.2
Peak Tonnage Reduction =	1.64
Total System Cfm =	220
Cfm Reduction =	655
Existing HVAC Fan (W) =	691
Proposed HVAC Fan (W) =	123.00
kWh Savings =	895
Proposed HVAC Fan Savings* =	$ 100.25

Total Cooling Power Saved (kWh) =	472.56
Cooling Savings =	$ 52.93
Total Cooling Savings =	$ 52.93
Total Heating Saved (BTU) =	(70,414,237)
Total Heating Saved (Therms or kWh) =	1,385
Total Heating Savings =	$ 1,483.14
Total Motor/Electric Savings =	$ 100.25
Maintenance Savings =	$ -
Net Savings =	$ 1,636.31
Cost of Project =	$ 7,200.00
Simple Payback (Yrs) =	4.40

* ASHRAE Std. 90.1-2004, Table 6.5.3.1 Fan Power Limitation assuming Constant Volume

Handbook of Energy Audits. Thuman,PE,RA, Albert, Third Ed.1992

Note: Actual savings will depend on operating conditions and application

Electric	1,116.33	**kWh**	3,810.04	Mbtus
Heating (G/E)	1,385	**Therms or kWh**	138,481.33	Mbtus
		Total Energy	**142,291.37**	**MBtus**

Table 14. Recommended Measures - Cost and Energy Savings

	Measure Name	Installed Cost (incl. design)	Annual Energy Savings		Demand Savings	Annual O&M Savings	Annual Cost Savings	Measure Life	Simple Payback	Life Cycle Savings	IRR
		$	kWh	Gas MMBtu	kW	$	$	years	years	$	%
1	Energy Recovery Ventilation	$242,370	175,245	2,436	88.0	$0	$49,560	15	4.89	$349,269	18.9%
2	Roofing Upgrade - R-30 + Energy Star Reflective Coating	$98,304	28,605	787	50.0	$0	$12,205	18	8.05	$69,561	10.3%
3	Window Film for Classrooms 101, 103, 105, 107, 111	$2,500	-44,966	166	12.0	$0	-$4,363	10	-0.57	-$39,721	#DIV/0!
4	HVAC VRV Upgrades with DDC	$204,000	112,736	-279	-34.0	$0	$12,386	15	16.47	-$56,138	-1.1%
5	Lighting Upgrade	$18,000	100,680	-55	35.0	$0	$13,115	15	1.37	$138,564	72.8%
	CM Fees	$0	*Overall project management, all fees associated with specific measures should be noted above.*								
	Partner Fees	$8,000	*Per Partner Contract*								
	TOTALS	$573,174.00	372,300	3,056	151.0	$0	$82,902		6.91	$453,534	12.1%
	Advanced Measure:										
	CHP Unit	$0	0	0	0.0	$0	$0	0	0.00	$0	0.0%

Note: CHP energy savings are not included in totals.

Building Performance Equipment, Inc.®

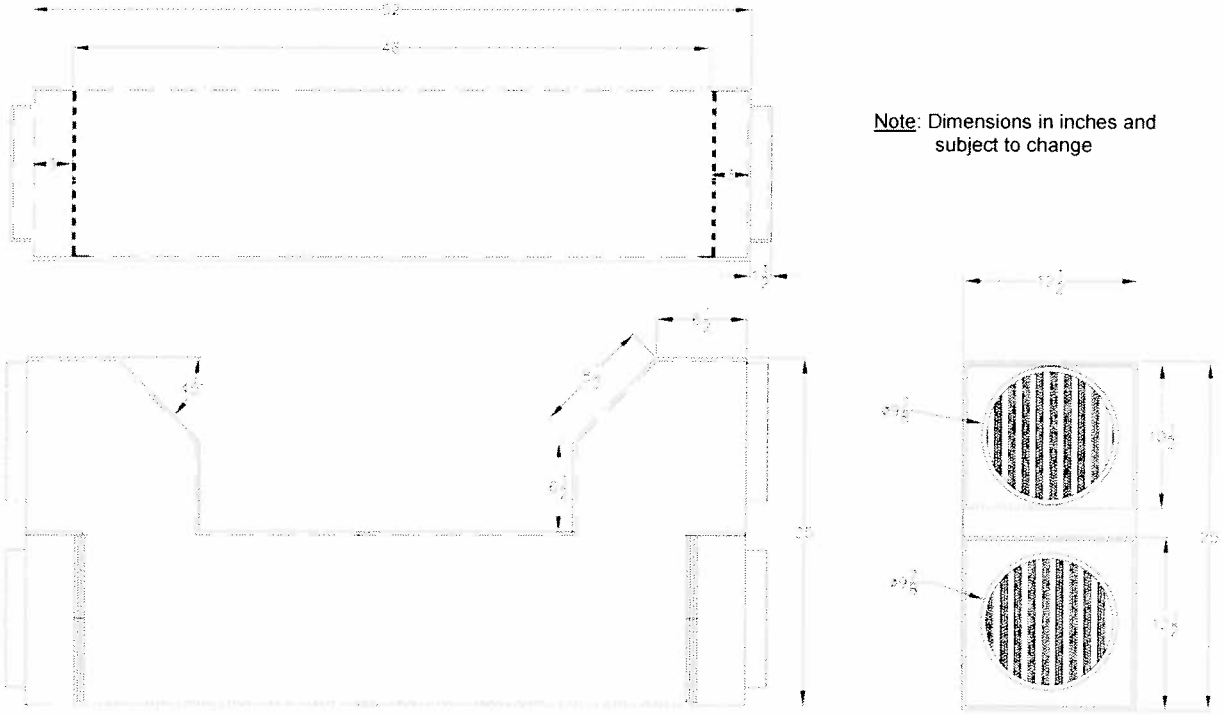
Sustainable, Reliable and Energy Efficient Ventilation Systems

ENERGY STAR PARTNER

BPE-XE-MIR 500

SPECIFICATIONS

Model Number: BPE-XE-MIR 500, Energy Recovery Module (ERM)				
Ventilation Type: Polymer Fixed Plate, Heat and Humidity Transfer				
Typical Air Flow Range: 200 to 550 cfm				
V	**Hz**	**Phase**	**Input Watts**	**FLA**
115	60	Single	274 @ 429 cfm	1.35 each fan
Energy Efficiency Ratio (EER) - Summer = BTUH/W = 31.53 (ARI 1060 at 95°F)				
Energy Efficiency Ratio (EER) - Winter = BTUH/W = 75.67 (ARI 1060 at 10°F)				
Typical Fans: Fantech FR-225, 274 Watts for two fans (NOTE: order fans separately)				
Shipping Dimensions: 60" x 28" x 14 ½" (boxed)				
Weight: 85 lbs (Packaged), 80 lbs (ERM alone)				



Note: Dimensions in inches and subject to change

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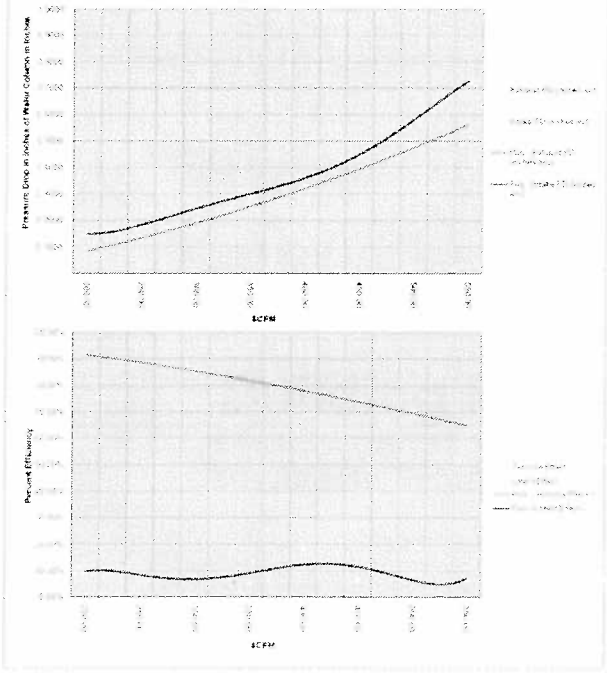
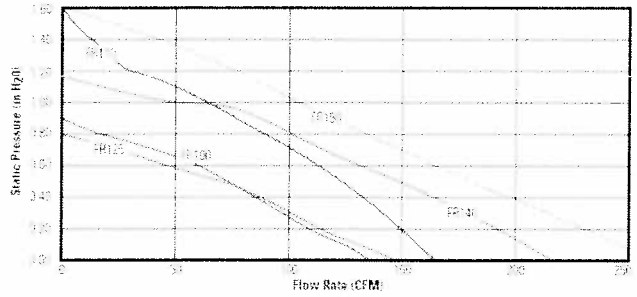
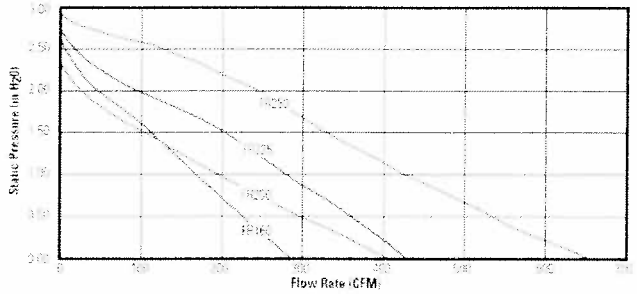
BPE Performance



AIR PERFORMANCE GRAPHS





ARI 1060 Testing

Project Name:	
Location:	
Application:	

Design Conditions

	SCFM - Outdoor Air		°F DB
	SCFM - Exhaust Air		°F WB
	% Sensible Effectiveness		

Fan Sizing

	in W.G. - HX Outdoor Air (ΔP)
	in W.G. - HX Exhaust Air (ΔP)
	in W.G. - OA External Static Pressure (ESP)
	in W.G. - EX External Static Pressure (ESP)
Booster Fan - OA	YES / NO
Booster Fan - EX	YES / NO

Fan Selections

Outdoor Air - Total Static Pressure (TSP)		in W.G.
Fan Model	FR / FKD	
Fan Size		

Voltage/Phase	Amps/Hz	Max. Watts

Manual Speed Controller	YES / NO
Describe Operating Controls	

Exhaust Air - Total Static Pressure (TSP)		in W.G.
Fan Model	FR / FKD	
Fan Size		

Voltage/Phase	Amps/Hz	Max. Watts

Manual Speed Controller	YES / NO
Describe Operating Controls	

Freehold Borough High School		
Number of Classrooms: 73	203,000	Gross SF Area

5.0%	GC	**25.0%**
	Allowance	
18.0%	Contingency	
	& Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**Laser prints on off mode at night, times power strips**	P4P	$5,978.70	$3,985.80	298.94	1,076.17	661.84	8,015.64	2,003.91	6,011.73	1.51

Cost Basis:	This is based on installing in 73 classrooms with a cost of $81.90 (cost with shipping and labor) per power saver strip with the ability to shut down additional plug-ins such as laser printers and other components. The installed effort would be done with an onsite maintenance personelle or possibly the people occupying the classrooms. This has been shown to provide an efficient way to get rid of vampire loads from printers and other equipment that are generally left on 24/7.
Saving Projection:	The saving is based on publications involved with evaluating the effectiveness of these components. For our geographic area we believe that the energy savings would be projected at 42.65 kWh per classroom per month for 73 classrooms. When we evaluate this we find that a reasonable estimated savings is $4,022.59.

Energy Savings	Savings per Year (kWh)	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	37,361.40	$4,184.48	20,660.85	61.86	51.12	1.80
Gas (Therms)	0.00	$0.00	0	0	0	0
Total Savings (kBtu)	127,482.39	$4,184.48	1,508,242.37	4,515.52	3,731.62	
					Total Pollution Reduction in Cars Removed from the Road =	**131.72**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Haglid Engineers has installed a set back power and an inline watt meter. Found typical watt meter savings of 42.65 kWh/month	or	$4.78	per month
	42.65 kWh/month x 12 months = 512 kWh/year per classroom			
	512 kWh/year per classroom x 73 classrooms = 37361 kWh/year			
Energy Savings Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$3,985.80	
Discussion:	These vampire load shutting power strips have been shown in peer reviewed articles to provide good energy savings while being relatively easy to install. It would be something that would be a low enough payback that it would actually help to bring high cost items such as heavy mechanical components more into line with the type of cost and internal rate of return in order to justify these capital projects. The recommendation would be to do these power strips for the simple reason that they are easy to install, have a quick payback and they would effectively help reduce the cost of other more expensive items.			

Freehold Borough High School						
Number of Classrooms: 73	203,000	Gross SF Area		**5.0%**	GC Allowance	**25.0%**
				18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**Other ERMs - Controls Upgrade**	P4P	$792,000.00	$34,318.00	39,600.00	142,560.00	87,674.40	1,061,834.40	265,458.60	796,375.80	23.21

Cost Basis:	The cost of this controls upgrade was provided with vendor pricing from one of the existing controls vendors that are currently providing controls automation for the school. This is based on a quote with vendor pricing with labor costs built in.
Saving Projection:	Based on typical energy savings from other projects of the same kind for high schools, we believe that the savings projection of $60,165.88 is reasonable and relatively conservative.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	307,440.00	$34,433.28	170,014.32	509.01	420.64	14.85
Gas (Therms)	24,026.70	$25,732.60	1,151,640.55	2,356.15	2,849.31	100.58
Total Savings Kbtu	3,451,698.81	$60,165.88	1,321,654.87	2,865.16	3,269.95	
					Total Pollution Reduction in Cars Removed from the Road =	**115.43**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From observations and the current operation of the existing pneumatic controls, Haglid Engineers estimate projected savings of 15%.		
Factor of Safety	1.75	Estimated annual savings with energy savings factor of safety =	$34,318.00
Discussion:	With a payback of 23.21 years this would have a relatively long payback. The expense is excessive, part of it involves upgrading controls that currently are not functioning. We would recommend upgrading the controls especially for the large exhaust fans that are running wild 24/7. Part of this can be addressed with the DOAS and other components we would evaluate as the project goes forward and try to address them as a part of the other energy reduction measures. Due to the cost of this energy reduction measure and the payback estimated at 23.21 years, we cannot recommend this energy reduction measure at this time.		

School/Building	ATC	Mechanical*	Contigency	Total
BOE	$ 85,500	$ 15,000	10%	**$ 110,550**
Tranporation	$ 34,000	$ -	10%	**$ 37,400**
Coltsneck HS	$ 225,000	$ -	10%	**$ 247,500**
Howell HS	$ 570,000	$ 50,000	10%	**$ 682,000**
Freehold Boro HS	$ 670,000	$ 50,000	10%	**$ 792,000**
Freehold Twp HS	$ 565,000	$ 75,000	10%	**$ 704,000**
Manalapan HS	$ 525,000	$ 75,000	10%	**$ 660,000**
Marlboro HS	$ 820,000	$ 100,000	10%	**$ 1,012,000**

* ATC contractor provides the valve and the Mechanical Contractor will install.

Freehold Borough High School					
Number of Classrooms: 73	203,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure
Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Lighting upgrades, at least T-8 or LED**	P4P	$201,883.50	$32,561.85	10,094.18	36,339.03	22,348.50	270,665.21	67,666.30	202,998.91	6.23

Cost Basis:	The $201,883.50 is based on doing the common areas, hallways and some of the longer run time lighting. These are based on known construction numbers for our area, RS Means and costs from other high school projects in Central NJ.
Saving Projection:	The annual saving is based on the change in Wattage from the existing fixture of mainly T8 and some T12's to high efficiency LED lighting. These are then estimated with something on the order of 4000 run hours a year. In some areas such as hallways, this would be higher as the lighting in these areas are used late into the night for custodial purposes. Stairways and other areas would run 24/7, so it is a mixture of run hours throughout the facility.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	368,708.89	$41,295.40	203896.0152	610.44	504.4700774	17.80751225
Gas (Therms)	-2,014.20	$ (2,157.21)	-96544.13742	-197.5206772	-238.8625397	-8.431802395
Total Savings Kbtu	1,056,666.70	$39,138.18	107351.8778	412.9233393	265.6075377	
					Total Pollution Reduction in Cars Removed from the Road =	**9.38**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Areas 101,102,104 which consist areas such ashallways, stairwells, and bathrooms will be considered for the current Energy Reduction Measure
	Area 103 are all classrooms and will not be included at this time in the Energy Reduction Measure
	Run hours are assumed to be the following as stated in the "Assumption Details" below

Assumption Details

Group	Run Time	Existing Total (kW)	Number of Fixtures	Retrofit Total (kW)	Savings Kwh	$ Savings	Comments
101	2,130	117.21	656.00	44.56	154,738.11	$17,331	Recommended
102	-	-	-	-	-	-	Not part of Project Work
103	2,225	20.16	178.00	5.47	32,696.38	$3,662	Recommended
104	6,120	48.34	398.00	18.72	181,274.40	$20,303	Recommended
	Totals =	**185.72**	**1,232.00**	**68.75**	**368,708.89**	**$39,138**	An additional gas heating cost is considered as shown in row labeled "Assumptions"

Energy Savigns Factor of Safety	1.20	Estimated annual savings with energy savings factor of safety =	$32,561.85

Discussion:	Recently a lighting audit has been done that is more comprehensive in nature and covers a larger amount of lighting going into the classrooms. We believe that this will have additional benefits and savings. However, before we can recommend this we are going to have to see sampling, test cases done in some of the classrooms where the lighting is installed. Specifically this is CPL rated, high performance, LED lighting. It has been represented that the light levels will be well in excess of 50ft candles but there are many parameters to lighting (color rendering index, quality of light, temperature, light levels at the desk height). At this point in time we recommend that there be several test sites in several classrooms to evaluate the lighting going into the individual classrooms.

School : Freehold Boro H.S.

Summary of Lighting Quote and Audit

Group	Run Time	Existing Total (W)	Number of Fixtures	Retrofit Total (W)	Savings Kwh	Area Served	Comments
101	4,428	117,207	656	44,560	321,681	Hallways	Recommended
102	4,067	126,826	1,051	54,703	293,324	Classrooms	Not part of Project Work
103	5,812	20,164	178	5,469	85,407	Bathrooms	Recommended
104	8,760	48,344	398	18,724	259,471	Stairwells	Recommended

Group	Run Time	Existing Total (W)	Number of Fixtures	Retrofit Total (W)	Savings Kwh	$ Savings	Comments
101	2,130	117.21	656.00	44.56	154,738.11	$ 17,330.67	Recommended
102	-	-	-	-	-	-	Not part of Project Work
103	2,225	20.16	178.00	5.47	32,696.38	$ 3,661.99	Recommended
104	6,120	48.34	398.00	18.72	181,274.40	$ 20,302.73	Recommended
	Totals =	**185.72**	**1,232.00**	**68.75**	**368,708.89**	**$ 41,295.40**	

	kWh	Therms	$ Amount	Factor of Safety
Lighting Savings =	368,708.89		$ 41,295.40	$ 1.20
Heating Costs =		-2,014.20	$ (2,157.21)	
Total Net Savings =			**$ 39,138.18**	

Cost/Fixture =	
Budget Cost =	

Table 14. Recommended Measures - Cost and Energy Savings

	Measure Name	Installed Cost (incl. design)	Annual Energy Savings		Demand Savings	Annual O&M Savings	Annual Cost Savings	Measure Life	Simple Payback	Life Cycle Savings	IRR
		$	kWh	Gas MMBtu	kW	$	$	years	years	$	%
1	Energy Recovery Ventilation	$242,370	175,245	2,436	88.0	$0	$49,560	15	4.89	$349,269	18.9%
2	Roofing Upgrade - R-30 + Energy Star Reflective Coating	$98,304	28,605	787	50.0	$0	$12,205	18	8.05	$69,561	10.3%
3	Window Film for Classrooms 101, 103, 105, 107, 111	$2,500	-44,966	166	12.0	$0	-$4,363	10	-0.57	-$39,721	#DIV/0!
4	HVAC VRV Upgrades with DDC	$204,000	112,736	-279	-34.0	$0	$12,386	15	16.47	-$56,138	-1.1%
5	Lighting Upgrade	$18,000	100,680	-55	35.0	$0	$13,115	15	1.37	$138,564	72.8%
	CM Fees	$0	*Overall project management, all fees associated with specific measures should be noted above.*								
	Partner Fees	$8,000	*Per Partner Contract*								
	TOTALS	$573,174.00	372,300	3,056	151.0	$0	$82,902		6.91	$453,534	12.1%
Advanced Measure:											
	CHP Unit	$0	0	0	0.0	$0	$0	0	0.00	$0	0.0%

Note: CHP energy savings are not included in totals.

TRI-STATE LED

255 Mill Street, 2nd Floor
Greenwich, CT 06830

p: (203) 813-3791
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www.TriStateLED.com

Project Name	*FREEHOLD HS*
Street Name	*2 ROBERTSVILLE RD*
City/State	*FREEHOLD NJ*
Zip Code	*7728*
Site Contact	*PAT LAGRAVANIS*
Phone #	
Cell Phone #	
Fax #	
Email Address	
Proposal Date	5/29/2013

Hours of Operation

Group 101		Group 102	
Hrs/Day	16	Hrs/Day	13
Days/Wk	6	Days/Wk	6
Wks/Yr	46	Wks/Yr	52
Total Hrs	4428	Total Hrs	4067

Group 103		Group 104	
Hrs/Day	18	Hrs/Day	24
Days/Wk	7	Days/Wk	7
Wks/Yr	46	Wks/Yr	52
Total Hrs	5812	Total Hrs	8760

Project Description

Supply LED Lamps & Fixtures as per Lighting Audit Worksheet

Sales Person	CHRIS ANASTASI	Cell Phone Number	914-482-4442
Sales Person		Cell Phone Number	

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
2	104	8760	1ST	ATTENDANCE OFFICE		4.2.32ELP	8	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
3	101	4428		MAIN LOBBY		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
4	101	4428		MAIN LOBBY	WALL	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
5	101	4428		MAIN LOBBY		P20.40	4	23 WATT PAR 38 COMPACT FLUORESCENT	23	Seesmart Par 38, 15W, High Powered DIMMABLE, 120V, SKU: 180112-180120	15
7	104	8760		MAIN STAIRWELL		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
8	104	8760		MAIN STAIRWELL		4.4.4SRB	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
9	104	8760		MAIN STAIRWELL		A60	2	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
10	101	4428		COLD HALL		4.4.4SRB	16	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
11	103	5812		MENS		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
12	103	5812		WOMENS		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
13	101	4428		BAND HALL		4.4.4SRB	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
14	102	4067		CHILD STUDY		4.2.32ELP	10	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
15	102	4067		CHILD STUDY		4.4.4SRB	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
16	101	4428		CLOSET		A60	4	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
17	102	4067		A100		4.4.4SRB	18	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
18	102	4067		A101		4.2.32ELP	33	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
19	101	4428		STORAGE		4.4.4SRB	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
20	103	5812		TUNNEL & BATH		4.4.4SRB	24	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
21	101	4428		AUDITORIUM LOBBY		4.2.4ERB	5	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
22	101	4428		AUDITORIUM		4.4.4SRB	26	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
23	101	4428		AUDITORIUM		P38.75	12	150 WATT PAR 38	150	Seesmart Par 38, 18W High Powered, DIMMABLE, 120V, SKU: 180121-180129	18
24	101	4428		STAGE		A75D	10	200 WATT INCANDESCENT	200	SEESMART HIGH POWERED 22 WATT LED LAMP SKU; 130028-130039 (3000-3200 Lumens)	22

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
25	102	4067		CONTROL BOOTH		A60	1	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
26	104	8760		STAIRS		4.4.4SRB	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
27	104	8760		A HALL & STAIRWELL		4.4.4SRB	19	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
28	102	4067		BOOK ROOM		4.4.4SRB	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
29	103	5812		BATH	WALL	2.3.2SRB	1	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
30	102	4067		A:103,105,106,108,109,110,111,112,113, 115,CLOSET, STAIREWELL		4.4.4SRB	108	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
31	104	8760		A WING ELEVATOR		4.2.4SRB	1	4' FIXTURE, 2-F34/T12 LAMPS, STANDARD MAGNETIC BALLAST	80	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
32	101	4428		A HALL		4.2.32ELP	7	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
33	101	4428		A HALL		4.4.4SRB	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
34	101	4428		STORAGE		4.2.4SR	3	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
35	102	4067		MENS, WOMENS, A117,A114,A119,A121		4.4.4SRB	44	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
36	104	8760		A WING STAIRWELL		4.2.3ERB	2	4' FIXTURE, 3-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	151	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
37	104	8760		A WING STAIRWELL		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
38	102	4067	2ND	AHALL,BATH,GIRLS,A207,A205,A203, A202,A201, A200		4.4.4SRB	76	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
39	102	4067		A206		4.2.32ELP	18	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
40	101	4428	BASE	BASEMENT HALL	BASEMENT	A60	1	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
41	101	4428		COMPRESSOR ROOM, BASEMENT HALL		4.3.3ERB	14	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
42	102	4067		A10,A12, BOILER A WING, A14		4.4.4SRB	24	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
43	102	4067		ANNEX LAB		4.3.3ERB	12	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
44	102	4067		MINI LAB, A16		4.4.4SRB	20	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
45	103	5812		MENS, WOMENS , BASEMENT HALL		4.3.3ERB	13	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
46	101	4428		BASEMENT HALL		4.4.4SRB	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
47	104	8760		CUSTODIAN OFFICE		4.4.4SRB	7	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
48	104	8760		CUSTODIAN OFFICE		2.2.3ELP	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
49	104	8760		CUSTODIAN OFFICE		4.2.3ELRB	5	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
50	104	8760		CUSTODIAN OFFICE		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
51	104	8760		BASEMENT HALL, ELECTRIC ROOM		4.4.4SRB	20	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
52	104	8760		ELECTRIC ROOM		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
53	102	4067		COPY ROOM		4.4.4SRB	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
54	103	5812		BATH		2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
55	104	8760		B STAIRWELL		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
56	104	8760		B STAIRWELL		4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
57	101	4428		B HALL		4.4.4SRB	20	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
58	101	4428		B WING	ELEVATOR	2.4.2SRB	1	2' FIXTURE, 3-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	84	Retrofit - LED Tube Lights, 3 - 2 Foot, 8W, 120V-277V, Single End Power	24
59	102	4067		B112, B113		4.2.3ELRB	24	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
60	101	4428		STORAGE		4.4.4SRB	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
61	103	5812		GIRLS, BOYS		4.2.4SR	4	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
62	102	4067		B110, B108		4.4.4SRB	18	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
63	102	4067		B111		4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
64	104	8760		B STAIRWELL		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
65	104	8760		B STAIRWELL		4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
66	104	8760		CROSS HALL, NURSE		4.4.4SRB	22	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
67	103	5812		BATH		4.2.3ERB	1	4' FIXTURE, 3-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	151	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
68	104	8760		GUIDANCE		4.2.3ELRB	33	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
69	104	8760		GUIDANCE		4.2.4ERB	23	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
70	104	8760		MAIN OFFICE		4.2.3ELRB	29	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
71	104	8760		OFFICE		4.4.4SRB	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
72	103	5812		BATHS		2.3.2SRB	2	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
73	101	4428		STORAGE		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
74	104	8760		OFFICE		4.4.4SRB	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
75	104	8760		MECHANICAL ROOM		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
78	101	4428		STORAGE		4.3.3ERB	50	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
79	104	8760		OFFICE		4.4.4SRB	7	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
80	102	4067		B207		4.3.3ERB	8	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
81	102	4067		CROSS HALL , B208, B210, B211, B214	2ND FL	4.3.3ERB	60	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
82	103	5812		GIRLS		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
83	101	4428		STORAGE		A60	1	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
84	101	4428		B HALL		4.4.4SRB	11	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
85	102	4067		B216		4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
86	102	4067		B218		4.4.4SRB	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
87	103	5812		BOYS		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
88	102	4067		B213, B220, PREP RM, B215		4.4.4SRB	49	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
89	102	4067		PREP RM		4.2.4ERB	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
90	104	8760		STORAGE, B STAIRWELL		4.3.3ERB	3	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
91	104	8760		B STAIRWELL		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
92	102	4067		WOMEN FACULTY		4.3.3ERB	4	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
93	102	4067		WOMEN FACULTY		2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
95	102	4067		B118		4.2.3ERB	13	4' FIXTURE, 3-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	151	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
96	102	4067		B118		4.3.3ERB	3	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
97	101	4428		STORAGE		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
98	101	4428		ART ATRIUM		4.2.3ELRB	8	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
99	101	4428		ART ATRIUM		2.4.2SRB	2	2' FIXTURE, 3-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	84	Retrofit - LED Tube Lights, 3 - 2 Foot, 8W, 120V-277V, Single End Power	24
100	101	4428		ART ATRIUM		P38.90	16	75 WATT PAR 38	75	Seesmart Par 38, 15W, High Powered DIMMABLE, 120V, SKU: 180112-180120	15
101	102	4067		B118, B119		4.2.3ELRB	31	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
102	102	4067		5 STAR KITCHEN		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
103	102	4067		5 STAR KITCHEN		4.3.32ELP	19	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
104	102	4067		5 STAR KITCHEN		4.2.3SR	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
105	102	4067		CAFÉ		4.2.3SR	8	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
106	102	4067		CAFÉ	WALL	4.1.32ELP	26	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	32	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
107	102	4067		CAFÉ		A150	25	26 WATT CFL	0	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
108	103	5812		BOYS, GIRLS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
109	103	5812		BOYS, GIRLS	EMERGENCY	4.2.3ER	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit, Ballast Ready LED Tube Lights, 2- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	44
110	101	4428		5 STAR VESTIBULE		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
111	101	4428		5 STAR HALL		4.2.3SR	7	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
112	103	5812		BOYS		4.2.3SR	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
113	101	4428		5 STAR HALL		2.3.2SRB	3	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
114	101	4428		5 STAR HALL		4.2.3SR	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
115	101	4428		5 STAR HALL	EMERGENCY	4.2.3ER	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit, Ballast Ready LED Tube Lights, 2- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	44

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
116	101	4428		5 STAR HALL		4.2.3SR	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
117	101	4428		5 STAR HALL		2.3.2SRB	4	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
118	102	4067		B122, B 121		4.2.3ELRB	27	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
119	102	4067		CAFÉ		4.3.32ELP	45	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
120	101	4428		STORAGE		4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
121	101	4428		STORAGE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
122	102	4067		KITCHEN		4.3.3ERB	31	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
123	102	4067		KITCHEN		A40D	17	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
124	101	4428		STORAGE		4.2.4SR	8	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
125	102	4067		CAFÉ 2		4.3.3ERB	28	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
126	103	5812		MENS, GIRLS		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
127	101	4428		GYM HALL		4.3.32ELP	28	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
128	101	4428		STORAGE		A40D	2	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
129	104	8760		BOILER AREA		4.3.3ERB	5	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
130	101	4428		MAIN GYM		HPS1000	36	HIGH PRESSURE SODIUM, 1-400 WATT LAMP	465	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
131	102	4067		C100		4.2.3ELRB	35	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
132	102	4067		C102		4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
133	102	4067		C104		4.2.3ELRB	35	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
134	102	4067		C104		4.2.4SR	6	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
135	102	4067		C104		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
136	101	4428		STORAGE		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
137	101	4428		STORAGE		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
138	102	4067		C106		4.2.3ELRB	23	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
139	102	4067		C106		2.3.2ERB	2	2' FIXTURE, 2-F17/T8/STD LAMPS, ELECTRONIC BALLAST	34	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
140	101	4428		GIRLS LOCKER		4.2.3ELRB	22	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
141	101	4428		GIRLS LOCKER		4.2.3SR	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
142	104	8760		OFFICE		4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
143	101	4428		D HALL		4.3.32ELP	18	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
144	102	4067		D112		4.2.3ELRB	10	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
145	102	4067		D110		4.2.3ELRB	8	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
146	104	8760		COACH OFFICE		4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
147	102	4067		D108		4.3.32ELP	21	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
148	101	4428		STORAGE		4.2.3SR	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
149	102	4067		D106		4.3.32ELP	20	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
150	102	4067		PREP RM		4.2.3ELRB	7	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
151	102	4067		D104		4.3.32ELP	20	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
152	102	4067		D104		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
153	104	8760		EXIT 15		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
154	104	8760		LOADING DOCK		4.2.3SR	7	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
155	101	4428		WEIGHT ROOM		4.3.32ELP	20	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
156	101	4428		WEIGHT ROOM		2.2.3SR	2	2x2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	82	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
157	104	8760		SECURITY OFFICE		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
158	101	4428		MECH LOFT		4.2.4SR	8	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
159	101	4428		MECH LOFT		A60	1	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
160	101	4428		TRAINERS HALL		4.3.32ELP	11	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
161	101	4428		CLOSET		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
162	101	4428		BOYS TEAM ROOM		4.2.3ERB	1	4' FIXTURE, 3-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	151	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
163	101	4428		BOYS TEAM ROOM		4.2.4SR	23	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
164	104	8760		OFFICE		4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
165	103	5812		BATH		A60	2	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
166	101	4428		TRAINERS ROOM		4.2.3ERB	10	4' FIXTURE, 3-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	151	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
167	101	4428		GIRLS TEAM ROOM		4.2.4SR	16	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
168	104	8760		COACH OFFICE		4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
169	104	8760		COACH OFFICE		A60	2	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
170	101	4428		AUX GYM		MH400.1	54	METAL HALIDE, 1-400 WATT LAMP	458	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
171	101	4428		AUX GYM	WALL MOUNT	4.2.4SR	6	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
172	101	4428		WEIGHT ROOM		MH350	16	METAL HALIDE, 1-250 WATT LAMP	295	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
173	101	4428		WEIGHT ROOM		4.2.4SR	15	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
174	104	8760		SEC OFFICE		4.2.3ELRB	5	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
175	104	8760		SEC OFFICE		A40D	2	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
176	101	4428		BOYS LOCKER		4.2.3ELRB	21	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
177	101	4428		BOYS LOCKER		4.2.3SR	13	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
178	103	5812		BATH		2.3.2SRB	1	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
179	104	8760		OFFICE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
180	101	4428		STORAGE		A60	3	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
181	101	4428		WRESTLING ROOM		MH350	32	METAL HALIDE, 1-250 WATT LAMP	295	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
182	101	4428		EXIT 11		2.2.3ELP	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
183	101	4428		CAFÉ HALL		4.3.32ELP	7	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
184	104	8760		MEDIA CENTER		4.3.3ERB	81	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
185	101	4428		STORAGE		4.3.3ERB	8	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
186	104	8760		MEDIA OFFICE		4.3.3ERB	11	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
187	104	8760		MEDIA OFFICE		A40D	14	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
188	104	8760		MEDIA OFFICE		8.1.7ERB	36	8' FIXTURE, 1-F96/T12/ 60 WATT LAMP, ENERGY SAVING MAGNETIC BALLAST	73	Retrofit 8' Fixture with 2 - 4 Foot, 15W LED Tube Lights ,120-277V - Includes Brackets & Sockets	30
189	104	8760		MEDIA OFFICE		4.1.3SRB	12	4' FIXTURE, 1-F34/T12 LAMP, STANDARD MAGNETIC BALLAST	50	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
190	103	5812		CANOPY	EXTERIOR	A60	6	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
191	103	5812		POLE BOX	EXTERIOR	HPS225	16	HIGH PRESSURE SODIUM, 1-250 WATT LAMP	295	SEESMART HIGH POWERED 22 WATT LED LAMP SKU; 130028-130039 (3000-3200 Lumens)	22
192	103	5812		WALL PACK	EXTERIOR	HPS50	4	HIGH PRESSURE SODIUM, 1-70 WATT LAMP	95	RAB 13W LED WALL PACK - WPLED13	13
193	103	5812		WALL PACK	EXTERIOR	HPS400	1	HIGH PRESSURE SODIUM, 1-400 WATT LAMP	465	RAB 78W LED WALL PACK - ALED4T78	78
194	103	5812		WALL	EXTERIOR	A150	40	26 WATT CFL	0	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
195	103	5812		WALL PACK	EXTERIOR	HPS360	2	HIGH PRESSURE SODIUM, 1-250 WATT LAMP	295	RAB 78W LED WALL PACK - ALED4T78	78
196	103	5812		WALL	EXTERIOR	HPS100	10	HIGH PRESSURE SODIUM, 1-150 WATT LAMP	188	SEESMART HIGH POWERED 22 WATT LED LAMP SKU; 130028-130039 (3000-3200 Lumens)	22
197	103	5812		CANOPY	EXTERIOR	A40D	8	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
198	103	5812		WALL	EXTERIOR	P38.90	15	75 WATT PAR 38	75	Seesmart Par 38, 15W, High Powered DIMMABLE, 120V, SKU: 180112-180120	15
199	103	5812		WALL	EXTERIOR	HPS360	2	HIGH PRESSURE SODIUM, 1-250 WATT LAMP	295	RAB 78W LED WALL PACK - ALED4T78	78
200	103	5812		ACORN POLE	EXTERIOR	HPS360	2	HIGH PRESSURE SODIUM, 1-250 WATT LAMP	295	RAB 78W LED WALL PACK - ALED4T78	78
201	103	5812		WALL	EXTERIOR	HPS400	1	HIGH PRESSURE SODIUM, 1-400 WATT LAMP	465	RAB 78W LED WALL PACK - ALED4T78	78
202											
				Total Fixture Quantity		2283					

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts

TRI-STATE LED
255 Mill Street, 2nd Floor
Greenwich, CT 06830
p: (203) 813-3791
f: (203) 813-3794
www.TriStateLED.com

Demand		Usage	
Existing Demand: kW	312.54	Existing Use: kWh	1,575,512.56
Proposed Demand: kW	123.46	Proposed Use: kWh	615,610.12
Demand Reduction: kWr	189.09	Use Reduction: kWh	959,902.45

Total Lighting Energy Savings	60.9%

Combined Unit Use Cost: kWh	$0.15	Supply Savings: KWH Per Year	$143,985.37
		*Delivery Savings: KW Per Year	$34,035.30
		*Maintenance Savings Per Year (Lamps & Ballast only)	$21,000.00
		*15% HVAC Savings Per Year	$33,910.54

Total Monthly Savings	$19,410.93
Total Annual Savings	$232,931.21
Total Cost Savings 5 Years	$1,164,656.05

Financial Summary

Material Cost	***$565,691.92***
Estimated Baypoint Electric Labor Cost	***$110,000.00***
One Time Approx. Rebate	***$130,000.00***
Total Job Cost ***(After Rebate & Labor)***	***$545,691.92***
Simple Payback (months)	**28.08**
First Year Return on Investment	***42.69%***
CO_2 Reduction (lbs)	1,276,670.25

Freehold Borough High School						
Number of Classrooms: 73	203,000	Gross SF Area		**5.0%**	GC Allowance	**25.0%**
				18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)**	P4P	$1,540.00	$739.20	77.00	277.20	170.48	2,064.68	516.17	1,548.51	2.09

Cost Basis:	This is based on installing in 73 classrooms with a cost of $21.10 per class room with the ability to shut down additional plug-ins . This has been shown to provide an efficient way to get rid of any parasitic loads from electrical equipment that are generally left on 24/7.
Saving Projection:	The saving is based on publications involved with evaluating the effectiveness of these components. For our geographic area we believe that the energy savings would be something along the lines of 50% of the initial cost. When we evaluate this we find that a reasonable estimated savings is $776.72.

Energy Savings	Savings per Year (kWh)	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	6,935.00	$776.72	3,835.06	11.48	9.49	0.33
Gas (Therms)	0	$0.00	0	0	0	0
Total Savings (kBtu)	23,663.20	$776.72			**Total Pollution Reduction in Cars Removed from the Road =**	**0.33**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Estimates average savings per classroom of 95 kWh/year removing hot plates from classroom.		
Energy Savings Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$739.20
Discussion:	These parasitic load reducing power strips have been shown in peer reviewed articles to provide good energy savings while being relatively easy to install. It would be something that would be a low enough payback that it would actually help to bring high cost items such as heavy mechanical components more into line with the type of cost and internal rate of return in order to justify these capital projects. The recommendation would be to do these power strips for the simple reason that they are easy to install, have a quick payback and they would effectively help reduce the cost of other more expensive items.		

Freehold Borough High School						
Number of Classrooms: 73	203,000	Gross SF Area		**5.0%**	GC Allowance	**25.0%**
				18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Soda vending machines off at night or weekends**	P4P	$453.00	$82.00	22.65	81.54	50.15	607.34	151.83	455.50	5.55

Cost Basis:	[Based on 2 USAT vending machines at 189.00 each plus a $75.00 labor to install each for a total of $453.00.
Saving Projection:	This is based on conservative estimates on weekends and late nights that the machines can be used to go into deep set back where the refrigeration can be shut off. It can be noted that this should only be used for things like soda; ice cream and milk would not be a good candidate for this type of energy savings measure.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	768.00	$86.02	424.70	1.27	1.05	0.04
Gas (Therms)		$0.00	0	0	0	0
Total Savings (kBtu)	2,620.52	$86.02			**Total Pollution Reduction in Cars Removed from the Road =**	**0.04**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Assumes savings of 384 kWh per vending machine each year		
	Two vending machines can use this upgrade		
Energy Savigns Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$82.00
Discussion:	There are candy machines and soda machines that do not need to keep all components refrigerated to keep them in a saleable fashion. For instance; coca cola, diet coke sodas can have the refrigeration shut off over long weekend, night or times where there is no one in the school. It would not be recommended to use this technology for any dairy products or foods that can potentially spoil with elevated temperatures. This is a good way to tie an occupancy sensors to when people are in the area and when the machines runs.		

Freehold Borough High School						
Number of Classrooms: 73	203,000	Gross SF Area		**5.0%**	GC Allowance	**25.0%**
				18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
3	**Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)**	P4P	$3,062.35	$1,416.20	153.12	551.22	339.00	4,105.69	1,026.42	3,079.27	2.17

Cost Basis:	Price of Equipment and installation is estimated to be $41.95 per class room based off of vendor pricing. With a total of 73 class rooms, the estimated installed hard cost is $3,062.35.
Saving Projection:	The savings is projected to be roughly 50% annually based off initial investment. This is calculated to be $1,488.03 saved per year, making this energy reduction measure's have an attractive payback. The savings is based off of historical data and past experience, see details below.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	13,286.00	$1,488.03	7,347.16	22.00	18.18	0.64
Gas (Therms)	0.00	$0.00				
Total Savings (kBtu)	45,333.71	$1,488.03			**Total Pollution Reduction in Cars Removed from the Road =**	**0.64**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	73 classrooms would have set-back power strip		
	Each classroom would have set-back savings of 182 kWh/ year.		
	Laser printers and other peripheral devices would add to savings.		
Energy Savings Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$1,416.20
Discussion:	Considering the low cost and easy installation, this is a recommended energy reduction measure. The simple payback of under three years is also another attractive benefit this investment offers.		

Freehold Borough High School							**5.0%**	GC Allowance		**25.0%**	
Number of Classrooms: 73	203,000			Gross SF Area			**18.0%**	Contingency &			

Concervative Incentive

Notes: Funding *;
Importance*; 1 =

Pic	Energy Reduction Measure	Funding *	Estimated	Estimated	5% General	15%	Professional	Revised	Concervative	Final Project	Total
	NJDOE ROD GRANT - 5 YEAR LEASE										
1	**Building "A" - (3) 2,000 MBH Condensing Boilers, Pumps, Gas Serv**	P4P	$303,500.00	$20,000.00	15,175.00	54,630.00	33,597.45	406,902.45	101,725.61	305,176.84	15.26

Cost Basis:	Based on RS Means and Contruction Costs, 3 boilers cost $303,500 or $101,166.67 each										
Saving Projection:	The boiler upgrade would improve the efficiency from around 74% up to 92% for a projected savings of $20,483.07 after energy savings factor of safety is considered. The estimated value has than been rounded to $20,000.										
Energy Savings	**Savings per Year**	**Estimated Annual Savings ($)**	**C02 Reduced (lbs.)**		**SO2 (lbs.)**		**NOX (lbs.)**		**Cars Removed**	
Electric (kW)	-19,668.00	-$2,202.82	-10,876.40		-32.56		-26.91		-0.95	
Gas Savings (Therms)	28832.04	$30,879.11	1,381,968.65		2,827.38		3,419.17		120.70	
Total Savings Kbtu	2,816,094.00	$28,676.30	1,371,092.25		2,794.82		3,392.26			
									Total Pollution Reduction in Cars Removed from the Road =	**119.75**	
	*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**										
Assumptions	From site visit and Haglid Engineering evaluation of existing boiler Gas efficiency of 74% to Aerco 92% efficient boiler (savings=18% x current Gas usage). Pumping upgrade - (2) 5HP circulating pumps considered to run for 4,000 hours/year (cost = .66x2x5HPx.745kW/HP x 4,000 hours).										
Energy Savings Factor of Safety	1.4	Estimated annual savings with energy savings factor of safety =		$20,000							
Discussion:	Current steam boilers with VFD are only running full before school starts, boilers idle or just in standby for rest of day. Run hours are 25% of the time as represented by boiler operators.										

Freehold BOE ESIP Estimate

School	Steam to Hydronic Conversion Boiler Room "A"	Steam to Hydronic Conversion Boiler Room "C"	Mechanical Equipment Steam to Hydronic Piping Conversion **
Freehold Boro HWS&R conversion	$ 303,500	$ 303,500	$ 960,000
Total:	**$ 303,500**	**$ 303,500**	**$ 960,000**

** Does not include DOAS equipment

Freehold HS (Boro)
ESIP Options

	School/Building	Unit	Qty	Sub-Total	Total	Remarks
Boilers Bdlg "A" Option New gas-fired HW Boilers	Demo Existing boilers w/ associated piping & controls	ea	2	$ 10,000	$ 20,000	(excludes Asbestos)
	(3) 2,000 MBH condensing boilers (BOD - Aerco)	ea	3	$ 35,000	$ 105,000	
	(2) Primary Pumps w/accessories	ea	2	$ 10,250	$ 20,500	
	Boiler Sequence Control Panel	ea	1	$ 3,000	$ 3,000	
	Install new boiler(s)	ea	3	$ 15,000	$ 45,000	
	New boiler breeching	ea	1	$ 35,000	$ 35,000	
	Associated piping, valves and fittings	ea	3	$ 7,500	$ 22,500	
	Electrical & boiler control wiring	ea	3	$ 7,500	$ 22,500	
	VFD's for system pumps	ea	2	$ 7,500	$ 15,000	
	New Combustion air louver w/interlock	ea	1	$ 5,000	$ 5,000	
	Gas piping (new gas service)	ea	3	$ 2,000	$ 6,000	(excludes Utility Co costs)
	ATC connection	ea	1	$ 4,000	$ 4,000	
	contingency	0%			$ -	(Project contigency added)
	Option Sub-Total				**$ 303,500**	
Boilers Bdlg "C" Option New gas-fired HW Boilers	Demo Existing boilers w/ associated piping & controls	ea	2	$ 10,000	$ 20,000	(excludes Asbestos)
	(3) 2,000 MBH condensing boilers (BOD - Aerco)	ea	3	$ 35,000	$ 105,000	
	(2) Primary Pumps w/accessories	ea	2	$ 10,250	$ 20,500	
	Boiler Sequence Control Panel	ea	1	$ 3,000	$ 3,000	
	Install new boiler(s)	ea	3	$ 15,000	$ 45,000	
	New boiler breeching	ea	1	$ 35,000	$ 35,000	
	Associated piping, valves and fittings	ea	3	$ 7,500	$ 22,500	
	Electrical & boiler control wiring	ea	3	$ 7,500	$ 22,500	
	VFD's for system pumps	ea	2	$ 7,500	$ 15,000	
	New Combustion air louver w/interlock	ea	1	$ 5,000	$ 5,000	
	Gas piping (new gas service)	ea	3	$ 2,000	$ 6,000	(excludes Utility Co costs)
	ATC connection	ea	1	$ 4,000	$ 4,000	
	contingency	0%			$ -	(Project contigency added)
	Option Sub-Total				**$ 303,500**	

Freehold HS (Boro)
ESIP Options

	School/Building	Unit	Qty	Sub-Total	Total	Remarks
Costs	Demo Existing AHU's (Qty 7)	ea	7	$ 3,500	$ 24,500	(excludes Asbestos)
	Abandon Existing UV's (~QTY 45) - steam	ea	45	$ 2,000	$ 90,000	(excludes Asbestos)
	Seal OAI louver UV's (~Qty 28) - hydronic	ea	28	$ 1,000	$ 28,000	(excludes Asbestos)
	New HWS&R main piping (Corridor) ~2,100 ft	ft	2100	$ 90	$ 189,000	Excludes corridor ceiling work
	New AHU w/valve package	ea	7	$ 29,500	$ 206,500	Re-use existing ductwork & Accessories
	New VAV unit w/HWS&R reheat coils	ea	10	$ 5,000	$ 50,000	
	Radiant Panel w/installation & valve package	ea	45	$ 4,000	$ 180,000	(excludes Asbestos)
	Electrical-AHU's	ea	7	$ 1,000	$ 7,000	Disconnect/reconnect only
		ea			$ -	
	Radiators w/Danfoss valve (corridor & stairwell)	ea	25	$ 2,500	$ 62,500	(Existing radiation & covers to remain)
	Cabinet & UH w/valve package	ea	39	$ 2,500	$ 97,500	(Re-use covers)
		ea			$ -	
	Testing & Balancing	ea	1	$ 25,000	$ 25,000	
	contingency	0%			$ -	(Project contigency added)
	Option Sub-Total				**$ 960,000**	

Freehold Borough High School						
Number of Classrooms: 73	203,000	Gross SF Area		**5.0%**	GC Allowance	**25.0%**
				18.0%	Contingency & Soft Costs	

Concervative Incentive

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Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
1	**Building "C" - (3) 2,000 MBH Condensing Boilers, Pumps, Gas Serv**	P4P	$303,500.00	$20,000.00	15,175.00	54,630.00	33,597.45	406,902.45	101,725.61	305,176.84	15.26

Cost Basis:	Based on RS Means and Contruction Costs, 3 boilers cost $303,500 or $101,166.67 each
Saving Projection:	The boiler upgrade would improve the efficiency from around 74% up to 92% for a projected savings of $20,483.07 after energy savings factor of safety is considered. The estimated value has than been rounded to $20,000.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kW)	-19,668.00	-$2,202.82	-10,876.40	-32.56	-26.91	-0.95
Gas Savings (Therms)	28832.04	30879.11484	1,381,968.65	2,827.38	3,419.17	120.70
Total Savings Kbtu	2,816,094.00	$28,676.30	1,371,092.25	2,794.82	3,392.26	
					Total Pollution Reduction in Cars Removed from the Road =	**119.75**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From site visit and Haglid Engineering evaluation of existing boiler Gas efficiency of 74% to Aerco 92% efficient boiler (savings=18% x current Gas usage). Pumping upgrade - (2) 5HP circulating pumps considered to run for 4,000 hours/year (cost = .66x2x5HPx.745kW/HP x 4,000 hours).		
Energy Savings Factor of Safety	1.4	Estimated annual savings with energy savings factor of safety =	$20,000
Discussion:	Current steam boilers with VFD are only running full before school starts, boilers idle or just in standby for rest of day. Run hours are 25% of the time as represented by boiler operators.		

Freehold BOE ESIP Estimate

School	Steam to Hydronic Conversion Boiler Room "A"	Steam to Hydronic Conversion Boiler Room "C"	Mechanical Equipment Steam to Hydronic Piping Conversion **
Freehold Boro HWS&R conversion	$ 303,500	$ 303,500	$ 960,000
Total:	**$ 303,500**	**$ 303,500**	**$ 960,000**

** Does not include DOAS equipment

Freehold HS (Boro)
ESIP Options

	School/Building	Unit	Qty	Sub-Total	Total	Remarks
Boilers Bdlg "A" Option New gas-fired HW Boilers	Demo Existing boilers w/ associated piping & controls	ea	2	$ 10,000	$ 20,000	(excludes Asbestos)
	(3) 2,000 MBH condensing boilers (BOD - Aerco)	ea	3	$ 35,000	$ 105,000	
	(2) Primary Pumps w/accessories	ea	2	$ 10,250	$ 20,500	
	Boiler Sequence Control Panel	ea	1	$ 3,000	$ 3,000	
	Install new boiler(s)	ea	3	$ 15,000	$ 45,000	
	New boiler breeching	ea	1	$ 35,000	$ 35,000	
	Associated piping, valves and fittings	ea	3	$ 7,500	$ 22,500	
	Electrical & boiler control wiring	ea	3	$ 7,500	$ 22,500	
	VFD's for system pumps	ea	2	$ 7,500	$ 15,000	
	New Combustion air louver w/interlock	ea	1	$ 5,000	$ 5,000	
	Gas piping (new gas service)	ea	3	$ 2,000	$ 6,000	(excludes Utility Co costs)
	ATC connection	ea	1	$ 4,000	$ 4,000	
	contingency	0%			$ -	(Project contigency added)
	Option Sub-Total				**$ 303,500**	
Boilers Bdlg "C" Option New gas-fired HW Boilers	Demo Existing boilers w/ associated piping & controls	ea	2	$ 10,000	$ 20,000	(excludes Asbestos)
	(3) 2,000 MBH condensing boilers (BOD - Aerco)	ea	3	$ 35,000	$ 105,000	
	(2) Primary Pumps w/accessories	ea	2	$ 10,250	$ 20,500	
	Boiler Sequence Control Panel	ea	1	$ 3,000	$ 3,000	
	Install new boiler(s)	ea	3	$ 15,000	$ 45,000	
	New boiler breeching	ea	1	$ 35,000	$ 35,000	
	Associated piping, valves and fittings	ea	3	$ 7,500	$ 22,500	
	Electrical & boiler control wiring	ea	3	$ 7,500	$ 22,500	
	VFD's for system pumps	ea	2	$ 7,500	$ 15,000	
	New Combustion air louver w/interlock	ea	1	$ 5,000	$ 5,000	
	Gas piping (new gas service)	ea	3	$ 2,000	$ 6,000	(excludes Utility Co costs)
	ATC connection	ea	1	$ 4,000	$ 4,000	
	contingency	0%			$ -	(Project contigency added)
	Option Sub-Total				**$ 303,500**	

Freehold HS (Boro)
ESIP Options

	School/Building	Unit	Qty	Sub-Total	Total	Remarks
Costs	Demo Existing AHU's (Qty 7)	ea	7	$ 3,500	$ 24,500	(excludes Asbestos)
	Abandon Existing UV's (~QTY 45) - steam	ea	45	$ 2,000	$ 90,000	(excludes Asbestos)
	Seal OAI louver UV's (~Qty 28) - hydronic	ea	28	$ 1,000	$ 28,000	(excludes Asbestos)
	New HWS&R main piping (Corridor) ~2,100 ft	ft	2100	$ 90	$ 189,000	Excludes corridor ceiling work
	New AHU w/valve package	ea	7	$ 29,500	$ 206,500	Re-use existing ductwork & Accessories
	New VAV unit w/HWS&R reheat coils	ea	10	$ 5,000	$ 50,000	
	Radiant Panel w/installation & valve package	ea	45	$ 4,000	$ 180,000	(excludes Asbestos)
	Electrical-AHU's	ea	7	$ 1,000	$ 7,000	Disconnect/reconnect only
		ea			$ -	
	Radiators w/Danfoss valve (corridor & stairwell)	ea	25	$ 2,500	$ 62,500	(Existing radiation & covers to remain)
	Cabinet & UH w/valve package	ea	39	$ 2,500	$ 97,500	(Re-use covers)
		ea			$ -	
	Testing & Balancing	ea	1	$ 25,000	$ 25,000	
	contingency	0%			$ -	(Project contigency added)
	Option Sub-Total				**$ 960,000**	

Freehold Borough High School		
Number of Classrooms: 73	203,000	Gross SF Area

5.0%	GC Allowance	**25.0%**
18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Conservative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
1	**Switching out steam heating for HYDRONIC heating, piping, radiant panels, cabinets, VAV, Valves**	CM OR P4P	$960,000.00	$5,500.00	48,000.00	172,800.00	106,272.00	1,287,072.00	321,768.00	965,304.00	175.51

Cost Basis:	The cost has been estimated based on engineering analysis and RS Means and Known Construction Costs to be $960,000.
Saving Projection:	The savings projection for this energy reduction measure is based on the limited replacement of electric resistive with gas heating for an annual savings of $5,775

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	0.00	$0.00	0.00	0.00	0.00	0.00
Gas Savings (Therms)	5391.78	$5,774.60	258,437.17	528.74	639.41	22.57
Total Savings Kbtu	539,178.00	$5,774.60	258,437.17	528.74	639.41	

Total Pollution Reduction in Cars Removed from the Road = **22.57**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From Haglid engineers site visit we found opportunity to replace inefficient over heating of classrooms of 73.86 Therms x 73 classrooms		
	Currently windows are left open even in very cold working environment		
	Windows to be closed and comfort controls to work to provide reasonable comfort		
Energy Savings Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$5,500
Discussion:	Savings would also support the boiler upgrades and boiler savings.		

Freehold BOE ESIP Estimate

School	Steam to Hydronic Conversion Boiler Room "A"	Steam to Hydronic Conversion Boiler Room "C"	Mechanical Equipment Steam to Hydronic Piping Conversion **
Freehold Boro HWS&R conversion	$ 303,500	$ 303,500	$ 960,000
Total:	**$ 303,500**	**$ 303,500**	**$ 960,000**

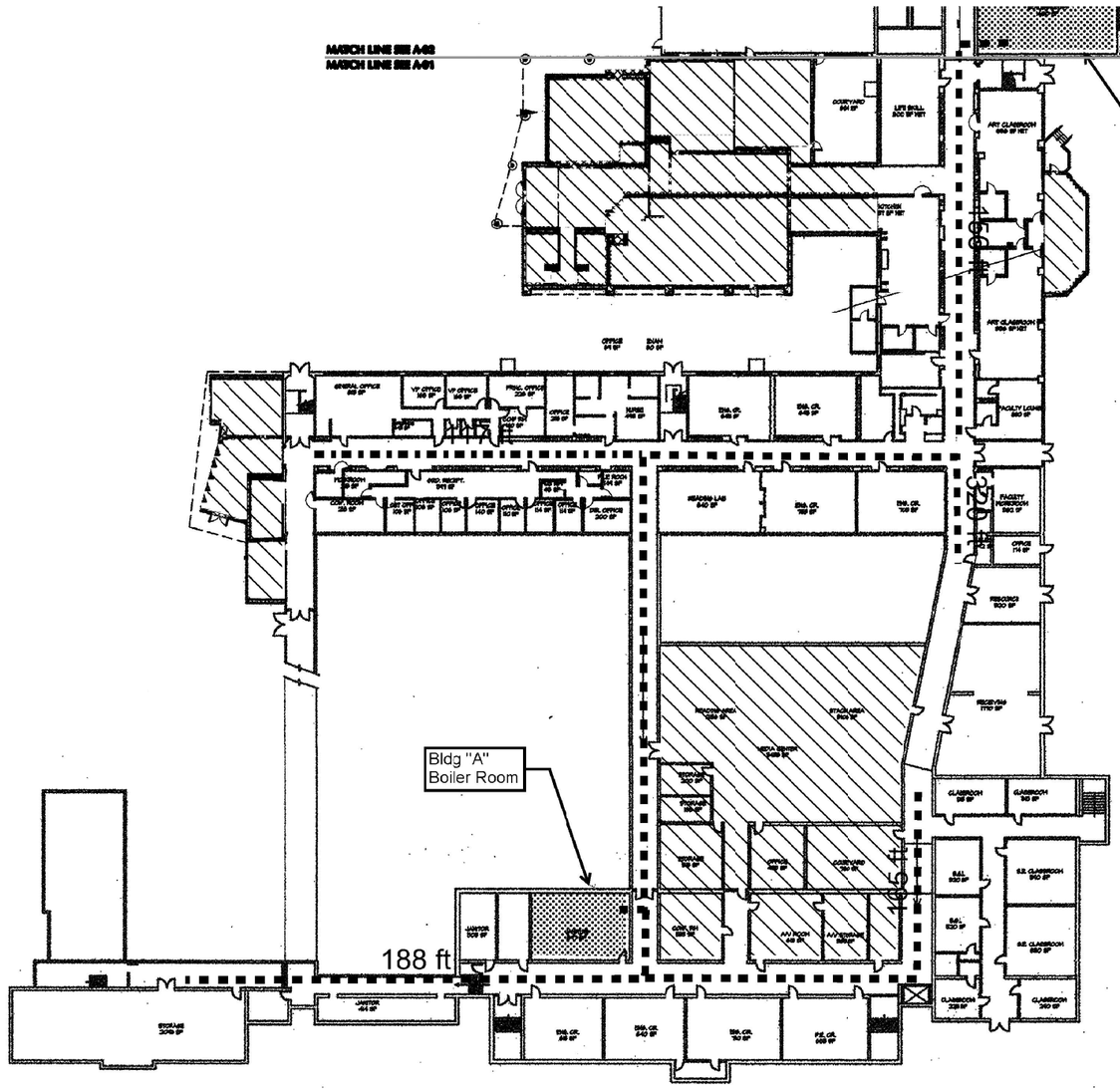
** Does not include DOAS equipment

Freehold HS (Boro)
ESIP Options

	School/Building	Unit	Qty	Sub-Total	Total	Remarks
Boilers Bdlg "A" Option New gas-fired HW Boilers	Demo Existing boilers w/ associated piping & controls	ea	2	$ 10,000	$ 20,000	(excludes Asbestos)
	(3) 2,000 MBH condensing boilers (BOD - Aerco)	ea	3	$ 35,000	$ 105,000	
	(2) Primary Pumps w/accessories	ea	2	$ 10,250	$ 20,500	
	Boiler Sequence Control Panel	ea	1	$ 3,000	$ 3,000	
	Install new boiler(s)	ea	3	$ 15,000	$ 45,000	
	New boiler breeching	ea	1	$ 35,000	$ 35,000	
	Associated piping, valves and fittings	ea	3	$ 7,500	$ 22,500	
	Electrical & boiler control wiring	ea	3	$ 7,500	$ 22,500	
	VFD's for system pumps	ea	2	$ 7,500	$ 15,000	
	New Combustion air louver w/interlock	ea	1	$ 5,000	$ 5,000	
	Gas piping (new gas service)	ea	3	$ 2,000	$ 6,000	(excludes Utility Co costs)
	ATC connection	ea	1	$ 4,000	$ 4,000	
	contingency	0%			$ -	(Project contigency added)
	Option Sub-Total				**$ 303,500**	
Boilers Bdlg "C" Option New gas-fired HW Boilers	Demo Existing boilers w/ associated piping & controls	ea	2	$ 10,000	$ 20,000	(excludes Asbestos)
	(3) 2,000 MBH condensing boilers (BOD - Aerco)	ea	3	$ 35,000	$ 105,000	
	(2) Primary Pumps w/accessories	ea	2	$ 10,250	$ 20,500	
	Boiler Sequence Control Panel	ea	1	$ 3,000	$ 3,000	
	Install new boiler(s)	ea	3	$ 15,000	$ 45,000	
	New boiler breeching	ea	1	$ 35,000	$ 35,000	
	Associated piping, valves and fittings	ea	3	$ 7,500	$ 22,500	
	Electrical & boiler control wiring	ea	3	$ 7,500	$ 22,500	
	VFD's for system pumps	ea	2	$ 7,500	$ 15,000	
	New Combustion air louver w/interlock	ea	1	$ 5,000	$ 5,000	
	Gas piping (new gas service)	ea	3	$ 2,000	$ 6,000	(excludes Utility Co costs)
	ATC connection	ea	1	$ 4,000	$ 4,000	
	contingency	0%			$ -	(Project contigency added)
	Option Sub-Total				**$ 303,500**	

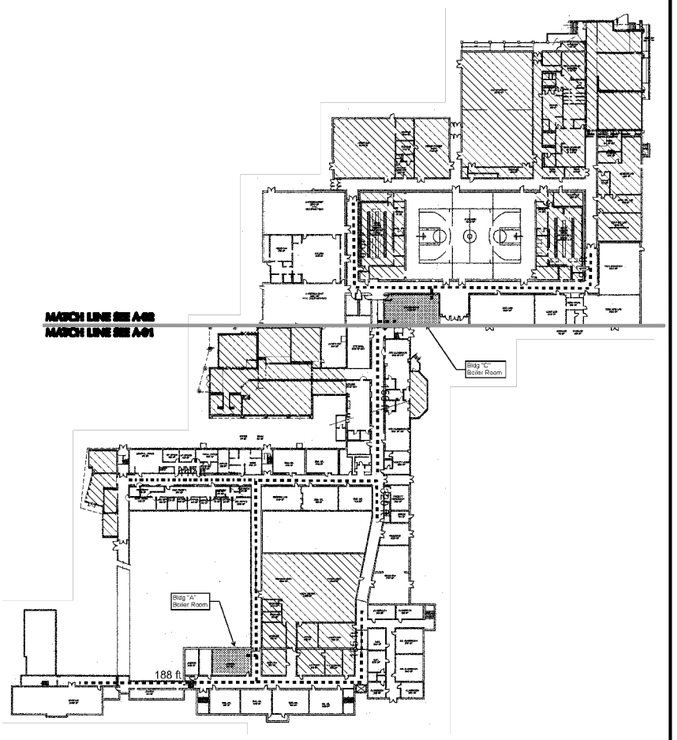
Freehold HS (Boro)
ESIP Options

	School/Building	Unit	Qty	Sub-Total	Total	Remarks
Costs	Demo Existing AHU's (Qty 7)	ea	7	$ 3,500	$ 24,500	(excludes Asbestos)
	Abandon Existing UV's (~QTY 45) - steam	ea	45	$ 2,000	$ 90,000	(excludes Asbestos)
	Seal OAI louver UV's (~Qty 28) - hydronic	ea	28	$ 1,000	$ 28,000	(excludes Asbestos)
	New HWS&R main piping (Corridor) ~2,100 ft	ft	2100	$ 90	$ 189,000	Excludes corridor ceiling work
	New AHU w/valve package	ea	7	$ 29,500	$ 206,500	Re-use existing ductwork & Accessories
	New VAV unit w/HWS&R reheat coils	ea	10	$ 5,000	$ 50,000	
	Radiant Panel w/installation & valve package	ea	45	$ 4,000	$ 180,000	(excludes Asbestos)
	Electrical-AHU's	ea	7	$ 1,000	$ 7,000	Disconnect/reconnect only
		ea			$ -	
	Radiators w/Danfoss valve (corridor & stairwell)	ea	25	$ 2,500	$ 62,500	(Existing radiation & covers to remain)
	Cabinet & UH w/valve package	ea	39	$ 2,500	$ 97,500	(Re-use covers)
		ea			$ -	
	Testing & Balancing	ea	1	$ 25,000	$ 25,000	
	contingency	0%			$ -	(Project contigency added)
	Option Sub-Total				**$ 960,000**	



BASEMENT AND FIRST FLOOR PLANS

SCALE: 1/64"=1'



BASEMENT AND FIRST FLOOR PLAN KEY PLANS

SCALE: 1/128

LEGEND APPLIES TO DRAWINGS A-01, A-02 AND A-03

- Proposed HWS&R piping.
- Existing spaces that are already hot-water or gas heated.
- Existing Mechanical Rooms.

PROJECT SCOPE APPLIES TO DRAWINGS A-01, A-02 AND A-03

1. PROPOSED ROUTING OF HWS&R HYDRONIC PIPING TO REPLACE EXISTING STEAM PIPING ESTIMATED COMBINED LENGTH 2,100 FEET. (FUNDED BY NJDOE ROD GRANT)
2. PROVIDE ZONE CONTROL VALVES FROM PRIMARY SUPPLY/ RETURN PIPES TO INDIVIDUAL SPACES. (FUNDED BY NJDOE ROD GRANT)
3. INSTALL NEW RADIANT H.W. CEILING PANELS AND/ OR PERIMETER RADIANT FIN TUBES IN ALL ROOMS CURRENTLY HEATED WITH STEAM. (FUNDED BY NJDOE ROD GRANT)
4. REMOVE EXISTING STEAM SUPPLY PIPES, CONDENSATE RETURNS AND TERMINAL EQUIPMENT. (FUNDED UNDER DISTRICT NJEFU-OCE E.S.I.P.) INCLUDES HAZARDOUS MATERIAL ABATEMENT.
5. COORDINATE PIPING INSTALLATION WITH INSTALLATION OF NEW HOT WATER BOILERS INSTALLED. (FUNDED UNDER DISTRICT NJEFU-OCE E.S.I.P.) INCLUDES HAZARDOUS MATERIAL ABATEMENT.
6. INSTALL NEW DIRECT DIGITAL - AUTOMATIC TEMPERATURE CONTROL SYSTEM WITH NEW HEAD END CONTROLLER TIED TO GRAPHIC COMPUTER PACKAGE. (FUNDED UNDER DISTRICT NJEFU-OCE E.S.I.P.)

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HVAC REPLACEMENT AT FREEHOLD BOROUGH HIGH SCHOOL

Project Name: FREEHOLD REGIONAL HIGH SCHOOL DISTRICT

Project Location: FREEHOLD HIGH SCHOOL 2 ROBERTSVILLE ROAD FREEHOLD, N.J. 07728

Project Number: ST13-325-FBHS

Project Date: 09-27-2013

Checked By: JJV

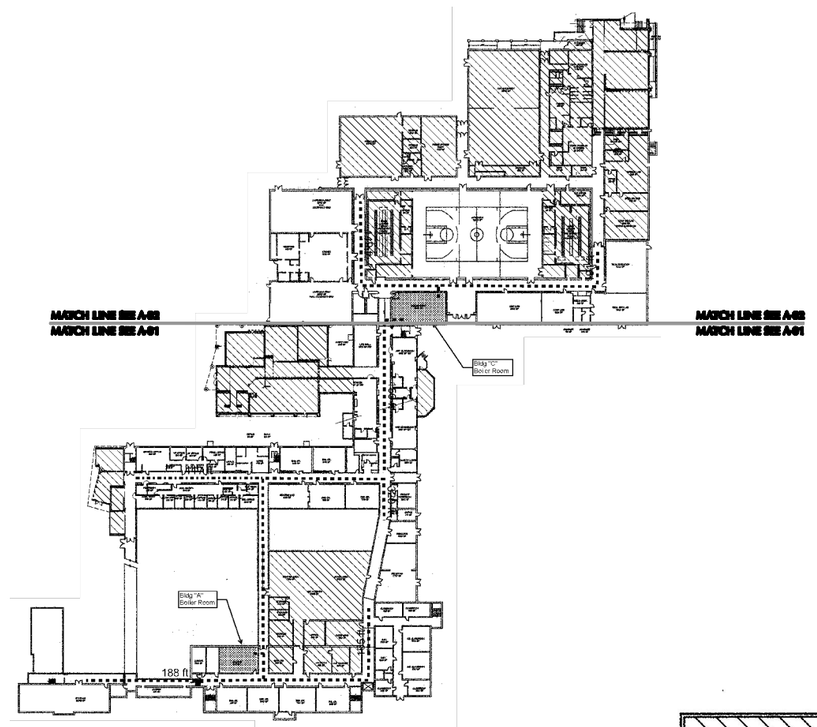
Drawn By: MS

Scale: AS NOTED

Drawing Name: PROPOSED ROUTING OF HWS&R HYDRONIC PIPING TO REPLACE EXISTING STEAM PIPING BASEMENT & FIRST FLOOR

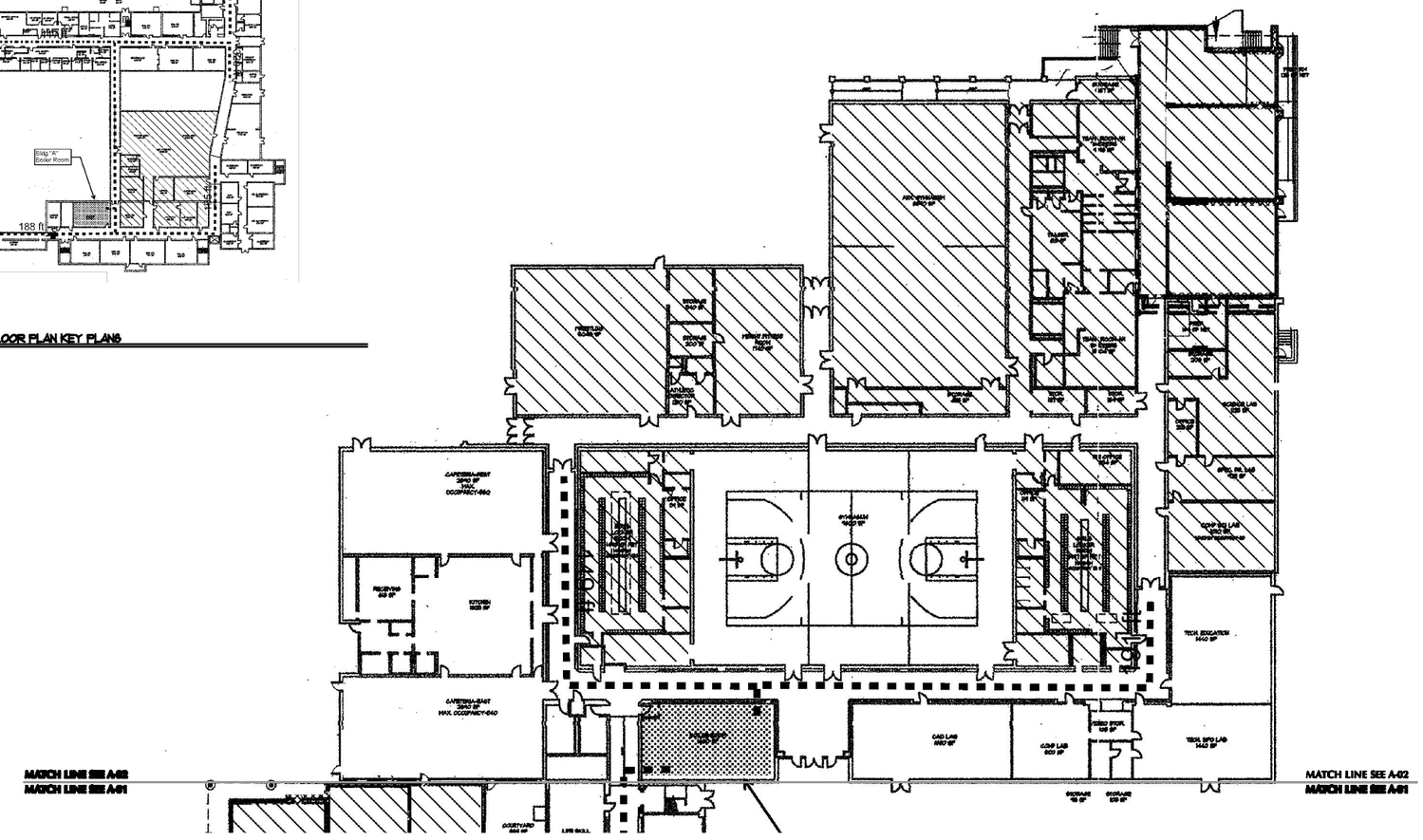
No.	Date	Description

Drawing Number: A-01



BASEMENT AND FIRST FLOOR PLAN KEY PLANS

SCALE: NTS



BASEMENT AND FIRST FLOOR PLANS

SCALE: 1/64"=1'

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HVAC REPLACEMENT AT FREEHOLD BOROUGH HIGH SCHOOL

FREEHOLD REGIONAL HIGH SCHOOL DISTRICT

FREEHOLD HIGH SCHOOL
2 ROBERTSVILLE ROAD FREEHOLD, NJ. 07728

ST13-325-FBHS

09-27-2013

JJV

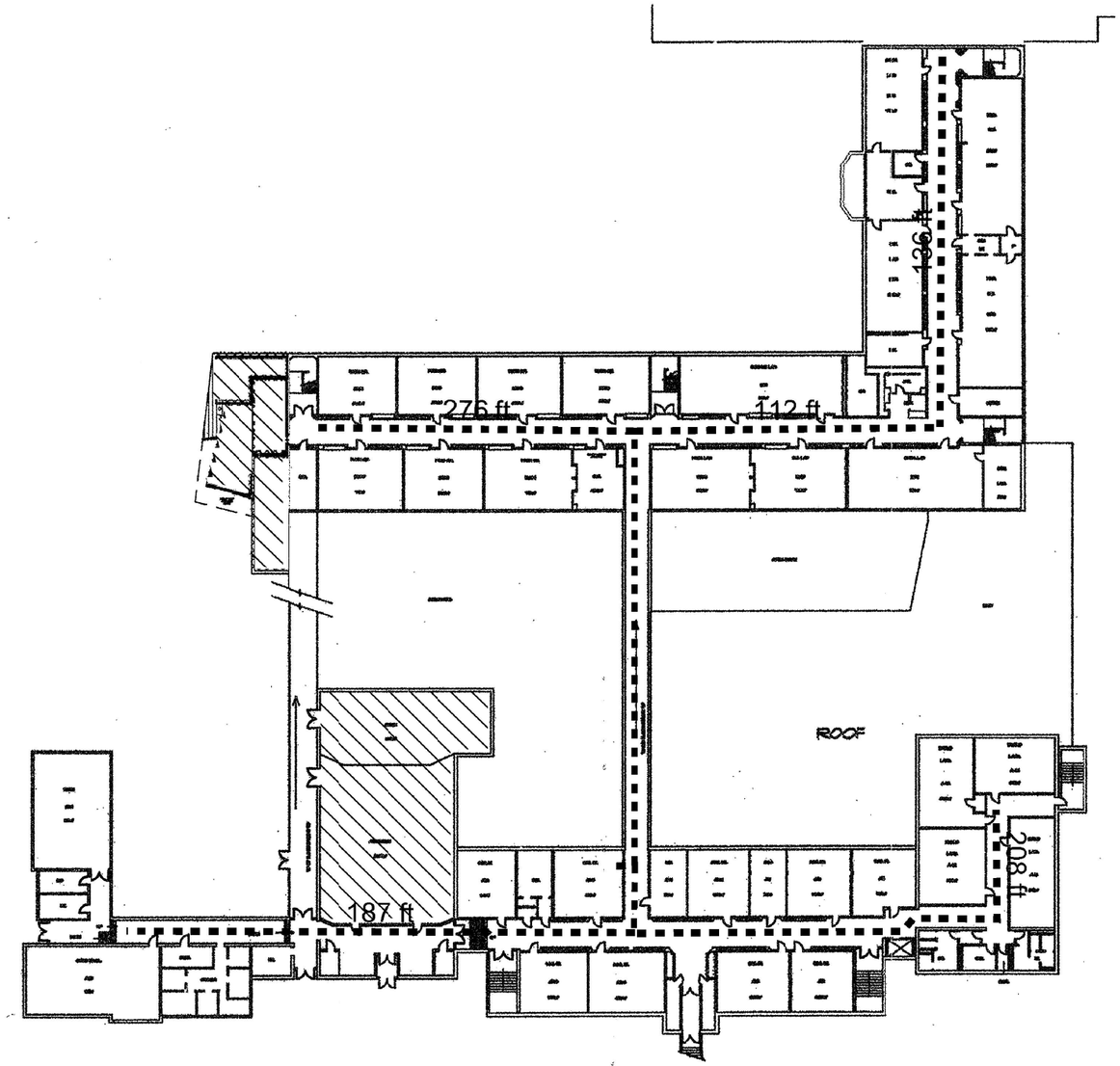
MS

AS NOTED

PROPOSED ROUTING OF HWS&R HYDRONIC PIPING TO REPLACE EXISTING STEAM PIPING BASEMENT & FIRST FLOOR

No.	Date	Description

A-02



FIRST AND SECOND FLOOR PLANS

SCALE: 1/64"=1'

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HVAC REPLACEMENT AT FREEHOLD BOROUGH HIGH SCHOOL

FREEHOLD REGIONAL HIGH SCHOOL DISTRICT

FREEHOLD HIGH SCHOOL
2 ROBERTSVILLE ROAD FREEHOLD, NJ. 07728

Project Number: ST13-325-FBHS
Project Date: 09-27-2013
Checked By: JJV
Drawn By: MS
Scale: AS NOTED

Drawing Name: PROPOSED ROUTING OF HWS&R HYDRONIC PIPING TO REPLACE EXISTING STEAM PIPING FIRST & SECOND FLOORS

No.	Date	Description

Drawing Number: A-03

Freehold Borough High School						
Number of Classrooms: 73	203,000	Gross SF Area		**5.0%**	GC Allowance	**25.0%**
				18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
3	**Envelope upgrades: roof insulation with a roof project (min R20; Avg. R25)**	P4P	$1,099,625.00	$14,500.00	54,981.25	197,932.50	121,728.49	1,474,267.24	368,566.81	1,105,700.43	76.26

Cost Basis:	The budgetary cost for evaluating the envelope, roof and insulation is provided with RS Means and known construction costs for working on similar high school projects in the Central NJ area. The estimate installed hard costs at $1,099,625.00 is typical of a roof this size.
Saving Projection:	The savings projection is based on computer modeling of like kind high schools in the area and we believe is relatively conservative but typically envelope upgrades do not have tremendously attractive energy savings and we believe this is reasonable and typical for this type of envelope upgrade.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	0.00	$0.00	0.00	0.00	0.00	0.00
Gas Savings (Therms)	14200	$15,208.20	680,630.12	1,392.51	1,683.97	59.44
Total Savings Kbtu	1,420,000.00	$15,208.20	680,630.12	1,392.51	1,683.97	

Total Pollution Reduction in Cars Removed from the Road = **59.44**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Haglid Engineering projects gas heating savings of 14,200 therms		
Energy Savings Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$14,500
Discussion	Given an estimated payback in excess of 75 years, this is not an energy reduction measure we would recommend until the roof needs to be repaired. Until that time, generally the cost of adding excess insulation or improving the roof to an R20 rating is something that is not as expensive as replacing the insulation and adding a new roof. The recommendation is to wait until the roof needs to be repaired and at that time evaluate adding thermal insulation to have the roof at least approach R20 and an average of R25.		

Table 14. Recommended Measures - Cost and Energy Savings

	Measure Name	Installed Cost (incl. design)	Annual Energy Savings		Demand Savings	Annual O&M Savings	Annual Cost Savings	Measure Life	Simple Payback	Life Cycle Savings	IRR
		$	kWh	Gas MMBtu	kW	$	$	years	years	$	%
1	Energy Recovery Ventilation	$242,370	175,245	2,436	88.0	$0	$49,560	15	4.89	$349,269	18.9%
2	Roofing Upgrade - R-30 + Energy Star Reflective Coating	$98,304	28,605	787	50.0	$0	$12,205	18	8.05	$69,561	10.3%
3	Window Film for Classrooms 101, 103, 105, 107, 111	$2,500	-44,966	166	12.0	$0	-$4,363	10	-0.57	-$39,721	#DIV/0!
4	HVAC VRV Upgrades with DDC	$204,000	112,736	-279	-34.0	$0	$12,386	15	16.47	-$56,138	-1.1%
5	Lighting Upgrade	$18,000	100,680	-55	35.0	$0	$13,115	15	1.37	$138,564	72.8%
	CM Fees	$0	*Overall project management, all fees associated with specific measures should be noted above.*								
	Partner Fees	$8,000	*Per Partner Contract*								
	TOTALS	$573,174.00	372,300	3,056	151.0	$0	$82,902		6.91	$453,534	12.1%
Advanced Measure:											
	CHP Unit	$0	0	0	0.0	$0	$0	0	0.00	$0	0.0%

Note: CHP energy savings are not included in totals.

Preliminary ESMs

Prepared for:

Freehold Township High School

Prepared by:

Haglid Engineering and Associates, Inc.

80 Broadway
Hillsdale, NJ 07642

Telephone: (201) 722-1233
Fax: (201) 722-0999

Engineer: Klas C. Haglid, P. E.

Assumptions	
$/kWh	0.113
$/Therm	1.05

	Energy Use	Expense
Current Electric Usage (kWh)	2,387,600.00	$269,798.80
Current Gas Usage (Therms)	96,275.00	$101,088.75
Total kBtu	17,774,325.46	$370,887.55

Total Annual Savings	$250,776.85
% savings of Current Utility Bill	67.62%

Freehold Township High School		
Number of Classrooms: 97	256,000	Gross SF Area

5.0%	GC Allowance	**25.0%**	
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**VRF and VRV variable refrigeration volume**	P4P	$324,000.00	$28,173.91	16,200.00	58,320.00	35,866.80	434,386.80	108,596.70	325,790.10	11.56

Cost Basis:	Estimated installed cost of $324,000 for 12 offices or classrooms ($27,000 per class) based on installed costs for Public High School installations on previous projects in the last two years in central NJ. This includes union labor and other typical installation costs.
Saving Projection:	A Trane Trace model for a "like kind" school in the same geographic area was modeled for adding VRV to 26 classrooms/offices at 243,736kWh/year or 9,374.5 kWh/class and 40,435 Therms or 1555.2 Therms/class. So for 12 classrooms the total annual savings for electric and gas is 112,493.54kWh and 18,662.31 respectively. See attached Trace model.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	112,493.54	$12,711.77	62,208.93	186.25	153.91	5.43
Gas (Therms)	18,662.31	$19,595.43	894,516.22	1,830.10	2,213.15	78.12
Total Savings Kbtu	2,250,074.88	$32,307.20	956,725.15	2,016.35	2,367.06	
					Total Pollution Reduction in Cars Removed from the Road =	**83.56**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions:	This VRV system will have an EER rating of 13 or better with reheat and the ability to recover heat energy from one classroom to another. The existing HVAC system has an EER of less than 7.0. The Existing RTU is in very poor condition and over 30 years old.		
Energy Savings Safety Factor	1.15	Estimated annual savings with Energy Savings Factor of Safety =	$28,173.91
Discussion:	There are parts of this high school that would benefit from this system, especially administrative offices. These calculations are based on installing VRV Heat pumps in 12 offices or classrooms. This is not a school wide application but strictly meant for office areas, critical use and areas that typically would have use during the summer months. While we have seen these VRV systems have very good savings compared to heating and cooling areas in other schools, we believe that for FH Borough this can likely be expected to be used in areas that do not have air conditioning or functional air conditioning. Therefore, the savings will not be great compared to the cost of this project. This can be something that we evaluate as this project goes forward. Another interesting note is that in Freehold Township High School there is an excessive amount of ventilation and the idea would be to address some of the runaway exhaust fans and other issues in tandem with installing the HVAC upgrades.		

VRVs for Freehold Township High School

Location	**Freehold Township High School**	
Building owner	**Freehold Regional High School District**	
Program user	**Employee**	
Company	**Haglid Engineering & Associates**	
Comments	**Energy Evaluation for Freehold HS**	
By	**Haglid Engineering & Associates, Inc.**	
Dataset name	**C:\Documents and Settings\Klas Haglid\My Documents\TRACE 700 Projects\Freehold Region HS\Freehold HS VRV & Lt.trc**	
Calculation time	**02:49 PM on 12/23/2013**	
TRACE® 700 version	**6.2.6.5**	
Location	**McGuire AFB, New Jersey**	
Latitude	**40.0**	**deg**
Longitude	**74.0**	**deg**
Time Zone	**5**	
Elevation	**133**	**ft**
Barometric pressure	**29.8**	**in. Hg**
Air density	**0.0757**	**lb/cu ft**
Air specific heat	**0.2444**	**Btu/lb·°F**
Density-specific heat product	**1.1098**	**Btu/h·cfm·°F**
Latent heat factor	**4,885.3**	**Btu·min/h·cu ft**
Enthalpy factor	**4.5402**	**lb·min/hr·cu ft**
Summer design dry bulb	**89**	**°F**
Summer design wet bulb	**76**	**°F**
Winter design dry bulb	**11**	**°F**
Summer clearness number	**0.99**	
Winter clearness number	**0.99**	
Summer ground reflectance	**0.20**	
Winter ground reflectance	**0.20**	
Carbon Dioxide Level	**400**	**ppm**
Design simulation period	**January - December**	
Cooling load methodology	**TETD-TA1**	
Heating load methodology	**UATD**	

MONTHLY ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1	**Freehold Boro HS**												
Electric													
On-Pk Cons. (kWh)	74,227	73,967	63,465	42,976	50,069	51,213	77,057	76,166	58,206	46,758	54,202	69,129	737,433
On-Pk Demand (kW)	212	221	194	198	270	398	456	451	333	178	191	207	456
Gas													
On-Pk Cons. (therms)	9,692	11,607	7,233	1,265	8	0	0	0	0	1,948	4,691	8,700	45,143
On-Pk Demand (therms/hr)	31	35	22	10	1	0	0	0	0	15	20	27	35

Energy Consumption

Building	94,645 Btu/(ft2-year)
Source	165,611 Btu/(ft2-year)
Floor Area	74,290 ft2

Environmental Impact Analysis

CO2	1,468,439 lbm/year
SO2	3,990 gm/year
NOX	2,058 gm/year

MONTHLY ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2 VRV Upgrades													
Electric													
On-Pk Cons. (kWh)	45,374	43,779	42,932	37,906	44,932	33,828	39,079	39,974	44,954	39,983	38,511	42,446	493,697
On-Pk Demand (kW)	271	268	264	204	198	214	234	234	210	208	242	270	271
Gas													
On-Pk Cons. (therms)	1,076	1,262	664	155	2	0	0	0	0	268	453	826	4,708
On-Pk Demand (therms/hr)	9	10	7	4	0	0	0	0	0	4	4	7	10

Energy Consumption

Building	29,018 Btu/(ft2-year)
Source	74,721 Btu/(ft2-year)
Floor Area	74,290 ft2

Environmental Impact Analysis

CO2	450,224 lbm/year
SO2	1,223 gm/year
NOX	631 gm/year

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Freehold Township High School

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Lights													
Electric (kWh)	20,618.1	18,645.4	22,021.4	19,726.6	21,319.7	6,169.7	6,316.3	6,381.2	19,726.7	21,319.8	20,428.3	19,916.5	202,589.6
Peak (kW)	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
Misc. Ld													
Electric (kWh)	12,690.5	11,462.3	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	149,420.0
Peak (kW)	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Cooling Coil Condensate													
Recoverable Water (1000gal)	0.0	0.0	0.0	0.7	1.4	7.3	12.9	15.4	5.9	0.5	0.0	0.0	44.2
Peak (1000gal/Hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=66.94 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=66.94 tons / 120.5 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	753.7	4,994.6	8,923.0	17,589.1	17,217.6	7,973.7	0.0	0.0	0.0	57,451.6
Peak (kW)	0.0	0.0	13.4	40.1	59.3	93.2	114.3	112.7	70.0	29.1	0.6	0.0	114.3
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=101.2 tons / 12.95 kW]													
Electric (kWh)	0.0	0.0	0.0	95.1	616.5	1,079.5	2,070.2	2,038.3	967.0	0.0	0.0	0.0	6,866.4
Peak (kW)	0.0	0.0	1.8	5.0	7.1	10.9	12.7	12.7	8.2	3.6	0.1	0.0	12.7
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	10.0	27.0	48.8	74.4	74.4	40.0	0.0	0.0	0.0	274.6
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=62.35 tons]													
Air-cooled unitary - 002 [Clg Nominal Capacity/F.L.Rate=62.35 tons / 112.2 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	1,156.7	3,964.1	11,629.7	20,319.0	20,544.4	8,880.4	718.4	0.0	0.0	67,212.6
Peak (kW)	0.0	0.0	0.0	19.0	31.6	83.7	106.5	105.0	62.8	18.3	0.0	0.0	106.5
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=94.26 tons / 12.07 kW]													
Electric (kWh)	0.0	0.0	0.0	147.2	495.1	1,426.2	2,410.0	2,448.2	1,096.3	92.0	0.0	0.0	8,115.0
Peak (kW)	0.0	0.0	0.0	2.4	3.8	9.8	11.9	11.8	7.4	2.3	0.0	0.0	11.9
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	18.0	38.6	63.2	74.4	74.4	64.0	8.1	0.0	0.0	340.7
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=28.44 tons]													

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Freehold Township High School

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=28.44 tons]													
Air-cooled unitary - 003 [Clg Nominal Capacity/F.L.Rate=28.44 tons / 51.20 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	942.5	3,473.3	6,538.4	9,684.0	9,193.5	5,103.9	252.1	0.0	0.0	35,187.8
Peak (kW)	0.0	0.0	0.0	14.8	25.4	44.4	48.0	46.7	35.2	9.1	0.0	0.0	48.0
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=43.01 tons / 5.50 kW]													
Electric (kWh)	0.0	0.0	0.0	119.8	433.2	800.2	1,148.5	1,094.5	627.1	32.4	0.0	0.0	4,255.6
Peak (kW)	0.0	0.0	0.0	1.9	3.0	5.2	5.4	5.3	4.1	1.2	0.0	0.0	5.4
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	20.0	47.0	72.0	74.4	74.4	68.0	5.4	0.0	0.0	361.2
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Cpl 4: Cooling plant - 008 [Sum of dsn coil capacities=13.98 tons]													
Air-cooled unitary - 004 [Clg Nominal Capacity/F.L.Rate=13.98 tons / 25.17 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	20.4	505.7	1,906.1	4,055.0	3,810.3	1,070.2	0.0	0.0	0.0	11,367.8
Peak (kW)	0.0	0.0	0.0	2.9	8.3	19.2	23.8	23.1	14.0	0.0	0.0	0.0	23.8
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=21.14 tons / 2.71 kW]													
Electric (kWh)	0.0	0.0	0.0	2.6	62.6	230.4	476.8	449.9	130.0	0.0	0.0	0.0	1,352.3
Peak (kW)	0.0	0.0	0.0	0.4	1.0	2.2	2.7	2.6	1.6	0.0	0.0	0.0	2.7
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	4.0	23.5	44.4	74.4	74.4	37.0	0.0	0.0	0.0	257.7
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=781.1 mbh]													
Boiler - 004 [Nominal Capacity/F.L.Rate=781.1 mbh / 12.02 Therms] (Heating Equipment)													
Gas (therms)	1,520.1	1,936.7	1,129.1	169.0	0.0	0.0	0.0	0.0	0.0	251.1	693.0	1,417.1	7,116.0
Peak (therms/Hr)	5.1	5.8	4.0	2.5	0.0	0.0	0.0	0.0	0.0	2.8	3.4	4.5	5.8
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	669.6	604.8	545.4	145.8	0.0	0.0	0.0	0.0	0.0	226.8	477.9	669.6	3,339.9
Peak (kW)	0.9	0.9	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.9	0.9	0.9	0.9
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	581.1	524.9	473.3	126.5	0.0	0.0	0.0	0.0	0.0	196.8	414.8	581.1	2,898.7
Peak (kW)	0.8	0.8	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.8	0.8

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Freehold Township High School

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=781.1 mbh]													
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	303.0	81.0	0.0	0.0	0.0	0.0	0.0	126.0	265.5	372.0	1,855.5
Peak (kW)	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=3,560 mbh]													
Boiler - 007 [Nominal Capacity/F.L.Rate=3,560 mbh / 54.77 Therms] (Heating Equipment)													
Gas (therms)	7,535.3	8,992.2	5,689.5	1,066.9	7.7	0.0	0.0	0.0	0.0	1,632.9	3,737.6	6,726.5	35,388.5
Peak (therms/Hr)	24.2	27.9	18.5	9.0	1.4	0.0	0.0	0.0	0.0	13.0	17.2	22.7	27.9
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	186.0	127.5	6.5	0.0	0.0	0.0	0.0	186.0	180.0	186.0	1,226.0
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	2,648.7	2,392.4	2,648.7	1,815.7	92.6	0.0	0.0	0.0	0.0	2,648.8	2,563.3	2,648.7	17,458.9
Peak (kW)	3.6	3.6	3.6	3.6	3.6	0.0	0.0	0.0	0.0	3.6	3.6	3.6	3.6
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	372.0	255.0	13.0	0.0	0.0	0.0	0.0	372.0	360.0	372.0	2,452.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 3: Heating plant - 006 [Sum of dsn coil capacities=239.0 mbh]													
Boiler - 006 [Nominal Capacity/F.L.Rate=239.0 mbh / 3.68 Therms] (Heating Equipment)													
Gas (therms)	636.3	678.5	414.1	28.8	0.0	0.0	0.0	0.0	0.0	64.2	260.2	556.4	2,638.5
Peak (therms/Hr)	2.0	2.2	1.5	0.8	0.0	0.0	0.0	0.0	0.0	1.3	1.5	1.8	2.2
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	144.8	15.0	0.0	0.0	0.0	0.0	0.0	27.5	118.0	186.0	845.3
Peak (kW)	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	177.8	160.6	138.4	14.3	0.0	0.0	0.0	0.0	0.0	26.3	112.8	177.8	808.0
Peak (kW)	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	289.5	30.0	0.0	0.0	0.0	0.0	0.0	55.0	236.0	372.0	1,690.5
Peak (kW)	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Freehold Township High School

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 4: Heating plant - 007 [Sum of dsn coil capacities=618.7 mbh]													
Electric Resistance - 005 [Nominal Capacity/F.L.Rate=618.7 mbh / 181.3 kW] (Heating Equipment)													
Electric (kWh)	35,353.0	38,832.0	23,652.0	5,067.7	1,265.2	0.0	0.0	0.0	140.2	7,774.6	16,764.3	30,956.4	159,805.6
Peak (kW)	73.9	82.6	57.2	25.9	8.8	0.0	0.0	0.0	1.4	39.5	52.8	69.3	82.6

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Lights													
Electric (kWh)	20,618.1	18,645.4	22,021.4	19,726.6	21,319.7	6,169.7	6,316.3	6,381.2	19,726.7	21,319.8	20,428.3	19,916.5	202,589.6
Peak (kW)	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
Misc. Ld													
Electric (kWh)	12,690.5	11,462.3	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	149,420.0
Peak (kW)	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Cooling Coil Condensate													
Recoverable Water (1000gal)	1.0	0.3	2.4	6.2	11.2	14.5	15.8	17.0	12.7	5.6	3.1	1.2	90.9
Peak (1000gal/Hr)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=40.67 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=40.67 tons / 39.66 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	103.5	40.2	228.2	1,240.0	2,793.2	3,904.2	5,217.4	6,046.8	3,546.6	1,268.9	424.3	118.8	24,932.1
Peak (kW)	1.5	1.5	3.1	19.9	24.1	28.5	34.9	35.2	29.4	19.3	12.5	1.9	35.2
Air-cooled unitary - 001 [Htg Nominal Capacity/F.L.Rate=549.1 mbh / 40.31 kW] (Cooling Equipment - Heating Mode)													
Electric (kWh)	451.1	895.9	152.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	343.1	1,842.7
Peak (kW)	19.4	22.2	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	22.2
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=51.95 tons / 2.55 kW]													
Electric (kWh)	320.7	234.2	468.4	468.4	514.2	560.0	733.1	707.7	516.8	516.8	481.1	399.7	5,921.0
Peak (kW)	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	75.5	68.0	103.5	92.0	101.0	110.0	144.0	139.0	101.5	101.5	94.5	88.5	1,219.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=36.36 tons]													
Air-cooled unitary - 002 [Clg Nominal Capacity/F.L.Rate=36.36 tons / 35.45 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	66.9	20.2	234.7	1,039.0	3,381.3	5,185.1	6,621.8	6,902.5	4,404.0	753.4	339.8	94.3	29,043.1
Peak (kW)	3.7	1.6	5.0	17.8	20.1	28.8	34.5	33.5	26.9	17.8	13.9	4.4	34.5
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=46.45 tons / 2.28 kW]													
Electric (kWh)	430.2	173.0	471.1	578.1	826.2	910.4	1,204.0	994.6	901.3	546.2	439.3	371.0	7,845.2
Peak (kW)	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=36.36 tons]													
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	94.5	38.0	103.5	127.0	181.5	200.0	264.5	218.5	198.0	120.0	96.5	81.5	1,723.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=18.60 tons]													
Air-cooled unitary - 003 [Clg Nominal Capacity/F.L.Rate=18.60 tons / 18.13 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	51.1	19.3	170.7	725.6	1,728.0	2,398.1	3,119.8	3,159.1	1,774.6	579.7	192.3	62.1	13,980.4
Peak (kW)	1.4	1.3	2.6	9.4	11.8	13.9	17.3	16.9	13.5	9.5	8.5	1.6	17.3
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=23.75 tons / 1.16 kW]													
Electric (kWh)	142.0	62.9	214.2	214.2	279.3	367.8	481.8	426.0	273.5	230.4	220.0	136.2	3,048.1
Peak (kW)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	61.0	27.0	92.0	92.0	120.0	158.0	207.0	183.0	117.5	99.0	94.5	58.5	1,309.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 4: Cooling plant - 008 [Sum of dsn coil capacities=8.33 tons]													
Air-cooled unitary - 004 [Clg Nominal Capacity/F.L.Rate=8.33 tons / 11.00 kW] [**Orig F.L.Rate=11.00 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	265.4	838.8	1,364.7	1,803.5	1,844.1	956.3	192.8	0.0	0.0	7,265.5
Peak (kW)	0.0	0.0	2.0	5.3	6.8	9.3	10.0	10.0	9.1	4.4	2.6	0.0	10.0
Condenser fan for Heat Pump [Design Heat Rejection/F.L.Rate=11.46 tons / 1.38 kW]													
Electric (kWh)	0.0	0.0	0.0	39.7	123.2	197.4	250.5	257.0	138.2	28.9	0.0	0.0	1,034.9
Peak (kW)	0.0	0.0	0.3	0.8	1.0	1.3	1.3	1.3	1.3	0.7	0.4	0.0	1.3
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	12.0	19.8	22.0	25.1	23.8	18.0	11.0	0.0	0.0	131.7
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=407.2 mbh]													
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=1,206 mbh]													
Boiler - 007 [Nominal Capacity/F.L.Rate=1,206 mbh / 14.49 Therms] (Heating Equipment)													
Gas (therms)	1,007.9	1,177.1	641.7	155.5	2.0	0.0	0.0	0.0	0.0	268.2	453.4	783.0	4,488.9
Peak (therms/Hr)	7.4	8.6	5.2	3.8	0.4	0.0	0.0	0.0	0.0	3.9	3.9	5.4	8.6

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=1,206 mbh]													
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	186.0	36.0	2.0	0.0	0.0	0.0	0.0	50.8	130.5	186.0	945.3
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	897.7	810.9	897.7	173.8	9.7	0.0	0.0	0.0	0.0	245.0	629.9	897.7	4,562.3
Peak (kW)	1.2	1.2	1.2	1.2	1.2	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	372.0	72.0	4.0	0.0	0.0	0.0	0.0	101.5	261.0	372.0	1,890.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 3: Heating plant - 006 [Sum of dsn coil capacities=201.3 mbh]													
Boiler - 006 [Nominal Capacity/F.L.Rate=201.3 mbh / 2.42 Therms] (Heating Equipment)													
Gas (therms)	68.5	85.2	21.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.2	218.8
Peak (therms/Hr)	1.7	2.2	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	2.2
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	12.5	15.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	43.3
Peak (kW)	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	10.1	12.1	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	34.8
Peak (kW)	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	25.0	30.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	86.5
Peak (kW)	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
Hpl 4: Heating plant - 007 [Sum of dsn coil capacities=381.8 mbh]													
Electric Resistance - 005 [Nominal Capacity/F.L.Rate=381.8 mbh / 111.9 kW] (Heating Equipment)													
Electric (kWh)	8,765.2	10,720.3	4,503.4	722.9	0.0	0.0	0.0	0.0	0.0	1,127.0	2,398.0	6,591.6	34,828.4
Peak (kW)	111.9	111.9	111.3	29.1	0.0	0.0	0.0	0.0	0.0	31.7	82.3	111.9	111.9

Freehold Township High School			5.0%	GC Allowance	25.0%
Number of Classrooms: 97	256,000	Gross SF Area	18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI
Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Lighting upgrades, at least T-8 or LED**	P4P	$367,744.00	$54,887.16	18,387.20	66,193.92	40,709.26	493,034.38	123,258.60	369,775.79	6.74

Cost Basis: The $367,744.00 is based on doing the common areas, hallways and some of the longer run time lighting. These are based on known construction numbers for our area, RS Means and costs from other high school projects in Central NJ.

Saving Projection: The annual saving is based on the change in Wattage from the existing fixture of mainly T8 and some T12's to high efficiency LED lighting. These are then estimated with something on the order of 4000 run hours a year. In some areas such as hallways, this would be higher as the lighting in these areas are used late into the night for custodial purposes. Stairways and other areas would run 24/7, so it is a mixture of run hours throughout the facility.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	562,981.09	$63,616.86	311328.5445	932.09	770.2746655	27.19026589
Gas (Therms)	-3,075.48	$ (3,229.26)	-147413.1103	-301.5940495	-364.7188825	-12.87450745
Total Savings Kbtu	1,613,422.92	$60,387.61	163915.4342	630.4920773	405.555783	

Total Pollution Reduction in Cars Removed from the Road = **14.32**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions:

Areas 101,102,104 which consist areas such ashallways, stairwells, and bathrooms will be considered for the current Energy Reduction Measure

Area 103 are all classrooms and will not be included at this time in the Energy Reduction Measure

Run hours are assumed to be the following as stated in the "Assumption Details" below

Assumption Details:

Group	Run Time	Existing Total (kW)	Number of Fixtures	Retrofit Total (kW)	Savings Kwh	$ Savings	Comments
101	4,428	118	892	42	336,971	38,078	Recommended
102	-	-	-	-	-	0	Not part of Project Work
103	5,812	6	67	2	20,133	2,275	Recommended
104	8,760	37	361	13	205,878	23,264	Recommended
	Totals =	**160.92**	**1,320.00**	**57.85**	**562,981.09**	**60,387.61**	An additional gas heating cost is considered as shown in row labeled "Assumptions"

Energy Savigns Factor of Safety 1.10 Estimated annual savings with energy savings factor of safety = $54,887.16

Discussion: Recently a lighting audit has been done that is more comprehensive in nature and covers a larger amount of lighting going into the classrooms. We believe that this will have additional benefits and savings. However, before we can recommend this we are going to have to see sampling, test cases done in some of the classrooms where the lighting is installed. Specifically this is CPL rated, high performance, LED lighting. It has been represented that the light levels will be well in excess of 50ft candles but there are many parameters to lighting (color rendering index, quality of light, temperature, light levels at the desk height). At this point in time we recommend that there be several test sites in several classrooms to evaluate the lighting going into the individual classrooms.

TRI-STATE LED

255 Mill Street, 2nd Floor
Greenwich, CT 06830

p: (203) 813-3791
f: (203) 813-3794

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Project Name	*Freehold Township High School*
Street Name	*281 Elton Adelphia Road*
City/State	*Freehold NJ*
Zip Code	*7728*
Site Contact	*PAT LAGRAVANIS*
Phone #	
Cell Phone #	
Fax #	
Email Address	
Proposal Date	5/29/2013

Hours of Operation

Group 101		Group 102	
Hrs/Day	16	Hrs/Day	14
Days/Wk	6	Days/Wk	6
Wks/Yr	46	Wks/Yr	46
Total Hrs	4428	Total Hrs	3875

Group 103		Group 104	
Hrs/Day	18	Hrs/Day	24
Days/Wk	7	Days/Wk	7
Wks/Yr	46	Wks/Yr	52
Total Hrs	5812	Total Hrs	8760

Project Description

Supply LED Lamps & Fixtures as per Lighting Audit Worksheet

Sales Person	Chris Anastasi	Cell Phone Number	914-482-4442
Sales Person		Cell Phone Number	

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Demand		Usage	
Existing Demand: kW	388.54	Existing Use: kWh	1,761,555.52
Proposed Demand: kW	154.90	Proposed Use: kWh	692,621.26
Demand Reduction: kWr	233.64	Use Reduction: kWh	1,068,934.26

Total Lighting Energy Savings	60.7%

Combined Unit Use Cost: kWh	$0.15	Supply Savings: KWH Per Year	$160,340.14
		*Delivery Savings: KW Per Year	$42,055.20
		*Maintenance Savings Per Year (Lamps & Ballast only)	$26,000.00
		*15% HVAC Savings Per Year	$37,152.93

Total Monthly Savings	$22,129.02
Total Annual Savings	$265,548.27
Total Cost Savings 5 Years	$1,327,741.35

Financial Summary-Freehold Township High School

Material Cost	*$720,582.89*
Estimated Baypoint Electric Labor Cost	*$172,000.00*
One Time Approx. Rebate	*$150,000.00*
Total Job Cost (After Rebate & Labor)	*$742,582.89*
Simple Payback (months)	**33.6**
First Year Return on Investment	*35.76%*
CO_2 Reduction (lbs)	1,421,682.56

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
1	101	4428		Little Theater	PR 4x4 T8 4b	4.3.32ELP	20	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
2	101	4428		Little Theater	Rec Trof 42W CFL	A100	8	42 WATT CFL	42	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
3	104	8760		Electrical Room	PR 4x4 T8 4b	4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
4	104	8760		Attendance	PR 3x4 T8 3b	4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
5	104	8760		Nurse	PR 2x4 T8 2b	4.2.4ERB	11	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
6	104	8760		Nurse	PR 3x4 T8 3b	4.2.3ELRB	6	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
7	101	4428		Main Foyer	PR 4x4 T8 4b	4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
8	101	4428		Main Office Hall	PR 4x4 T8 4b	4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
9	104	8760		Asst Pr Office	PR 2x4 T8 2b	4.2.4ERB	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
10	101	4428		Storage	75W Incan	A40D	1	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
11	101	4428		Storage	75W Incan	A40D	1	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
12	102	3875		Work Room	PR 2x4- T12 -2b	4.2.4SR	6	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
13	101	4428		Closet	60W Incan	A60	1	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
14	104	8760		Main Office	PR 4x4 T8 4b	4.3.32ELP	17	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
15	104	8760		Office	Para 3x4 T8 3b	4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
16	104	8760		Office	Para 3x4 T8 3b	4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
17	104	8760		Office	Para 3x4 T8 3b	4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
18	103	5812		Bath	Wall 2x2- T12-2b	2.3.2SRB	1	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
19	103	5812		Bath	60W Incan	A60	1	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
20	101	4428		Closet	60W Incan	A60	2	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
21	103	5812		Mens	PR 2x4- T12 -2b	4.2.4SR	3	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
22	103	5812		Womens	PR 2x4- T12 -2b	4.2.4SR	3	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
23	104	8760		Guidance	PR 3x4 T8 3b	4.2.3ELRB	8	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
24	104	8760		Guidance	PR 2x4 T8 2b	4.2.4ERB	7	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
25	102	3875		Room 4	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
26	102	3875		Room 5	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
27	102	3875		Room 6	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
28	102	3875		Room 7	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
29	104	8760		SAC Office	PR 4x4 T8 4b	4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
30	102	3875		Room 10	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
31	104	8760		CST Office	PR 3x4 T8 3b	4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
32	102	3875		Room 12	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
33	102	3875		Conf Room	Para 3x4 T8 3b	4.2.3ELRB	6	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
34	104	8760		Office	PR 4x4 T8 4b	4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
35	102	3875		Conf Room	PR 3x4 T8 3b	4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
36	102	3875		Conf Room	PR 4x4 T8 4b	4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
37	102	3875		Room 1	PR 4x4 T8 4b	4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
38	102	3875		Room 2	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
39	102	3875		Room 3	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
40	101	4428		Auditorium Hall	PR 4x4 T8 4b	4.3.32ELP	30	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
41	101	4428		Band Hall	PR 4x4 T8 4b	4.3.32ELP	7	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
42	102	3875		A104	PR 4x4 T8 4b	4.3.32ELP	14	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
43	101	4428		Closet	PR 2x4- T12 -2b	4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
44	101	4428		Closet	PR 2x4- T12 -2b	4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
45	101	4428		Closet	PR 4x4- T12 -4b	4.3.3ERB	1	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
46	101	4428		Practice Room Hall	PR 4x4 T8 4b	4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
47	101	4428		Closet	PR 4x4 T8 4b	4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
48	101	4428		Closet	PR 4x4- T12 -4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
49	101	4428		Closet	PR 4x4- T12 -4b	4.3.3ERB	1	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
50	102	3875		Room 6	PR 4x4- T12 -4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
51	102	3875		Room 7	PR 4x4- T12 -4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
52	104	8760		Office	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
53	104	8760		Office	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
54	102	3875		A105	PR 4x4 T8 4b	4.3.32ELP	18	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
55	102	3875		A105	PR 2x4- T12 -2b	4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
56	101	4428		Storage	PR 2x4- T12 -2b	4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
57	101	4428		Stage	HB 175W Incan	A75D	15	A LAMP 150 WATT INCANDESCENT	150	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
58	101	4428		Auditorium	PR 4x4 T8 4b	4.3.32ELP	57	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
59	101	4428		Auditorium	65W Flood	P38.120	26	65 WATT PAR 30	65	Duracell Energy Star Par 30, 12 Watt 120V, 60DEG Short Neck	12
60	101	4428		Auditorium	75W Incan	A40D	10	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
61	101	4428		Auditorium	26 W CFL	A150	6	26 WATT CFL	0	Seesmart Household Bulb, 12Watt, SMD 120V SKU:140041-140042	12
62	103	5812		Girls	PR 2x4 T8 2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
63	103	5812		Boys	PR 2x4 T8 2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
64	102	3875		A107	Pen Cage 1x4 T8 1b	4.1.3ERB	29	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
65	102	3875		A107	PR 2x4 T8 2b	4.2.4ERB	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
66	101	4428		Art Foyer	PR 2x4 T8 2b	4.2.4ERB	5	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
67	101	4428		Art Foyer	Rec Trof 42W CFL	A100	2	42 WATT CFL	42	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
68	102	3875		A106	Para Pen 2x4 T8 2b	4.2.4ERB	49	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
69	104	8760		Office	Para 3x4 T8 3b	4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
70	101	4428		Storage	PR 2x4 T8 2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
71	102	3875		Art light	4x3 -3ft-T12-4b	3.2.2SR	1	3' FIXTURE, 4-F30/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	162	Retrofit - LED Tube Lights, 3 Foot, 15W, 120V-277V, Single End Power	15
72	101	4428		Closet	PR 2x4 T8 2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
73	101	4428		Art Hall	PR 2x4 T8 2b	4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
74	101	4428		Art Hall	PR 4x4 T8 4b	4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
75	101	4428		Art Hall	PR 4x4 T8 4b	4.3.32ELP	20	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
76	101	4428		Closet	PR 4x4- T12 -4b	4.3.3ERB	1	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
77	101	4428		Closet	PR 4x4 T8 4b	4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
78	102	3875		A102	PR 4x4 T8 4b	4.3.32ELP	20	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
79	101	4428		Closet	PR 4x4- T12 -4b	4.3.3ERB	1	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
80	101	4428		D Hall	PR 4x4 T8 4b	4.3.32ELP	18	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
81	101	4428		Storage	PR 2x4 T12 -2b	4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
82	103	5812		Womens	PR 4x4 T8 4b	4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
83	103	5812		Mens	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
84	102	3875		D100	PR 4x4 T8 4b	4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
85	101	4428		Exit 17	Para 4x4- T12 -4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
86	104	8760		Eixt 8 Stairs	PR 2x2 Utube 32W-2b	2.2.3ELP	8	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
87	102	3875		D99 Art Shack	PR 4x4- T12 -4b	4.3.3ERB	1	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
88	102	3875		D101	PR 4x4 T8 4b	4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
89	102	3875		D103	PR 4x4 T8 4b	4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
90	102	3875		D105	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
91	102	3875		D107	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
92	102	3875		D109	PR 4x4 T8 4b	4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
93	102	3875		D111	PR 4x4 T8 4b	4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
94	102	3875		D113	PR 4x4 T8 4b	4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
95	102	3875		D115	PR 4x4 T8 4b	4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
96	101	4428		Exit 16	Para 4x4 T8 4b	4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
97	101	4428		Exit 9	PR 2x2 Utube 32W-2b	2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
98	102	3875		D117	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
99	102	3875		D119	PR 4x4- T12 -4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
100	102	3875		D121	PR 4x4- T12 -4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
101	101	4428		G Wing Hall	PR 2x4 T8 2b	4.2.4ERB	27	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
102	103	5812		Boys	PR 2x4 T8 2b	4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
103	103	5812		Girls	PR 2x4 T8 2b	4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
104	101	4428		Exit 10	PR 2x4 T8 2b	4.2.4ERB	12	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
105	102	3875		G102	PR 3x4 T8 3b	4.2.3ELRB	10	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
106	102	3875		G110	PR 3x4 T8 3b	4.2.3ELRB	6	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
107	102	3875		G104	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
108	102	3875		G106	PR 3x4 T8 3b	4.2.3ELRB	15	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
109	102	3875		G108	PR 3x4 T8 3b	4.2.3ELRB	15	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
110	101	4428		Exit 11	PR 2x4 T8 2b	4.2.4ERB	10	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
111	102	3875		G112	Para 3x4 T8 3b	4.2.3ELRB	17	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
112	102	3875		G105	PR 3x4 T8 3b	4.2.3ELRB	15	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
113	102	3875		G103	PR 3x4 T8 3b	4.2.3ELRB	15	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
114	102	3875		G101	PR 3x4 T8 3b	4.2.3ELRB	15	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
115	104	8760		Office	PR 3x4 T8 3b	4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
116	104	8760		G Wing Stairs	PR 2x2 Utube 32W-2b	2.2.3ELP	4	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
117	101	4428		Boiler Hall	PR 2x4 T8 2b	4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
118	101	4428		Elec Closet	PR 1x4 T8 -1b	4.1.3ERB	2	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
119	104	8760		G Wing Boiler	PR 1x4 T8 -1b	4.1.3ERB	7	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
120	101	4428		E Hall	PR 4x4 T8 4b	4.3.32ELP	17	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
121	102	3875		E115	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
122	102	3875		E113	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
123	102	3875		E113	Wall Down 1x4 T12-1b	4.1.4SRB	5	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
124	101	4428		Closet	65W Flood	P38.120	2	65 WATT PAR 30	65	Duracell Energy Star Par 30, 12 Watt 120V, 60DEG Short Neck	12
125	102	3875		E110	PR 4x4- T12 -4b	4.3.3ERB	6	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
126	102	3875		E111	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
127	102	3875		E108	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
128	102	3875		E109	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
129	102	3875		E106	PR 4x4 T8 4b	4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
130	102	3875		E107	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
131	102	3875		E104	PR 4x4- T12 -4b	4.3.3ERB	6	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
132	102	3875		E105	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
133	102	3875		E102	PR 4x4- T12 -4b	4.3.3ERB	6	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
134	102	3875		E103	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
135	102	3875		E101	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
136	101	4428		Exit 13	Para 2x2 Utube 32W-2b	2.2.3ELP	6	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
137	101	4428		C Hall	PR 4x4 T8 4b	4.3.32ELP	17	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
138	102	3875		C122	PR 4x4 T8 4b	4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
139	102	3875		C118	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
140	101	4428		Exit 15	Para 4x4- T12 -4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
141	101	4428		Exit 14	PR 2x2 Utube 32W-2b	2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
142	102	3875		C120	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
143	102	3875		C116	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
144	102	3875		C114	PR 3x4 T8 3b	4.2.3ELRB	15	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
145	102	3875		C112	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
146	102	3875		C110	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
147	102	3875		C106	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
148	102	3875		C102	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
149	102	3875		C108	PR 4x4 T8 4b	4.3.32ELP	20	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
150	102	3875		C100	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
151	101	4428		Book Storage	PR 4x4- T12 -4b	4.3.3ERB	3	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
152	104	8760		SECA Office	PR 4x4 T8 4b	4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
153	101	4428		Eixt 18	Para 4x4- T12 -4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
154	101	4428		Exit 19	PR 2x2 Utube 32W-2b	2.2.3ELP	10	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
155	102	3875		C Rooms	Wall Down 1x4 T12-1b	4.1.4SRB	25	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
156	102	3875		C Rooms	65W Incan	A60	10	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
157	103	5812		Mens	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
158	103	5812		Womens	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
159	104	8760		Elev Room	PR 2x4 T12 -2b	4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
160	104	8760		Elec Room	PR 2x4 T12 -2b	4.2.4SR	4	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
161	101	4428		Storage	IH 2x4 T12 -2b	4.2.4SR	3	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
162	104	8760		Elevator	Para 1x3 T12- 1b	3.1.3SRB	3	3' FIXTURE, 1-F30/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	46	0	0
163	101	4428		A Hall	Para 4x4 T12- 4b	4.3.3ERB	11	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
164	101	4428		D Hall	PR 3x4 T8 3b	4.2.3ELRB	17	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
165	103	5812		Mens	PR 2x4 T12 -2b	4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
166	103	5812		Mens	IH 2x4 T12 -2b	4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
167	101	4428		Storage	IH 2x4 T12 -2b	4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
168	102	3875		C203	PR 4x4 T8 4b	4.3.32ELP	20	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
169	102	3875		C201	PR 4x4 T8 4b	4.3.32ELP	15	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
170	102	3875		C202	PR 4x4 T12- 4b	4.3.3ERB	8	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
171	103	5812		Womens	PR 2x4 T12 -2b	4.2.4SR	3	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
172	101	4428		Storage	IH 2x4 T12 -2b	4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
173	103	5812		Mens	PR 3x4 T8 3b	4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
174	101	4428		Closet	IH 2x4 T12 -2b	4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
175	102	3875		C203	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
176	104	8760		Science Office	PR 4x4 T8 4b	4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
177	102	3875		D205	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
178	102	3875		D207	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
179	102	3875		D209	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
180	102	3875		D211	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
181	102	3875		D213	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
182	102	3875		D215	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
183	102	3875		D217	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
184	102	3875		D219	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
185	102	3875		D221	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
186	101	4428		D Hall	PR 2x2 Utube 32W-2b	2.2.3ELP	4	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
187	101	4428		Storage	IH 2x4 T12 -2b	4.2.4SR	4	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
188	101	4428		Closet	IH 2x4 T12 -2b	4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
189	103	5812		Boys	IH 2x4 T12 -2b	4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
190	103	5812		Boys	PR 2x2 Utube T12-2b	2.2.3SR	1	2x2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	82	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
191	102	3875		D225	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
192	101	4428		G Wing Hall	PR 2x4 T8 2b	4.2.4ERB	13	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
193	103	5812		Boys	PR 2x4 T8 2b	4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
194	103	5812		Girls	PR 2x4 T8 2b	4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
195	102	3875		G202	PR 3x4 T8 3b	4.2.3ELRB	20	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
196	102	3875		G204	PR 3x4 T8 3b	4.2.3ELRB	20	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
197	101	4428		Storage	PR 3x4 T8 3b	4.2.3ELRB	5	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
198	104	8760		Supers Office	PR 3x4 T8 3b	4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
199	102	3875		G205	PR 3x4 T8 3b	4.2.3ELRB	19	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
200	102	3875		G203	PR 3x4 T8 3b	4.2.3ELRB	23	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
201	104	8760		Office	PR 3x4 T8 3b	4.2.3ELRB	18	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
202	102	3875		Science	PR 2x4 T8 2b	4.2.4ERB	8	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
203	102	3875		G201	PR 3x4 T8 3b	4.2.3ELRB	29	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
204	101	4428		E Hall	PR 4x4 T8 4b	4.3.32ELP	7	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
205	102	3875		E215	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
206	102	3875		E213	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
207	102	3875		E211	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
208	102	3875		E209	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
209	102	3875		E208	PR 4x4 T8 4b	4.3.32ELP	17	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
210	102	3875		E210	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
211	101	4428		E Hall	PR 2x2 Utube 32W-2b	2.2.3ELP	15	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
212	102	3875		E207	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
213	102	3875		E206	PR 4x4 T8 4b	4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
214	102	3875		E204	PR 4x4 T8 4b	4.3.32ELP	15	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
215	102	3875		E205	PR 4x4 T8 4b	4.3.32ELP	15	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
216	102	3875		E203	PR 4x4 T8 4b	4.3.32ELP	15	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
217	102	3875		E201	PR 4x4 T8 4b	4.3.32ELP	15	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
218	102	3875		E202	PR 4x4 T12- 4b	4.3.3ERB	4	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
219	102	3875		E Class Rooms	65W Incan	A60	16	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
220	102	3875		E Class Rooms	Wall Down 1x4 T12-1b	4.1.4SRB	40	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
221	101	4428		C Hall	PR 2x2 Utube 32W-2b	2.2.3ELP	4	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
222	102	3875		C218	PR 4x4 T8 4b	4.3.32ELP	15	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
223	101	4428		Closet	IH 2x4 T12 -2b	4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
224	101	4428		Elec Closet	PR 2x4 T12 -2b	4.2.4ERB	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
225	101	4428		C Hall	PR 4x4 T8 4b	4.3.32ELP	13	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
226	102	3875		C212	PR 4x4 T8 4b	4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
227	102	3875		C214	PR 4x4 T8 4b	4.3.32ELP	21	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
228	103	5812		Womens	PR 4x4 T12- 4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
229	103	5812		Womens	PR 2x2 Utube 32W-2b	2.2.3ELP	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
230	102	3875		Prep Room	PR 4x4 T8 4b	4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
231	101	4428		Storage	IH 2x4 T12 -2b	4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
232	102	3875		Prep Room	PR 4x4 T12- 4b	4.3.3ERB	6	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
233	102	3875		C210	PR 4x4 T8 4b	4.3.32ELP	21	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
234	102	3875		C208	PR 4x4 T8 4b	4.3.32ELP	23	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
235	102	3875		C206	PR 4x4 T8 4b	4.3.32ELP	15	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
236	102	3875		C204	PR 4x4 T8 4b	4.3.32ELP	23	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
237	102	3875		C204	IH 2x4 T12 -2b	4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
238	102	3875		C200	PR 4x4 T12- 4b	4.3.3ERB	20	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
239	103	5812		Mens	PR 2x4 T12 -2b	4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
240	101	4428		Closet	IH 2x4 T12 -2b	4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
241	102	3875		A100	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
242	104	8760		Media Conf	PR 4x4 T8 4b	4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
243	104	8760		Media Conf	Wall 2x4 T8- 2b	4.2.4ERB	8	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
244	104	8760		Media Center	PR 2x2 Biax Utube 31W-2b	2.3.4ERB	48	2x2' FIXTURE, 2-F40 BIAX LAMPS, ELECTRONIC BALLAST	80	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
245	104	8760		Media Center	Para 2x2 Biax Utube 31W-3b	2.3.3ERB	90	2x2' 3-F40T8, BIAX ELECTRONIC BALLAST	120	New 2x2 Acrylic Fixture With 3 - 8 Watt LED Tube Lights SKU: 131A317X-2	24
246	104	8760		Media Center	Pen Up/Down 2x4 T8- 2b	4.2.4ERB	8	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
247	104	8760		Office	PR 4x4 T8 4b	4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
248	104	8760		Office	PR 2x4 T8- 2b	4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
249	104	8760		Office	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
250	101	4428		Copy Room Closet	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
251	104	8760		TEC Office	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
252	101	4428		Closet	PR 2x4 T12 -2b	4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
253	102	3875		A101	PR 4x4 T8 4b	4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
254	101	4428		Times Sq Hall	PR 4x4 T8 4b	4.3.32ELP	18	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
255	101	4428		Little Theater Hall	PR 4x4 T8 4b	4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
256	102	3875		Café	PR 4x4 T12- 4b	4.3.3ERB	60	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
257	102	3875		Café	PR 2x4 T8 2b	4.2.4ERB	36	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
258	101	4428		Storage	PR 2x4 T8 2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
259	102	3875		Faculty Lounge	PR 3x4 T8 3b	4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
260	101	4428		Kitchen	PR 4x4 T12- 4b	4.3.3ERB	26	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
261	101	4428		Store	PR 2x4 T12 -2b	4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
262	101	4428		Storage	PR Pen Vapor 2x4 T12 -2b	4.2.4ERB	5	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
263	101	4428		Freezer	65W Incan	A60	2	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
264	103	5812		Mens	PR 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
265	101	4428		B Hall	PR 3x4 T8 3b	4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
266	101	4428		B Hall	PR 4x4 T8 4b	4.3.32ELP	40	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
267	101	4428		Storage	IH 2x4 T12- 2b	4.2.4SR	4	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
268	103	5812		Mens	PR 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
269	103	5812		Womens	PR 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
270	102	3875		B101	PR 4x4 T8 4b	4.3.32ELP	24	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
271	104	8760		Supers Office	PR 4x4 T8 4b	4.3.32ELP	16	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
272	104	8760		Office	PR 4x4 T8 4b	4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
273	102	3875		B105	PR 4x4 T8 4b	4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
274	102	3875		B103	PR 4x4 T8 4b	4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
275	101	4428		Storage	IH 2x4 T12- 2b	4.2.4SR	9	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
276	101	4428		Storage	PR 4x4 T12- 4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
277	104	8760		Boiler Room	IH 2x4 T12 -2b	4.2.4ERB	6	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
278	104	8760		Boiler Room	PR 4x4 T12- 4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
279	104	8760		Boiler Room	PR 2x4 T8 2b	4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
280	101	4428		Storage	PR 2x4 T12 -2b	4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
281	101	4428		Gym	HB 40W MH	MH360	20	METAL HALIDE, 1-400 WATT LAMP	458	New Open High Bay Fixture With Wire Guard, 6 - 15 Watt LED Tubes SKU: HBT8632M23X-2-WG	90
282	101	4428		Storage	PR 4x4 T12- 4b	4.3.3ERB	1	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
283	101	4428		Storage	PR 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
284	101	4428		Main Gym	HB 400W MH	MH360	40	METAL HALIDE, 1-400 WATT LAMP	458	New Open High Bay Fixture With Wire Guard, 6 - 15 Watt LED Tubes SKU: HBT8632M23X-2-WG	90
285	101	4428		Storage	PR 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
286	101	4428		Storage	PR 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
287	101	4428		Girls Team Room	IH 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
288	101	4428		Girls Team Room	PR 2x4 T12 -2b	4.2.4ERB	16	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
289	104	8760		Office	PR 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
290	101	4428		Trainers Room	PR 4x4 T8 4b	4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
291	101	4428		Boys Team Room	PR 3x4 T8 3b	4.2.3ELRB	9	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
292	101	4428		Boys Team Room	PR 2x4 T12 -2b	4.2.4SR	8	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
293	101	4428		Boys Team Room	PR 4x4 T8 4b	4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
294	104	8760		Coach Office	PR 4x4 T12- 4b	4.3.3ERB	3	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
295	101	4428	1st	H Wing Foyer	PR 2x4 T8 2b	4.2.4ERB	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
296	101	4428		H Wing Hall	PR 2x4 T8 2b	4.2.4ERB	14	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
297	101	4428		H Wing Hall	PR 2x2 Biax Utube 31W-2b	2.3.4ERB	3	2x2' FIXTURE, 2-F40 BIAX LAMPS, ELECTRONIC BALLAST	80	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
298	101	4428		Blue Gym	HB 250W MH	MH320	35	METAL HALIDE, 1-250 WATT LAMP	295	New Open High Bay Fixture With Wire Guard, 6 - 15 Watt LED Tubes SKU: HBT8632M23X-2-WG	90
299	103	5812		Mens	PR 2x4 T8 2b	4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
300	103	5812		Womens	PR 2x4 T8 2b	4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
301	101	4428		Custodian	PR 1x4 T8 -1b	4.1.3ERB	1	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
302	101	4428		Custodian	PR 1x4 T8 -1b	4.1.3ERB	3	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
303	101	4428		H103 Wieght zroom	Pen Cage 1x4 T8 -1b	4.1.3ERB	42	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
304	102	3875		H Hall	PR 2x4 T8 2b	4.2.4ERB	18	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
305	102	3875		H102	PR 3x4 T8 3b	4.2.3ELRB	15	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
306	102	3875		H101	PR 3x4 T8 3b	4.2.3ELRB	15	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
307	102	3875		H100	PR 3x4 T8 3b	4.2.3ELRB	15	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
308	104	8760		Coach Office	Para 3x4 T8 3b	4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
309	104	8760		Coach Office	PR 2x4 T12 -2b	4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
310	102	3875		Sprinkler Room	PR 1x4 T8 -1b	4.1.3ERB	3	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
311	101	4428		Blue Gym	PR 2x2 Biax Utube 31W-2b	2.3.4ERB	3	2x2' FIXTURE, 2-F40 BIAX LAMPS, ELECTRONIC BALLAST	80	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
312	101	4428		Boys Locker Room	PR 2x4 T12 -2b	4.2.4ERB	25	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
313	101	4428		Boys Locker Room	42W CFL	A100	4	42 WATT CFL	42	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
314	104	8760		Office	PR 4x4 T12- 4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
315	104	8760		Office	PR 4x4 T12- 4b	4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
316	104	8760		Office	PR 3x4 T8 3b	4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
317	104	8760		Office	Wall 1x2 T12- 1b	2.1.2SRB	2	2' FIXTURE, 1-F20/T12/STD LAMP, STANDARD MAGNETIC BALLAST	28	Retrofit - LED Tube Lights, 2 Foot, 8W, 120V-277V, Single End Power	8
318	101	4428		B Hall	PR 4x4 T8 4b	4.3.32ELP	19	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
319	102	3875		Closet	60W Incan	A60	2	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
320	103	5812		Womens	PR 4x4 T8 4b	4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
321	103	5812		Womens	PR 4x4 T8 4b	4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
322	102	3875		Storage	PR 4x4 T8 4b	4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
323	102	3875		B108	PR 4x4 T8 4b	4.3.32ELP	15	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
324	102	3875		B110	PR 4x4 T8 4b	4.3.32ELP	36	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
325	102	3875		B110	IH 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
326	102	3875		B110	PR 4x4 T12- 4b	4.3.3ERB	1	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
327	102	3875		Greenhouse	Pen Vapor 2x4 T8- 2b	4.2.4ERB	34	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
328	102	3875		B112	PR 4x4 T8 4b	4.3.32ELP	32	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
329	102	3875		B112	IH 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
330	102	3875		B114	PR 4x4 T8 4b	4.3.32ELP	22	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
331	102	3875		Closet	PR 4x4 T12- 4b	4.3.3ERB	1	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
332	102	3875		Closet	IH 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
333	102	3875		B116	HB 250W MH	MH320	20	METAL HALIDE, 1-250 WATT LAMP	295	New Open High Bay Fixture With Wire Guard, 6 - 15 Watt LED Tubes SKU: HBT8632M23X-2-WG	90
334	102	3875		B116	IH 2x4 T12 -2b	4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
335	102	3875		B116	PR 4x4 T8 4b	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
336	102	3875		B106	PR 4x4 T8 4b	4.3.32ELP	15	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
337	102	3875		Closet	PR 4x4 T12- 4b	4.3.3ERB	1	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
338	102	3875	Exterior	Wall Paks	175W HPS	HPS200	23	HIGH PRESSURE SODIUM, 1-175 WATT LAMP	200	SEESMART HIGH POWERED 22 WATT LED LAMP SKU; 130028-130039 (3000-3200 Lumens)	22
339	102	3875	Exterior	Wall Paks	75W HPS	HPS70	2	HIGH PRESSURE SODIUM, 1-70 WATT LAMP	95	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
340	102	3875	Exterior	Pole Lights	400W HPS	HPS750	40	HIGH PRESSURE SODIUM, 1-400 WATT LAMP	465	Seesmart High Bay, DLC Listed, 200W, 120-277V " Grey, SKU: 120314-120317	200
341	102	3875	Exterior	Canopy	75W MH	MH70	27	METAL HALIDE, 1-70 WATT LAMP	95	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
342	102	3875	Exterior	Wall Paks	175W MH	MH175	4	METAL HALIDE, 1-175 WATT LAMP	215	SEESMART HIGH POWERED 22 WATT LED LAMP SKU; 130028-130039 (3000-3200 Lumens)	22
343	102	3875	Exterior	Canopy	42W CFL	A100	26	42 WATT CFL	42	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
344	102	3875	Exterior	Canopy	Para 2x4 T12-2b	4.2.4SR	6	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
						3189					

Freehold Township High School			5.0%	GC Allowance	25.0%
Number of Classrooms: 97	256,000	Gross SF Area	18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**DOAS ventilation system**	P4P	$482,400.00	$79,081.96	24,120.00	86,832.00	53,401.68	646,753.68	161,688.42	485,065.26	6.13

Cost Basis:	The cost basis of the $482,400 is based on 67 classrooms and known construction numbers from other high schools in this central part of NJ. We believe that this will cover a large number of the classrooms in Freehold Twp. High School and will provide additional benefits in the form of thermal comfort. The cost is based on a direct counter flow high efficiency heat exchanger that can move up to 500 cubic feet per minute. This would be tied to two high performance fans that would use energy on the order of 0.2 Watts per CFM and provide an energy efficiency rating of above 60. These would be individually controlled, there would be one energy recovery module per classroom and it would be tied to a self calibrating, 10 year CO2 sensor that would come on at a prescribed part per million concentration of CO2.
Saving Projection:	Projected Savings of 1524 Therms per classroom X 67 classrooms for a total projected savings = 102,108 therms. The saving is modeled using a bin method where within a NJ Weather bin temperature range the hours at a certain temperature are modeled using 30 year weather data for the central area of NJ. Also this is based on full Pay for Performance projects where these units have been installed monitored and verified and evaluated for energy savings and this has been used to provide the estimated annual savings. We believe this number is conservative and with careful installation and preparation, this number can be exceeded.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	33,165.00	$3,747.65	18340.25	54.91	45.38	1.60
Gas (Therms)	102,108.00	$107,213.40	4894209.89	10013.12	12108.90	427.44
Total Savings Kbtu	10,323,963.68	$110,961.05	4912550.14	10068.02	12154.28	
					Total Pollution Reduction in Cars Removed from the Road =	**429.04**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	The current system is poorly controlled and has an existing fan consumption of 691 watts. The new system is to have an 87% thermally efficient BPE direct counter flow air to air energy system. Proposed fans would use 123 watts of power and be controlled with GE CO2 sensor running only with classroom occupancy of 6 hours for 5 days. Existing system is 700 cfm and new system is 700 cfm, typically switch from dilution ventilation to displacement ventilation can reduce ventilation needs by 2.5 times. in other schools the 700 cfm can be reduced to below 300cfm with improved IAQ. This will produce additional savings that is currently not modeled.

	Quantity	CFM	%OA	% Run time	Heating eff. (%)	Cooling Eff. (EER)	Comments
Assumptions Details	(67) BPE-XE-MIR 500	700	100%	18%	65%	9	

Energy Savings Factor of Safety	1.40	Estimated annual savings with energy savings factor of safety =	$79,081.96

Discussion:	Currently Freehold Township High School, with talking with onsite Maintenance and Building management, we find that there is an awful lot of outdoor air being brought in throughout all weather conditions taken through unit ventilators and different HVAC equipment and in a single pass being exhausted up to the roof. We were also able to look at some of these and found that they are not controllable by the building automation or control systems. When we asked how these are shut down during weekends or holidays, we found that they are left to basically run which means that there is a lot of outdoor air running through the building for 8,760 run hours per year. The idea would be to illuminate some of these exhaust fans all together and replace them with the dedicated outdoor air system and in other places, tie these exhaust fans into a building automation system or a timer and only have them running during occupied times of the school year where there are people in the school. This will also reduce the amount of moisture being brought through the building and will help with thermal comfort and the cost of owning and operating this high school.

School : Freehold Township

Summary of Lighting Quote and Audit

Group	Run Time	Existing Total (kW)	Number of Fixtures	Retrofit Total (kW)	Savings Kwh	Area Served	Comments
101	4,428	118.31	892	42.21	336,970.80		Recommended
102	3,875	227.59	1869	97.04	505,861.88	Classrooms	Not part of Project Work
103	5,812	5.95	67	2.49	20,132.77		Recommended
104	8,760	36.66	361	13.16	205,877.52		Recommended

Group	Run Time	Existing Total (kW)	Number of Fixtures	Retrofit Total (kW)	Savings Kwh	$ Savings	Comments
101	4,428	118.31	892.00	42.21	336,970.80	$ 38,077.70	Recommended
102	-	-	-	-	-		Not part of Project Work
103	5,812	5.95	67.00	2.49	20,132.77	$ 2,275.00	Recommended
104	8,760	36.66	361.00	13.16	205,877.52	$ 23,264.16	Recommended
	Totals =	160.92	1,320.00	57.85	562,981.09	$ 63,616.86	

	kWh	Therms	$ Amount	Factor of Safety
Lighting Savings =	562,981.09		$ 63,616.86	1.10
Heating Costs =		-3075.482702	$ (3,229.26)	
Total Net Savings =			$ 60,387.61	

Cost/Fixture =	
Budget Cost =	

BPE Payback Calculator

Enter in the requested information below. If you are not sure of a value, See our recommendations in the comment boxes (red arrows).

Thank you for using BPE, Inc.®
For more specific engineering analysis, please see the BPE Performance Calculator at: **www.LowKWH.com**

SYSTEM GENERAL INFO		
Heating System Type	Gas Fired	
Cooling System Type	DX	
Outdoor Air Flow (OA)	700	scfm
Percent Outdoor Air (OA/SA, %)	100	%
Building Type	Commercial (> 5,000 SF)	
Nearest Location	Newark, NJ	

Number of Units

2000	1000	500	200
0	0	1	0

UTILITY INFORMATION	
Electric Rate ($/kWh)	0.113
Peak Demand Charge ($/kW)	
Months of Peak Demand Charge	0
Gas Rates ($/Therm)	1.050

COST ASSUMPTIONS		
Installed Cost per Ton ($/Ton)	0	*Use for New Construction or Major Retrofits
ERV Installed Cost	$ 7,240	
Maintenance Savings	$ -	
Total Incentives	$ -	

SYSTEM EFFICIENCIES		
Heating Efficiency	65	%
Cooling Efficiency	9	EER
BPE Effectiveness	87	%

CONTROLS AND SET-POINTS		
CO_2 Controller	Yes	
Percent Run-time	18	%
Summer (Cooling)	74	°F (db)
Winter (Heating)	70	°F (db)

BPE Payback Calculator

20 Years of Savings!

BPE Energy Recovery Ventilators are guaranteed for 20 years not to become unusable for providing breathable air as a result from rust, rot, or corrosion. This does not apply to other gases other than breathable air. See Limited Lifetime Warranty for more details.

ENERGY ANALYSIS		
BPE Cooling Capacity	1.29	TONS
BPE Heating Capacity	44.40	MBH
Peak Demand Reduction	1.72	KW
Annual Electric Energy Saved	3,888	MBTU
Annual Thermal Energy Saved	145,155	MBTU
TOTAL Savings	**149,043**	MBTU

OPERATING COST ANALYSIS		
Maintenance Savings	$	-
Cooling Cost Savings	$	(56)
Peak Demand Cost Savings	$	-
Heating Cost Savings (Gas or HP)	$	(1,524)
Electrical Cost Savings (ER+Fans)	$	(101)
Electric Resistive Savings		0
Reduced Supply + Exhaust Fan Savings		(101)
BPE Parasitic Fan Cost		28
TOTAL Savings	**$**	**(1,681.24)**

CAPITAL EXPENSE ANALYSIS		
HVAC Initial Cost Avoidance	$	-
Added Cost of ERV	$	7,240
Total Incentives/Funding	$	-
Net Capital Expenditure	$	7,240
Simple Payback (Years)		**4.31**
Internal Rate of Return (IRR)		**23%**
Net Present Value (20 Yr Life Cycle)		**$36,713.98**
Emission Reduction (Cars/yr)		**6.13**

	200	500	1000	2000
Products:	0	1	0	0

All Weather Air Management

Ex Eff	87%
Evaporative Eff	Not Used
Winter SP T3	70
Summer SP T3	74

Equipment Operation and Efficiencies					System Air Flow Profile			
Del. Heat Eff	65%	Gas	0	KWh Elect/Thm	Nominal CFM	Actual CFM	Supply CFM	Exhaust CFM
	1.05	$/Therm	0.11	$/kWh	500	700	700	700
Del. Cool Eff	NA	Gas	1.33	KWh Elect/Ton				
	1.05	$/Therm	0.11	$/kWh				
		Demand Savings	0.00	$/kW				

Profile of Energy Savings

Time of Year	Mid-Pts	DB (F)	Total	OA Temp DB (F)	OA Supply Temp DB (F)	Space Temp DB (F)	Exhaust Temp DB (F)	Recovered BTU/H	Annually Saved BTUs	OPERATE BPE?
Summer Cooling	117.5	115 to 120	0	117.5	79.7	74	111.8	-	-	NO
	112.5	110 to 115	0	112.5	79.0	74	107.5	-	-	NO
	107.5	105 to 110	0	107.5	78.4	74	103.1	-	-	NO
	102.5	100 to 105	0	102.5	77.7	74	98.8	-	-	NO
	97.5	95 to 100	6	97.5	77.1	74	94.4	15,456	92,739	YES
	92.5	90 to 95	40	92.5	76.4	74	90.1	12,168	486,713	YES
	87.5	85 to 90	122	87.5	75.8	74	85.7	8,879	1,083,265	YES
	82.5	80 to 85	500	82.5	75.1	74	81.4	5,591	2,795,310	YES
	77.5	75 to 80	620	77.5	74.5	74	77.0	2,302	1,427,252	NO
	72.5	70 to 75	847	72.5	73.8	74	72.7	-	-	NO
Free Cooling	67.5	65 to 70	671	67.5	73.2	74	71.2			NO
	62.5	60 to 65	927	62.5	72.5	74	64.0			NO
	57.5	55 to 60	600	57.5	71.9	74	59.6			NO
	52.5	50 to 55	730	52.5	67.7	70	54.8			YES
	47.5	45 to 50	634	47.5	67.1	70	50.4			YES
Winter Heating	42.5	40 to 45	513	42.5	66.4	70	46.1	(18,087)	(9,278,785)	YES
	37.5	35 to 40	1023	37.5	65.8	70	41.7	(21,376)	(21,867,546)	YES
	32.5	30 to 35	734	32.5	65.1	70	37.4	(24,665)	(18,103,743)	YES
	27.5	25 to 30	391	27.5	64.5	70	33.0	(27,953)	(10,929,662)	YES
	22.5	20 to 25	195	22.5	63.8	70	28.7	(31,242)	(6,092,132)	YES
	17.5	15 to 20	125	17.5	63.2	70	24.3	(34,530)	(4,316,288)	YES
	12.5	10 to 15	47	12.5	62.5	70	20.0	(37,819)	(1,777,488)	YES
	7.5	5 to 10	34	7.5	61.9	70	15.6	(41,108)	(1,397,655)	YES
	2.5	0 to 5	1	2.5	61.2	70	11.3	(44,396)	(44,396)	YES
	-2.5	-5 to 0	0	-2.5	60.6	70	6.9	-	-	YES
	-7.5	-10 to -5	0	-7.5	59.9	70	2.6	-	-	YES

ERV Operating Hours = **917**
All Operating Hours = **8,760**
% Cooling = 24%
% Heating = 35%
% Free = 25%

Operational Hours

* ASHRAE Std. 90.1-2004, Table 6.5.3.1 Fan Power Limitation assuming Constant Volume

Handbook of Energy Audits. Thuman,PE,RA, Albert, Third Ed.1992

Supply Fan HP/1,000 cfm*
1.2

Peak Tonnage Reduction = 1.72
Total System Cfm = 220
Cfm Reduction = 687
Existing HVAC Fan (W) = 691
Proposed HVAC Fan (W) = 123.00
kWh Savings = 895
Proposed HVAC Fan Savings* = **$ 101.14**

Fan Power (kWh) = 251
Fan Power Cost = **$ 28.40**
Total Cooling Saved (BTU) = 4,458,026
Total Peak Demand kW saved = 1.72
Peak Energy Savings ($ for kW) = $ -
Total Cooling Power Saved (kWh) = 495.34
Cooling Savings = $ 55.97
Total Cooling Savings = $ 55.97
Total Heating Saved (BTU) = (73,807,694)
Total Heating Saved (Therms or kWh) = 1,452
Total Heating Savings = $ 1,524.13
Total Motor/Electric Savings = $ 101.14
Maintenance Savings = $ -
Net Savings = $ 1,681.24
Cost of Project = $ 7,239.78
Simple Payback (Yrs) = 4.31

Note: Actual savings will depend on operating conditions and application

Electric	1,139.11	**kWh**	3,887.77	Mbtus
Heating (G/E)	1,452	**Therms or kWh**	145,155.13	Mbtus
		Total Energy	**149,042.90**	**MBtus**

Freehold Township High School		
Number of Classrooms: 97	256,000	Gross SF Area

5.0%	GC Allowance	**25.0%**	
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Conservative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
1	**Motor upgrades, standard efficiency to high efficiency**	CM OR P4P	$69,600.00	$13,384.61	3,480.00	12,528.00	7,704.72	93,312.72	23,328.18	69,984.54	5.23

Cost Basis:	The $69,600 cost for the motor upgrades is based on vendor pricing and typical installation and construction costs in the Central NJ region.
Saving Projection:	The savings are based on converting electric resistive heating to gas heating and upgraded motor and piping for a total of 210,760 kWh saved. There is additional gas consumption projected to be 7,231.95 Therms

Energy Savings	**Savings per Year**	**Estimated Annual Savings ($)**	**C02 Reduced (lbs.)**	**SO2 (lbs.)**	**NOX (lbs.)**	**Cars Removed**
Electric (kWh)	210,760.00	$23,815.88	116,550.28	348.94	288.36	10.18
Gas Savings (Therms)	-7231.95	-$7,593.55	-346,639.65	-709.19	-857.63	-30.27
Total Savings Kbtu	-4,052.04	$16,222.33	-230,089.37	-360.25	-569.27	
					Total Pollution Reduction in Cars Removed from the Road =	**-20.10**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Shifting electric resistive heating of 195,000 kWh to gas with hydronic heating and by upgrading motors and piping address electric resistive repairs
	48.75 kW of electric resistive heating x 4,000 hours =195,000kWh
	Added gas consumption with 92% efficient Aerco boilers of 7,231.95 Therms
	Upgrading motors with high efficiency motors give a savings of 1.93 kW x 4,000 hours =15,760kW

Energy Savings Factor of Safety	1.21	Estimated annual savings with energy savings factor of safety =	$13,384.61

Discussion:	The implementation of this involves installing the motor upgrades and also making sure that these motor are efficiently controlled and are either shut down or effectively cycled during low use or low occupancy times. The savings are conservative and we believe that with reasonable commissioning this can easily be exceeded. This would not be considered a primary upgrade because the payback seems to be in excess of 10 years. The recommendation would be to hold off on this energy reduction measure for the simple reason that the payback is not that attractive and it takes away from some of the larger projects that also have a poor payback but can possibly be brought into one of the incentive programs by putting this together with other items that have a quicker payback.

Freehold Township High School			5.0%	GC Allowance	25.0%
Number of Classrooms: 97	256,000	Gross SF Area	**18.0%**	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**Other ERMs - Controls Upgrade**	P4P	$704,000.00	$34,960.00	35,200.00	126,720.00	77,932.80	943,852.80	235,963.20	707,889.60	20.25

Cost Basis:	The cost of this controls upgrade was provided with vendor pricing from one of the existing controls vendors that are currently providing controls automation for the school. This is based on a quote with vendor pricing with labor costs built in.
Saving Projection:	Based on typical energy savings from other projects of the same kind for high schools, we believe that the savings projection of $44,506.51 is reasonable and relatively conservative.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	286,512.00	$32,375.86	158,441.14	474.36	392.01	13.84
Gas (Therms)	11,553.00	$12,130.65	553,754.92	1,132.93	1,370.06	48.36
Total Savings Kbtu	2,132,919.51	$44,506.51	712,196.05	1,607.29	1,762.07	
					Total Pollution Reduction in Cars Removed from the Road =	**62.20**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From observations and the current operation of the existing pneumatic controls, Haglid Engineers estimate projected savings of 12% for both gas and electric.		
Factor of Safety	1.27	Estimated annual savings with energy savings factor of safety =	$34,960.00
Discussion:	With a payback of 20.25 years this would have a relatively long payback. The expense is excessive, part of it involves upgrading controls that currently are not functioning. We would recommend upgrading the controls especially for the large exhaust fans that are running wild 24/7. Part of this can be addressed with the DOAS and other components we would evaluate as the project goes forward and try to address them as a part of the other energy reduction measures. Due to the cost of this energy reduction measure and the payback estimated at 20.25 years, we cannot recommend this energy reduction measure at this time.		

School/Building	ATC	Mechanical*	Contigency	Total
BOE	$ 85,500	$ 15,000	10%	**$ 110,550**
Tranporation	$ 34,000	$ -	10%	**$ 37,400**
Coltsneck HS	$ 225,000	$ -	10%	**$ 247,500**
Howell HS	$ 570,000	$ 50,000	10%	**$ 682,000**
Freehold Boro HS	$ 670,000	$ 50,000	10%	**$ 792,000**
Freehold Twp HS	$ 565,000	$ 75,000	10%	**$ 704,000**
Manalapan HS	$ 525,000	$ 75,000	10%	**$ 660,000**
Marlboro HS	$ 820,000	$ 100,000	10%	**$ 1,012,000**

* ATC contractor provides the valve and the Mechanical Contractor will install.

Freehold Township High School			5.0%	GC Allowance	25.0%
Number of Classrooms: 97	256,000	Gross SF Area	**18.0%**	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Soda vending machines off at night or weekends**	P4P	$3,080.00	$1,386.00	154.00	554.40	340.96	4,129.36	1,032.34	3,097.02	2.23

Cost Basis:	Based on 11 USAT vending machines at 189.00 each plus a $75.00 labor to install each for a total of $3,080.00.
Saving Projection:	This is based on conservative estimates on weekends and late nights that the machines can be used to go into deep set back where the refrigeration can be shut off. It can be noted that this should only be used for things like soda; Ice cream and milk would not be a good candidate for this type of energy savings measure. It is projected to save 97.58kWh/month per vending machine x 12months x 11 machines for a total of 12,880.56kWh/year.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	12,880.56	$1,455.50	7,122.95	21.33	17.62	0.62
Gas (Therms)		$0.00	0	0	0	0
Total Savings (kBtu)	43,950.29	$1,455.50			**Total Pollution Reduction in Cars Removed from the Road =**	**0.62**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Assumes savings of 97.58 kWh per vending machine each month		
	11 vending machines can use this upgrade.		
Energy Savigns Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$1,386.00
Discussion:	There are candy machines and soda machines that do not need to keep all components refrigerated to keep them in a saleable fashion. For instance; coca cola, diet coke sodas can have the refrigeration shut off over long weekend, night or times where there is no one in the school. It would not be recommended to use this technology for any dairy products or foods that can potentially spoil with elevated temperatures. This is a good way to tie an occupancy sensors to when people are in the area and when the machines runs.		

Freehold Township High School					
Number of Classrooms: 97	256,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)**	P4P	$2,046.70	$982.61	102.34	368.41	226.57	2,744.01	686.00	2,058.01	2.09

Cost Basis:	This is based on installing in 97 classrooms with a cost of $21.10 per class room with the ability to shut down additional plug-ins . This has been shown to provide an efficient way to get rid of any parasitic loads from electrical equipment that are generally left on 24/7.
Saving Projection:	The saving is based on publications involved with evaluating the effectiveness of these components.It is estimated to be 94 kWh/year per classroom for 97 classrooms for a projected saving of 9,118kWh/year . When we evaluate this we find that a reasonable estimated savings is $1,030.33.

Energy Savings	**Savings per Year (kWh)**	**Estimated Annual Savings ($)**	**C02 Reduced (lbs.)**	**SO2 (lbs.)**	**NOX (lbs.)**	**Cars Removed**
Electric (kWh)	9,118.00	$1,030.33	5,042.25	15.10	12.48	0.44
Gas (Therms)	0	$0.00	0	0	0	0
Total Savings (kBtu)	31,111.91	$1,030.33			**Total Pollution Reduction in Cars Removed from the Road =**	**0.44**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Estimates average savings per classroom of 94 kWh/year removing hot plates from classroom.		
Energy Savings Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$982.61
Discussion:	These parasitic load reducing power strips have been shown in peer reviewed articles to provide good energy savings while being relatively easy to install. It would be something that would be a low enough payback that it would actually help to bring high cost items such as heavy mechanical components more into line with the type of cost and internal rate of return in order to justify these capital projects. The recommendation would be to do these power strips for the simple reason that they are easy to install, have a quick payback and they would effectively help reduce the cost of other more expensive items.		

Freehold Township High School		
Number of Classrooms: 97	256,000	Gross SF Area

5.0%	GC Allowance	**25.0%**
18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**Laser prints on off mode at night, times power strips**	P4P	$7,944.30	$5,296.20	397.22	1,429.97	879.43	10,650.92	2,662.73	7,988.19	1.51

Cost Basis:	This is based on installing in 97 classrooms with a cost of $81.90 (cost with shipping and labor) per power saver strip with the ability to shut down additional plug-ins such as laser printers and other components. The installed effort would be done with an onsite maintenance personelle or possibly the people occupying the classrooms. This has been shown to provide an efficient way to get rid of vampire loads from printers and other equipment that are generally left on 24/7.
Saving Projection:	The saving is based on publications involved with evaluating the effectiveness of these components. For our geographic area we believe that the energy savings would be projected at 42.65 kWh per classroom per month for 97 classrooms. When we evaluate this we find that a reasonable estimated savings is $5,557.23.

Energy Savings	Savings per Year (kWh)	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	49,644.60	$5,609.84	27,453.46	82.19	67.92	2.40
Gas (Therms)	0.00	$0.00	0	0	0	0
Total Savings (kBtu)	169,394.40	$5,609.84	2,004,102.88	6,000.08	4,958.46	
					Total Pollution Reduction in Cars Removed from the Road =	**175.03**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Haglid Engineers has installed a set back power and an inline watt meter. Found typical watt meter savings of 42.65 kWh/month or	$4.82	per month
	42.65 kWh/month x 12 months = 512 kWh/year per classroom		
	512 kWh/year per classroom x 97 classrooms = 49,644.60 kWh/year		
Energy Savings Factor of Safety	1.06	Estimated annual savings with energy savings factor of safety =	$5,296.20
Discussion:	These vampire load shutting power strips have been shown in peer reviewed articles to provide good energy savings while being relatively easy to install. It would be something that would be a low enough payback that it would actually help to bring high cost items such as heavy mechanical components more into line with the type of cost and internal rate of return in order to justify these capital projects. The recommendation would be to do these power strips for the simple reason that they are easy to install, have a quick payback and they would effectively help reduce the cost of other more expensive items.		

Freehold Township High School		
Number of Classrooms: 97	256,000	Gross SF Area

5.0%	GC Allowance		**25.0%**
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
1	Boiler Upgrades: Replace (2) 10 MBH Boilers with (3) MBH Modular Condensing Boilers	P4P	$596,500.00	$18,841.60	29,825.00	107,370.00	66,032.55	799,727.55	199,931.89	599,795.66	31.83

Cost Basis:	Replacing the hot water boiler with a new500 gallon gas fired AO Smith hot water boiler is based on RS Means, known construction and vendor pricing the installed cost with labor would be about $596,500.00.
Saving Projection:	The annual energy savings is estimated at $23,250.41 based on current gas usage and the difference between the current boilers and upgraded boilers efficiency.

Energy Savings	**Savings per Year**	**Estimated Annual Savings ($)**	**C02 Reduced (lbs.)**	**SO2 (lbs.)**	**NOX (lbs.)**	**Cars Removed**
Electric (kW)	0.00	$0.00	0.00	0.00	0.00	0.00
Gas Savings (Therms)	22143.25	23250.4125	1,061,363.59	2,171.46	2,625.95	92.70
Total Savings Kbtu	2,214,325.00	$23,250.41	1,061,363.59	2,171.46	2,625.95	
					Total Pollution Reduction in Cars Removed from the Road =	**92.70**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From site visit and Haglid Engineering evaluation of existing boiler Gas efficiency of 69% to Aerco 92% efficient boiler (savings=23% x current Gas usage).		
Energy Savings Factor of Safety	1.2	Estimated annual savings with energy savings factor of safety =	$18,841.60
Discussion:	At this time, given the long payback, it is not recommended to do this energy reduction measure and replacing the existing boiler/hot water heat exchanger with a gas fired AO Smith boiler. This would be a recommendation if there is a failure in the system and there would be a need to replace what is currently being used. The payback is not going to be attractive enough to make this economically viable when packaged with other more expensive components. Our recommendation is to use this as a good thing to do as the existing equipment starts to become maintenance prone or fails all together.		

Freehold Township High School					
Number of Classrooms: 97	256,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
3	**Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)**	P4P	$4,069.15	$1,881.80	203.46	732.45	450.45	5,455.51	1,363.88	4,091.63	2.17

Cost Basis:	Price of Equipment and installation is estimated to be $41.95 per class room based off of vendor pricing. With a total of 97 class rooms, the estimated installed hard cost is $4,069.15						
Saving Projection:	Having the computers on deep set-back is projected to save 182 kWh/year per classroom for 97 classrooms for a total savings of 17,654 kWh/year. This is calculated to be $1,994.90 saved per year, making this energy reduction measure have an attractive payback. The savings is based off of historical data and past experience, see details below.						
Energy Savings	**Savings per Year**	**Estimated Annual Savings ($)**	**C02 Reduced (lbs.)**	**SO2 (lbs.)**	**NOX (lbs.)**	**Cars Removed**	
Electric (kWh)	17,654.00	$1,994.90	9,762.66	29.23	24.15	0.85	
Gas (Therms)	0.00	$0.00					
Total Savings (kBtu)	60,237.95	$1,994.90			**Total Pollution Reduction in Cars Removed from the Road =**	**0.85**	
*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**							
Assumptions	97 classrooms would have set-back power strip						
	Each classroom would have set-back savings of 182 kWh/ year.						
	Laser printers and other peripheral devices would add to savings.						
Energy Savings Factor of Safety	1.06	Estimated annual savings with energy savings factor of safety =	$1,881.80				
Discussion:	Considering the low cost and easy installation, this is a recommended energy reduction measure. The simple payback of under three years is also another attractive benefit this investment offers.						

Freehold Township High School		
Number of Classrooms: 97	256,000	Gross SF Area

5.0%	GC Allowance		**25.0%**
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
3	**Envelope upgrades: roof insulation with a roof project (min R20; Avg. R25)**	P4P	$902,538.00	$11,901.00	45,126.90	162,456.84	99,910.96	1,210,032.70	302,508.17	907,524.52	76.26

Cost Basis:	The budgetary cost for evaluating the envelope, roof and insulation is provided with RS Means and known construction costs for working on similar high school projects in the Central NJ area. The estimate installed hard costs at $902,538.00 is typical of a roof this size.
Saving Projection:	The savings projection is based on computer modeling of like kind high schools in the area and we believe is relatively conservative but typically envelope upgrades do not have tremendously attractive energy savings and we believe this is reasonable and typical for this type of envelope upgrade.

Energy Savings	**Savings per Year**	**Estimated Annual Savings ($)**	**C02 Reduced (lbs.)**	**SO2 (lbs.)**	**NOX (lbs.)**	**Cars Removed**
Electric (kWh)	0.00	$0.00	0.00	0.00	0.00	0.00
Gas Savings (Therms)	11,901.00	$12,496.05	570,435.15	1,167.06	1,411.33	49.82
Total Savings Kbtu	1,190,100.00	$12,496.05	570,435.15	1,167.06	1,411.33	
					Total Pollution Reduction in Cars Removed from the Road =	**49.82**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Haglid Engineering projects gas heating savings of 11,901 therms		
Energy Savings Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$11,901
Discussion	Given an estimated payback in excess of 75 years, this is not an energy reduction measure we would recommend until the roof needs to be repaired. Until that time, generally the cost of adding excess insulation or improving the roof to an R20 rating is something that is not as expensive as replacing the insulation and adding a new roof. The recommendation is to wait until the roof needs to be repaired and at that time evaluate adding thermal insulation to have the roof at least approach R20 and an average of R25.		

Preliminary ESMs

Prepared for:

Howell High School

Prepared by:

Haglid Engineering and Associates, Inc.

80 Broadway
Hillsdale, NJ 07642

Telephone: (201) 722-1233
Fax: (201) 722-0999

Engineer: Klas C. Haglid, P. E.

Assumptions	
$/kWh	0.113
$/Therm	1.043

	Energy Use	Expense
Current Electric Usage (kWh)	2,731,200.00	$308,625.60
Current Gas Usage (Therms)	83,152.00	$86,727.54
Total kBtu	17,634,436.77	$395,353.14

Total Annual Savings	$166,759.30
% savings of Current Utility Bill	42.18%

Howell High School		
Number of Classrooms: 104	249,000	Gross SF Area

5.0%	GC Allowance	**25.0%**	
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**VRF and VRV variable refrigeration volume**	P4P	$340,200.00	$26,372.00	17,010.00	61,236.00	37,660.14	456,106.14	114,026.54	342,079.61	12.97

Cost Basis:	Estimated installed cost of $340,200 for 12 offices or classrooms ($28,350 per class) based on installed costs for Public High School installations on previous projects in the last two years in central NJ. This includes union labor and other typical installation costs.
Saving Projection:	A Trane Trace model for a "like kind" school in the same geographic area was modeled for adding VRV to 26 classrooms/offices for an annual electric savings of 243,736kWh or 9,374.5 kWh/class and a gas savings of 40,435 Therms or 1555.2 Therms/class. The total electric and gas savings for 12 classrooms are 112,493.54 kWh and 18,662.31 Therms respectiveley. See attached Trace model.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	112,493.54	$12,711.77	62,208.93	186.25	153.91	5.43
Gas (Therms)	18,662.31	$19,464.79	894,516.22	1,830.10	2,213.15	78.12
Total Savings Kbtu	2,250,074.89	$32,176.56	956,725.15	2,016.35	2,367.06	
					Total Pollution Reduction in Cars Removed from the Road =	**83.56**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	This VRV system will have an EER rating of 13 or better with reheat and the ability to recover heat energy from one classroom to another. The existing HVAC system has an EER of less than 7.0. The existing RTU is in very poor condition and over 30 years old.		
Energy Savings Safety Factor	1.22	Estimated annual savings with Energy Savings Factor of Safety =	$26,372.00
Discussion:	There are parts of this high school that would benefit from this system, especially administrative offices. These calculations are based on installing VRV Heat pumps in 12 offices or classrooms. This is not a school wide application but strictly meant for office areas, critical use and areas that typically would have use during the summer months. While we have seen these VRV systems have very good savings compared to heating and cooling areas in other schools, we believe that for Howell this can likely be expected to be used in areas that do not have air conditioning or functional air conditioning. Therefore, the savings will not be great compared to the cost of this project. This can be something that we evaluate as this project goes forward. Another interesting note is that in Howell High School there is an excessive amount of ventilation and the idea would be to address some of the runaway exhaust fans and other issues in tandem with installing the HVAC upgrades.		

VRVs for Howell High School

Location	**Howell High School**
Building owner	**Freehold Regional High School District**
Program user	**Employee**
Company	**Haglid Engineering & Associates**
Comments	**Energy Evaluation for Howell High School**
By	**Haglid Engineering & Associates, Inc.**
Dataset name	**C:\Documents and Settings\Klas Haglid\My Documents\TRACE 700 Projects\Freehold Region HS\Howell HS VRV & Lt.trc**
Calculation time	**03:31 PM on 12/23/2013**
TRACE® 700 version	**6.2.6.5**
Location	**McGuire AFB, New Jersey**
Latitude	**40.0 deg**
Longitude	**74.0 deg**
Time Zone	**5**
Elevation	**133 ft**
Barometric pressure	**29.8 in. Hg**
Air density	**0.0757 lb/cu ft**
Air specific heat	**0.2444 Btu/lb·°F**
Density-specific heat product	**1.1098 Btu/h·cfm·°F**
Latent heat factor	**4,885.3 Btu·min/h·cu ft**
Enthalpy factor	**4.5402 lb·min/hr·cu ft**
Summer design dry bulb	**89 °F**
Summer design wet bulb	**76 °F**
Winter design dry bulb	**11 °F**
Summer clearness number	**0.99**
Winter clearness number	**0.99**
Summer ground reflectance	**0.20**
Winter ground reflectance	**0.20**
Carbon Dioxide Level	**400 ppm**
Design simulation period	**January - December**
Cooling load methodology	**TETD-TA1**
Heating load methodology	**UATD**

MONTHLY ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1	**Howell High School**												
Electric													
On-Pk Cons. (kWh)	74,227	73,967	63,465	42,976	50,069	51,213	77,057	76,166	58,206	46,758	54,202	69,129	737,433
On-Pk Demand (kW)	212	221	194	198	270	398	456	451	333	178	191	207	456
Gas													
On-Pk Cons. (therms)	9,692	11,607	7,233	1,265	8	0	0	0	0	1,948	4,691	8,700	45,143
On-Pk Demand (therms/hr)	31	35	22	10	1	0	0	0	0	15	20	27	35

Energy Consumption

Building	94,645 Btu/(ft2-year)
Source	165,611 Btu/(ft2-year)
Floor Area	74,290 ft2

Environmental Impact Analysis

CO2	1,468,439 lbm/year
SO2	3,990 gm/year
NOX	2,058 gm/year

MONTHLY ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2 VRV Upgrades													
Electric													
On-Pk Cons. (kWh)	45,374	43,779	42,932	37,906	44,932	33,828	39,079	39,974	44,954	39,983	38,511	42,446	493,697
On-Pk Demand (kW)	271	268	264	204	198	214	234	234	210	208	242	270	271
Gas													
On-Pk Cons. (therms)	1,076	1,262	664	155	2	0	0	0	0	268	453	826	4,708
On-Pk Demand (therms/hr)	9	10	7	4	0	0	0	0	0	4	4	7	10

Energy Consumption

Building	29,018 Btu/(ft2-year)
Source	74,721 Btu/(ft2-year)
Floor Area	74,290 ft2

Environmental Impact Analysis

CO2	450,224 lbm/year
SO2	1,223 gm/year
NOX	631 gm/year

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Howell High School

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Lights													
Electric (kWh)	20,618.1	18,645.4	22,021.4	19,726.6	21,319.7	6,169.7	6,316.3	6,381.2	19,726.7	21,319.8	20,428.3	19,916.5	202,589.6
Peak (kW)	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
Misc. Ld													
Electric (kWh)	12,690.5	11,462.3	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	149,420.0
Peak (kW)	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Cooling Coil Condensate													
Recoverable Water (1000gal)	0.0	0.0	0.0	0.7	1.4	7.3	12.9	15.4	5.9	0.5	0.0	0.0	44.2
Peak (1000gal/Hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=66.94 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=66.94 tons / 120.5 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	753.7	4,994.6	8,923.0	17,589.1	17,217.6	7,973.7	0.0	0.0	0.0	57,451.6
Peak (kW)	0.0	0.0	13.4	40.1	59.3	93.2	114.3	112.7	70.0	29.1	0.6	0.0	114.3
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=101.2 tons / 12.95 kW]													
Electric (kWh)	0.0	0.0	0.0	95.1	616.5	1,079.5	2,070.2	2,038.3	967.0	0.0	0.0	0.0	6,866.4
Peak (kW)	0.0	0.0	1.8	5.0	7.1	10.9	12.7	12.7	8.2	3.6	0.1	0.0	12.7
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	10.0	27.0	48.8	74.4	74.4	40.0	0.0	0.0	0.0	274.6
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=62.35 tons]													
Air-cooled unitary - 002 [Clg Nominal Capacity/F.L.Rate=62.35 tons / 112.2 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	1,156.7	3,964.1	11,629.7	20,319.0	20,544.4	8,880.4	718.4	0.0	0.0	67,212.6
Peak (kW)	0.0	0.0	0.0	19.0	31.6	83.7	106.5	105.0	62.8	18.3	0.0	0.0	106.5
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=94.26 tons / 12.07 kW]													
Electric (kWh)	0.0	0.0	0.0	147.2	495.1	1,426.2	2,410.0	2,448.2	1,096.3	92.0	0.0	0.0	8,115.0
Peak (kW)	0.0	0.0	0.0	2.4	3.8	9.8	11.9	11.8	7.4	2.3	0.0	0.0	11.9
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	18.0	38.6	63.2	74.4	74.4	64.0	8.1	0.0	0.0	340.7
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=28.44 tons]													

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Howell High School

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=28.44 tons]													
Air-cooled unitary - 003 [Clg Nominal Capacity/F.L.Rate=28.44 tons / 51.20 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	942.5	3,473.3	6,538.4	9,684.0	9,193.5	5,103.9	252.1	0.0	0.0	35,187.8
Peak (kW)	0.0	0.0	0.0	14.8	25.4	44.4	48.0	46.7	35.2	9.1	0.0	0.0	48.0
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=43.01 tons / 5.50 kW]													
Electric (kWh)	0.0	0.0	0.0	119.8	433.2	800.2	1,148.5	1,094.5	627.1	32.4	0.0	0.0	4,255.6
Peak (kW)	0.0	0.0	0.0	1.9	3.0	5.2	5.4	5.3	4.1	1.2	0.0	0.0	5.4
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	20.0	47.0	72.0	74.4	74.4	68.0	5.4	0.0	0.0	361.2
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Cpl 4: Cooling plant - 008 [Sum of dsn coil capacities=13.98 tons]													
Air-cooled unitary - 004 [Clg Nominal Capacity/F.L.Rate=13.98 tons / 25.17 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	20.4	505.7	1,906.1	4,055.0	3,810.3	1,070.2	0.0	0.0	0.0	11,367.8
Peak (kW)	0.0	0.0	0.0	2.9	8.3	19.2	23.8	23.1	14.0	0.0	0.0	0.0	23.8
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=21.14 tons / 2.71 kW]													
Electric (kWh)	0.0	0.0	0.0	2.6	62.6	230.4	476.8	449.9	130.0	0.0	0.0	0.0	1,352.3
Peak (kW)	0.0	0.0	0.0	0.4	1.0	2.2	2.7	2.6	1.6	0.0	0.0	0.0	2.7
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	4.0	23.5	44.4	74.4	74.4	37.0	0.0	0.0	0.0	257.7
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=781.1 mbh]													
Boiler - 004 [Nominal Capacity/F.L.Rate=781.1 mbh / 12.02 Therms] (Heating Equipment)													
Gas (therms)	1,520.1	1,936.7	1,129.1	169.0	0.0	0.0	0.0	0.0	0.0	251.1	693.0	1,417.1	7,116.0
Peak (therms/Hr)	5.1	5.8	4.0	2.5	0.0	0.0	0.0	0.0	0.0	2.8	3.4	4.5	5.8
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	669.6	604.8	545.4	145.8	0.0	0.0	0.0	0.0	0.0	226.8	477.9	669.6	3,339.9
Peak (kW)	0.9	0.9	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.9	0.9	0.9	0.9
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	581.1	524.9	473.3	126.5	0.0	0.0	0.0	0.0	0.0	196.8	414.8	581.1	2,898.7
Peak (kW)	0.8	0.8	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.8	0.8

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Howell High School

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=781.1 mbh]													
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	303.0	81.0	0.0	0.0	0.0	0.0	0.0	126.0	265.5	372.0	1,855.5
Peak (kW)	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=3,560 mbh]													
Boiler - 007 [Nominal Capacity/F.L.Rate=3,560 mbh / 54.77 Therms] (Heating Equipment)													
Gas (therms)	7,535.3	8,992.2	5,689.5	1,066.9	7.7	0.0	0.0	0.0	0.0	1,632.9	3,737.6	6,726.5	35,388.5
Peak (therms/Hr)	24.2	27.9	18.5	9.0	1.4	0.0	0.0	0.0	0.0	13.0	17.2	22.7	27.9
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	186.0	127.5	6.5	0.0	0.0	0.0	0.0	186.0	180.0	186.0	1,226.0
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	2,648.7	2,392.4	2,648.7	1,815.7	92.6	0.0	0.0	0.0	0.0	2,648.8	2,563.3	2,648.7	17,458.9
Peak (kW)	3.6	3.6	3.6	3.6	3.6	0.0	0.0	0.0	0.0	3.6	3.6	3.6	3.6
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	372.0	255.0	13.0	0.0	0.0	0.0	0.0	372.0	360.0	372.0	2,452.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 3: Heating plant - 006 [Sum of dsn coil capacities=239.0 mbh]													
Boiler - 006 [Nominal Capacity/F.L.Rate=239.0 mbh / 3.68 Therms] (Heating Equipment)													
Gas (therms)	636.3	678.5	414.1	28.8	0.0	0.0	0.0	0.0	0.0	64.2	260.2	556.4	2,638.5
Peak (therms/Hr)	2.0	2.2	1.5	0.8	0.0	0.0	0.0	0.0	0.0	1.3	1.5	1.8	2.2
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	144.8	15.0	0.0	0.0	0.0	0.0	0.0	27.5	118.0	186.0	845.3
Peak (kW)	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	177.8	160.6	138.4	14.3	0.0	0.0	0.0	0.0	0.0	26.3	112.8	177.8	808.0
Peak (kW)	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	289.5	30.0	0.0	0.0	0.0	0.0	0.0	55.0	236.0	372.0	1,690.5
Peak (kW)	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Howell High School

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 4: Heating plant - 007 [Sum of dsn coil capacities=618.7 mbh]													
Electric Resistance - 005 [Nominal Capacity/F.L.Rate=618.7 mbh / 181.3 kW] (Heating Equipment)													
Electric (kWh)	35,353.0	38,832.0	23,652.0	5,067.7	1,265.2	0.0	0.0	0.0	140.2	7,774.6	16,764.3	30,956.4	159,805.6
Peak (kW)	73.9	82.6	57.2	25.9	8.8	0.0	0.0	0.0	1.4	39.5	52.8	69.3	82.6

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Lights													
Electric (kWh)	20,618.1	18,645.4	22,021.4	19,726.6	21,319.7	6,169.7	6,316.3	6,381.2	19,726.7	21,319.8	20,428.3	19,916.5	202,589.6
Peak (kW)	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
Misc. Ld													
Electric (kWh)	12,690.5	11,462.3	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	149,420.0
Peak (kW)	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Cooling Coil Condensate													
Recoverable Water (1000gal)	1.0	0.3	2.4	6.2	11.2	14.5	15.8	17.0	12.7	5.6	3.1	1.2	90.9
Peak (1000gal/Hr)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=40.67 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=40.67 tons / 39.66 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	103.5	40.2	228.2	1,240.0	2,793.2	3,904.2	5,217.4	6,046.8	3,546.6	1,268.9	424.3	118.8	24,932.1
Peak (kW)	1.5	1.5	3.1	19.9	24.1	28.5	34.9	35.2	29.4	19.3	12.5	1.9	35.2
Air-cooled unitary - 001 [Htg Nominal Capacity/F.L.Rate=549.1 mbh / 40.31 kW] (Cooling Equipment - Heating Mode)													
Electric (kWh)	451.1	895.9	152.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	343.1	1,842.7
Peak (kW)	19.4	22.2	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	22.2
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=51.95 tons / 2.55 kW]													
Electric (kWh)	320.7	234.2	468.4	468.4	514.2	560.0	733.1	707.7	516.8	516.8	481.1	399.7	5,921.0
Peak (kW)	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	75.5	68.0	103.5	92.0	101.0	110.0	144.0	139.0	101.5	101.5	94.5	88.5	1,219.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=36.36 tons]													
Air-cooled unitary - 002 [Clg Nominal Capacity/F.L.Rate=36.36 tons / 35.45 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	66.9	20.2	234.7	1,039.0	3,381.3	5,185.1	6,621.8	6,902.5	4,404.0	753.4	339.8	94.3	29,043.1
Peak (kW)	3.7	1.6	5.0	17.8	20.1	28.8	34.5	33.5	26.9	17.8	13.9	4.4	34.5
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=46.45 tons / 2.28 kW]													
Electric (kWh)	430.2	173.0	471.1	578.1	826.2	910.4	1,204.0	994.6	901.3	546.2	439.3	371.0	7,845.2
Peak (kW)	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=36.36 tons]													
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	94.5	38.0	103.5	127.0	181.5	200.0	264.5	218.5	198.0	120.0	96.5	81.5	1,723.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=18.60 tons]													
Air-cooled unitary - 003 [Clg Nominal Capacity/F.L.Rate=18.60 tons / 18.13 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	51.1	19.3	170.7	725.6	1,728.0	2,398.1	3,119.8	3,159.1	1,774.6	579.7	192.3	62.1	13,980.4
Peak (kW)	1.4	1.3	2.6	9.4	11.8	13.9	17.3	16.9	13.5	9.5	8.5	1.6	17.3
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=23.75 tons / 1.16 kW]													
Electric (kWh)	142.0	62.9	214.2	214.2	279.3	367.8	481.8	426.0	273.5	230.4	220.0	136.2	3,048.1
Peak (kW)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	61.0	27.0	92.0	92.0	120.0	158.0	207.0	183.0	117.5	99.0	94.5	58.5	1,309.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 4: Cooling plant - 008 [Sum of dsn coil capacities=8.33 tons]													
Air-cooled unitary - 004 [Clg Nominal Capacity/F.L.Rate=8.33 tons / 11.00 kW] [**Orig F.L.Rate=11.00 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	265.4	838.8	1,364.7	1,803.5	1,844.1	956.3	192.8	0.0	0.0	7,265.5
Peak (kW)	0.0	0.0	2.0	5.3	6.8	9.3	10.0	10.0	9.1	4.4	2.6	0.0	10.0
Condenser fan for Heat Pump [Design Heat Rejection/F.L.Rate=11.46 tons / 1.38 kW]													
Electric (kWh)	0.0	0.0	0.0	39.7	123.2	197.4	250.5	257.0	138.2	28.9	0.0	0.0	1,034.9
Peak (kW)	0.0	0.0	0.3	0.8	1.0	1.3	1.3	1.3	1.3	0.7	0.4	0.0	1.3
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	12.0	19.8	22.0	25.1	23.8	18.0	11.0	0.0	0.0	131.7
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=407.2 mbh]													
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=1,206 mbh]													
Boiler - 007 [Nominal Capacity/F.L.Rate=1,206 mbh / 14.49 Therms] (Heating Equipment)													
Gas (therms)	1,007.9	1,177.1	641.7	155.5	2.0	0.0	0.0	0.0	0.0	268.2	453.4	783.0	4,488.9
Peak (therms/Hr)	7.4	8.6	5.2	3.8	0.4	0.0	0.0	0.0	0.0	3.9	3.9	5.4	8.6

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=1,206 mbh]													
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	186.0	36.0	2.0	0.0	0.0	0.0	0.0	50.8	130.5	186.0	945.3
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	897.7	810.9	897.7	173.8	9.7	0.0	0.0	0.0	0.0	245.0	629.9	897.7	4,562.3
Peak (kW)	1.2	1.2	1.2	1.2	1.2	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	372.0	72.0	4.0	0.0	0.0	0.0	0.0	101.5	261.0	372.0	1,890.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 3: Heating plant - 006 [Sum of dsn coil capacities=201.3 mbh]													
Boiler - 006 [Nominal Capacity/F.L.Rate=201.3 mbh / 2.42 Therms] (Heating Equipment)													
Gas (therms)	68.5	85.2	21.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.2	218.8
Peak (therms/Hr)	1.7	2.2	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	2.2
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	12.5	15.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	43.3
Peak (kW)	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	10.1	12.1	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	34.8
Peak (kW)	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	25.0	30.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	86.5
Peak (kW)	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
Hpl 4: Heating plant - 007 [Sum of dsn coil capacities=381.8 mbh]													
Electric Resistance - 005 [Nominal Capacity/F.L.Rate=381.8 mbh / 111.9 kW] (Heating Equipment)													
Electric (kWh)	8,765.2	10,720.3	4,503.4	722.9	0.0	0.0	0.0	0.0	0.0	1,127.0	2,398.0	6,591.6	34,828.4
Peak (kW)	111.9	111.9	111.3	29.1	0.0	0.0	0.0	0.0	0.0	31.7	82.3	111.9	111.9

Howell High School					
Number of Classrooms: 104	249,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure
Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Lighting upgrades, at least T-8 or LED**	P4P	$201,883.50	$32,561.85	10,094.18	36,339.03	22,348.50	270,665.21	67,666.30	202,998.91	6.23

Cost Basis:	The $201,883.50 is based on doing the common areas, hallways and some of the longer run time lighting. These are based on known construction numbers for our area, RS Means and costs from other high school projects in Central NJ.
Saving Projection:	The annual saving is based on the change in Wattage from the existing fixture of mainly T8 and some T12's to high efficiency LED lighting. These are then estimated with something on the order of 4000 run hours a year. In some areas such as hallways, this would be higher as the lighting in these areas are used late into the night for custodial purposes. Stairways and other areas would run 24/7, so it is a mixture of run hours throughout the facility.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	365,341.04	$41,283.54	202033.5969	604.87	499.8621683	17.64485563
Gas (Therms)	-1,995.80	($2,081.62)	-95662.28807	-195.7164922	-236.6807317	-8.354784984
Total Savings Kbtu	1,047,014.94	$39,201.91	106371.3089	409.1516325	263.1814366	

Total Pollution Reduction in Cars Removed from the Road = **9.29**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Areas 101,102,104 which consist areas such ashallways, stairwells, and bathrooms will be considered for the current Energy Reduction Measure
	Area 103 are all classrooms and will not be included at this time in the Energy Reduction Measure
	Run hours are assumed to be the following as stated in the "Assumption Details" below

Assumption Details

Group	Run Time	Existing Total (kW)	Number of Fixtures	Retrofit Total (kW)	Savings Kwh	$ Savings	Comments
101	2,550	117	886	43	187,507	21,188	Recommended
102			0			0	Not part of Project Work
103	3,500	27	277	12	51,086	5,773	Recommended
104	8,760	25	275	10	126,748	14,323	Recommended
	Totals =	**168.40**	**1,438.00**	**65.80**	**365,341.04**	**39,201.91**	An additional gas heating cost is considered as shown in row labeled "Assumptions"

Energy Savigns Factor of Safety	1.20	Estimated annual savings with energy savings factor of safety =	$32,561.85

Discussion:	Recently a lighting audit has been done that is more comprehensive in nature and covers a larger amount of lighting going into the classrooms. We believe that this will have additional benefits and savings. However, before we can recommend this we are going to have to see sampling, test cases done in some of the classrooms where the lighting is installed. Specifically this is CPL rated, high performance, LED lighting. It has been represented that the light levels will be well in excess of 50ft candles but there are many parameters to lighting (color rendering index, quality of light, temperature, light levels at the desk height). At this point in time we recommend that there be several test sites in several classrooms to evaluate the lighting going into the individual classrooms.

TRI-STATE LED

255 Mill Street, 2nd Floor
Greenwich, CT 06830

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f: (203) 813-3794

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Project Name	HOWELL HIGH SCHOOL
Street Name	405 Squankum-Yellowbrook Road
City/State	Farmingdale • New Jersey
Zip Code	7727
Site Contact	Pat Lagravenis OR Judi Lawson
Phone #	732-431-8375 Ext. 2
Cell Phone #	
Fax #	
Email Address	Judi Lawson <jlawson@frhsd.com>
Proposal Date	5/31/2013

Hours of Operation

Group 101		Group 102	
Hrs/Day	24	Hrs/Day	16.5
Days/Wk	7	Days/Wk	6
Wks/Yr	52	Wks/Yr	52
Total Hrs	8760	Total Hrs	5162

Group 103		Group 104	
Hrs/Day	8	Hrs/Day	12
Days/Wk	6	Days/Wk	6
Wks/Yr	52	Wks/Yr	40
Total Hrs	2503	Total Hrs	2888

Project Description

Supply LED Lamps & Fixtures as per Lighting Audit Worksheet

Sales Person	CHRIS ANASTASI	Cell Phone Number	914-482-4442
Sales Person		Cell Phone Number	

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Demand		Usage	
Existing Demand: kW	382.72	Existing Use: kWh	2,007,028.36
Proposed Demand: kW	161.38	Proposed Use: kWh	848,976.25
Demand Reduction: kWr	221.34	Use Reduction: kWh	1,158,052.11
Total Lighting Energy Savings			57.7%
Combined Unit Use Cost: kWh	$0.15	Supply Savings: KWH Per Year	$173,707.82
		*Delivery Savings: KW Per Year	$39,841.11
		*Maintenance Savings Per Year (Lamps & Ballast only)	$27,000.00
		*15% HVAC Savings Per Year	$35,000.00
Total Monthly Savings			$22,962.41
Total Annual Savings			$275,548.93
Total Cost Savings 5 Years			$1,377,744.65

Financial Summary

Material Cost	*$748,307.78*
Estimated Baypoint Electric Labor Cost	*$212,000.00*
One Time Approx. Rebate	*$160,000.00*
Total Job Cost (After Rebate & Labor)	*$800,307.78*
Simple Payback (months)	**34.8**
First Year Return on Investment	*34.43%*
CO_2 Reduction (lbs)	1,540,209.31

School : Howell

Summary of Lighting Quote and Audit

Group	Run Time	Existing Total (W)	Number of Fixtures	Retrofit Total (W)	Savings Kwh	Area Served	Comments
101	4,428	116,997	886	43,465	325,600		Recommended
102	4,067	214,849	1,661	84,826	528,804	Classrooms	Not part of Project Work
103	5,812	26,649	277	12,053	84,832		Recommended
104	8,760	24,754	275	10,285	126,748		Recommended

Group	Run Time	Existing Total (kW)	Number of Fixtures	Retrofit Total (kW)	Savings Kwh	$ Savings	Comments
101	2,550	117.00	886.00	43.47	187,506.60	$ 21,188.25	Recommended
102							Not part of Project Work
103	3,500	26.65	277.00	12.05	51,086.00	$ 5,772.72	Recommended
104	8,760	24.75	275.00	10.29	126,748.44	$ 14,322.57	Recommended
	Totals =	168.40	1,438.00	65.80	365,341.04	$ 41,283.54	

	kWh	Therms	$ Amount	Factor of Safety
Lighting Savings =	365,341.04		$ 41,283.54	1.20
Heating Costs =		-1995.804251	$ (2,081.62)	
Total Net Savings =			$ 39,201.91	

Howell High School		
Number of Classrooms: 104	249,000	Gross SF Area

5.0%	GC Allowance	**25.0%**
18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled,

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Conservative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**DOAS ventilation system**	P4P	$309,600.00	$48,375.00	15,480.00	55,728.00	34,272.72	415,080.72	103,770.18	311,310.54	6.44

Cost Basis:

The cost basis of the $309,600 is based on 43 classrooms and known construction numbers from other high schools in this central part of NJ. We believe that this will cover a large number of the classrooms in Howell High School and will provide additional benefits in the form of thermal comfort. The cost is based on a direct counter flow high efficiency heat exchanger that can move up to 500 cubic feet per minute. This would be tied to two high performance fans that would use energy on the order of 0.2 Watts per CFM and provide an energy efficiency rating of above 60. These would be individually controlled, there would be one energy recovery module per classroom and it would be tied to a self calibrating, 10 year CO2 sensor that would come on at a prescribed part per million concentration of CO2.

Saving Projection:

Projected Savings of 1,452 Therms per classroom X 43 classrooms for a total projected savings = 62,436 therms. The savings is modeled using a bin method where within a NJ Weather bin temperature range the hours at a certain temperature are modeled using 30 year weather data for the central area of NJ. Also this is based on full Pay for Performance projects where these units have been installed monitored and verified and evaluated for energy savings and this has been used to provide the estimated annual savings. We believe this number is conservative and with careful installation and preparation, this number can be exceeded.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	21,285.00	$2,405.21	11770.60511	35.24	29.122286	1.028000446
Gas (Therms)	62,436.00	$65,120.75	2992663.541	6122.722156	7404.232232	261.3679949
Total Savings Kbtu	6,316,227.43	$67,525.95	3004434.146	6157.962155	7433.354518	
					Total Pollution Reduction in Cars Removed from the Road =	**262.40**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions

The current system is poorly controlled and has an existing fan consumption of 691 watts. The new system is to have an 87% thermally efficient BPE direct counter flow air to air energy system. Proposed fans would use 123 watts of power and be controlled with GE CO2 sensor running only with classroom occupancy of 6 hours for 5 days. Existing system is 700 cfm and new system is 700 cfm, typically switch from dilution ventilation to displacement ventilation can reduce ventilation needs by 2.5 times. in other schools the 700 cfm can be reduced to below 300cfm with improved IAQ. This will produce additional savings that is currently not modeled.

	Quantity	CFM	%OA	% Run time	Heating eff. (%)	Cooling Eff. (EER)	Comments
Assumptions Details	(43) BPE-XE-MIR 500	700	100%	18%	65%	9	
Energy Savings Factor of Safety	1.40	Estimated annual savings with energy savings factor of safety =				$48,375.00	

Discussion:

Currently Howell High School, with talking with onsite Maintenance and Building management, we find that there is an awful lot of outdoor air being brought in throughout all weather conditions taken through unit ventilators and different HVAC equipment and in a single pass being exhausted up to the roof. We were also able to look at some of these and found that they are not controllable by the building automation or control system. When we asked how these are shut down during weekends or holidays, we found that they are left to basically run which means that there is allot of outdoor air running through the building for 8,740 run hours per year. The idea would be to eliminate some of these exhaust fans all together and replace them with the dedicated outdoor air system and in other places, tie these exhaust fans into a building automation system or a timer and only have them running during occupied times of the school year where there are people in the school. This will also reduce the amount of moisture being brought through the building and will help with thermal comfort and the cost of owning and operating this high school.

BPE Payback Calculator

Enter in the requested information below. If you are not sure of a value, See our recommendations in the comment boxes (red arrows).

Thank you for using BPE, Inc.®
For more specific engineering analysis, please see the BPE Performance Calculator at: **www.LowKWH.com**

SYSTEM GENERAL INFO		
Heating System Type	Gas Fired	
Cooling System Type	DX	
Outdoor Air Flow (OA)	700	scfm
Percent Outdoor Air (OA/SA, %)	100	%
Building Type	Commercial (> 5,000 SF)	
Nearest Location	Newark, NJ	

Number of Units

2000	1000	500	200
0	0	1	0

UTILITY INFORMATION	
Electric Rate ($/kWh)	0.113
Peak Demand Charge ($/kW)	
Months of Peak Demand Charge	0
Gas Rates ($/Therm)	1.043

COST ASSUMPTIONS		
Installed Cost per Ton ($/Ton)	0	*Use for New Construction or Major Retrofits
ERV Installed Cost	$ 7,200	
Maintenance Savings	$ -	
Total Incentives	$ -	

SYSTEM EFFICIENCIES		
Heating Efficiency	65	%
Cooling Efficiency	9	EER
BPE Effectiveness	87	%

CONTROLS AND SET-POINTS		
CO_2 Controller	Yes	
Percent Run-time	18	%
Summer (Cooling)	74	°F (db)
Winter (Heating)	70	°F (db)

BPE Payback Calculator

20 Years of Savings!

BPE Energy Recovery Ventilators are guaranteed for 20 years not to become unusable for providing breathable air as a result from rust, rot, or corrosion. This does not apply to other gases other than breathable air. See Limited Lifetime Warranty for more details.

ENERGY ANALYSIS		
BPE Cooling Capacity	1.29	TONS
BPE Heating Capacity	44.40	MBH
Peak Demand Reduction	1.72	KW
Annual Electric Energy Saved	3,888	MBTU
Annual Thermal Energy Saved	145,155	MBTU
TOTAL Savings	**149,043**	MBTU

OPERATING COST ANALYSIS		
Maintenance Savings	$	-
Cooling Cost Savings	$	(56)
Peak Demand Cost Savings	$	-
Heating Cost Savings (Gas or HP)	$	(1,514)
Electrical Cost Savings (ER+Fans)	$	(101)
Electric Resistive Savings		0
Reduced Supply + Exhaust Fan Savings		(101)
BPE Parasitic Fan Cost		28
TOTAL Savings	**$**	**(1,671.08)**

CAPITAL EXPENSE ANALYSIS		
HVAC Initial Cost Avoidance	$	-
Added Cost of ERV	$	7,200
Total Incentives/Funding	$	-
Net Capital Expenditure	$	7,200
Simple Payback (Years)		**4.31**
Internal Rate of Return (IRR)		**23%**
Net Present Value (20 Yr Life Cycle)		**$36,479.08**
Emission Reduction (Cars/yr)		**6.13**

	200	500	1000	2000
Products:	0	1	0	0

All Weather Air Management

Ex Eff	87%
Evaporative Eff	Not Used
Winter SP T3	70
Summer SP T3	74

Equipment Operation and Efficiencies					System Air Flow Profile			
Del. Heat Eff	65%	Gas	0	KWh Elect/Thm	Nominal CFM	Actual CFM	Supply CFM	Exhaust CFM
	1.04	$/Therm	0.11	$/kWh	500	700	700	700
Del. Cool Eff	NA	Gas	1.33	KWh Elect/Ton				
	1.04	$/Therm	0.11	$/kWh				
		Demand Savings	0.00	$/kW				

Profile of Energy Savings

Time of Year	Mid-Pts	DB (F)	Total	OA Temp DB (F)	OA Supply Temp DB (F)	Space Temp DB (F)	Exhaust Temp DB (F)	Recovered BTU/H	Annually Saved BTUs	OPERATE BPE?
Summer Cooling	117.5	115 to 120	0	117.5	79.7	74	111.8	-	-	NO
	112.5	110 to 115	0	112.5	79.0	74	107.5	-	-	NO
	107.5	105 to 110	0	107.5	78.4	74	103.1	-	-	NO
	102.5	100 to 105	0	102.5	77.7	74	98.8	-	-	NO
	97.5	95 to 100	6	97.5	77.1	74	94.4	15,456	92,739	YES
	92.5	90 to 95	40	92.5	76.4	74	90.1	12,168	486,713	YES
	87.5	85 to 90	122	87.5	75.8	74	85.7	8,879	1,083,265	YES
	82.5	80 to 85	500	82.5	75.1	74	81.4	5,591	2,795,310	YES
	77.5	75 to 80	620	77.5	74.5	74	77.0	2,302	1,427,252	NO
	72.5	70 to 75	847	72.5	73.8	74	72.7	-	-	NO
Free Cooling	67.5	65 to 70	671	67.5	73.2	74	71.2			NO
	62.5	60 to 65	927	62.5	72.5	74	64.0			NO
	57.5	55 to 60	600	57.5	71.9	74	59.6			NO
	52.5	50 to 55	730	52.5	67.7	70	54.8			YES
	47.5	45 to 50	634	47.5	67.1	70	50.4			YES
Winter Heating	42.5	40 to 45	513	42.5	66.4	70	46.1	(18,087)	(9,278,785)	YES
	37.5	35 to 40	1023	37.5	65.8	70	41.7	(21,376)	(21,867,546)	YES
	32.5	30 to 35	734	32.5	65.1	70	37.4	(24,665)	(18,103,743)	YES
	27.5	25 to 30	391	27.5	64.5	70	33.0	(27,953)	(10,929,662)	YES
	22.5	20 to 25	195	22.5	63.8	70	28.7	(31,242)	(6,092,132)	YES
	17.5	15 to 20	125	17.5	63.2	70	24.3	(34,530)	(4,316,288)	YES
	12.5	10 to 15	47	12.5	62.5	70	20.0	(37,819)	(1,777,488)	YES
	7.5	5 to 10	34	7.5	61.9	70	15.6	(41,108)	(1,397,655)	YES
	2.5	0 to 5	1	2.5	61.2	70	11.3	(44,396)	(44,396)	YES
	-2.5	-5 to 0	0	-2.5	60.6	70	6.9	-	-	YES
	-7.5	-10 to -5	0	-7.5	59.9	70	2.6	-	-	YES

ERV Operating Hours =	**917**	Fan Power (kWh) =	251
All Operating Hours =	**8,760**	Fan Power Cost =	**$ 28.40**
% Cooling =	24%	Total Cooling Saved (BTU) =	4,458,026
% Heating =	35%	Total Peak Demand kW saved =	1.72
% Free =	25%	**Peak Energy Savings ($ for kW) =**	**$ -**
Peak Tonnage Reduction =	1.72	Total Cooling Power Saved (kWh) =	495.34
Total System Cfm =	220	Cooling Savings =	$ 55.97
Cfm Reduction =	687	**Total Cooling Savings =**	**$ 55.97**
Existing HVAC Fan (W) =	691	Total Heating Saved (BTU) =	(73,807,694)
Proposed HVAC Fan (W) =	123.00	Total Heating Saved (Therms or kWh) =	1,452
kWh Savings =	895	**Total Heating Savings =**	**$ 1,513.97**
Proposed HVAC Fan Savings* =	**$ 101.14**	**Total Motor/Electric Savings =**	**$ 101.14**
		Maintenance Savings =	**$ -**
		Net Savings =	**$ 1,671.08**
		Cost of Project =	**$ 7,200.00**
		Simple Payback (Yrs) =	**4.31**

Supply

Fan HP/1,000 cfm*
1.2

Operational Hours

* ASHRAE Std. 90.1-2004, Table 6.5.3.1 Fan Power Limitation assuming Constant Volume

Handbook of Energy Audits. Thuman,PE,RA, Albert, Third Ed.1992

Note: Actual savings will depend on operating conditions and application

Electric	1,139.11	**kWh**	3,887.77	Mbtus
Heating (G/E)	1,452	**Therms or kWh**	145,155.13	Mbtus
		Total Energy	**149,042.90**	**MBtus**

Howell High School					
Number of Classrooms: 104	249,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
3	Motor upgrades, standard efficiency to high efficiency	P4P	$35,000.00	$3,390.00	1,750.00	6,300.00	3,874.50	46,924.50	11,731.13	35,193.38	10.38

Cost Basis:	The $35,000 cost for the motor upgrades is based on vendor pricing and typical installation and construction costs in the Central NJ region.
Saving Projection:	The savings projection is based on $0.113 per kWh multiplied by 36,000 kwh projected to be saved for a total savings of $4,068.00.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	36,000.00	$4,068.00	19,908.00	59.60	49.26	1.74
Gas Savings (Therms)		$0.00	0.00	0.00	0.00	0.00
Total Savings Kbtu	122,837.10	$4,068.00	19,908.00	59.60	49.26	
					Total Pollution Reduction in Cars Removed from the Road =	**1.74**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From site visit and Haglid Engineering evaluation of (3) 10HP motors, upgrading to high efficiency motors along with Variable Speed Drives is estimated to reduce energy consumption by 3 kW per motor. They are considered to run for 4,000 hours/year (savings = 2 x 3kW x 4,000 hours = 36,000kWh).		
Energy Savings Factor of Safety	1.2	Estimated annual savings with energy savings factor of safety =	$3,390
Discussion	The implementation of this involves installing the motor upgrades and also making sure that these motor are efficiently controlled and are either shut down or effectively cycled during lo use or low occupancy times. The savings are conservative and we believe that with reasonable commissioning this can easily be exceeded. The recommendation would be to hold off on this energy reduction measure for the simple reason that the payback is not that attractive and it takes away from some of the larger projects that also have a poor payback but can possibly be brought into one of the incentive programs by putting this together with other items that have a quicker payback.		

Howell High School					
Number of Classrooms: 104	249,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	Replace (2) 7,500 MBH w/ (4) 2,856 MBH	P4P	$170,880.00	$18,316.85	8,544.00	30,758.40	18,916.42	229,098.82	57,274.70	171,824.11	9.38

Cost Basis:	The cost for these two 7500 MBH and four 2,856 MBH boilers are based on RS Means and known construction numbers for high schools in Central, NJ.
Saving Projection:	Given the existing condition of the current boilers and the relative efficiency of the current boilers, which we believe is at 81%, there would be a benefit to replacing these with newer high efficiency boilers. The gain in efficiency is not going to be great. Boilers when operating run at about 80%. There is an additional ability to go into the low 90% of efficiency but the gain in efficiency is not going to be immense. We believe that an annual savings of $22,896.07 is a reasonable number and that this is a conservative estimate.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kW)		$0.00	0.00	0.00	0.00	0.00
Gas Savings (Therms)	21,952.13	$22,896.07	1,052,202.79	2,152.71	2,603.28	91.90
Total Savings Kbtu	2,195,212.80	$22,896.07	1,052,202.79	2,152.71	2,603.28	
					Total Pollution Reduction in Cars Removed from the Road =	**91.90**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From site visit and Haglid Engineering evaluation of the replacement of the two 7500 MBH with four 2,856 MBH will increase the efficiency of each 7500 MBH system by 13.2%.		
Energy Savings Factor of Safety	1.25	Estimated annual savings with energy savings factor of safety =	$18,317
Discussion:	This project has a payback of 9.38 years and will be difficult will be incentivize in itself. While this is something we recommend to do for maintenance, servability and general reliability of this equipment, we believe some of these boilers are over 30 years old and have actually passed there normal expected useful life. These boilers are very old and will need to be replaced sometime in the near future. There is an ability to package these heavy mechanical upgrades with a relatively long payback with other items that have a quicker payback. This could potentially could be incentivized under Pay for Performance and this is something we would recommend.		

Howell High School					
Number of Classrooms: 104	249,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
1	Replace Boiler HW Heat Exchanger with <500gal. Gas fired AO Smith HW Boiler	P4P	$102,500.00	$7,500.00	5,125.00	18,450.00	11,346.75	137,421.75	34,355.44	103,066.31	13.74

Cost Basis:	Replacing the hot water boiler with a new less than 500 gallon gas fired AO Smith hot water boiler is based on RS Means, known construction and vendor pricing the installed cost with labor would be about $102,500.
Saving Projection:	The boiler upgrade would improve the efficiency from around 74% up to 92% for a projected savings of $9019.66, after energy savings factor of safety is considered the estimated value is $7,500.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kW)		$0.00	0.00	0.00	0.00	0.00
Gas Savings (Therms)	8647.808	$9,019.66	414,504.13	848.04	1,025.54	36.20
Total Savings Kbtu	864,780.80	$9,019.66	414,504.13	848.04	1,025.54	
					Total Pollution Reduction in Cars Removed from the Road =	**36.20**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From site visit and Haglid Engineering evaluation of existing boiler Gas efficiency of 74% to Aerco 90.4% efficient boiler (savings=10.4% x current Gas usage).		
Energy Savings Factor of Safety	1.20	Estimated annual savings with energy savings factor of safety =	$7,500
Discussion:	At this time, given the long payback, it is not recommended to do this energy reduction measure and replacing the existing boiler/hot water heat exchanger with a gas fired AO Smith boiler. This would be a recommendation if there is a failure in the system and there would be a need to replace what is currently being used. The payback is not going to be attractive enough to make this economically viable when packaged with other more expensive components. Our recommendation is to use this as a good thing to do as the existing equipment starts to become maintenance prone or fails all together.		

Howell High School		
Number of Classrooms: 104	249,000	Gross SF Area

5.0%	GC	**25.0%**
	Allowance	
18.0%	Contingency	
	& Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**Laser prints on off mode at night, times power strips**	P4P	$8,517.00	$5,678.60	425.85	1,533.06	942.83	11,418.74	2,854.69	8,564.06	1.51

Cost Basis:	This is based on installing in 104 classrooms with a cost of $81.90 (cost with shipping and labor) per power saver strip with the ability to shut down additional plug-ins such as laser printers and other components. The installed effort would be done with an onsite maintenance personelle or possibly the people occupying the classrooms. This has been shown to provide an efficient way to get rid of vampire loads from printers and other equipment that are generally left on 24/7.
Saving Projection:	The saving is based on publications involved with evaluating the effectiveness of these components. For our geographic area we believe that the energy savings would be projected at 42.65 kWh per classroom per month for 104 classrooms. When we evaluate this we find that a reasonable estimated savings is $6,014.67.

Energy Savings	Savings per Year (kWh)	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	53,227.20	$6,014.67	29,434.64	88.12	72.83	2.57
Gas (Therms)	0.00	$0.00	0	0	0	0
Total Savings (kBtu)	181,618.74	$6,014.67	2,148,728.86	6,433.08	5,316.29	
					Total Pollution Reduction in Cars Removed from the Road =	**187.66**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Haglid Engineers has installed a set back power and an inline watt meter. Found typical watt meter savings of 42.65 kWh/month	or	$4.82	per month
	42.65 kWh/month x 12 months = 512 kWh/year per classroom			
	512 kWh/year per classroom x 104 classrooms = 181,618.74 kWh/year			
Energy Savings Factor of Safety	1.06	Estimated annual savings with energy savings factor of safety =	$5,678.60	
Discussion:	These vampire load shutting power strips have been shown in peer reviewed articles to provide good energy savings while being relatively easy to install. It would be something that would be a low enough payback that it would actually help to bring high cost items such as heavy mechanical components more into line with the type of cost and internal rate of return in order to justify these capital projects. The recommendation would be to do these power strips for the simple reason that they are easy to install, have a quick payback and they would effectively help reduce the cost of other more expensive items.			

Howell High School		
Number of Classrooms: 104	249,000	Gross SF Area

5.0%	GC Allowance		**25.0%**
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Soda vending machines off at night or weekends**	P4P	$2,640.00	$1,200.00	132.00	475.20	292.25	3,539.45	884.86	2,654.59	2.21

Cost Basis:	Based on 10 USAT vending machines at 189.00 each plus a $75.00 labor to install each for a total of $2,640.00.
Saving Projection:	This is based on conservative estimates on weekends and late nights that the machines can be used to go into deep set back where the refrigeration can be shut off. It can be noted that this should only be used for things like soda; ice cream and milk would not be a good candidate for this type of energy savings measure.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	11,150.00	$1,259.95	6,165.95	18.46	15.26	0.54
Gas (Therms)		$0.00	0	0	0	0
Total Savings (kBtu)	38,045.38	$1,259.95			**Total Pollution Reduction in Cars Removed from the Road =**	**0.54**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Assumes savings of 1,115 kWh per vending machine each year		
	Two vending machines can use this upgrade		
Energy Savigns Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$1,200.00
Discussion:	There are candy machines and soda machines that do not need to keep all components refrigerated to keep them in a saleable fashion. For instance; coca cola, diet coke sodas can have the refrigeration shut off over long weekend, night or times where there is no one in the school. It would not be recommended to use this technology for any dairy products or foods that can potentially spoil with elevated temperatures. This is a good way to tie an occupancy sensors to when people are in the area and when the machines runs.		

Howell High School		
Number of Classrooms: 104	249,000	Gross SF Area

5.0%	GC Allowance		**25.0%**
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
3	**Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)**	P4P	$4,362.80	$2,017.60	218.14	785.30	482.96	5,849.21	1,462.30	4,386.90	2.17

Cost Basis:	Price of Equipment and installation is estimated to be $41.95 per class room based off of vendor pricing. With a total of 104 class rooms, the estimated installed hard cost is $4,362.80.
Saving Projection:	The savings is projected to be roughly 50% annually based off initial investment. This is calculated to be $2,138.86 saved per year, making this energy reduction measure have an attractive payback. The savings is based off of historical data and past experience, see details below.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	18,928.00	$2,138.86	10,467.18	31.34	25.90	0.91
Gas (Therms)	0.00	$0.00				
Total Savings (kBtu)	64,585.02	$2,138.86			**Total Pollution Reduction in Cars Removed from the Road =**	**0.91**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	104 classrooms would have set-back power strip		
	Each classroom would have set-back savings of 182 kWh/ year.		
	Laser printers and other peripheral devices would add to savings.		
Energy Savings Factor of Safety	1.06	Estimated annual savings with energy savings factor of safety =	$2,017.60
Discussion:	Considering the low cost and easy installation, this is a recommended energy reduction measure. The simple payback of under three years is also another attractive benefit this investment offers.		

Howell High School		
Number of Classrooms: 104	249,000	Gross SF Area

5.0%	GC Allowance		**25.0%**
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**Other ERMs - Controls Upgrade**	P4P	$682,000.00	$34,960.00	34,100.00	122,760.00	75,497.40	914,357.40	228,589.35	685,768.05	19.62

Cost Basis:	The cost of this controls upgrade was provided with vendor pricing from one of the existing controls vendors that are currently providing controls automation for the school. This is based on a quote with vendor pricing with labor costs built in.
Saving Projection:	Based on typical energy savings from other projects of the same kind for high schools, we believe that the savings projection of $39,535.31 is reasonable and relatively conservative.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	273,120.00	$30,862.56	151,035.36	452.18	373.68	13.19
Gas (Therms)	8,315.20	$8,672.75	398,561.66	815.42	986.09	34.81
Total Savings Kbtu	1,763,444.11	$39,535.31	549,597.02	1,267.61	1,359.78	
					Total Pollution Reduction in Cars Removed from the Road =	**48.00**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From observations and the current operation of the existing pneumatic controls, Haglid Engineers estimate projected savings of 10%.		
Factor of Safety	1.13	Estimated annual savings with energy savings factor of safety =	$34,960.00
Discussion:	With a payback of 19.62 years this would have a relatively long payback. The expense is excessive, part of it involves upgrading controls that currently are not functioning. We would recommend upgrading the controls especially for the large exhaust fans that are running wild 24/7. Part of this can be addressed with the DOAS and other components we would evaluate as the project goes forward and try to address them as a part of the other energy reduction measures. Due to the cost of this energy reduction measure and the payback estimated at 19.62 years, we cannot recommend this energy reduction measure at this time.		

School/Building	ATC	Mechanical*	Contigency	Total
BOE	$ 85,500	$ 15,000	10%	**$ 110,550**
Tranporation	$ 34,000	$ -	10%	**$ 37,400**
Coltsneck HS	$ 225,000	$ -	10%	**$ 247,500**
Howell HS	$ 570,000	$ 50,000	10%	**$ 682,000**
Freehold Boro HS	$ 670,000	$ 50,000	10%	**$ 792,000**
Freehold Twp HS	$ 565,000	$ 75,000	10%	**$ 704,000**
Manalapan HS	$ 525,000	$ 75,000	10%	**$ 660,000**
Marlboro HS	$ 820,000	$ 100,000	10%	**$ 1,012,000**

* ATC contractor provides the valve and the Mechanical Contractor will install.

Howell High School					
Number of Classrooms: 104	249,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
3	**Envelope upgrades: roof insulation with a roof project (min R20; Avg. R25)**	P4P	$1,689,442.00	$22,277.00	84,472.10	304,099.56	187,021.23	2,265,034.89	566,258.72	1,698,776.17	76.26

Cost Basis:	The budgetary cost for evaluating the envelope, roof and insulation is provided with RS Means and known construction costs for working on similar high school projects in the Central NJ area. The estimate installed hard costs at $1,689,442.00 is typical of a roof this size.
Saving Projection:	The savings projection is based on computer modeling of like kind high schools in the area and we believe is relatively conservative but typically envelope upgrades do not have tremendously attractive energy savings and we believe this is reasonable and typical for this type of envelope upgrade.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	0.00	$0.00	0.00	0.00	0.00	0.00
Gas Savings (Therms)	22,500.00	$23,467.50	1,078,463.22	2,206.44	2,668.26	94.19
Total Savings Kbtu	2,250,000.00	$23,467.50	1,078,463.22	2,206.44	2,668.26	
					Total Pollution Reduction in Cars Removed from the Road =	**94.19**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Haglid Engineering projects gas heating savings of 22,500 therms		
Energy Savings Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$22,277
Discussion	Given an estimated payback in excess of 75 years, this is not an energy reduction measure we would recommend until the roof needs to be repaired. Until that time, generally the cost of adding excess insulation or improving the roof to an R20 rating is something that is not as expensive as replacing the insulation and adding a new roof. The recommendation is to wait until the roof needs to be repaired and at that time evaluate adding thermal insulation to have the roof at least approach R20 and an average of R25.		

Preliminary ESMs

Prepared for:

Manalapan High School

Prepared by:

Haglid Engineering and Associates, Inc.

80 Broadway
Hillsdale, NJ 07642

Telephone: (201) 722-1233
Fax: (201) 722-0999

Engineer: Klas C. Haglid, P. E.

Assumptions	
$/kWh	0.122
$/Therm	1.045

	Energy Use	Expense
Current Electric Usage (kWh)	2,377,200.00	$290,018.40
Current Gas Usage (Therms)	106,618.00	$111,415.81
Total kBtu	18,773,139.21	$401,434.21

Total Annual Savings	$216,055.80
% savings of Current Utility Bill	53.82%

Manalapan High School		
Number of Classrooms: 156	256,000	Gross SF Area

5.0%	GC Allowance	**25.0%**	
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.
Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**VRF and VRV variable refrigeration volume**	P4P	$324,000.00	$26,776.00	16,200.00	58,320.00	35,866.80	434,386.80	108,596.70	325,790.10	12.17

Cost Basis:	Estimated installed cost of $324,000 for 12 offices or classrooms ($27,000 per class) based on installed costs for Public High School installations on previous projects in the last two years in central NJ. This includes union labor and other typical installation costs.
Saving Projection:	A Trane Trace model for a "like kind" school in the same geographic area was modeled for adding VRV to 26 classrooms/offices at 243,736kWh/year or 9,374.5 kWh/class and 40,435 Therms or 1555.2 Therms/class. So for 12 classrooms the total annual savings for electric and gas is 112,493.54kWh and 18,662.31 respectively. See attached Trace model.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	112,493.54	$13,724.21	62,208.93	186.25	153.91	5.43
Gas (Therms)	18662.31	$19,502.11	894,516.22	1,830.10	2,213.15	78.12
Total Savings Kbtu	2,250,074.89	$33,226.33	956,725.15	2,016.35	2,367.06	
					Total Pollution Reduction in Cars Removed from the Road =	**83.56**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	This VRV system will have an EER rating of 13 or better with reheat and the ability to recover heat energy from one classroom to another. The existing HVAC system has an EER of less than 7.0. The Existing RTU is in very poor condition and over 30 years old.		
Energy Savings Safety Factor	1.24	Estimated annual savings with Energy Savings Factor of Safety =	$26,776.00
Discussion:	There are parts of this high school that would benefit from this system, especially administrative offices. These calculations are based on installing VRV Heat pumps in 12 offices or classrooms. This is not a school wide application but strictly meant for office areas, critical use and areas that typically would have use during the summer months. While we have seen these VRV systems have very good savings compared to heating and cooling areas in other schools, we believe that for Manalapan this can likely be expected to be used in areas that do not have air conditioning or functional air conditioning. Therefore, the savings will not be great compared to the cost of this project. This can be something that we evaluate as this project goes forward. Another interesting note is that in Manalapan High School there is an excessive amount of ventilation and the idea would be to address some of the runaway exhaust fans and other issues in tandem with installing the HVAC upgrades.		

VRVs for Manalapan High School

Location	**Manalapan High School**	
Building owner	**Freehold Regional High School District**	
Program user	**Employee**	
Company	**Haglid Engineering & Associates**	
Comments	**Energy Evaluation for VRV at Manalapan High School**	
By	**Haglid Engineering & Associates, Inc.**	
Dataset name	**C:\Documents and Settings\Klas Haglid\My Documents\TRACE 700 Projects\Freehold Region HS\Manalapan HS VRV.trc**	
Calculation time	**05:10 PM on 12/23/2013**	
TRACE® 700 version	**6.2.6.5**	
Location	**McGuire AFB, New Jersey**	
Latitude	**40.0**	**deg**
Longitude	**74.0**	**deg**
Time Zone	**5**	
Elevation	**133**	**ft**
Barometric pressure	**29.8**	**in. Hg**
Air density	**0.0757**	**lb/cu ft**
Air specific heat	**0.2444**	**Btu/lb·°F**
Density-specific heat product	**1.1098**	**Btu/h·cfm·°F**
Latent heat factor	**4,885.3**	**Btu·min/h·cu ft**
Enthalpy factor	**4.5402**	**lb·min/hr·cu ft**
Summer design dry bulb	**89**	**°F**
Summer design wet bulb	**76**	**°F**
Winter design dry bulb	**11**	**°F**
Summer clearness number	**0.99**	
Winter clearness number	**0.99**	
Summer ground reflectance	**0.20**	
Winter ground reflectance	**0.20**	
Carbon Dioxide Level	**400**	**ppm**
Design simulation period	**January - December**	
Cooling load methodology	**TETD-TA1**	
Heating load methodology	**UATD**	

MONTHLY ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1	**Manalapan HS**												
Electric													
On-Pk Cons. (kWh)	74,227	73,967	63,465	42,976	50,069	51,213	77,057	76,166	58,206	46,758	54,202	69,129	737,433
On-Pk Demand (kW)	212	221	194	198	270	398	456	451	333	178	191	207	456
Gas													
On-Pk Cons. (therms)	9,692	11,607	7,233	1,265	8	0	0	0	0	1,948	4,691	8,700	45,143
On-Pk Demand (therms/hr)	31	35	22	10	1	0	0	0	0	15	20	27	35

Energy Consumption

Building	94,645 Btu/(ft2-year)
Source	165,611 Btu/(ft2-year)
Floor Area	74,290 ft2

Environmental Impact Analysis

CO2	1,468,439 lbm/year
SO2	3,990 gm/year
NOX	2,058 gm/year

MONTHLY ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2 VRV Upgrades													
Electric													
On-Pk Cons. (kWh)	45,374	43,779	42,932	37,906	44,932	33,828	39,079	39,974	44,954	39,983	38,511	42,446	493,697
On-Pk Demand (kW)	271	268	264	204	198	214	234	234	210	208	242	270	271
Gas													
On-Pk Cons. (therms)	1,076	1,262	664	155	2	0	0	0	0	268	453	826	4,708
On-Pk Demand (therms/hr)	9	10	7	4	0	0	0	0	0	4	4	7	10

Energy Consumption

Building	29,018 Btu/(ft2-year)
Source	74,721 Btu/(ft2-year)
Floor Area	74,290 ft2

Environmental Impact Analysis

CO2	450,224 lbm/year
SO2	1,223 gm/year
NOX	631 gm/year

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Manalapan HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Lights													
Electric (kWh)	20,618.1	18,645.4	22,021.4	19,726.6	21,319.7	6,169.7	6,316.3	6,381.2	19,726.7	21,319.8	20,428.3	19,916.5	202,589.6
Peak (kW)	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
Misc. Ld													
Electric (kWh)	12,690.5	11,462.3	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	149,420.0
Peak (kW)	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Cooling Coil Condensate													
Recoverable Water (1000gal)	0.0	0.0	0.0	0.7	1.4	7.3	12.9	15.4	5.9	0.5	0.0	0.0	44.2
Peak (1000gal/Hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=66.94 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=66.94 tons / 120.5 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	753.7	4,994.6	8,923.0	17,589.1	17,217.6	7,973.7	0.0	0.0	0.0	57,451.6
Peak (kW)	0.0	0.0	13.4	40.1	59.3	93.2	114.3	112.7	70.0	29.1	0.6	0.0	114.3
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=101.2 tons / 12.95 kW]													
Electric (kWh)	0.0	0.0	0.0	95.1	616.5	1,079.5	2,070.2	2,038.3	967.0	0.0	0.0	0.0	6,866.4
Peak (kW)	0.0	0.0	1.8	5.0	7.1	10.9	12.7	12.7	8.2	3.6	0.1	0.0	12.7
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	10.0	27.0	48.8	74.4	74.4	40.0	0.0	0.0	0.0	274.6
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=62.35 tons]													
Air-cooled unitary - 002 [Clg Nominal Capacity/F.L.Rate=62.35 tons / 112.2 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	1,156.7	3,964.1	11,629.7	20,319.0	20,544.4	8,880.4	718.4	0.0	0.0	67,212.6
Peak (kW)	0.0	0.0	0.0	19.0	31.6	83.7	106.5	105.0	62.8	18.3	0.0	0.0	106.5
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=94.26 tons / 12.07 kW]													
Electric (kWh)	0.0	0.0	0.0	147.2	495.1	1,426.2	2,410.0	2,448.2	1,096.3	92.0	0.0	0.0	8,115.0
Peak (kW)	0.0	0.0	0.0	2.4	3.8	9.8	11.9	11.8	7.4	2.3	0.0	0.0	11.9
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	18.0	38.6	63.2	74.4	74.4	64.0	8.1	0.0	0.0	340.7
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=28.44 tons]													

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Manalapan HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=28.44 tons]													
Air-cooled unitary - 003 [Clg Nominal Capacity/F.L.Rate=28.44 tons / 51.20 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	942.5	3,473.3	6,538.4	9,684.0	9,193.5	5,103.9	252.1	0.0	0.0	35,187.8
Peak (kW)	0.0	0.0	0.0	14.8	25.4	44.4	48.0	46.7	35.2	9.1	0.0	0.0	48.0
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=43.01 tons / 5.50 kW]													
Electric (kWh)	0.0	0.0	0.0	119.8	433.2	800.2	1,148.5	1,094.5	627.1	32.4	0.0	0.0	4,255.6
Peak (kW)	0.0	0.0	0.0	1.9	3.0	5.2	5.4	5.3	4.1	1.2	0.0	0.0	5.4
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	20.0	47.0	72.0	74.4	74.4	68.0	5.4	0.0	0.0	361.2
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Cpl 4: Cooling plant - 008 [Sum of dsn coil capacities=13.98 tons]													
Air-cooled unitary - 004 [Clg Nominal Capacity/F.L.Rate=13.98 tons / 25.17 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	20.4	505.7	1,906.1	4,055.0	3,810.3	1,070.2	0.0	0.0	0.0	11,367.8
Peak (kW)	0.0	0.0	0.0	2.9	8.3	19.2	23.8	23.1	14.0	0.0	0.0	0.0	23.8
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=21.14 tons / 2.71 kW]													
Electric (kWh)	0.0	0.0	0.0	2.6	62.6	230.4	476.8	449.9	130.0	0.0	0.0	0.0	1,352.3
Peak (kW)	0.0	0.0	0.0	0.4	1.0	2.2	2.7	2.6	1.6	0.0	0.0	0.0	2.7
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	4.0	23.5	44.4	74.4	74.4	37.0	0.0	0.0	0.0	257.7
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=781.1 mbh]													
Boiler - 004 [Nominal Capacity/F.L.Rate=781.1 mbh / 12.02 Therms] (Heating Equipment)													
Gas (therms)	1,520.1	1,936.7	1,129.1	169.0	0.0	0.0	0.0	0.0	0.0	251.1	693.0	1,417.1	7,116.0
Peak (therms/Hr)	5.1	5.8	4.0	2.5	0.0	0.0	0.0	0.0	0.0	2.8	3.4	4.5	5.8
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	669.6	604.8	545.4	145.8	0.0	0.0	0.0	0.0	0.0	226.8	477.9	669.6	3,339.9
Peak (kW)	0.9	0.9	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.9	0.9	0.9	0.9
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	581.1	524.9	473.3	126.5	0.0	0.0	0.0	0.0	0.0	196.8	414.8	581.1	2,898.7
Peak (kW)	0.8	0.8	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.8	0.8

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Manalapan HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=781.1 mbh]													
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	303.0	81.0	0.0	0.0	0.0	0.0	0.0	126.0	265.5	372.0	1,855.5
Peak (kW)	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=3,560 mbh]													
Boiler - 007 [Nominal Capacity/F.L.Rate=3,560 mbh / 54.77 Therms] (Heating Equipment)													
Gas (therms)	7,535.3	8,992.2	5,689.5	1,066.9	7.7	0.0	0.0	0.0	0.0	1,632.9	3,737.6	6,726.5	35,388.5
Peak (therms/Hr)	24.2	27.9	18.5	9.0	1.4	0.0	0.0	0.0	0.0	13.0	17.2	22.7	27.9
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	186.0	127.5	6.5	0.0	0.0	0.0	0.0	186.0	180.0	186.0	1,226.0
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	2,648.7	2,392.4	2,648.7	1,815.7	92.6	0.0	0.0	0.0	0.0	2,648.8	2,563.3	2,648.7	17,458.9
Peak (kW)	3.6	3.6	3.6	3.6	3.6	0.0	0.0	0.0	0.0	3.6	3.6	3.6	3.6
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	372.0	255.0	13.0	0.0	0.0	0.0	0.0	372.0	360.0	372.0	2,452.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 3: Heating plant - 006 [Sum of dsn coil capacities=239.0 mbh]													
Boiler - 006 [Nominal Capacity/F.L.Rate=239.0 mbh / 3.68 Therms] (Heating Equipment)													
Gas (therms)	636.3	678.5	414.1	28.8	0.0	0.0	0.0	0.0	0.0	64.2	260.2	556.4	2,638.5
Peak (therms/Hr)	2.0	2.2	1.5	0.8	0.0	0.0	0.0	0.0	0.0	1.3	1.5	1.8	2.2
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	144.8	15.0	0.0	0.0	0.0	0.0	0.0	27.5	118.0	186.0	845.3
Peak (kW)	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	177.8	160.6	138.4	14.3	0.0	0.0	0.0	0.0	0.0	26.3	112.8	177.8	808.0
Peak (kW)	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	289.5	30.0	0.0	0.0	0.0	0.0	0.0	55.0	236.0	372.0	1,690.5
Peak (kW)	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Manalapan HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 4: Heating plant - 007 [Sum of dsn coil capacities=618.7 mbh]													
Electric Resistance - 005 [Nominal Capacity/F.L.Rate=618.7 mbh / 181.3 kW] (Heating Equipment)													
Electric (kWh)	35,353.0	38,832.0	23,652.0	5,067.7	1,265.2	0.0	0.0	0.0	140.2	7,774.6	16,764.3	30,956.4	159,805.6
Peak (kW)	73.9	82.6	57.2	25.9	8.8	0.0	0.0	0.0	1.4	39.5	52.8	69.3	82.6

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Lights													
Electric (kWh)	20,618.1	18,645.4	22,021.4	19,726.6	21,319.7	6,169.7	6,316.3	6,381.2	19,726.7	21,319.8	20,428.3	19,916.5	202,589.6
Peak (kW)	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
Misc. Ld													
Electric (kWh)	12,690.5	11,462.3	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	149,420.0
Peak (kW)	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Cooling Coil Condensate													
Recoverable Water (1000gal)	1.0	0.3	2.4	6.2	11.2	14.5	15.8	17.0	12.7	5.6	3.1	1.2	90.9
Peak (1000gal/Hr)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=40.67 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=40.67 tons / 39.66 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	103.5	40.2	228.2	1,240.0	2,793.2	3,904.2	5,217.4	6,046.8	3,546.6	1,268.9	424.3	118.8	24,932.1
Peak (kW)	1.5	1.5	3.1	19.9	24.1	28.5	34.9	35.2	29.4	19.3	12.5	1.9	35.2
Air-cooled unitary - 001 [Htg Nominal Capacity/F.L.Rate=549.1 mbh / 40.31 kW] (Cooling Equipment - Heating Mode)													
Electric (kWh)	451.1	895.9	152.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	343.1	1,842.7
Peak (kW)	19.4	22.2	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	22.2
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=51.95 tons / 2.55 kW]													
Electric (kWh)	320.7	234.2	468.4	468.4	514.2	560.0	733.1	707.7	516.8	516.8	481.1	399.7	5,921.0
Peak (kW)	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	75.5	68.0	103.5	92.0	101.0	110.0	144.0	139.0	101.5	101.5	94.5	88.5	1,219.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=36.36 tons]													
Air-cooled unitary - 002 [Clg Nominal Capacity/F.L.Rate=36.36 tons / 35.45 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	66.9	20.2	234.7	1,039.0	3,381.3	5,185.1	6,621.8	6,902.5	4,404.0	753.4	339.8	94.3	29,043.1
Peak (kW)	3.7	1.6	5.0	17.8	20.1	28.8	34.5	33.5	26.9	17.8	13.9	4.4	34.5
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=46.45 tons / 2.28 kW]													
Electric (kWh)	430.2	173.0	471.1	578.1	826.2	910.4	1,204.0	994.6	901.3	546.2	439.3	371.0	7,845.2
Peak (kW)	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=36.36 tons]													
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	94.5	38.0	103.5	127.0	181.5	200.0	264.5	218.5	198.0	120.0	96.5	81.5	1,723.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=18.60 tons]													
Air-cooled unitary - 003 [Clg Nominal Capacity/F.L.Rate=18.60 tons / 18.13 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	51.1	19.3	170.7	725.6	1,728.0	2,398.1	3,119.8	3,159.1	1,774.6	579.7	192.3	62.1	13,980.4
Peak (kW)	1.4	1.3	2.6	9.4	11.8	13.9	17.3	16.9	13.5	9.5	8.5	1.6	17.3
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=23.75 tons / 1.16 kW]													
Electric (kWh)	142.0	62.9	214.2	214.2	279.3	367.8	481.8	426.0	273.5	230.4	220.0	136.2	3,048.1
Peak (kW)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	61.0	27.0	92.0	92.0	120.0	158.0	207.0	183.0	117.5	99.0	94.5	58.5	1,309.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 4: Cooling plant - 008 [Sum of dsn coil capacities=8.33 tons]													
Air-cooled unitary - 004 [Clg Nominal Capacity/F.L.Rate=8.33 tons / 11.00 kW] [**Orig F.L.Rate=11.00 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	265.4	838.8	1,364.7	1,803.5	1,844.1	956.3	192.8	0.0	0.0	7,265.5
Peak (kW)	0.0	0.0	2.0	5.3	6.8	9.3	10.0	10.0	9.1	4.4	2.6	0.0	10.0
Condenser fan for Heat Pump [Design Heat Rejection/F.L.Rate=11.46 tons / 1.38 kW]													
Electric (kWh)	0.0	0.0	0.0	39.7	123.2	197.4	250.5	257.0	138.2	28.9	0.0	0.0	1,034.9
Peak (kW)	0.0	0.0	0.3	0.8	1.0	1.3	1.3	1.3	1.3	0.7	0.4	0.0	1.3
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	12.0	19.8	22.0	25.1	23.8	18.0	11.0	0.0	0.0	131.7
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=407.2 mbh]													
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=1,206 mbh]													
Boiler - 007 [Nominal Capacity/F.L.Rate=1,206 mbh / 14.49 Therms] (Heating Equipment)													
Gas (therms)	1,007.9	1,177.1	641.7	155.5	2.0	0.0	0.0	0.0	0.0	268.2	453.4	783.0	4,488.9
Peak (therms/Hr)	7.4	8.6	5.2	3.8	0.4	0.0	0.0	0.0	0.0	3.9	3.9	5.4	8.6

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=1,206 mbh]													
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	186.0	36.0	2.0	0.0	0.0	0.0	0.0	50.8	130.5	186.0	945.3
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	897.7	810.9	897.7	173.8	9.7	0.0	0.0	0.0	0.0	245.0	629.9	897.7	4,562.3
Peak (kW)	1.2	1.2	1.2	1.2	1.2	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	372.0	72.0	4.0	0.0	0.0	0.0	0.0	101.5	261.0	372.0	1,890.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 3: Heating plant - 006 [Sum of dsn coil capacities=201.3 mbh]													
Boiler - 006 [Nominal Capacity/F.L.Rate=201.3 mbh / 2.42 Therms] (Heating Equipment)													
Gas (therms)	68.5	85.2	21.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.2	218.8
Peak (therms/Hr)	1.7	2.2	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	2.2
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	12.5	15.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	43.3
Peak (kW)	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	10.1	12.1	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	34.8
Peak (kW)	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	25.0	30.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	86.5
Peak (kW)	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
Hpl 4: Heating plant - 007 [Sum of dsn coil capacities=381.8 mbh]													
Electric Resistance - 005 [Nominal Capacity/F.L.Rate=381.8 mbh / 111.9 kW] (Heating Equipment)													
Electric (kWh)	8,765.2	10,720.3	4,503.4	722.9	0.0	0.0	0.0	0.0	0.0	1,127.0	2,398.0	6,591.6	34,828.4
Peak (kW)	111.9	111.9	111.3	29.1	0.0	0.0	0.0	0.0	0.0	31.7	82.3	111.9	111.9

Manalapan High School					
Number of Classrooms: 156	256,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure
Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Lighting upgrades, at least T-8 or LED**	P4P	$201,883.50	$32,561.85	10,094.18	36,339.03	22,348.50	270,665.21	67,666.30	202,998.91	6.23

Cost Basis:	The $201,883.50 is based on doing the common areas, hallways and some of the longer run time lighting. These are based on known construction numbers for our area, RS Means and costs from other high school projects in Central NJ.
Saving Projection:	The annual saving is based on the change in Wattage from the existing fixture of mainly T8 and some T12's to high efficiency LED lighting. These are then estimated with something on the order of 4000 run hours a year. In some areas such as hallways, this would be higher as the lighting in these areas are used late into the night for custodial purposes. Stairways and other areas would run 24/7, so it is a mixture of run hours throughout the facility.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	364,603.24	$44,481.60	201625.5935	603.65	498.8527052	17.60922214
Gas (Therms)	-1,991.77	$ (2,081.40)	-95469.09971	-195.3212461	-236.202759	-8.337912638
Total Savings Kbtu	1,044,900.51	$42,400.19	106156.4938	408.3253577	262.6499462	

Total Pollution Reduction in Cars Removed from the Road = **9.27**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Areas 101,102,104 which consist areas such ashallways, stairwells, and bathrooms will be considered for the current Energy Reduction Measure
	Area 103 are all classrooms and will not be included at this time in the Energy Reduction Measure
	Run hours are assumed to be the following as stated in the "Assumption Details" below

Assumption Details

Group	Run Time	Existing Total (kW)	Number of Fixtures	Retrofit Total (kW)	Savings Kwh	$ Savings	Comments
101	2,400	110	833	40	167,904	20,484	Recommended
102			0			0	Not part of Project Work
103	3,190	37	331	15	68,611	8,370	Recommended
104	8,760	25	278	10	128,089	15,627	Recommended
	Totals =	**172.09**	**1,442.00**	**66.00**	**364,603.24**	**42,400.19**	An additional gas heating cost is considered as shown in row labeled "Assumptions"

Energy Savigns Factor of Safety	1.30	Estimated annual savings with energy savings factor of safety =	$32,561.85

Discussion:	Recently a lighting audit has been done that is more comprehensive in nature and covers a larger amount of lighting going into the classrooms. We believe that this will have additional benefits and savings. However, before we can recommend this we are going to have to see sampling, test cases done in some of the classrooms where the lighting is installed. Specifically this is CPL rated, high performance, LED lighting. It has been represented that the light levels will be well in excess of 50ft candles but there are many parameters to lighting (color rendering index, quality of light, temperature, light levels at the desk height). At this point in time we recommend that there be several test sites in several classrooms to evaluate the lighting going into the individual classrooms.

TRI-STATE LED
255 Mill Street, 2nd Floor
Greenwich, CT 06830

p: (203) 813-3791
f: (203) 813-3794

www.TriStateLED.com

Project Name	MANALAPAN HS
Street Name	20 CHURCH LANE
City/State	ENGLISHTOWN NJ
Zip Code	7726
Site Contact	PAT GRAVANIS
Phone #	
Cell Phone #	
Fax #	
Email Address	
Proposal Date	5/29/2013

Hours of Operation

Group 101		Group 102	
Hrs/Day	16	Hrs/Day	13
Days/Wk	6	Days/Wk	6
Wks/Yr	46	Wks/Yr	46
Total Hrs	4428	Total Hrs	3598

Group 103		Group 104	
Hrs/Day	18	Hrs/Day	24
Days/Wk	7	Days/Wk	7
Wks/Yr	46	Wks/Yr	52
Total Hrs	5812	Total Hrs	8760

Project Description

Supply LED Lamps & Fixtures as per Lighting Audit Worksheet

Sales Person	CHRIS ANASTASI	Cell Phone Number	914-482-4442
Sales Person		Cell Phone Number	

SEESMART® EARTH FRIENDLY LED SOLUTIONS
DURACELL® LED Lighting
CREE® LED Lighting Solutions
RAB LIGHTING

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
2	104	8760		ATTENDANCE		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
3	104	8760		ATTENDANCE	EMERGENCY	4.3.4SRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit, Ballast Ready LED Tube Lights, 3- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	66
4	101	4428		MAIN FOYER		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
5	104	8760		NURSE		4.2.4ERB	7	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
6	104	8760		NURSE		4.2.3ELRB	7	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
7	101	4428		MAIN HALL		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
8	101	4428		MAIN OFFICE HALL		4.3.32ELP	10	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
9	104	8760		ASST PRINCIPAL OFFICE		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
10	103	5812		WOMENS/MENS		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
11	103	5812		WOMENS/MENS		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
12	104	8760		OFFICE		4.2.4ERB	6	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
13	101	4428		CLOSET		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
14	101	4428		CLOSET		A60	1	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
15	104	8760		MAIN OFFICE		4.2.3ELRB	17	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
16	103	5812		BATH		2.2.3ELP	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
17	103	5812		BATH		2.3.2SRB	1	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
18	104	8760		OFFICE		4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
19	103	5812		GIRLS		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
20	101	4428		CLOSET		A60	1	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
21	104	8760		GUIDANCE SUITE		4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
22	101	4428		GUIDANCE HALL		4.2.3ELRB	5	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
23	104	8760		WORK ROOM		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
24	104	8760		OFFICE,DIR OFFICE,CONF RM,OFFICE4		4.2.3ELRB	17	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
25	104	8760		OFFICES:5,6,7,8,COPYRM,CST OFFICE, LOUNGE		4.2.3ELRB	18	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
26	101	4428		STORAGE		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
27	102	3598		EXIT 2, D WING HALL, A111, OFFICE, CLOSET		4.3.32ELP	48	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
28	101	4428		A WING BAND HALL		4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
29	103	5812		BOYS		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
30	101	4428		CLOSET 6		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
31	102	3598		MUSIC HALL, CLOSET 0, OFFICE 3, OFFICE 2		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
32	102	3598		MUSIC DIR OFFICE, MUSIC LIBRARY,CL0,OFF3,OFF2		4.3.3ERB	8	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
33	104	8760		OFFICE, MUSIC ROOM,		4.3.3ERB	18	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
34	101	4428		CLOSET		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
35	101	4428		CLOSET		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
36	101	4428		AUDITORIUM		4.3.32ELP	45	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
37	101	4428		AUDITORIUM		P38.120	24	65 WATT	65	Seesmart Par 38, 18W High Powered, DIMMABLE, 120V, SKU: 180121-180129	18
38	101	4428		AUDITORIUM		A40	3	A LAMP 100 WATT INCANDESCENT	100	Seesmart Household Bulb, 12Watt, SMD 120V SKU:140041-140042	12
39	101	4428		STAGE		A75D	14	A LAMP 200 WATT INCANDESCENT	150	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
40	101	4428		DRAMA BACKSTAGE		4.1.3ERB	28	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
41	101	4428		DRAMA BACKSTAGE		4.2.4ERB	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
42	103	5812		ART FOYER/MENS/WOMENS		4.2.4ERB	9	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
43	101	4428		ART FOYER		A100	2	42 WATT CFL	42	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
44	102	3598		A106		4.2.4ERB	49	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
45	102	3598		DESIGN LAB		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
46	101	4428		STORAGE		4.2.4ERB	5	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
47	102	3598		ART HALL,A105,A104,KILN		4.3.32ELP	52	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
48	102	3598		A103,AHALL		4.3.32ELP	16	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
49	101	4428		MAIN LOBBY HALL		2.2.3ELP	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
50	102	3598		SECTION A		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
51	102	3598		SUPERVISION ROOM, SCHOOL STORE		4.3.32ELP	15	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
52	101	4428		STORAGE		A60	6	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
53	101	4428		SCHOOL STORE		4.2.3ERB	3	4' FIXTURE, 3-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	151	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
54	104	8760		ELEC CLOSET		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
55	102	3598		LOUNGE,LOUNGE STORAGE		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
56	102	3598		LOUNGE STORAGE		4.2.4ERB	6	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
57	104	8760		OFFICE		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
58	104	8760		OFFICE		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
59	101	4428		CLOSET		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
60	104	8760		SAL OFFICE		4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
61	101	4428		STAC		4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
62	101	4428		STAC		4.2.4ERB	9	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
63	102	3598		OFFICE,CAFÉ		4.3.32ELP	60	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
64	102	3598		CAFÉ,STORAGE		4.2.4ERB	37	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
65	102	3598		KITCHEN		4.3.32ELP	23	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
66	104	8760		DISH ROOM,OFFICE STOR		4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
67	101	4428		OFFICE STOR		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
68	101	4428		OVEN HOOD		2.3.2SRB	6	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
69	101	4428		STORAGE		4.2.4SR	5	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
70	102	3598		SLOP ROOM		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
71	102	3598		FREEZER		A40D	2	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
72	102	3598		KITCHEN,KITCHEN LOUNGE		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
73	102	3598		KITCHEN LOUNGE		4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
74	103	5812		WOMENS		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
75	103	5812		D HALL, BOYS		4.3.32ELP	19	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
76	103	5812		BOYS		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
77	101	4428		EXIT HALL, CUSTODIANS		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
78	103	5812		WOMENS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
79	101	4428		STORAGE		4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
80	102	3598		D101,D103,D104,D107,D109		4.3.32ELP	54	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
81	101	4428		EXIT 5		2.2.3ELP	5	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
82	102	3598		D111,D115		4.3.32ELP	21	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
83	102	3598		D113,D117		4.2.3ELRB	28	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
84	101	4428		EXIT 9		2.2.3ELP	4	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
85	104	8760		SS OFFICE		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
86	104	8760		SUPERVISOR		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
87	101	4428		G HALL		4.2.4ERB	25	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
88	102	3598		G102,G104,G106,G108		4.2.3ELRB	51	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
89	102	3598		G106		2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
90	101	4428		WORK ROOM		4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
91	104	8760		G WING EXIT 11 STAIRS		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
92	104	8760		G WING EXIT 11 STAIRS	EMERGENCY	4.3.3SRB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit, Ballast Ready LED Tube Lights, 2- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	44
93	101	4428		G WING EXIT 11 STAIRS		2.2.3SR	3	2x2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	82	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
94	102	3598		G112,G105,G103,G101, OFFICE		4.2.3ELRB	65	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
95	104	8760		G EXIT 10 STAIRWELL		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
96	104	8760		G EXIT 10 STAIRWELL	EMERGENCY	4.3.3SRB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit, Ballast Ready LED Tube Lights, 2- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	44
97	103	5812		BOYS, WOMENS		4.2.4ERB	6	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
98	104	8760		STAIRS		2.2.3SR	4	2x2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	82	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
99	101	4428		EXIT 12 HALL		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
100	104	8760		ELEC CLOSET		4.1.3ERB	2	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
101	104	8760		G WING BOILER ROOM		4.1.3ERB	6	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
102	101	4428		E HALL EXIT		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
103	102	3598		E HALL, E115,E113,E111,E108,E109		4.3.3ERB	69	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
104	102	3598		E115,E111,E108,E109		4.1.4SRB	24	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
105	102	3598		E106,E107,E105,E101		4.3.3ERB	44	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
106	102	3598		E107,E105,E103,E101		4.1.4SRB	20	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
107	102	3598		E104		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
108	101	4428		CLOSET		A40D	14	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
109	102	3598		CHALL,C118,C120		4.3.32ELP	28	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
110	101	4428		EXIT 14,EXIT 15		2.2.3ELP	9	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
111	102	3598		E102,E104		4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
112	102	3598		C116,C114,C112,C108,C104,C100		4.3.32ELP	54	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
113	102	3598		C110,C106,C102,		4.3.3ERB	30	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
114	101	4428		BOOK ROOM,WORK ROOM, EXIT10		4.3.3ERB	9	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
115	101	4428		EXIT 15		2.2.3ELP	10	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
116	103	5812		BOYS/GIRLS		4.3.3ERB	6	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
117	102	3598		C ELEC RM, CLOSET, CUST CLOS, FACULTY, STORAGE		4.2.4SR	10	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
118	104	8760		ELEVATOR, FACULTY		4.2.3ERB	2	4' FIXTURE, 3-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	151	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
119	102	3598	2ND	C HALL,C200,C204,C206,C208,C210,PRE PRM		4.3.32ELP	75	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
120	102	3598		STORAGE, PREP RM		4.2.4SR	18	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
121	102	3598		C212,C214,C218		4.3.32ELP	33	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
122	101	4428		E WING HALL		2.2.3ELP	26	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
123	101	4428		STORAGE, EQUIP STORAGE		4.2.4SR	3	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
124	103	5812		GIRLS		4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
125	103	5812		GIRLS		2.2.3SR	1	2x2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	82	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
126	101	4428		E WING HALL		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
127	102	3598		E201,E203,E205,E207,E209,E211,E213, E215		4.1.4SRB	38	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
128	102	3598		E201,E203,E204,E205,E207,E209,E211, E213,E215		4.3.3ERB	100	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
129	104	8760		E WING OFFIC, LOUNGES		4.3.3ERB	8	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
130	101	4428		CLOSETS		A40D	10	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
131	102	3598		E208		4.3.32ELP	17	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
132	103	5812		BOYS/GIRLS		4.2.4ERB	6	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
133	101	4428	2ND	G WING HALL		4.2.4ERB	11	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
134	103	5812		G204,CONFRM,G205,SCIENCE OFFICE, OFFICE, PREP		4.2.3ELRB	78	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
135	103	5812		G203,G202,G201,OFFICE		4.2.3ELRB	68	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
136	101	4428	2ND	D HALL		2.2.3ELP	4	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
137	101	4428		D HALL		4.2.3ELRB	14	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
138	102	3598		D225,D221,D219,D217,D215,D213,D211, D209,D207, D205		4.2.3ELRB	124	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
139	103	5812		MENS		2.2.3SR	1	2x2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	82	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
140	102	3598		MENS, D223		4.3.3ERB	8	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
141	101	4428		CLOSET		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
142	101	4428		WORK ROOM		4.3.3ERB	4	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
143	102	3598		SCIENCE & ENG RM		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
144	102	3598		SCIENCE & ENG RM		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
145	103	5812		WOMENS/GIRLS		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
146	103	5812		GIRLS		4.2.3ERB	1	4' FIXTURE, 3-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	151	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
147	102	3598		D203		4.2.3ELRB	14	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
148	102	3598		D203		2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
149	101	4428		CLOSET		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
150	102	3598	2ND	AHALL,A203,A202,A201		4.3.32ELP	43	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
151	102	3598		STORAGE,MENS		4.2.4SR	4	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
152	103	5812		MENS		2.3.2SRB	1	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
153	101	4428		LIBRARY		2.3.32ELP	89	2x2' 3-F40T8, BIAX ELECTRONIC BALLAST	120	New 2x2 Parabolic Fixture With 3 - 8 Watt LED Tube Lights SKU: PARA9C317X-2	24
154	101	4428		LIBRARY		2.3.4ERB	45	2x2' FIXTURE, 2-F40 BIAX LAMPS, ELECTRONIC BALLAST	80	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
155	101	4428		LIBRARY		4.2.4ERB	8	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
156	103	5812		WOMENS/MENS		4.2.4SR	3	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
157	101	4428	1ST	B HALL		4.3.32ELP	43	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
158	101	4428		STORAGE		4.3.3ERB	4	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
159	102	3598		B101,B103,CUSTRM, OFFICES		4.3.32ELP	53	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
160	102	3598		B105		4.3.3ERB	18	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
161	101	4428		RECEIVING		4.2.4SR	9	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
162	101	4428		RECEIVING		2.2.3ELP	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
163	101	4428		B BOILER RM, STORAGE		4.2.4SR	10	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
164	101	4428		MAIN GYM		MH400.1	40	METAL HALIDE, 1-400 WATT LAMP	458	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
165	101	4428		CLOSET,GYM STORAGE		4.2.4SR	6	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
166	104	8760		PHYS ED OFFICE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
167	101	4428		HALL, BATHS		4.2.4SR	15	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
168	103	5812		BOYS/GIRLS TEAM RMS		4.3.32ELP	16	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
169	104	8760		COACH OFFICE		4.3.3ERB	8	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
170	101	4428		TRAINERS ROOM		4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
171	101	4428		TRAINERS ROOM		4.2.4SR	7	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
172	101	4428		BOYS LOCKER ROOM		4.3.3ERB	22	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
173	101	4428		BOYS LOCKER ROOM, OFFICE, LOCKER RM		A60	7	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
174	104	8760		OFFICE		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
175	104	8760		OFFICE		4.3.3ERB	2	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
176	104	8760		OFFICE		2.1.2SRB	2	2' FIXTURE, 1-F20/T12/STD LAMP, STANDARD MAGNETIC BALLAST	28	Retrofit - LED Tube Lights, 2 Foot, 8W, 120V-277V, Single End Power	8
177	101	4428		LOCKER ROOM		4.3.3ERB	7	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
178	101	4428		AUX GYM		MH400.1	20	METAL HALIDE, 1-400 WATT LAMP	458	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
179	101	4428		AUX GYM		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
180	104	8760		STORAGE, OFFICE		4.3.3ERB	4	4' FIXTURE, 4-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	188	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
181	104	8760		OFFICE		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
182	103	5812	1ST	H WING, BOYS, GIRLS		4.2.4ERB	34	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
183	101	4428		H WING	EMERGENCY	4.3.3SRB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit, Ballast Ready LED Tube Lights, 2- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	44
184	102	3598		H100,H101		4.2.3ELRB	30	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
185	101	4428		AUX GYM 2		MH350	40	METAL HALIDE, 1-250 WATT LAMP	295	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
186	101	4428		CUSTODIAN, STORAGE		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
187	101	4428		WEIGHT ROOM		4.1.3ERB	35	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
188	101	4428		G WING EXIT 25		4.2.4ERB	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
189	104	8760		OFFICE		4.1.3ERB	6	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
190	102	3598		H102		4.2.4ERB	12	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
191	101	4428		B106 HALL		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
192	103	5812		BOYS/GIRLS		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
193	103	5812		BOYS/GIRLS		2.2.3ELP	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
194	101	4428		CUSTODIAN		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
195	102	3598		B108,B106,OFFICES,B HALL,RLA HALL		4.3.32ELP	54	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
196	101	4428		CLOSET		2.2.3ELP	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
197	102	3598		100,101,102		4.2.3ELRB	23	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
198	102	3598		CONF RM		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
199	101	4428		STORAGE		A60	2	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
200	104	8760		OFFICE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
201	103	5812		RESTROOM		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
202	101	4428		GYM		4.3.32ELP	16	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
203	101	4428		GYM		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
204	101	4428		STORAGE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
205	101	4428		STORAGE		A60	2	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
206	101	4428		STORAGE		4.2.4ERB	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
207	102	3598		CLASS		4.2.3ELRB	26	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
208	102	3598		CLASS		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
209	101	4428		STORAGE		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
210	104	8760		OFFICE		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
211	102	3598		B116		MH400.1	20	METAL HALIDE, 1-400 WATT LAMP	458	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
212	101	4428		STORAGE		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
213	104	8760		BASEMENT		4.1.3ERB	72	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
214	102	3598		WALL PACK	EXTERIOR	HPS175	33	HIGH PRESSURE SODIUM, 1-175 WATT LAMP	200	RAB 78W LED WALL PACK - ALED4T78	78
215	102	3598		PARKING POLES	EXTERIOR	HPS225	28	HIGH PRESSURE SODIUM, 1-250 WATT LAMP	295	SEESMART HIGH POWERED 22 WATT LED LAMP SKU; 130028-130039 (3000-3200 Lumens)	22
216	102	3598		PARKING POLES	EXTERIOR	HPS750	6	HIGH PRESSURE SODIUM, 1-400 WATT LAMP	465	Cree XSP2 Street light, 100 Watt, High Lumen, With Photocell	100
217	102	3598		CANOPY	EXTERIOR	A100	30	42 WATT CFL	42	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
218	102	3598		CANOPY	EXTERIOR	MH70	24	METAL HALIDE, 1-70 WATT LAMP	95	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
219	102	3598		WALL PACK	EXTERIOR	HPS50	3	HIGH PRESSURE SODIUM, 1-70 WATT LAMP	95	RAB 26W LED WALL PACK - WPLED26	26
220	102	3598		CANOPY	EXTERIOR	A60	4	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
221	102	3598		WALL	EXTERIOR	P38.75D	2	100 WATT	100	Duracell Energy Star Par 38, 17 Watt 120V, 38DEG	17

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
				Total Fixture Quantity		3103					

TRI-STATE LED
255 Mill Street, 2nd Floor
Greenwich, CT 06830
p: (203) 813-3791
f: (203) 813-3794
www.TriStateLED.com

Demand		Usage	
Existing Demand: kW	383.67	Existing Use: kWh	1,660,178.52
Proposed Demand: kW	150.81	Proposed Use: kWh	656,512.52
Demand Reduction: kWr	232.86	Use Reduction: kWh	1,003,666.00
Total Lighting Energy Savings			60.5%
Combined Unit Use Cost: kWh	$0.15	Supply Savings: KWH Per Year	$150,549.90
		*Delivery Savings: KW Per Year	$41,914.08
		*Maintenance Savings Per Year (Lamps & Ballast only)	$24,000.00
		*15% HVAC Savings Per Year	$35,579.96
Total Monthly Savings			$21,003.66
Total Annual Savings			$252,043.94
Total Cost Savings 5 Years			$1,260,219.70

Financial Summary

Material Cost	*$705,627.33*
Estimated Baypoint Electric Labor Cost	*$153,000.00*
One Time Approx. Rebate	*$140,000.00*
Total Job Cost (After Rebate & Labor)	*$718,627.33*
Simple Payback (months)	**34.2**
First Year Return on Investment	*35.07%*
CO_2 Reduction (lbs)	1,334,875.78

School : Manalapan

Summary of Lighting Quote and Audit

Group	Run Time	Existing Total (W)	Number of Fixtures	Retrofit Total (W)	Savings Kwh	Area Served	Comments
101	4,428	110,245	833	40,285	309,783		Recommended
102	4,067	221,729	1,715	88,051	543,668	Classrooms	Not part of Project Work
103	5,812	36,801	331	15,293	125,004		Recommended
104	8,760	25,042	278	10,420	128,089		Recommended

Group	Run Time	Existing Total (kW)	Number of Fixtures	Retrofit Total (kW)	Savings Kwh	$ Savings	Comments
101	2,400	110.25	833.00	40.29	167,904.00	$ 20,484.29	Recommended
102							Not part of Project Work
103	3,190	36.80	331.00	15.29	68,610.52	$ 8,370.48	Recommended
104	8,760	25.04	278.00	10.42	128,088.72	$ 15,626.82	Recommended
	Totals =	172.09	1,442.00	66.00	364,603.24	$ 44,481.60	

	kWh	Therms	$ Amount	**Factor of Safety**
Lighting Savings =	364,603.24		$ 44,481.60	1.30
Heating Costs =		-1991.773758	$ (2,081.40)	
Total Net Savings =			$ 42,400.19	

Manalapan High School		
Number of Classrooms: 156	256,000	Gross SF Area

5.0%	GC Allowance		**25.0%**
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled,

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**DOAS ventilation system**	P4P	$596,400.00	$96,193.54	29,820.00	107,352.00	66,021.48	799,593.48	199,898.37	599,695.11	6.23

Cost Basis:

The cost basis of the $596,400 is based on 81 classrooms and known construction numbers from other high schools in this central part of NJ. We believe that this will cover a large number of the classrooms in Manalapan High School and will provide additional benefits in the form of thermal comfort. The cost is based on a direct counter flow high efficiency heat exchanger that can move up to 500 cubic feet per minute. These would be tied to two high performance fans that would use 0.2 Watts per CFM and provide an energy efficiency rating of above 60. These units would be individually controlled, there would be one energy recovery module per classroom and it would be tied to a self calibrating CO2 sensor that would come on at a prescribed part per million concentration of CO2.

Saving Projection:

Projected Savings of 1,452 Therms per classroom X 81 classrooms for a total projected savings = 117,612 therms. The saving is modeled using a bin method where within a NJ Weather bin temperature range the hours at a certain temperature are modeled using 30 year weather data for the central area of NJ. Also this is based on full Pay for Performance projects where these units have been installed monitored and verified and evaluated for energy savings and this has been used to provide the estimated annual savings. We believe this number is conservative and with careful installation and preparation, this number can be exceeded.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	40,095.00	$4,891.59	22172.5352	66.38	54.85825967	1.936465956
Gas (Therms)	117612	$122,904.54	5637342.95	11533.49987	13947.50723	492.3443624
Total Savings Kbtu	11,898,009.82	$127,796.13	5659515.485	11599.8822	14002.36549	
					Total Pollution Reduction in Cars Removed from the Road =	**494.28**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions

The current system is poorly controlled and has an existing fan consumption of 691 watts. The new system is to have an 87% thermally efficient BPE direct counter flow air to air energy system. Proposed fans would use 123 watts of power and be controlled with GE CO2 sensor running only with classroom occupancy of 6 hours for 5 days. Existing system is 700 cfm and new system is 700 cfm, typically switch from dilution ventilation to displacement ventilation can reduce ventilation needs by 2.5 times. in other schools the 700 cfm can be reduced to below 300cfm with improved IAQ. This will produce additional savings that is currently not modeled.

Assumptions Details	Quantity	CFM	%OA	% Run time	Heating eff. (%)	Cooling Eff. (EER)	Comments
	(81) BPE-XE-MIR 500	700	100%	18%	65%	9	

Energy Savings Factor of Safety	1.33	Estimated annual savings with energy savings factor of safety =	$96,193.54

Discussion:

Currently Manalapan High School, with talking with onsite Maintenance and Building management, we find that there is an awful lot of outdoor air being brought in throughout all weather conditions taken through unit ventilators and different HVAC equipment and in a single pass being exhausted up to the roof. We were also able to look at some of these and found that they are not controllable by the building automation or control systems. When we asked how these are shut down during weekends or holidays, we found that they are left to basically run which means that there is a lot of outdoor air running through the building for 8,760 run hours per year. The idea would be to illuminate some of these exhaust fans all together and replace them with the dedicated outdoor air system and in other places, tie these exhaust fans into a building automation system or a timer and only have them running during occupied times of the school year where there are people in the school. This will also reduce the amount of moisture being brought through the building and will help with thermal comfort and the cost of owning and operating this high school.

BPE Payback Calculator

Enter in the requested information below. If you are not sure of a value, See our recommendations in the comment boxes (red arrows).

Thank you for using BPE, Inc.®
For more specific engineering analysis, please see the BPE Performance Calculator at: **www.LowKWH.com**

SYSTEM GENERAL INFO		
Heating System Type	Gas Fired	
Cooling System Type	DX	
Outdoor Air Flow (OA)	700	scfm
Percent Outdoor Air (OA/SA, %)	100	%
Building Type	Commercial (> 5,000 SF)	
Nearest Location	Newark, NJ	

Number of Units

2000	1000	500	200
0	0	1	0

UTILITY INFORMATION	
Electric Rate ($/kWh)	0.122
Peak Demand Charge ($/kW)	
Months of Peak Demand Charge	0
Gas Rates ($/Therm)	1.045

COST ASSUMPTIONS		
Installed Cost per Ton ($/Ton)	0	*Use for New Construction or Major Retrofits
ERV Installed Cost	$ 3,844.20	
Maintenance Savings	$ -	
Total Incentives	$ -	

SYSTEM EFFICIENCIES		
Heating Efficiency	65	%
Cooling Efficiency	9	EER
BPE Effectiveness	87	%

CONTROLS AND SET-POINTS		
CO_2 Controller	Yes	
Percent Run-time	18	%
Summer (Cooling)	74	°F (db)
Winter (Heating)	70	°F (db)

20 Years of Savings!

BPE Energy Recovery Ventilators are guaranteed for 20 years not to become unusable for providing breathable air as a result from rust, rot, or corrosion. This does not apply to other gases other than breathable air. See Limited Lifetime Warranty for more details.

ENERGY ANALYSIS		
BPE Cooling Capacity	1.29	TONS
BPE Heating Capacity	44.40	MBH
Peak Demand Reduction	1.72	KW
Annual Electric Energy Saved	3,888	MBTU
Annual Thermal Energy Saved	145,155	MBTU
TOTAL Savings	**149,043**	MBTU

OPERATING COST ANALYSIS		
Maintenance Savings	$	-
Cooling Cost Savings	$	(60)
Peak Demand Cost Savings	$	-
Heating Cost Savings (Gas or HP)	$	(1,517)
Electrical Cost Savings (ER+Fans)	$	(109)
Electric Resistive Savings		0
Reduced Supply + Exhaust Fan Savings		(109)
BPE Parasitic Fan Cost		31
TOTAL Savings	**$**	**(1,686.50)**

CAPITAL EXPENSE ANALYSIS		
HVAC Initial Cost Avoidance	$	-
Added Cost of ERV	$	3,844
Total Incentives/Funding	$	-
Net Capital Expenditure	$	3,844
Simple Payback (Years)		**2.28**
Internal Rate of Return (IRR)		**44%**
Net Present Value (20 Yr Life Cycle)		**$40,064.49**
Emission Reduction (Cars/yr)		**6.13**

	200	500	1000	2000
Products:	0	1	0	0

All Weather Air Management

Ex Eff	87%
Evaporative Eff	Not Used
Winter SP T3	70
Summer SP T3	74

Equipment Operation and Efficiencies					System Air Flow Profile			
Del. Heat Eff	65%	Gas	0	KWh Elect/Thm	Nominal CFM	Actual CFM	Supply CFM	Exhaust CFM
	1.05	$/Therm	0.12	$/kWh	500	700	700	700
Del. Cool Eff	NA	Gas	1.33	KWh Elect/Ton				
	1.05	$/Therm	0.12	$/kWh				
		Demand Savings	0.00	$/kW				

Profile of Energy Savings

Time of Year	Mid-Pts	DB (F)	Total	OA Temp DB (F)	OA Supply Temp DB (F)	Space Temp DB (F)	Exhaust Temp DB (F)	Recovered BTU/H	Annually Saved BTUs	OPERATE BPE?
Summer Cooling	117.5	115 to 120	0	117.5	79.7	74	111.8	-	-	NO
	112.5	110 to 115	0	112.5	79.0	74	107.5	-	-	NO
	107.5	105 to 110	0	107.5	78.4	74	103.1	-	-	NO
	102.5	100 to 105	0	102.5	77.7	74	98.8	-	-	NO
	97.5	95 to 100	6	97.5	77.1	74	94.4	15,456	92,739	YES
	92.5	90 to 95	40	92.5	76.4	74	90.1	12,168	486,713	YES
	87.5	85 to 90	122	87.5	75.8	74	85.7	8,879	1,083,265	YES
	82.5	80 to 85	500	82.5	75.1	74	81.4	5,591	2,795,310	YES
	77.5	75 to 80	620	77.5	74.5	74	77.0	2,302	1,427,252	NO
	72.5	70 to 75	847	72.5	73.8	74	72.7	-	-	NO
Free Cooling	67.5	65 to 70	671	67.5	73.2	74	71.2			NO
	62.5	60 to 65	927	62.5	72.5	74	64.0			NO
	57.5	55 to 60	600	57.5	71.9	74	59.6			NO
	52.5	50 to 55	730	52.5	67.7	70	54.8			YES
	47.5	45 to 50	634	47.5	67.1	70	50.4			YES
Winter Heating	42.5	40 to 45	513	42.5	66.4	70	46.1	(18,087)	(9,278,785)	YES
	37.5	35 to 40	1023	37.5	65.8	70	41.7	(21,376)	(21,867,546)	YES
	32.5	30 to 35	734	32.5	65.1	70	37.4	(24,665)	(18,103,743)	YES
	27.5	25 to 30	391	27.5	64.5	70	33.0	(27,953)	(10,929,662)	YES
	22.5	20 to 25	195	22.5	63.8	70	28.7	(31,242)	(6,092,132)	YES
	17.5	15 to 20	125	17.5	63.2	70	24.3	(34,530)	(4,316,288)	YES
	12.5	10 to 15	47	12.5	62.5	70	20.0	(37,819)	(1,777,488)	YES
	7.5	5 to 10	34	7.5	61.9	70	15.6	(41,108)	(1,397,655)	YES
	2.5	0 to 5	1	2.5	61.2	70	11.3	(44,396)	(44,396)	YES
	-2.5	-5 to 0	0	-2.5	60.6	70	6.9	-	-	YES
	-7.5	-10 to -5	0	-7.5	59.9	70	2.6	-	-	YES

ERV Operating Hours = **917**
All Operating Hours = **8,760**
% Cooling = 24%
% Heating = 35%
% Free = 25%

Operational Hours

* ASHRAE Std. 90.1-2004, Table 6.5.3.1 Fan Power Limitation assuming Constant Volume

Handbook of Energy Audits. Thuman,PE,RA, Albert, Third Ed.1992

	Supply Fan HP/1,000 cfm*
	1.2
Peak Tonnage Reduction =	1.72
Total System Cfm =	220
Cfm Reduction =	687
Existing HVAC Fan (W) =	691
Proposed HVAC Fan (W) =	123.00
kWh Savings =	895
Proposed HVAC Fan Savings* =	**$ 109.20**

Fan Power (kWh) =	251
Fan Power Cost =	**$ 30.66**
Total Cooling Saved (BTU) =	4,458,026
Total Peak Demand kW saved =	1.72
Peak Energy Savings ($ for kW) =	**$ -**
Total Cooling Power Saved (kWh) =	495.34
Cooling Savings =	$ 60.43
Total Cooling Savings =	**$ 60.43**
Total Heating Saved (BTU) =	(73,807,694)
Total Heating Saved (Therms or kWh) =	1,452
Total Heating Savings =	**$ 1,516.87**
Total Motor/Electric Savings =	**$ 109.20**
Maintenance Savings =	**$ -**
Net Savings =	**$ 1,686.50**
Cost of Project =	**$ 3,844.20**
Simple Payback (Yrs) =	**2.28**

Note: Actual savings will depend on operating conditions and application

Electric	1,139.11	**kWh**	3,887.77	Mbtus
Heating (G/E)	1,452	**Therms or kWh**	145,155.13	Mbtus
		Total Energy	**149,042.90**	**MBtus**

Manalapan High School		
Number of Classrooms: 156	256,000	Gross SF Area

5.0%	GC Allowance	**25.0%**
18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *;
Importance*; 1 =

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	Motor upgrades, standard efficiency to high efficiency - VFD (2) 10 HP	P4P	$16,000.00	$2,256.00	800.00	2,880.00	1,771.20	21,451.20	5,362.80	16,088.40	7.13

Cost Basis:	The $16,000 cost for the motor upgrades or $8,000 each, is based on vendor pricing and typical installation and construction costs in the Central NJ region.
Saving Projection:	The savings projection is based on $0.122 per kWh multiplied by 28,646.40 kwh projected to be saved for a total savings of $3,494.86.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kW)	28,646.40	$3,494.86	15,841.46	47.43	39.19	1.38
Gas Savings (Therms)	0	$0.00	0.00	0.00	0.00	0.00
Total Savings Kbtu	28,646.40	$3,494.86	15,841.46	47.43	39.19	
					Total Pollution Reduction in Cars Removed from the Road =	**119.75**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From site visit and Haglid Engineering evaluation of existing motor upgrade improvement is estimated to reduce energy consumption by 3.5808 kW per motor - (2) 10HP motors considered to run for 4,000 hours/year (savings = 2x3.5808x 4,000 hours).		
Energy Savings Factor of Safety	1.5	Estimated annual savings with energy savings factor of safety =	$2,256
Discussion:	The implementation of this involves installing the motor upgrades and also making sure that these motor are efficiently controlled and are either shut down or effectively cycled during low use or low occupancy times. The savings are conservative and we believe that with reasonable commissioning this can easily be exceeded. The recommendation would be to hold off on this energy reduction measure for the simple reason that the payback is not that attractive and it takes away from some of the larger projects that also have a poor payback but can possibly be brought into one of the incentive programs by putting this together with other items that have a quicker payback.		

Manalapan High School					
Number of Classrooms: 156	256,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
3	Motor upgrades, standard efficiency to high efficiency - VFD (2) 25 HP	P4P	$32,000.00	$6,224.00	1,600.00	5,760.00	3,542.40	42,902.40	10,725.60	32,176.80	5.17

Cost Basis:	The $32,000 cost for the motor upgrades is based on vendor pricing and typical installation and construction costs in the Central NJ region.
Saving Projection:	The savings projection is based on $0.122 per kWh multiplied by 71,616 kWh projected to be saved for a total savings of $8,737.15.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	71,616.00	$8,737.15	39,603.65	118.57	97.99	3.46
Gas Savings (Therms)		$0.00	0.00	0.00	0.00	0.00
Total Savings Kbtu	244,363.93	$8,737.15	39,603.65	118.57	97.99	
					Total Pollution Reduction in Cars Removed from the Road =	**3.46**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Heating hydronic run time = 4000 hours/year 2 pumps running at 70% of maximum flow on average pump efficiencies of 88% with additional savings with new electric motors with new minimum efficiency of over 90%		
Energy Savings Factor of Safety	1.40	Estimated annual savings with energy savings factor of safety =	$6,224
Discussion	The implementation of this involves installing the motor upgrades and also making sure that these motor are efficiently controlled and are either shut down or effectively cycled during low use or low occupancy times. The savings are conservative and we believe that with reasonable commissioning this can easily be exceeded. The recommendation would be to hold off on this energy reduction measure for the simple reason that the payback is not that attractive and it takes away from some of the larger projects that also have a poor payback but can possibly be brought into one of the incentive programs by putting this together with other items that have a quicker payback.		

Manalapan High School		
Number of Classrooms: 156	256,000	Gross SF Area

5.0%	GC Allowance		**25.0%**
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *;
Importance*; 1 =

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	4000 CFM Wing ERV Upgrade	P4P	$22,000.00	$4,230.00	1,100.00	3,960.00	1,980.00	29,040.00	7,260.00	21,780.00	5.15

Cost Basis:	The Cost is based on vendor pricing and known construction costs. It has been estimated to be $15,990 for the cost of the ERV plus $6,010 for installation, for a total of $22,000.
Saving Projection:	Projected Savings of 6,674 Therms and 849 kWh for a total projected savings = $7,077.96. The saving is modeled using a bin method where within a NJ Weather bin temperature range the hours at a certain temperature are modeled using 30 year weather data for the central area of NJ. Also this is based on full Pay for Performance projects where these units have been installed monitored and verified and evaluated for energy savings and this has been used to provide the estimated annual savings. We believe this number is conservative and with careful installation and preparation, this number can be exceeded.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kW)	849.40	$103.63	469.72	1.41	1.16	0.04
Gas Savings (Therms)	6,674.00	$6,974.33	319,896.16	654.48	791.46	27.94
Total Savings Kbtu	7,523.40	$7,077.96	320,365.88	655.89	792.63	
					Total Pollution Reduction in Cars Removed from the Road =	**27.98**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	The current system is poorly controlled and has inefficient blowers. The new system is to have a 70% thermally efficient BPE direct counter flow air to air energy system. Proposed fans would use 742 watts of power and be controlled with GE CO2 sensor running only with classroom occupancy of 6 hours for 5 days.						
Assumptions Details	**Quantity**	**CFM**	**%OA**	**% Run time**	**Heating eff. (%)**	**Cooling Eff. (EER)**	**Comments**
	(2) BPE-XE-MIR 2000	4000	100%	18%	65%	9	
Energy Savings Factor of Safety	1.67	Estimated annual savings with energy savings factor of safety =				$4,230.00	
Discussion:	This equipment has the benefit of saving energy and also provide better indoor air quality for all of the students and staff.						

BPE Payback Calculator

Enter in the requested information below. If you are not sure of a value, See our recommendations in the comment boxes (red arrows).

Thank you for using BPE, Inc.®
For more specific engineering analysis, please see the BPE Performance Calculator at: **www.LowKWH.com**

SYSTEM GENERAL INFO		
Heating System Type	Gas Fired	
Cooling System Type	DX	
Outdoor Air Flow (OA)	2,000	scfm
Percent Outdoor Air (OA/SA, %)	100	%
Building Type	Commercial (> 5,000 SF)	
Nearest Location	Newark, NJ	

Number of Units

2000	1000	500	200
1	0	0	0

UTILITY INFORMATION	
Electric Rate ($/kWh)	0.122
Peak Demand Charge ($/kW)	
Months of Peak Demand Charge	0
Gas Rates ($/Therm)	1.045

COST ASSUMPTIONS		
Installed Cost per Ton ($/Ton)	0	*Use for New Construction or Major Retrofits
ERV Installed Cost	$ 11,000	
Maintenance Savings	$ -	
Total Incentives	$ -	

SYSTEM EFFICIENCIES		
Heating Efficiency	65	%
Cooling Efficiency	9	EER
BPE Effectiveness	70	%

CONTROLS AND SET-POINTS		
CO_2 Controller	Yes	
Percent Run-time	18	%
Summer (Cooling)	74	°F (db)
Winter (Heating)	70	°F (db)

20 Years of Savings!

BPE Energy Recovery Ventilators are guaranteed for 20 years not to become unusable for providing breathable air as a result from rust, rot, or corrosion. This does not apply to other gases other than breathable air. See Limited Lifetime Warranty for more details.

ENERGY ANALYSIS		
BPE Cooling Capacity	2.96	TONS
BPE Heating Capacity	102.06	MBH
Peak Demand Reduction	3.95	KW
Annual Electric Energy Saved	338	MBTU
Annual Thermal Energy Saved	333,690	MBTU
TOTAL Savings	**334,028**	MBTU

OPERATING COST ANALYSIS		
Maintenance Savings	$	-
Cooling Cost Savings	$	(52)
Peak Demand Cost Savings	$	-
Heating Cost Savings (Gas or HP)	$	(3,487)
Electrical Cost Savings (ER+Fans)	$	(109)
Electric Resistive Savings		0
Reduced Supply + Exhaust Fan Savings		(109)
BPE Parasitic Fan Cost		149
TOTAL Savings	**$**	**(3,648.07)**

CAPITAL EXPENSE ANALYSIS		
HVAC Initial Cost Avoidance	$	-
Added Cost of ERV	$	11,000
Total Incentives/Funding	$	-
Net Capital Expenditure	$	11,000
Simple Payback (Years)		**3.02**
Internal Rate of Return (IRR)		**33%**
Net Present Value (20 Yr Life Cycle)		**$86,158.66**
Emission Reduction (Cars/yr)		**13.97**

	200	500	1000	2000
Products:	0	0	0	1

All Weather Air Management

Ex Eff	70%
Evaporative Eff	Not Used
Winter SP T3	70
Summer SP T3	74

Equipment Operation and Efficiencies					System Air Flow Profile			
Del. Heat Eff	65%	Gas	0	KWh Elect/Thm	Nominal CFM	Actual CFM	Supply CFM	Exhaust CFM
	1.05	$/Therm	0.12	$/kWh	2,000	2,000	2,000	2,000
Del. Cool Eff	NA	Gas	1.33	KWh Elect/Ton				
	1.05	$/Therm	0.12	$/kWh				
		Demand Savings	0.00	$/kW				

Profile of Energy Savings

Time of Year	Mid-Pts	DB (F)	Total	OA Temp DB (F)	OA Supply Temp DB (F)	Space Temp DB (F)	Exhaust Temp DB (F)	Recovered BTU/H	Annually Saved BTUs	OPERATE BPE?
	117.5	115 to 120	0	117.5	87.1	74	104.5	-	-	NO
	112.5	110 to 115	0	112.5	85.6	74	101.0	-	-	NO
	107.5	105 to 110	0	107.5	84.1	74	97.5	-	-	NO
	102.5	100 to 105	0	102.5	82.6	74	94.0	-	-	NO
Summer Cooling	97.5	95 to 100	6	97.5	81.1	74	90.5	35,532	213,192	YES
	92.5	90 to 95	40	92.5	79.6	74	87.0	27,972	1,118,880	YES
	87.5	85 to 90	122	87.5	78.1	74	83.5	20,412	2,490,264	YES
	82.5	80 to 85	500	82.5	76.6	74	80.0	12,852	6,426,000	NO
	77.5	75 to 80	620	77.5	75.1	74	76.5	5,292	3,281,040	NO
	72.5	70 to 75	847	72.5	73.6	74	73.0	-	-	NO
	67.5	65 to 70	671	67.5	72.1	74	71.7			NO
	62.5	60 to 65	927	62.5	70.6	74	66.0			NO
Free Cooling	57.5	55 to 60	600	57.5	69.1	74	62.5			NO
	52.5	50 to 55	730	52.5	64.8	70	57.8			YES
	47.5	45 to 50	634	47.5	63.3	70	54.3			YES
	42.5	40 to 45	513	42.5	61.8	70	50.8	(41,580)	(21,330,540)	YES
	37.5	35 to 40	1023	37.5	60.3	70	47.3	(49,140)	(50,270,220)	YES
	32.5	30 to 35	734	32.5	58.8	70	43.8	(56,700)	(41,617,800)	YES
	27.5	25 to 30	391	27.5	57.3	70	40.3	(64,260)	(25,125,660)	YES
	22.5	20 to 25	195	22.5	55.8	70	36.8	(71,820)	(14,004,900)	YES
Winter Heating	17.5	15 to 20	125	17.5	54.3	70	33.3	(79,380)	(9,922,500)	YES
	12.5	10 to 15	47	12.5	52.8	70	29.8	(86,940)	(4,086,180)	YES
	7.5	5 to 10	34	7.5	51.3	70	26.3	(94,500)	(3,213,000)	YES
	2.5	0 to 5	1	2.5	49.8	70	22.8	(102,060)	(102,060)	YES
	-2.5	-5 to 0	0	-2.5	48.3	70	19.3	-	-	YES
	-7.5	-10 to -5	0	-7.5	46.8	70	15.8	-	-	YES

ERV Operating Hours = **827**

All Operating Hours = **8,760**

% Cooling = 24%

% Heating = 35%

% Free = 25%

Operational Hours

* ASHRAE Std. 90.1-2004, Table 6.5.3.1 Fan Power Limitation assuming Constant Volume

Handbook of Energy Audits. Thuman,PE,RA, Albert, Third Ed.1992

	Supply Fan HP/1,000 cfm*
	1.2
Peak Tonnage Reduction =	3.95
Total System Cfm =	220
Cfm Reduction =	1,579
Existing HVAC Fan (W) =	691
Proposed HVAC Fan (W) =	123.00
kWh Savings =	895
Proposed HVAC Fan Savings* =	**$ 109.20**

Fan Power (kWh) = 1,221

Fan Power Cost = **$ 148.94**

Total Cooling Saved (BTU) = 3,822,336

Total Peak Demand kW saved = 3.95

Peak Energy Savings ($ for kW) = $ -

Total Cooling Power Saved (kWh) = 424.70

Cooling Savings = $ 51.81

Total Cooling Savings = $ 51.81

Total Heating Saved (BTU) = (169,672,860)

Total Heating Saved (Therms or kWh) = 3,337

Total Heating Savings = $ 3,487.06

Total Motor/Electric Savings = $ 109.20

Maintenance Savings = $ -

Net Savings = $ 3,648.07

Cost of Project = $ 11,000.00

Simple Payback (Yrs) = 3.02

Note: Actual savings will depend on operating conditions and application

Electric	98.96	**kWh**	337.75	Mbtus
Heating (G/E)	3,337	**Therms or kWh**	333,689.96	Mbtus
		Total Energy	**334,027.71**	**MBtus**

Manalapan High School

Number of Classrooms: 156	256,000	Gross SF Area

5.0% GC Allowance

18.0% Contingency & Soft Costs

25.0%

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**Laser prints on off mode at night, times power strips**	P4P	$12,448.00	$8,299.00	622.40	2,240.64	1,377.99	16,689.03	4,172.26	12,516.78	1.51

Cost Basis:	This is based on installing in 156 classrooms with a cost of $81.90 (cost with shipping and labor) per power saver strip with the ability to shut down additional plug-ins such as laser printers and other components. The installed effort would be done with an onsite maintenance personelle or possibly the people occupying the classrooms. This has been shown to provide an efficient way to get rid of vampire loads from printers and other equipment that are generally left on 24/7.
Saving Projection:	The saving is based on publications involved with evaluating the effectiveness of these components. For our geographic area we believe that the energy savings would be projected at 40 kWh per classroom per month for 156 classrooms. When we evaluate this we find that a reasonable estimated savings is $9,740.58.

Energy Savings	Savings per Year (kWh)	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	74,880.00	$9,135.36	41,408.64	123.97	102.45	3.62
Gas (Therms)	0.00	$0.00	0	0	0	0
Total Savings (kBtu)	255,501.16	$9,135.36	3,022,830.75	9,050.05	7,478.95	
					Total Pollution Reduction in Cars Removed from the Road =	**264.00**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Haglid Engineers has installed a set back power and an inline watt meter. Found typical watt meter savings of 40 kWh/month or	$4.88	per month	
	40 kWh/month x 12 months = 480 kWh/year per classroom			
	480 kWh/year per classroom x 156 classrooms = 5,760 kWh/year			
Energy Savings Factor of Safety	1.10	Estimated annual savings with energy savings factor of safety =	$8,299.00	
Discussion:	These vampire load shutting power strips have been shown in peer reviewed articles to provide good energy savings while being relatively easy to install. It would be something that would be a low enough payback that it would actually help to bring high cost items such as heavy mechanical components more into line with the type of cost and internal rate of return in order to justify these capital projects. The recommendation would be to do these power strips for the simple reason that they are easy to install, have a quick payback and they would effectively help reduce the cost of other more expensive items.			

Manalapan High School					
Number of Classrooms: 156	256,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Soda vending machines off at night or weekends**	P4P	$2,640.00	$1,108.00	132.00	475.20	292.25	3,539.45	884.86	2,654.59	2.40

Cost Basis:	[Based on 10 USAT vending machines at 189.00 each plus a $75.00 labor to install each for a total of $2,640.00.					
Saving Projection:	This is based on conservative estimates on weekends and late nights that the machines can be used to go into deep set back where the refrigeration can be shut off. It can be noted that this should only be used for things like soda; ice cream and milk would not be a good candidate for this type of energy savings measure.					
Energy Savings	**Savings per Year**	**Estimated Annual Savings ($)**	**C02 Reduced (lbs.)**	**SO2 (lbs.)**	**NOX (lbs.)**	**Cars Removed**
Electric (kWh)	9,600.00	$1,171.20	5,308.80	15.89	13.13	0.46
Gas (Therms)		$0.00	0	0	0	0
Total Savings (kBtu)	32,756.56	$1,171.20			**Total Pollution Reduction in Cars Removed from the Road =**	**0.46**
*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**						
Assumptions	Assumes savings of 80 kWh per vending machine per month (80kWh x 10 vending machines x 12 months = 9600kWh/year)					
	10 vending machines can use this upgrade.					
Energy Savigns Factor of Safety	1.06	Estimated annual savings with energy savings factor of safety =	$1,108.00			
Discussion:	There are candy machines and soda machines that do not need to keep all components refrigerated to keep them in a saleable fashion. For instance; coca cola, diet coke sodas can have the refrigeration shut off over long weekend, night or times where there is no one in the school. It would not be recommended to use this technology for any dairy products or foods that can potentially spoil with elevated temperatures. This is a good way to tie an occupancy sensors to when people are in the area and when the machines runs.					

Manalapan High School						
Number of Classrooms: 156	256,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**	
			18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
1	Boiler Upgrades: Replace (2) 10 MBH Boilers with (3) MBH Modular Condensing Boilers	P4P	$596,500.00	$18,841.60	29,825.00	107,370.00	66,032.55	799,727.55	199,931.89	599,795.66	31.83

Cost Basis:	Replacing the hot water boiler with a new 500 gallon gas fired AO Smith hot water boiler is based on RS Means, known construction and vendor pricing the installed cost with labor would be about $596,500.
Saving Projection:	The boiler upgrade would improve the efficiency from around 74% up to 92% for a projected savings of $20,054.85 after energy savings factor of safety is considered the estimated value is $18,841.60.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kW)		$0.00	0.00	0.00	0.00	0.00
Gas Savings (Therms)	19,191.24	$20,054.85	919,868.73	1,881.97	2,275.87	80.34
Total Savings Kbtu	1,919,124.00	$20,054.85	919,868.73	1,881.97	2,275.87	
					Total Pollution Reduction in Cars Removed from the Road =	**80.34**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From site visit and Haglid Engineering evaluation of existing boiler Gas efficiency of 74% to Aerco 92% efficient boiler (savings=18% x current Gas usage).		
Energy Savings Factor of Safety	1.06	Estimated annual savings with energy savings factor of safety =	$18,841.60
Discussion:	At this time, given the long payback, it is not recommended to do this energy reduction measure and replacing the existing boiler/hot water heat exchanger with a gas fired AO Smith boiler. This would be a recommendation if there is a failure in the system and there would be a need to replace what is currently being used. The payback is not going to be attractive enough to make this economically viable when packaged with other more expensive components. Our recommendation is to use this as a good thing to do as the existing equipment starts to become maintenance prone or fails all together.		

Manalapan High School		
Number of Classrooms: 156	256,000	Gross SF Area

5.0%	GC Allowance	**25.0%**	
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)**	P4P	$3,291.60	$1,580.28	164.58	592.49	364.38	4,413.05	1,103.26	3,309.79	2.09

Cost Basis:	This is based on installing in 156 classrooms with a cost of $21.10 per class room with the ability to shut down additional plug-ins . This has been shown to provide an efficient way to get rid of any parasitic loads from electrical equipment that are generally left on 24/7.
Saving Projection:	The saving is based on publications involved with evaluating the effectiveness of these components. It is estimated to be 95 kWh/year per classroom for 156 classrooms for a projected savings of 14,820 kWh/year. When we evaluate this we find that a reasonable estimated savings is $1,808.04.

Energy Savings	Savings per Year (kWh)	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	14,820.00	$1,808.04	8,195.46	24.54	20.28	0.72
Gas (Therms)	0	$0.00	0	0	0	0
Total Savings (kBtu)	50,567.94	$1,808.04			**Total Pollution Reduction in Cars Removed from the Road =**	**0.72**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Estimates average savings per classroom of 95 kWh/year removing hot plates from classroom.		
Energy Savings Factor of Safety	1.14	Estimated annual savings with energy savings factor of safety =	$1,580.28
Discussion:	These parasitic load reducing power strips have been shown in peer reviewed articles to provide good energy savings while being relatively easy to install. It would be something that would be a low enough payback that it would actually help to bring high cost items such as heavy mechanical components more into line with the type of cost and internal rate of return in order to justify these capital projects. The recommendation would be to do these power strips for the simple reason that they are easy to install, have a quick payback and they would effectively help reduce the cost of other more expensive items.		

Manalapan High School		
Number of Classrooms: 156	256,000	Gross SF Area

5.0%	GC Allowance		**25.0%**
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
3	**Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)**	P4P	$6,544.20	$3,026.40	327.21	1,177.96	724.44	8,773.81	2,193.45	6,580.36	2.17

Cost Basis:	Price of Equipment and installation is estimated to be $41.95 per class room based off of vendor pricing. With a total of 156 class rooms, the estimated installed hard cost is $6,544.20.
Saving Projection:	The savings is is estimated to be 182 kWh/year per classroom for 156 for a projected savings of 28,392 kWh/year. This is calculated to be $3,463.82 saved per year, making this energy reduction measure have an attractive payback. The savings is based off of historical data and past experience, see details below.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	28,392.00	$3,463.82	15,700.78	47.01	38.85	1.37
Gas (Therms)	0.00	$0.00				
Total Savings (kBtu)	96,877.52	$3,463.82			**Total Pollution Reduction in Cars Removed from the Road =**	**1.37**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	156 classrooms would have set-back power strip		
	Each classroom would have set-back savings of 182 kWh/ year.		
	Laser printers and other peripheral devices would add to savings.		
Energy Savings Factor of Safety	1.14	Estimated annual savings with energy savings factor of safety =	$3,026.40
Discussion:	Considering the low cost and easy installation, this is a recommended energy reduction measure. The simple payback of under three years is also another attractive benefit this investment offers.		

Manalapan High School		
Number of Classrooms: 156	256,000	Gross SF Area

5.0%	GC Allowance		**25.0%**
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**Other ERMs - Controls Upgrade**	P4P	$660,000.00	$37,463.41	33,000.00	118,800.00	73,062.00	884,862.00	221,215.50	663,646.50	17.71

Cost Basis:	The cost of this controls upgrade was provided with vendor pricing from one of the existing controls vendors that are currently providing controls automation for the school. This is based on a quote with vendor pricing and labor costs built in.
Saving Projection:	Based on typical energy savings from other projects of the same kind for high schools, we believe that the savings projection of $40,143.42 is reasonable and relatively conservative.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	237,720.00	$29,001.84	131,459.16	393.58	325.25	11.48
Gas (Therms)	10,661.80	$11,141.58	511,038.19	1,045.54	1,264.37	44.63
Total Savings Kbtu	1,877,314.30	$40,143.42	642,497.35	1,439.11	1,589.62	
					Total Pollution Reduction in Cars Removed from the Road =	**56.11**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From observations and the current operation of the existing pneumatic controls, Haglid Engineers estimate projected savings of 10% for both gas and electric.		
Factor of Safety	1.07	Estimated annual savings with energy savings factor of safety =	$37,463.41
Discussion:	With a payback of 17.71 years this would have a relatively long payback. The expense is excessive, part of it involves upgrading controls that currently are not functioning. We would recommend upgrading the controls especially for the large exhaust fans that are running wild 24/7. Part of this can be addressed with the DOAS and other components we would evaluate as the project goes forward and try to address them as a part of the other energy reduction measures. Due to the cost of this energy reduction measure and the payback estimated at 17.71 years, we cannot recommend this energy reduction measure at this time.		

School/Building	ATC	Mechanical*	Contigency	Total
BOE	$ 85,500	$ 15,000	10%	**$ 110,550**
Tranporation	$ 34,000	$ -	10%	**$ 37,400**
Coltsneck HS	$ 225,000	$ -	10%	**$ 247,500**
Howell HS	$ 570,000	$ 50,000	10%	**$ 682,000**
Freehold Boro HS	$ 670,000	$ 50,000	10%	**$ 792,000**
Freehold Twp HS	$ 565,000	$ 75,000	10%	**$ 704,000**
Manalapan HS	$ 525,000	$ 75,000	10%	**$ 660,000**
Marlboro HS	$ 820,000	$ 100,000	10%	**$ 1,012,000**

* ATC contractor provides the valve and the Mechanical Contractor will install.

Manalapan High School		
Number of Classrooms: 156	256,000	Gross SF Area

5.0%	GC Allowance		**25.0%**
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
3	**Envelope upgrades: roof insulation with a roof project (min R20; Avg. R25)**	P4P	$764,636.00	$10,082.00	38,231.80	137,634.48	84,645.21	1,025,147.49	256,286.87	768,860.61	76.26

Cost Basis:	The budgetary cost for evaluating the envelope, roof and insulation is provided with RS Means and known construction costs for working on similar high school projects in the Central NJ area. The estimate installed hard costs at $764,636.00 is typical of a roof this size.
Saving Projection:	The savings projection is based on computer modeling of like kind high schools in the area and we believe is relatively conservative but typically envelope upgrades do not have tremendously attractive energy savings and we believe this is reasonable and typical for this type of envelope upgrade.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	0.00	$0.00	0.00	0.00	0.00	0.00
Gas Savings (Therms)	10,100.00	$10,554.50	484,110.16	990.45	1,197.75	42.28
Total Savings Kbtu	1,010,000.00	$10,554.50	484,110.16	990.45	1,197.75	
					Total Pollution Reduction in Cars Removed from the Road =	**42.28**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Haglid Engineering projects gas heating savings of 10,100therms		
Energy Savings Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$10,082
Discussion	Given an estimated payback in excess of 75 years, this is not an energy reduction measure we would recommend until the roof needs to be repaired. Until that time, generally the cost of adding excess insulation or improving the roof to an R20 rating is something that is not as expensive as replacing the insulation and adding a new roof. The recommendation is to wait until the roof needs to be repaired and at that time evaluate adding thermal insulation to have the roof at least approach R20 and an average of R25.		

Preliminary ESMs

Prepared for:

Marlboro High School

Prepared by:

Haglid Engineering and Associates, Inc.

80 Broadway
Hillsdale, NJ 07642

Telephone: (201) 722-1233
Fax: (201) 722-0999

Engineer: Klas C. Haglid, P. E.

Assumptions	
$/kWh	0.122
$/Therm	1.049

	Energy Use	Expense
Current Electric Usage (kWh)	2,303,040.00	$280,970.88
Current Gas Usage (Therms)	111,605.00	$117,073.65
Total kBtu	19,018,794.91	$398,044.53

Total Annual Savings	$223,962.32
% savings of Current Utility Bill	56.27%

Marlboro High School						
Number of Classrooms: 102	264,000	Gross SF Area		**5.0%**	GC Allowance	**25.0%**
				18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**VRF and VRV variable refrigeration volume**	P4P	$438,400.00	$35,354.84	21,920.00	78,912.00	48,530.88	587,762.88	146,940.72	440,822.16	12.47

Cost Basis:	Estimated installed cost of $438,400 for 16 offices or classrooms based on installed costs for Public High School installations on previous projects in the last two years in central NJ. This includes union labor and other typical installation costs.
Saving Projection:	A Trane Trace model for a "like kind" school in the same geographic area was modeled for adding VRV to 26 classrooms/offices at 243,736kWh/year or 9,374.5 kWh/class and 40,435 Therms or 1555.2 Therms/class. So for 16 classrooms the total annual savings for electric and gas is 149,991.38kWh and 24,883.08 Therms respectively. See attached Trace model.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	149,991.38	$18,298.95	82,945.23	248.33	205.22	7.24
Gas (Therms)	24883.08	$26,102.35	1,192,688.29	2,440.13	2,950.86	104.16
Total Savings Kbtu	3,000,099.83	$44,401.30	1,275,633.53	2,688.46	3,156.08	
					Total Pollution Reduction in Cars Removed from the Road =	**111.41**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	This VRV system will have an EER rating of 13 or better with reheat and the ability to recover heat energy from one classroom to another. The existing HVAC system has an EER of less than 7.0. The Existing RTU is in very poor condition and over 30 years old.		
Energy Savings Safety Factor	1.26	Estimated annual savings with Energy Savings Factor of Safety =	$35,354.84
Discussion:	There are parts of this high school that would benefit from this system, especially administrative offices. These calculations are based on installing VRV Heat pumps in 16 offices or classrooms. This is not a school wide application but strictly meant for office areas, critical use and areas that typically would have use during the summer months. While we have seen these VRV systems have very good savings compared to heating and cooling areas in other schools, we believe that for Marlboro HS this can likely be expected to be used in areas that do not have air conditioning or functional air conditioning. Therefore, the savings will not be great compared to the cost of this project. This can be something that we evaluate as this project goes forward. Another interesting note is that in Marlboro High School there is an excessive amount of ventilation and the idea would be to address some of the runaway exhaust fans and other issues in tandem with installing the HVAC upgrades.		

VRVs for Marlboro High School

Location	**Marlboro High School**	
Building owner	**Freehold Regional High School District**	
Program user	**Employee**	
Company	**Haglid Engineering & Associates**	
Comments	**Energy Evaluation for VRV at Marlboro High School**	
By	**Haglid Engineering & Associates, Inc.**	
Dataset name	**C:\Documents and Settings\Klas Haglid\My Documents\TRACE 700 Projects\Freehold Region HS\Marlboro HS VRV & Lt.trc**	
Calculation time	**03:47 PM on 12/23/2013**	
TRACE® 700 version	**6.2.6.5**	
Location	**McGuire AFB, New Jersey**	
Latitude	**40.0**	**deg**
Longitude	**74.0**	**deg**
Time Zone	**5**	
Elevation	**133**	**ft**
Barometric pressure	**29.8**	**in. Hg**
Air density	**0.0757**	**lb/cu ft**
Air specific heat	**0.2444**	**Btu/lb·°F**
Density-specific heat product	**1.1098**	**Btu/h·cfm·°F**
Latent heat factor	**4,885.3**	**Btu·min/h·cu ft**
Enthalpy factor	**4.5402**	**lb·min/hr·cu ft**
Summer design dry bulb	**89**	**°F**
Summer design wet bulb	**76**	**°F**
Winter design dry bulb	**11**	**°F**
Summer clearness number	**0.99**	
Winter clearness number	**0.99**	
Summer ground reflectance	**0.20**	
Winter ground reflectance	**0.20**	
Carbon Dioxide Level	**400**	**ppm**
Design simulation period	**January - December**	
Cooling load methodology	**TETD-TA1**	
Heating load methodology	**UATD**	

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Marlboro HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Lights													
Electric (kWh)	20,618.1	18,645.4	22,021.4	19,726.6	21,319.7	6,169.7	6,316.3	6,381.2	19,726.7	21,319.8	20,428.3	19,916.5	202,589.6
Peak (kW)	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
Misc. Ld													
Electric (kWh)	12,690.5	11,462.3	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	149,420.0
Peak (kW)	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Cooling Coil Condensate													
Recoverable Water (1000gal)	0.0	0.0	0.0	0.7	1.4	7.3	12.9	15.4	5.9	0.5	0.0	0.0	44.2
Peak (1000gal/Hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=66.94 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=66.94 tons / 120.5 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	753.7	4,994.6	8,923.0	17,589.1	17,217.6	7,973.7	0.0	0.0	0.0	57,451.6
Peak (kW)	0.0	0.0	13.4	40.1	59.3	93.2	114.3	112.7	70.0	29.1	0.6	0.0	114.3
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=101.2 tons / 12.95 kW]													
Electric (kWh)	0.0	0.0	0.0	95.1	616.5	1,079.5	2,070.2	2,038.3	967.0	0.0	0.0	0.0	6,866.4
Peak (kW)	0.0	0.0	1.8	5.0	7.1	10.9	12.7	12.7	8.2	3.6	0.1	0.0	12.7
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	10.0	27.0	48.8	74.4	74.4	40.0	0.0	0.0	0.0	274.6
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=62.35 tons]													
Air-cooled unitary - 002 [Clg Nominal Capacity/F.L.Rate=62.35 tons / 112.2 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	1,156.7	3,964.1	11,629.7	20,319.0	20,544.4	8,880.4	718.4	0.0	0.0	67,212.6
Peak (kW)	0.0	0.0	0.0	19.0	31.6	83.7	106.5	105.0	62.8	18.3	0.0	0.0	106.5
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=94.26 tons / 12.07 kW]													
Electric (kWh)	0.0	0.0	0.0	147.2	495.1	1,426.2	2,410.0	2,448.2	1,096.3	92.0	0.0	0.0	8,115.0
Peak (kW)	0.0	0.0	0.0	2.4	3.8	9.8	11.9	11.8	7.4	2.3	0.0	0.0	11.9
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	18.0	38.6	63.2	74.4	74.4	64.0	8.1	0.0	0.0	340.7
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=28.44 tons]													

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Marlboro HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=28.44 tons]													
Air-cooled unitary - 003 [Clg Nominal Capacity/F.L.Rate=28.44 tons / 51.20 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	942.5	3,473.3	6,538.4	9,684.0	9,193.5	5,103.9	252.1	0.0	0.0	35,187.8
Peak (kW)	0.0	0.0	0.0	14.8	25.4	44.4	48.0	46.7	35.2	9.1	0.0	0.0	48.0
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=43.01 tons / 5.50 kW]													
Electric (kWh)	0.0	0.0	0.0	119.8	433.2	800.2	1,148.5	1,094.5	627.1	32.4	0.0	0.0	4,255.6
Peak (kW)	0.0	0.0	0.0	1.9	3.0	5.2	5.4	5.3	4.1	1.2	0.0	0.0	5.4
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	20.0	47.0	72.0	74.4	74.4	68.0	5.4	0.0	0.0	361.2
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Cpl 4: Cooling plant - 008 [Sum of dsn coil capacities=13.98 tons]													
Air-cooled unitary - 004 [Clg Nominal Capacity/F.L.Rate=13.98 tons / 25.17 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	20.4	505.7	1,906.1	4,055.0	3,810.3	1,070.2	0.0	0.0	0.0	11,367.8
Peak (kW)	0.0	0.0	0.0	2.9	8.3	19.2	23.8	23.1	14.0	0.0	0.0	0.0	23.8
Cond fan for Recip < 15ton [Design Heat Rejection/F.L.Rate=21.14 tons / 2.71 kW]													
Electric (kWh)	0.0	0.0	0.0	2.6	62.6	230.4	476.8	449.9	130.0	0.0	0.0	0.0	1,352.3
Peak (kW)	0.0	0.0	0.0	0.4	1.0	2.2	2.7	2.6	1.6	0.0	0.0	0.0	2.7
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	4.0	23.5	44.4	74.4	74.4	37.0	0.0	0.0	0.0	257.7
Peak (kW)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=781.1 mbh]													
Boiler - 004 [Nominal Capacity/F.L.Rate=781.1 mbh / 12.02 Therms] (Heating Equipment)													
Gas (therms)	1,520.1	1,936.7	1,129.1	169.0	0.0	0.0	0.0	0.0	0.0	251.1	693.0	1,417.1	7,116.0
Peak (therms/Hr)	5.1	5.8	4.0	2.5	0.0	0.0	0.0	0.0	0.0	2.8	3.4	4.5	5.8
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	669.6	604.8	545.4	145.8	0.0	0.0	0.0	0.0	0.0	226.8	477.9	669.6	3,339.9
Peak (kW)	0.9	0.9	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.9	0.9	0.9	0.9
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	581.1	524.9	473.3	126.5	0.0	0.0	0.0	0.0	0.0	196.8	414.8	581.1	2,898.7
Peak (kW)	0.8	0.8	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.8	0.8

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Marlboro HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=781.1 mbh]													
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	303.0	81.0	0.0	0.0	0.0	0.0	0.0	126.0	265.5	372.0	1,855.5
Peak (kW)	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=3,560 mbh]													
Boiler - 007 [Nominal Capacity/F.L.Rate=3,560 mbh / 54.77 Therms] (Heating Equipment)													
Gas (therms)	7,535.3	8,992.2	5,689.5	1,066.9	7.7	0.0	0.0	0.0	0.0	1,632.9	3,737.6	6,726.5	35,388.5
Peak (therms/Hr)	24.2	27.9	18.5	9.0	1.4	0.0	0.0	0.0	0.0	13.0	17.2	22.7	27.9
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	186.0	127.5	6.5	0.0	0.0	0.0	0.0	186.0	180.0	186.0	1,226.0
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	2,648.7	2,392.4	2,648.7	1,815.7	92.6	0.0	0.0	0.0	0.0	2,648.8	2,563.3	2,648.7	17,458.9
Peak (kW)	3.6	3.6	3.6	3.6	3.6	0.0	0.0	0.0	0.0	3.6	3.6	3.6	3.6
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	372.0	255.0	13.0	0.0	0.0	0.0	0.0	372.0	360.0	372.0	2,452.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 3: Heating plant - 006 [Sum of dsn coil capacities=239.0 mbh]													
Boiler - 006 [Nominal Capacity/F.L.Rate=239.0 mbh / 3.68 Therms] (Heating Equipment)													
Gas (therms)	636.3	678.5	414.1	28.8	0.0	0.0	0.0	0.0	0.0	64.2	260.2	556.4	2,638.5
Peak (therms/Hr)	2.0	2.2	1.5	0.8	0.0	0.0	0.0	0.0	0.0	1.3	1.5	1.8	2.2
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	144.8	15.0	0.0	0.0	0.0	0.0	0.0	27.5	118.0	186.0	845.3
Peak (kW)	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	177.8	160.6	138.4	14.3	0.0	0.0	0.0	0.0	0.0	26.3	112.8	177.8	808.0
Peak (kW)	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	289.5	30.0	0.0	0.0	0.0	0.0	0.0	55.0	236.0	372.0	1,690.5
Peak (kW)	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 1 Marlboro HS

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 4: Heating plant - 007 [Sum of dsn coil capacities=618.7 mbh]													
Electric Resistance - 005 [Nominal Capacity/F.L.Rate=618.7 mbh / 181.3 kW] (Heating Equipment)													
Electric (kWh)	35,353.0	38,832.0	23,652.0	5,067.7	1,265.2	0.0	0.0	0.0	140.2	7,774.6	16,764.3	30,956.4	159,805.6
Peak (kW)	73.9	82.6	57.2	25.9	8.8	0.0	0.0	0.0	1.4	39.5	52.8	69.3	82.6

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Lights													
Electric (kWh)	20,618.1	18,645.4	22,021.4	19,726.6	21,319.7	6,169.7	6,316.3	6,381.2	19,726.7	21,319.8	20,428.3	19,916.5	202,589.6
Peak (kW)	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
Misc. Ld													
Electric (kWh)	12,690.5	11,462.3	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	12,690.5	12,281.1	12,690.5	12,281.1	12,690.5	149,420.0
Peak (kW)	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Cooling Coil Condensate													
Recoverable Water (1000gal)	1.0	0.3	2.4	6.2	11.2	14.5	15.8	17.0	12.7	5.6	3.1	1.2	90.9
Peak (1000gal/Hr)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=40.67 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=40.67 tons / 39.66 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	103.5	40.2	228.2	1,240.0	2,793.2	3,904.2	5,217.4	6,046.8	3,546.6	1,268.9	424.3	118.8	24,932.1
Peak (kW)	1.5	1.5	3.1	19.9	24.1	28.5	34.9	35.2	29.4	19.3	12.5	1.9	35.2
Air-cooled unitary - 001 [Htg Nominal Capacity/F.L.Rate=549.1 mbh / 40.31 kW] (Cooling Equipment - Heating Mode)													
Electric (kWh)	451.1	895.9	152.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	343.1	1,842.7
Peak (kW)	19.4	22.2	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	22.2
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=51.95 tons / 2.55 kW]													
Electric (kWh)	320.7	234.2	468.4	468.4	514.2	560.0	733.1	707.7	516.8	516.8	481.1	399.7	5,921.0
Peak (kW)	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	75.5	68.0	103.5	92.0	101.0	110.0	144.0	139.0	101.5	101.5	94.5	88.5	1,219.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=36.36 tons]													
Air-cooled unitary - 002 [Clg Nominal Capacity/F.L.Rate=36.36 tons / 35.45 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	66.9	20.2	234.7	1,039.0	3,381.3	5,185.1	6,621.8	6,902.5	4,404.0	753.4	339.8	94.3	29,043.1
Peak (kW)	3.7	1.6	5.0	17.8	20.1	28.8	34.5	33.5	26.9	17.8	13.9	4.4	34.5
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=46.45 tons / 2.28 kW]													
Electric (kWh)	430.2	173.0	471.1	578.1	826.2	910.4	1,204.0	994.6	901.3	546.2	439.3	371.0	7,845.2
Peak (kW)	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Cpl 2: Cooling plant - 003 [Sum of dsn coil capacities=36.36 tons]													
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	94.5	38.0	103.5	127.0	181.5	200.0	264.5	218.5	198.0	120.0	96.5	81.5	1,723.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 3: Cooling plant - 005 [Sum of dsn coil capacities=18.60 tons]													
Air-cooled unitary - 003 [Clg Nominal Capacity/F.L.Rate=18.60 tons / 18.13 kW] (Cooling Equipment - Cooling Mode)													
Electric (kWh)	51.1	19.3	170.7	725.6	1,728.0	2,398.1	3,119.8	3,159.1	1,774.6	579.7	192.3	62.1	13,980.4
Peak (kW)	1.4	1.3	2.6	9.4	11.8	13.9	17.3	16.9	13.5	9.5	8.5	1.6	17.3
VRV Condensing Unit [Design Heat Rejection/F.L.Rate=23.75 tons / 1.16 kW]													
Electric (kWh)	142.0	62.9	214.2	214.2	279.3	367.8	481.8	426.0	273.5	230.4	220.0	136.2	3,048.1
Peak (kW)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	61.0	27.0	92.0	92.0	120.0	158.0	207.0	183.0	117.5	99.0	94.5	58.5	1,309.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cpl 4: Cooling plant - 008 [Sum of dsn coil capacities=8.33 tons]													
Air-cooled unitary - 004 [Clg Nominal Capacity/F.L.Rate=8.33 tons / 11.00 kW] [**Orig F.L.Rate=11.00 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	0.0	265.4	838.8	1,364.7	1,803.5	1,844.1	956.3	192.8	0.0	0.0	7,265.5
Peak (kW)	0.0	0.0	2.0	5.3	6.8	9.3	10.0	10.0	9.1	4.4	2.6	0.0	10.0
Condenser fan for Heat Pump [Design Heat Rejection/F.L.Rate=11.46 tons / 1.38 kW]													
Electric (kWh)	0.0	0.0	0.0	39.7	123.2	197.4	250.5	257.0	138.2	28.9	0.0	0.0	1,034.9
Peak (kW)	0.0	0.0	0.3	0.8	1.0	1.3	1.3	1.3	1.3	0.7	0.4	0.0	1.3
Cntl panel & interlocks - 0.1 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	0.0	12.0	19.8	22.0	25.1	23.8	18.0	11.0	0.0	0.0	131.7
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Hpl 1: Heating plant - 002 [Sum of dsn coil capacities=407.2 mbh]													
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=1,206 mbh]													
Boiler - 007 [Nominal Capacity/F.L.Rate=1,206 mbh / 14.49 Therms] (Heating Equipment)													
Gas (therms)	1,007.9	1,177.1	641.7	155.5	2.0	0.0	0.0	0.0	0.0	268.2	453.4	783.0	4,488.9
Peak (therms/Hr)	7.4	8.6	5.2	3.8	0.4	0.0	0.0	0.0	0.0	3.9	3.9	5.4	8.6

EQUIPMENT ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

Alternative: 2 VRV Upgrades

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Hpl 2: Heating plant - 004 [Sum of dsn coil capacities=1,206 mbh]													
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	186.0	168.0	186.0	36.0	2.0	0.0	0.0	0.0	0.0	50.8	130.5	186.0	945.3
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	897.7	810.9	897.7	173.8	9.7	0.0	0.0	0.0	0.0	245.0	629.9	897.7	4,562.3
Peak (kW)	1.2	1.2	1.2	1.2	1.2	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	372.0	72.0	4.0	0.0	0.0	0.0	0.0	101.5	261.0	372.0	1,890.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Hpl 3: Heating plant - 006 [Sum of dsn coil capacities=201.3 mbh]													
Boiler - 006 [Nominal Capacity/F.L.Rate=201.3 mbh / 2.42 Therms] (Heating Equipment)													
Gas (therms)	68.5	85.2	21.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.2	218.8
Peak (therms/Hr)	1.7	2.2	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	2.2
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	12.5	15.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	43.3
Peak (kW)	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	10.1	12.1	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	34.8
Peak (kW)	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	25.0	30.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	86.5
Peak (kW)	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
Hpl 4: Heating plant - 007 [Sum of dsn coil capacities=381.8 mbh]													
Electric Resistance - 005 [Nominal Capacity/F.L.Rate=381.8 mbh / 111.9 kW] (Heating Equipment)													
Electric (kWh)	8,765.2	10,720.3	4,503.4	722.9	0.0	0.0	0.0	0.0	0.0	1,127.0	2,398.0	6,591.6	34,828.4
Peak (kW)	111.9	111.9	111.3	29.1	0.0	0.0	0.0	0.0	0.0	31.7	82.3	111.9	111.9

MONTHLY ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1	**Marlboro HS**												
Electric													
On-Pk Cons. (kWh)	74,227	73,967	63,465	42,976	50,069	51,213	77,057	76,166	58,206	46,758	54,202	69,129	737,433
On-Pk Demand (kW)	212	221	194	198	270	398	456	451	333	178	191	207	456
Gas													
On-Pk Cons. (therms)	9,692	11,607	7,233	1,265	8	0	0	0	0	1,948	4,691	8,700	45,143
On-Pk Demand (therms/hr)	31	35	22	10	1	0	0	0	0	15	20	27	35

Energy Consumption

Building	94,645 Btu/(ft2-year)
Source	165,611 Btu/(ft2-year)
Floor Area	74,290 ft2

Environmental Impact Analysis

CO2	1,468,439 lbm/year
SO2	3,990 gm/year
NOX	2,058 gm/year

MONTHLY ENERGY CONSUMPTION

By Haglid Engineering & Associates, Inc.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2 VRV Upgrades													
Electric													
On-Pk Cons. (kWh)	45,374	43,779	42,932	37,906	44,932	33,828	39,079	39,974	44,954	39,983	38,511	42,446	493,697
On-Pk Demand (kW)	271	268	264	204	198	214	234	234	210	208	242	270	271
Gas													
On-Pk Cons. (therms)	1,076	1,262	664	155	2	0	0	0	0	268	453	826	4,708
On-Pk Demand (therms/hr)	9	10	7	4	0	0	0	0	0	4	4	7	10

Energy Consumption

Building	29,018 Btu/(ft2-year)
Source	74,721 Btu/(ft2-year)
Floor Area	74,290 ft2

Environmental Impact Analysis

CO2	450,224 lbm/year
SO2	1,223 gm/year
NOX	631 gm/year

Marlboro High School			5.0%	GC Allowance	25.0%
Number of Classrooms: 102	264,000	Gross SF Area	**18.0%**	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**DOAS ventilation system**	P4P	$734,400.00	$114,750.00	36,720.00	132,192.00	81,298.08	984,610.08	246,152.52	738,457.56	6.44

Cost Basis:	The cost basis of the $734,400 is based on 102 classrooms and known construction numbers from other high schools in this central part of NJ. We believe that this will provide additional benefits in the form of thermal comfort. The cost is based on a direct counter flow high efficiency heat exchanger that can move up to 500 cubic feet per minute. These would be tied to two high performance fans that would use 0.2 Watts per CFM and provide an energy efficiency rating of above 60. These units would be individually controlled, there would be one energy recovery module per classroom and it would be tied to a self calibrating CO2 sensor that would come on at a prescribed part per million concentration of CO2.
Saving Projection:	Projected Savings of 1,452 Therms per classroom X 102 classrooms for a total projected savings = 148,104 therms. The saving is modeled using a bin method where within a NJ Weather bin temperature range the hours at a certain temperature are modeled using 30 year weather data for the central area of NJ. Also this is based on full Pay for Performance projects where these units have been installed monitored and verified and evaluated for energy savings and this has been used to provide the estimated annual savings. We believe this number is conservative and with careful installation and preparation, this number can be exceeded.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	50,490.00	$6,159.78	27,920.97	83.59	69.08	2.44
Gas (Therms)	148,104.00	$155,361.10	7,098,876.31	14,523.67	17,563.53	619.99
Total Savings Kbtu	14,982,679.03	$161,520.88	7,126,797.28	14,607.26	17,632.61	
					Total Pollution Reduction in Cars Removed from the Road =	**622.43**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	The current system is poorly controlled and has an existing fan consumption of 691 watts. The new system is to have an 87% thermally efficient BPE direct counter flow air to air energy system. Proposed fans would use 123 watts of power and be controlled with GE CO2 sensor running only with classroom occupancy of 6 hours for 5 days. Existing system is 700 cfm and new system is 700 cfm, typically switch from dilution ventilation to displacement ventilation can reduce ventilation needs by 2.5 times. in other schools the 700 cfm can be reduced to below 300cfm with improved IAQ. This will produce additional savings that is currently not modeled.

Assumptions Details	Quantity	CFM	%OA	% Run time	Heating eff. (%)	Cooling Eff. (EER)	Comments
	(102) BPE-XE-MIR 500	22,338	100%	18%	65%	9	

Energy Savings Factor of Safety	1.41	Estimated annual savings with energy savings factor of safety =	$114,750.00

Discussion:	Currently Marlboro High School, with talking with onsite Maintenance and Building management, we find that there is an awful lot of outdoor air being brought in throughout all weather conditions taken through unit ventilators and different HVAC equipment and in a single pass being exhausted up to the roof. We were also able to look at some of these and found that they are not controllable by the building automation or control systems. When we asked how these are shut down during weekends or holidays, we found that they are left to basically run which means that there is a lot of outdoor air running through the building for 8,760 run hours per year. The idea would be to illuminate some of these exhaust fans all together and replace them with the dedicated outdoor air system and in other places, tie these exhaust fans into a building automation system or a timer and only have them running during occupied times of the school year where there are people in the school. This will also reduce the amount of moisture being brought through the building and will help with thermal comfort and the cost of owning and operating this high school.

BPE Payback Calculator

Enter in the requested information below. If you are not sure of a value, See our recommendations in the comment boxes (red arrows).

Thank you for using BPE, Inc.®
For more specific engineering analysis, please see the BPE Performance Calculator at: **www.LowKWH.com**

SYSTEM GENERAL INFO		
Heating System Type	Gas Fired	
Cooling System Type	DX	
Outdoor Air Flow (OA)	700	scfm
Percent Outdoor Air (OA/SA, %)	100	%
Building Type	Commercial (> 5,000 SF)	
Nearest Location	Newark, NJ	

Number of Units

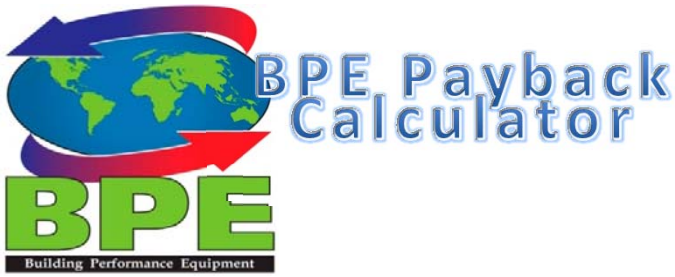
2000	1000	500	200
0	0	1	0

UTILITY INFORMATION	
Electric Rate ($/kWh)	0.122
Peak Demand Charge ($/kW)	
Months of Peak Demand Charge	0
Gas Rates ($/Therm)	1.049

COST ASSUMPTIONS		
Installed Cost per Ton ($/Ton)	0	*Use for New Construction or Major Retrofits
ERV Installed Cost	$ 7,200	
Maintenance Savings	$ -	
Total Incentives	$ -	

SYSTEM EFFICIENCIES		
Heating Efficiency	65	%
Cooling Efficiency	9	EER
BPE Effectiveness	87	%

CONTROLS AND SET-POINTS		
CO_2 Controller	Yes	
Percent Run-time	18	%
Summer (Cooling)	74	°F (db)
Winter (Heating)	70	°F (db)



20 Years of Savings!

BPE Energy Recovery Ventilators are guaranteed for 20 years not to become unusable for providing breathable air as a result from rust, rot, or corrosion. This does not apply to other gases other than breathable air. See Limited Lifetime Warranty for more details.

ENERGY ANALYSIS		
BPE Cooling Capacity	1.29	TONS
BPE Heating Capacity	44.40	MBH
Peak Demand Reduction	1.72	KW
Annual Electric Energy Saved	3,888	MBTU
Annual Thermal Energy Saved	145,155	MBTU
TOTAL Savings	**149,043**	MBTU

OPERATING COST ANALYSIS		
Maintenance Savings	$	-
Cooling Cost Savings	$	(60)
Peak Demand Cost Savings	$	-
Heating Cost Savings (Gas or HP)	$	(1,523)
Electrical Cost Savings (ER+Fans)	$	(109)
Electric Resistive Savings		0
Reduced Supply + Exhaust Fan Savings		(109)
BPE Parasitic Fan Cost		31
TOTAL Savings	**$**	**(1,692.31)**

CAPITAL EXPENSE ANALYSIS		
HVAC Initial Cost Avoidance	$	-
Added Cost of ERV	$	7,200
Total Incentives/Funding	$	-
Net Capital Expenditure	$	7,200
Simple Payback (Years)		**4.25**
Internal Rate of Return (IRR)		**23%**
Net Present Value (20 Yr Life Cycle)		**$36,931.00**
Emission Reduction (Cars/yr)		**6.13**

	200	500	1000	2000
Products:	0	1	0	0

All Weather Air Management

Ex Eff	87%
Evaporative Eff	Not Used
Winter SP T3	70
Summer SP T3	74

Equipment Operation and Efficiencies					System Air Flow Profile			
Del. Heat Eff	65%	Gas	0	KWh Elect/Thm	Nominal CFM	Actual CFM	Supply CFM	Exhaust CFM
	1.05	$/Therm	0.12	$/kWh	500	700	700	700
Del. Cool Eff	NA	Gas	1.33	KWh Elect/Ton				
	1.05	$/Therm	0.12	$/kWh				
		Demand Savings	0.00	$/kW				

Profile of Energy Savings

Time of Year	Mid-Pts	DB (F)	Total	OA Temp DB (F)	OA Supply Temp DB (F)	Space Temp DB (F)	Exhaust Temp DB (F)	Recovered BTU/H	Annually Saved BTUs	OPERATE BPE?
Summer Cooling	117.5	115 to 120	0	117.5	79.7	74	111.8	-	-	NO
	112.5	110 to 115	0	112.5	79.0	74	107.5	-	-	NO
	107.5	105 to 110	0	107.5	78.4	74	103.1	-	-	NO
	102.5	100 to 105	0	102.5	77.7	74	98.8	-	-	NO
	97.5	95 to 100	6	97.5	77.1	74	94.4	15,456	92,739	YES
	92.5	90 to 95	40	92.5	76.4	74	90.1	12,168	486,713	YES
	87.5	85 to 90	122	87.5	75.8	74	85.7	8,879	1,083,265	YES
	82.5	80 to 85	500	82.5	75.1	74	81.4	5,591	2,795,310	YES
	77.5	75 to 80	620	77.5	74.5	74	77.0	2,302	1,427,252	NO
	72.5	70 to 75	847	72.5	73.8	74	72.7	-	-	NO
Free Cooling	67.5	65 to 70	671	67.5	73.2	74	71.2			NO
	62.5	60 to 65	927	62.5	72.5	74	64.0			NO
	57.5	55 to 60	600	57.5	71.9	74	59.6			NO
	52.5	50 to 55	730	52.5	67.7	70	54.8			YES
	47.5	45 to 50	634	47.5	67.1	70	50.4			YES
Winter Heating	42.5	40 to 45	513	42.5	66.4	70	46.1	(18,087)	(9,278,785)	YES
	37.5	35 to 40	1023	37.5	65.8	70	41.7	(21,376)	(21,867,546)	YES
	32.5	30 to 35	734	32.5	65.1	70	37.4	(24,665)	(18,103,743)	YES
	27.5	25 to 30	391	27.5	64.5	70	33.0	(27,953)	(10,929,662)	YES
	22.5	20 to 25	195	22.5	63.8	70	28.7	(31,242)	(6,092,132)	YES
	17.5	15 to 20	125	17.5	63.2	70	24.3	(34,530)	(4,316,288)	YES
	12.5	10 to 15	47	12.5	62.5	70	20.0	(37,819)	(1,777,488)	YES
	7.5	5 to 10	34	7.5	61.9	70	15.6	(41,108)	(1,397,655)	YES
	2.5	0 to 5	1	2.5	61.2	70	11.3	(44,396)	(44,396)	YES
	-2.5	-5 to 0	0	-2.5	60.6	70	6.9	-	-	YES
	-7.5	-10 to -5	0	-7.5	59.9	70	2.6	-	-	YES

ERV Operating Hours =	**917**	Fan Power (kWh) =	251
All Operating Hours =	**8,760**	Fan Power Cost =	**$ 30.66**
% Cooling =	24%	Total Cooling Saved (BTU) =	4,458,026
% Heating =	35%	Total Peak Demand kW saved =	1.72
% Free =	25%	**Peak Energy Savings ($ for kW) =**	**$ -**
Peak Tonnage Reduction =	1.72	Total Cooling Power Saved (kWh) =	495.34
Total System Cfm =	220	Cooling Savings =	$ 60.43
Cfm Reduction =	687	**Total Cooling Savings =**	**$ 60.43**
Existing HVAC Fan (W) =	691	Total Heating Saved (BTU) =	(73,807,694)
Proposed HVAC Fan (W) =	123.00	Total Heating Saved (Therms or kWh) =	1,452
kWh Savings =	895	**Total Heating Savings =**	**$ 1,522.68**
Proposed HVAC Fan Savings* =	**$ 109.20**	**Total Motor/Electric Savings =**	**$ 109.20**
		Maintenance Savings =	**$ -**
		Net Savings =	**$ 1,692.31**
		Cost of Project =	**$ 7,200.00**
		Simple Payback (Yrs) =	**4.25**

Supply

Fan HP/1,000 cfm*
1.2

Operational Hours

* ASHRAE Std. 90.1-2004, Table 6.5.3.1 Fan Power Limitation assuming Constant Volume

Handbook of Energy Audits. Thuman,PE,RA, Albert, Third Ed.1992

Note: Actual savings will depend on operating conditions and application

Electric	1,139.11	**kWh**	3,887.77	Mbtus
Heating (G/E)	1,452	**Therms or kWh**	145,155.13	Mbtus
		Total Energy	**149,042.90**	**MBtus**

Marlboro High School			5.0%	GC Allowance	25.0%
Number of Classrooms: 102	264,000	Gross SF Area	**18.0%**	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**Laser prints on off mode at night, times power strips**	P4P	$8,353.80	$5,569.20	417.69	1,503.68	924.77	11,199.94	2,799.98	8,399.95	1.51

Cost Basis:	This is based on installing in 102 classrooms with a cost of $81.90 (cost with shipping and labor) per power saver strip with the ability to shut down additional plug-ins such as laser printers and other components. The installed effort would be done with an onsite maintenance personelle or possibly the people occupying the classrooms. This has been shown to provide an efficient way to get rid of vampire loads from printers and other equipment that are generally left on 24/7.
Saving Projection:	The saving is based on publications involved with evaluating the effectiveness of these components. For our geographic area we believe that the energy savings would be projected at 42.65 kWh per classroom per month for 102 classrooms. When we evaluate this we find that a reasonable estimated savings is $6,368.84.

Energy Savings	Savings per Year (kWh)	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	52,203.60	$6,368.84	28,868.59	86.43	71.43	2.52
Gas (Therms)	0.00	$0.00	0	0	0	0
Total Savings (kBtu)	178,126.08	$6,368.84	28,868.59	86.43	71.43	
					Total Pollution Reduction in Cars Removed from the Road =	**2.52**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Haglid Engineers has installed a set back power and an inline watt meter. Found typical watt meter savings of 42.65 kWh/month or	$5.20	per month
	42.65 kWh/month x 12 months = 512 kWh/year per classroom		
	512 kWh/year per classroom x 102 classrooms = 52,224 kWh/year		
Energy Savings Factor of Safety	1.14	Estimated annual savings with energy savings factor of safety =	$5,569.20
Discussion:	These vampire load shutting power strips have been shown in peer reviewed articles to provide good energy savings while being relatively easy to install. It would be something that would be a low enough payback that it would actually help to bring high cost items such as heavy mechanical components more into line with the type of cost and internal rate of return in order to justify these capital projects. The recommendation would be to do these power strips for the simple reason that they are easy to install, have a quick payback and they would effectively help reduce the cost of other more expensive items.		

Marlboro High School					
Number of Classrooms: 102	264,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**Other ERMs - Controls Upgrade**	P4P	$1,012,000.00	$34,434.78	50,600.00	182,160.00	112,028.40	1,356,788.40	339,197.10	1,017,591.30	29.55

Cost Basis:	The cost of this controls upgrade was provided with vendor pricing from one of the existing controls vendors that are currently providing controls automation for the school. This is based on a quote with vendor pricing with labor costs built in.
Saving Projection:	Based on typical energy savings from other projects of the same kind for high schools, we believe that the savings projection of $39,804.45 is reasonable and relatively conservative.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	230,304.00	$28,097.09	127,358.11	381.30	315.10	11.12
Gas (Therms)	11,160.50	$11,707.36	534,941.72	1,094.44	1,323.51	46.72
Total Savings Kbtu	1,901,879.86	$39,804.45	662,299.84	1,475.74	1,638.62	
					Total Pollution Reduction in Cars Removed from the Road =	**57.84**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From observations and the current operation of the existing pneumatic controls, Haglid Engineers estimate projected savings of 10%.		
Factor of Safety	1.16	Estimated annual savings with energy savings factor of safety =	$34,434.78
Discussion:	With a payback of 29.55 years this would have a relatively long payback. The expense is excessive, part of it involves upgrading controls that currently are not functioning. We would recommend upgrading the controls especially for the large exhaust fans that are running wild 24/7. Part of this can be addressed with the DOAS and other components we would evaluate as the project goes forward and try to address them as a part of the other energy reduction measures. Due to the cost of this energy reduction measure and the payback estimated at 29.55 years, we cannot recommend this energy reduction measure at this time.		

School/Building	ATC	Mechanical*	Contigency	Total
BOE	$ 85,500	$ 15,000	10%	**$ 110,550**
Tranporation	$ 34,000	$ -	10%	**$ 37,400**
Coltsneck HS	$ 225,000	$ -	10%	**$ 247,500**
Howell HS	$ 570,000	$ 50,000	10%	**$ 682,000**
Freehold Boro HS	$ 670,000	$ 50,000	10%	**$ 792,000**
Freehold Twp HS	$ 565,000	$ 75,000	10%	**$ 704,000**
Manalapan HS	$ 525,000	$ 75,000	10%	**$ 660,000**
Marlboro HS	$ 820,000	$ 100,000	10%	**$ 1,012,000**

* ATC contractor provides the valve and the Mechanical Contractor will install.

Marlboro High School					
Number of Classrooms: 102	264,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI
Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Lighting upgrades, at least T-8 or LED**	P4P	$262,548.00	$41,674.28	13,127.40	47,258.64	29,064.06	351,998.10	87,999.53	263,998.58	6.33

Cost Basis: The $262,548.00 is based on doing the common areas, hallways and some of the longer run time lighting. These are based on known construction numbers for our area, RS Means and costs from other high school projects in Central NJ.

Saving Projection: The annual saving is based on the change in Wattage from the existing fixture of mainly T8 and some T12's to high efficiency LED lighting. These are then estimated with something on the order of 4000 run hours a year. In some areas such as hallways, this would be higher as the lighting in these areas are used late into the night for custodial purposes. Stairways and other areas would run 24/7, so it is a mixture of run hours throughout the facility.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	412,254.42	$50,295.04	227976.6963	682.54	564.0493832	19.9106285
Gas (Therms)	-2,252.09	$ (2,362.44)	-107946.266	-220.8484132	-267.0728637	-9.427621484
Total Savings Kbtu	1,181,461.94	$47,932.60	120030.4303	461.6907231	296.9765195	
					Total Pollution Reduction in Cars Removed from the Road =	**10.48**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions

Areas 101,102,104 which consist areas such ashallways, stairwells, and bathrooms will be considered for the current Energy Reduction Measure

Area 103 are all classrooms and will not be included at this time in the Energy Reduction Measure

Run hours are assumed to be the following as stated in the "Assumption Details" below

Assumption Details

Group	Run Time	Existing Total (kW)	Number of Fixtures	Retrofit Total (kW)	Savings Kwh	$ Savings	Comments
101	5,500	94	638	41	290,417	$35,431	Recommended
102			0			$0	Not part of Project Work
103	6,600	9	110	3	38,907	$4,747	Recommended
104	8,760	18	197	8	82,931	$10,118	Recommended
	Totals =	**120.44**	**945.00**	**52.28**	**412,254.42**	**$47,933**	An additional gas heating cost is considered as shown in row labeled "Assumptions"

Energy Savigns Factor of Safety 1.15 Estimated annual savings with energy savings factor of safety = $41,674.28

Discussion: Recently a lighting audit has been done that is more comprehensive in nature and covers a larger amount of lighting going into the classrooms. We believe that this will have additional benefits and savings. However, before we can recommend this we are going to have to see sampling, test cases done in some of the classrooms where the lighting is installed. Specifically this is CPL rated, high performance, LED lighting. It has been represented that the light levels will be well in excess of 50ft candles but there are many parameters to lighting (color rendering index, quality of light, temperature, light levels at the desk height). At this point in time we recommend that there be several test sites in several classrooms to evaluate the lighting going into the individual classrooms.

TRI-STATE LED
255 Mill Street, 2nd Floor
Greenwich, CT 06830

p: (203) 813-3791
f: (203) 813-3794

www.TriStateLED.com

Project Name	*MARLBORO HS*
Street Name	*95 NORTH MAIN ST.*
City/State	*MARLBORO NJ*
Zip Code	*7746*
Site Contact	*PAT LAGRAVANIS*
Phone #	
Cell Phone #	
Fax #	
Email Address	
Proposal Date	5/29/2013

Hours of Operation

Group 101		Group 102	
Hrs/Day	16	Hrs/Day	13
Days/Wk	6	Days/Wk	6
Wks/Yr	46	Wks/Yr	46
Total Hrs	4428	Total Hrs	3598

Group 103		Group 104	
Hrs/Day	13	Hrs/Day	24
Days/Wk	6	Days/Wk	7
Wks/Yr	46	Wks/Yr	52
Total Hrs	3598	Total Hrs	8760

Project Description

Supply LED Lamps & Fixtures as per Lighting Audit Worksheet

Sales Person	CHRIS ANASTASI	Cell Phone Number	914-482-4442
Sales Person		Cell Phone Number	

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
2	101	4428		C HALL		4.2.4ERB	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
3	101	4428		C HALL	EMERGENCY	4.2.3ER	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit, Ballast Ready LED Tube Lights, 2- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	44
4	102	3598		C130, C128		4.2.4ERB	46	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
5	101	4428		AUX GYM #3		MH350	32	METAL HALIDE, 1-250 WATT LAMP	295	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
6	101	4428		AUX GYM #2		MH360	16	METAL HALIDE, 1-300 WATT LAMP	358	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
7	102	3598		C126		4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
8	101	4428		C126 CLOSET		A40	1	A LAMP 100 WATT INCANDESCENT	100	Seesmart Household Bulb, 12Watt, SMD 120V SKU:140041-140042	12
9	101	4428		GIRLS TEAM ROOM		4.2.4SR	8	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
10	101	4428		GYM HALL		2.2.3ELP	9	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
11	101	4428		MAIN GYM		MH360	37	METAL HALIDE, 1-300 WATT LAMP	358	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
12	101	4428		STORAGE		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
13	104	8760		C103, OFFICE		4.3.32ELP	22	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
14	104	8760		OFFICE		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
15	101	4428		MUSIC STORAGE		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
16	103	3598		MUSIC STORAGE		BR40.90D	2	100 WATT INCANDESCENT	100	Seesmart Par 38, 12W, High Powered DIMMABLE, 120V, SKU: 180100-180111	12
17	101	4428		STORAGE		4.2.4SR	10	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
18	101	4428		GYM FOYER		4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
19	101	4428		GYM FOYER	EMERGENCY	2.2.3ERB	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit, Ballast ReadyLED Tube Lights, 2- 2 Foot, 12W, 120-277V(Includes Battery/Ballast Kit)	24
20	101	4428		C HALL		4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
21	101	4428		C HALL		2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
22	103	3598		BOYS/GIRLS		4.2.4ERB	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
23	103	3598		CUSTODIAN		A150D	1	23 WATT CFL	14	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
24	101	4428		CHOIR ROOM		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
25	101	4428		CHOIR ROOM		4.3.32ELP	17	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
26	101	4428		CHOIR ROOM/STORAGE		MV75	12	MERCURY VAPOR, 1-75 WATT LAMP	93	Seesmart Household Bulb, 12Watt, SMD 120V SKU:140041-140042	12
27	101	4428		A HALL		4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
28	101	4428		STAGE		MH360	10	METAL HALIDE, 1-300 WATT LAMP	358	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
29	101	4428		AUDITORIUM		4.3.32ELP	58	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
30	101	4428		STAGE		A75	4	A LAMP 40 WATT INCANDESCENT	40	Duracell A19 Lamp, Dimmable, Energy Star Rated, 8.5 Watt, 120V, 2700K	8.5
32	101	4428		STAGE		P30.55D	24	150 WATT FLOOD	150	Seesmart Par 38, 18W High Powered, DIMMABLE, 120V, SKU: 180121-180129	18
33	101	4428		STAGE		2.2.3ELP	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
34	101	4428		CONTROL ROOM		A60D	10	A LAMP 24 WATT INCANDESCENT	24	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
35	101	4428		MAIN OFFICE HALL		4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
36	101	4428		MAIN OFFICE HALL		4.2.4SR	12	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
37	103	3598		STORAGE/MEN/GIRLS		2.1.3ERB	3	2' FIXTURE, 4-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	112	Retrofit - LED Tube Lights, 4 - 2 Foot, 8W, 120V-277V, Single End Power	32
38	103	3598		GIRLS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
39	104	8760		MAIN OFFICE		4.2.3ELRB	9	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
40	102	3598		MAIN OFFICE/COPY ROOM		4.3.32ELP	24	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
41	101	4428		MAIN OFFICE HALL		2.2.3SR	1	2x2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	82	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
42	104	8760		ASST PRINC OFFICE		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
43	103	3598		STORAGE		A75D	2	A LAMP 150 WATT INCANDESCENT	150	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
44	103	3598		WOMENS/MENS		A60	2	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
45	104	8760		PRINC OFFICE		4.2.3ELRB	7	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
46	104	8760		ASST PRINC OFFICE		2.3.2ERB	6	2' FIXTURE, 2-F17/T8/STD LAMPS, ELECTRONIC BALLAST	34	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
47	104	8760		OFFICE		4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
48	104	8760		GUIDANCE		4.2.3ELRB	14	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
49	104	8760		GUIDANCE		2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
50	104	8760		OFFICE		4.2.3ELRB	8	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
51	101	4428		STORAGE		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
52	101	4428		GUIDANCE HALL		4.2.3SR	5	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
53	101	4428		GUIDANCE HALL		4.2.3ELRB	5	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
54	103	3598		MENS/GIRLS		2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
55	104	8760		DR OFFICE		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
56	104	8760		DR OFFICE	EMERGENCY	4.3.4SRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit, Ballast Ready LED Tube Lights, 3- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	66
57	104	8760		LST OFFICE		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
58	104	8760		LST OFFICE	EMERGENCY	4.3.4SRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit, Ballast Ready LED Tube Lights, 3- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	66
59	104	8760		OFFICE		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
60	104	8760		OFFICE	EMERGENCY	4.3.4SRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit, Ballast Ready LED Tube Lights, 3- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	66
61	102	3598		CONFERENCE ROOM		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
62	104	8760		SPECIAL ED OFFICE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
63	101	4428		CAFÉ HALL		4.3.32ELP	22	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
64	102	3598		GYM HALL/BOYS/GIRLS		4.2.3SR	20	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
65	101	4428		TRAINING ROOM		4.2.3ELRB	7	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
66	103	3598		BATHROOM		4.2.3SR	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
67	101	4428		STORAGE		4.2.4SR	6	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
68	101	4428		SHOP HALL		4.3.32ELP	15	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
69	102	3598		B110,B111,B113,CLOSET,ST RM		4.3.32ELP	66	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
70	101	4428		STOR RM		2.3.2ERB	1	2' FIXTURE, 2-F17/T8/STD LAMPS, ELECTRONIC BALLAST	34	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
71	101	4428		CLOSET		4.2.4SR	2	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
72	102	3598		COMP TECH RM		4.3.32ELP	19	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
73	102	3598		PHOTO RM		4.2.3SR	9	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
74	102	3598		TECH DRAWING RM		4.3.32ELP	27	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
75	104	8760		OFFICE		4.2.4SR	4	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
76	102	3598		SHOP		4.2.4SR	46	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
77	101	4428		CLOSET		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
78	103	3598		BOYS		4.2.3SR	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
79	101	4428		CUSTODIAN HALL		4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
80	104	8760		CUSTODIAN OFFICE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
81	104	8760		CUSTODIAN OFFICE	EMERGENCY	4.4.4SRB	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit, Ballast Ready LED Tube Lights, 4- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	88
82	104	8760		BOILER		A300	17	150 WATT INCANDESCENT	150	Seesmart Par 38, 15W, High Powered DIMMABLE, 120V, SKU: 180112-180120	15
83	104	8760		BOILER		A400	1	200 WATT INCANDESCENT	200	Seesmart Par 38, 15W, High Powered DIMMABLE, 120V, SKU: 180112-180120	15
84	104	8760		BOILER		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
85	104	8760		BOILER		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
86	104	8760		CUSTODIAN SUPR OFFICE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
87	101	4428		WEIGHT ROOM HALL		4.3.32ELP	10	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
88	101	4428		WEIGHT ROOM		MH400.1	15	METAL HALIDE, 1-400 WATT LAMP	458	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
89	103	3598		GIRLS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
90	102	3598		B101		4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
91	103	3598		CUSTODIAN		A200	1	14 WATT CFL	9	Duracell A19 Lamp, Dimmable, Energy Star Rated, 8.5 Watt, 120V, 2700K	8.5
92	102	3598		CAFÉ		4.3.32ELP	85	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
93	102	3598		CAFÉ	EMERGENCY	4.4.4SRB	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit, Ballast Ready LED Tube Lights, 4- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	88
94	102	3598		CAFÉ		A300	35	150 WATT INCANDESCENT	150	Seesmart Par 38, 15W, High Powered DIMMABLE, 120V, SKU: 180112-180120	15
95	102	3598		FACULTY CAFÉ		4.2.3ELRB	28	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
96	102	3598		FACULTY CAFÉ		4.2.4SR	36	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
97	103	3598		STORAGE		A300	13	150 WATT INCANDESCENT	150	Seesmart Par 38, 15W, High Powered DIMMABLE, 120V, SKU: 180112-180120	15
98	104	8760		OFFICE		2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
99	103	3598		STORAGE		A75	7	A LAMP 40 WATT INCANDESCENT	40	Duracell A19 Lamp, Dimmable, Energy Star Rated, 8.5 Watt, 120V, 2700K	8.5
100	102	3598		DISH ROOM		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
101	101	4428		HALL		4.3.32ELP	16	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
102	101	4428		HALL		2.2.3ELP	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
103	102	3598		FACULTY WORK ROOM		4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
104	104	8760		ATTENDANCE OFFICE		4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
105	101	4428		A STORAGE		4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
106	102	3598		MEDIA CENTER		4.2.3ELRB	30	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
107	102	3598		MEDIA CENTER	EMERGENCY	4.3.4SRB	8	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit, Ballast Ready LED Tube Lights, 3- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	66
108	102	3598		MEDIA CENTER		4.3.32ELP	13	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
109	102	3598		MEDIA CENTER		4.2.3SR	30	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
110	101	4428		STORAGE		4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
111	101	4428		D HALL		4.2.3SR	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
112	102	3598		CAFÉ FOYER		2.2.3SR	16	2x2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	82	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
113	102	3598		CAFÉ FOYER	EMERGENCY	2.2.3SRB	11	2x2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	82	Retrofit, Ballast ReadyLED Tube Lights, 2- 2 Foot, 12W, 120-277V(Includes Battery/Ballast Kit)	24
114	101	4428		D HALL		4.2.3SR	14	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
115	101	4428		D HALL	EMERGENCY	4.2.3ER	7	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit, Ballast Ready LED Tube Lights, 2- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	44
116	101	4428		CLOSET		4.2.3SR	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
117	103	3598		GIRLS/BOYS/MECH RM		4.2.3SR	17	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
118	102	3598		D101,D102,D103,F104,D105,D106,D108, D110,D112,D114		4.2.3SR	270	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
119	104	8760		D WING STAIR, D HALL		4.2.3SR	18	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
120	102	3598		E HALL, A135		4.3.32ELP	39	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
121	101	4428		STORAGE		4.2.3SR	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
122	102	3598		A133,TECH RM, LAB A 131		4.3.32ELP	31	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
123	102	3598		A134, COMP CENTER		4.2.3ELRB	26	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
124	104	8760		ELECTRIC ROOM		4.2.4SR	3	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
125	104	8760		PREP ROOM		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
127	104	8760		PREP ROOM		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
128	103	3598		STORAGE		A300	1	150 WATT INCANDESCENT	150	Seesmart Par 38, 15W, High Powered DIMMABLE, 120V, SKU: 180112-180120	15
129	103	3598		GIRLS/BOYS		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
130	104	8760		CUSTODIAN #2		A40D	1	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
131	102	3598		A127, RES CTR, E110,E108,E125		4.3.32ELP	40	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
132	102	3598		E123		4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
133	102	3598		E123		4.1.4SRB	5	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
134	101	4428		STORAGE		4.2.4SR	4	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
135	102	3598		E121,E HALL, E119, E104		4.3.32ELP	36	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
136	102	3598		E 121		4.1.4SRB	5	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
137	101	4428		E FOYER		2.2.3ELP	1	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
138	102	3598		E119, E117, E113		A40D	5	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
139	102	3598		E104		4.1.4SRB	5	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
140	102	3598		E117, E102, E115,E100,E113		4.3.32ELP	45	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
141	102	3598		E102,E115,E100, E113		4.1.4SRB	20	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
142	101	4428		CLOSET		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
143	102	3598		E111		4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
144	102	3598		E111		4.1.4SRB	5	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
145	102	3598		E111		A40D	1	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
146	101	4428		E FOYER		2.3.2SRB	4	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
147	101	4428		E FOYER		4.2.3SR	6	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
148	101	4428		E HALL		4.3.32ELP	10	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
149	103	3598		GIRLS/MENS		2.2.3ELP	8	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
150	102	3598		E107		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
151	104	8760		SUPER		4.2.3SR	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
152	101	4428		EXIT 9		2.3.2ERB	3	2' FIXTURE, 2-F17/T8/STD LAMPS, ELECTRONIC BALLAST	34	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
153	102	3598		A HALL,A125,A123,A121,A117,A115		4.3.32ELP	64	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
154	101	4428		STORAGE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
155	102	3598		A119,A130		4.2.3ELRB	40	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
156	103	3598		STORAGE		A40D	2	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
157	104	8760		ELEVATOR		3.2.2SR	1	3' FIXTURE, 4-F30/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	162	Retrofit - LED Tube Lights, 3 Foot, 15W, 120V-277V, Single End Power	15

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
158	104	8760		STAIRWELL 3		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
159	102	3598		A HALL, A113, BOYS/GIRLS,A107,A109		4.3.32ELP	55	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
160	101	4428		A HALL		2.3.2ERB	2	2' FIXTURE, 2-F17/T8/STD LAMPS, ELECTRONIC BALLAST	34	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
161	102	3598		A108,A106,A105,A103,A104,A102.A101, EXIT4		4.3.32ELP	90	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
162	102	3598	2ND	AHALL, A202,A201,A204,A206,A203,A205.A208. A210.A209		4.3.32ELP	150	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
163	103	3598	2ND	CLOSET		P38.75D	2	100 WATT PAR 38	100	Duracell Energy Star Par 38, 17 Watt 120V, 38DEG	17
164	102	3598	2ND	A210		A300	1	150 WATT INCANDESCENT	150	Seesmart Par 38, 15W, High Powered DIMMABLE, 120V, SKU: 180112-180120	15
165	104	8760	2ND	EXIT 3 STAIRS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
166	103	3598	2ND	BOYS/GIRLS		2.2.3ELP	4	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
167	102	3598	2ND	A213,A211		4.3.32ELP	24	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
168	101	4428	2ND	STORAGE		A40D	2	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
169	102	3598	2ND	FOREIGN LANGUAGE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
170	103	3598	2ND	MENS/WOMENS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
171	102	3598	2ND	A215,A217		4.2.4SR	28	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
172	102	3598	2ND	A217		4.1.4SRB	4	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
173	102	3598	2ND	A219		4.2.3ELRB	18	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
174	102	3598	2ND	A221,A223,A225,A228		4.3.32ELP	60	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
175	101	4428	2ND	2ND FL HALL		4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
176	104	8760		E 2ND FL STAIR		2.2.3ELP	7	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
177	101	4428		STORAGE		4.2.4SR	4	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
178	103	3598		BOYS/GIRLS		2.2.3ELP	8	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
179	104	8760		CUSTODIANS		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
180	104	8760		E WING STAIRWELL		4.2.3SR	6	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
181	104	8760		E WING STAIRWELL		4.1.3ERB	2	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
182	101	4428		E HALL		4.3.32ELP	11	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
183	102	3598		E213,E211,E200,E215,E202,E204,E217, E217A,EHALL,E219,E219A,E221		4.3.32ELP	118	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
184	102	3598		E211,E200,E202,E204		A40D	10	A LAMP 75 WATT INCANDESCENT	75	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
185	102	3598		E206,E208,E210.E HALL,STORAGE,BOYS, GIRLS		4.3.32ELP	34	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
186	101	4428		STORAGE		A300	2	150 WATT INCANDESCENT	150	Seesmart Par 38, 15W, High Powered DIMMABLE, 120V, SKU: 180112-180120	15
187	102	3598		A227,A229,A230,A232, STORAGE		4.3.32ELP	62	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
188	102	3598		A231,LAB,A233,A234		4.3.32ELP	37	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
189	102	3598		A233		4.1.4SRB	4	4' FIXTURE, 1-F40/T12 LAMP, STANDARD MAGNETIC BALLAST	57	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
190	102	3598		A TO D HALL, D STAIRWELL, D HALL		4.2.4ERB	39	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
191	104	8760		D STAIRWELL	EMERGENCY	4.2.3ER	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit, Ballast Ready LED Tube Lights, 2- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	44
192	103	3598		STORAGE,BOYS, GIRLS		4.2.4ERB	13	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
193	104	8760		D PREP ROOM		4.2.3ELRB	5	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
194	104	8760		D PREP ROOM		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
195	102	3598		D201,D202,STAIRWELL, D203,D204		4.2.4ERB	152	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
196	104	8760		D PREP ROOM #1		4.2.3ELRB	6	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
197	104	8760		D PREP ROOM #4		4.2.3ELRB	6	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
198	102	3598		D205,D206,D207,D208		4.2.4ERB	86	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
199	102	3598		D208		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
200	102	3598		D208	EMERGENCY	4.3.4SRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit, Ballast Ready LED Tube Lights, 3- 4 Foot, 22W, 120-277V (Includes Battery/Ballast Kit)	66
201	101	4428		E/D HALL, E HALL, STAIR #11		4.2.4ERB	16	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
202	101	4428		GIRLS LOCKER		4.3.32ELP	32	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
203	101	4428		GIRLS LOCKER		2.3.2SRB	2	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
204	101	4428		BOYS TEAM		4.3.32ELP	12	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
205	101	4428		BOYS TEAM		2.3.2SRB	2	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
206	101	4428		BOYS LOCKER		4.3.32ELP	29	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
207	101	4428		BOYS LOCKER		2.3.2SRB	5	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	56	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
208	104	8760		OFFICE		4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
209	103	3598		SHOWER		A61	6	A LAMP 2-60 WATT INCANDESCENT	120	2-Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	22
210	101	4428		BOYS TEAM		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
211	102	3598		WALL PACKS	EXTERIOR	HPS35	8	HPS-75 WATT WALL PACK	100	RAB 20W LED WALL PACK - WPLED20	20
212	102	3598		WALL PACKS	EXTERIOR	HPS225	20	HIGH PRESSURE SODIUM, 1-250 WATT LAMP	295	RAB 78W LED WALL PACK - ALED4T78	78
213	102	3598		POLES	EXTERIOR	HPS250.1	34	HIGH PRESSURE SODIUM, 1-250 WATT LAMP	295	RAB 52W LED AREA LIGHT - ALED5T52	52
214	102	3598		EXTERIOR	EXTERIOR	MH400	3	METAL HALIDE, 1-400 WATT LAMP	458	Cree XSP2 Street light, 100 Watt, High Lumen, With Photocell	100
215	102	3598		CANOPY	EXTERIOR	P38.120	27	60 WATT HALOGEN	60	Duracell Energy Star Par 38, 17 Watt 120V, 38DEG	17
216	102	3598		FLOOD WALL	EXTERIOR	P30.55	5	100 WATT FLOOD	100	RAB FLOODLIGHT 39 WATT - FFLED39	39
217	102	3598		EXTERIOR	EXTERIOR	MH32	2	MH 250 WATT	295	SEESMART HIGH POWERED 22 WATT LED LAMP SKU; 130028-130039 (3000-3200 Lumens)	22
				Total Fixture Quantity		3270					

TRI-STATE LED
255 Mill Street, 2nd Floor
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Demand		Usage	
Existing Demand: kW	375.78	Existing Use: kWh	1,534,291.10
Proposed Demand: kW	159.61	Proposed Use: kWh	650,084.47
Demand Reduction: kWr	216.18	Use Reduction: kWh	884,206.63

Total Lighting Energy Savings	57.6%

Combined Unit Use Cost: kWh	$0.15	Supply Savings: KWH Per Year	$132,630.99
		*Delivery Savings: KW Per Year	$38,911.86
		*Maintenance Savings Per Year (Lamps & Ballast only)	$27,000.00
		*15% HVAC Savings Per Year	$32,836.62

Total Monthly Savings	$19,281.62
Total Annual Savings	$231,379.47
Total Cost Savings 5 Years	$1,156,897.35

Financial Summary

Material Cost	*$733,063.53*
Estimated Baypoint Electric Labor Cost	*$157,000.00*
One Time Approx. Rebate	*$120,000.00*
Total Job Cost (After Rebate & Labor)	*$770,063.53*
Simple Payback (months)	**39.96**
First Year Return on Investment	*30.05%*
CO_2 Reduction (lbs)	1,175,994.81

School : Marlboro

Summary of Lighting Quote and Audit

Group	Run Time	Existing Total (W)	Number of Fixtures	Retrofit Total (W)	Savings Kwh	Area Served	Comments
101	4,428	94,007	638	41,204	233,812		Recommended
102	4,067	251,323	2,325	107,472	585,042	Classrooms	Not part of Project Work
103	5,812	8,758	110	2,863	34,262		Recommended
104	8,760	17,676	197	8,209	82,931		Recommended

Group	Run Time	Existing Total (kW)	Number of Fixtures	Retrofit Total (kW)	Savings Kwh	$ Savings	Comments
101	5,500	94.01	638.00	41.20	290,416.50	$ 35,430.81	Recommended
102							Not part of Project Work
103	6,600	8.76	110.00	2.86	38,907.00	$ 4,746.65	Recommended
104	8,760	17.68	197.00	8.21	82,930.92	$ 10,117.57	Recommended
	Totals =	120.44	945.00	52.28	412,254.42	$ 50,295.04	

	kWh	Therms	$ Amount	Factor of Safety
Lighting Savings =	412,254.42		$ 50,295.04	1.15
Heating Costs =		-2252.09	$ (2,362.44)	
Total Net Savings =			$ 47,932.60	

Marlboro High School					
Number of Classrooms: 102	264,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *;
Importance*; 1 =

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	Plug Loads on Timers, Reduce Plug Loads, Vending Machines (10 +/-)	P4P	$1,890.00	$630.00	94.50	340.20	209.22	2,533.92	633.48	1,900.44	3.02

Cost Basis:	This is based on installing approximately 10 in the building with a cost of $189.00 per install with the ability to shut down additional plug-ins when not in service . This has been shown to provide an efficient way to get rid of any parasitic loads from electrical equipment that are generally left on 24/7.
Saving Projection:	The saving is based on publications involved with evaluating the effectiveness of these components. It is estimated to be 595kWh/year for each install, with 10 being installed the annual savings is projected to be 5,950 kWh.year. When we evaluate this we find that a reasonable estimated savings is $725.90.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kW)	5,950.00	$725.90	3,290.35	9.85	8.14	0.29
Gas Savings (Therms)	0	$0.00	0	0	0	0
Total Savings Kbtu	2,816,094.00	$725.90	3,290.35	9.85	8.14	
					Total Pollution Reduction in Cars Removed from the Road =	**0.29**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	By implementing timers on plug loads it is projected to save 595kWh each per year		
Energy Savings Factor of Safety	1.15	Estimated annual savings with energy savings factor of safety =	$630
Discussion:	These parasitic load reducing power strips have been shown in peer reviewed articles to provide good energy savings while being relatively easy to install. It would be something that would be a low enough payback that it would actually help to bring high cost items such as heavy mechanical components more into line with the type of cost and internal rate of return in order to justify these capital projects. The recommendation would be to do these power strips for the simple reason that they are easy to install, have a quick payback and they would effectively help reduce the cost of other more expensive items.		

Marlboro High School					
Number of Classrooms: 102	264,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)**	P4P	$2,152.20	$1,033.26	107.61	387.40	238.25	2,885.45	721.36	2,164.09	2.09

Cost Basis:	This is based on installing in 102 classrooms with a cost of $21.10 per class room with the ability to shut down additional plug-ins . This has been shown to provide an efficient way to get rid of any parasitic loads from electrical equipment that are generally left on 24/7.
Saving Projection:	The saving is based on publications involved with evaluating the effectiveness of these components. The savings is estimated to be 95 kWh/year per classroom for 102 classrooms. When we evaluate this we find that a reasonable estimated savings is $1,182.18.

Energy Savings	**Savings per Year (kWh)**	**Estimated Annual Savings ($)**	**C02 Reduced (lbs.)**	**SO2 (lbs.)**	**NOX (lbs.)**	**Cars Removed**
Electric (kWh)	9,690.00	$1,182.18	5,358.57	16.04	13.26	0.47
Gas (Therms)	0	$0.00	0	0	0	0
Total Savings (kBtu)	33,063.65	$1,182.18			**Total Pollution Reduction in Cars Removed from the Road =**	**0.47**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Estimates average savings per classroom of 95 kWh/year removing hot plates from classroom.		
Energy Savings Factor of Safety	1.14	Estimated annual savings with energy savings factor of safety =	$1,033.26
Discussion:	These parasitic load reducing power strips have been shown in peer reviewed articles to provide good energy savings while being relatively easy to install. It would be something that would be a low enough payback that it would actually help to bring high cost items such as heavy mechanical components more into line with the type of cost and internal rate of return in order to justify these capital projects. The recommendation would be to do these power strips for the simple reason that they are easy to install, have a quick payback and they would effectively help reduce the cost of other more expensive items.		

Marlboro High School					
Number of Classrooms: 102	264,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Soda vending machines off at night or weekends**	P4P	$2,640.00	$1,108.00	132.00	475.20	292.25	3,539.45	884.86	2,654.59	2.40

Cost Basis:	Based on 10 USAT vending machines at 189.00 each plus a $75.00 labor to install each for a total of $2,640.00.						
Saving Projection:	This is based on conservative estimates on weekends and late nights that the machines can be used to go into deep set back where the refrigeration can be shut off. It can be noted that this should only be used for things like soda; ice cream and milk would not be a good candidate for this type of energy savings measure. The savings is estimated to be 1092 kWh/year per vending machine, therefore with 10 installations, an annual savings is projected to be $1,332.24.						
Energy Savings	**Savings per Year**	**Estimated Annual Savings ($)**	**C02 Reduced (lbs.)**	**SO2 (lbs.)**	**NOX (lbs.)**	**Cars Removed**	
Electric (kWh)	10,920.00	$1,332.24	6,038.76	18.08	14.94	0.53	
Gas (Therms)		$0.00	0	0	0	0	
Total Savings (kBtu)	37,260.59	$1,332.24			**Total Pollution Reduction in Cars Removed from the Road =**	**0.53**	
*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**							
Assumptions	Assumes savings of 91 kWh/month per vending machine						
	Ten vending machines can use this upgrade						
Energy Savigns Factor of Safety	1.20	Estimated annual savings with energy savings factor of safety =	$1,108.00				
Discussion:	There are candy machines and soda machines that do not need to keep all components refrigerated to keep them in a saleable fashion. For instance; coca cola, diet coke sodas can have the refrigeration shut off over long weekend, night or times where there is no one in the school. It would not be recommended to use this technology for any dairy products or foods that can potentially spoil with elevated temperatures. This is a good way to tie an occupancy sensors to when people are in the area and when the machines runs.						

Marlboro High School					
Number of Classrooms: 102	264,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
3	**Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)**	P4P	$4,278.90	$1,978.80	213.95	770.20	473.67	5,736.72	1,434.18	4,302.54	2.17

Cost Basis:	Price of Equipment and installation is estimated to be $41.95 per class room based off of vendor pricing. With a total of 102 class rooms, the estimated installed hard cost is $4,278.90						
Saving Projection:	The savings is projected to be 182 kWh/year for each classroom installing set-back power strips. For 102 classroom this is calculated to be $2,264.81 saved per year, making this energy reduction measure have an attractive payback. The savings is based off of historical data and past experience, see details below.						
Energy Savings	**Savings per Year**	**Estimated Annual Savings ($)**	**C02 Reduced (lbs.)**	**SO2 (lbs.)**	**NOX (lbs.)**	**Cars Removed**	
Electric (kWh)	18,564.00	$2,264.81	10,265.89	30.74	25.40	0.90	
Gas (Therms)	0.00	$0.00					
Total Savings (kBtu)	63,343.00	$2,264.81			**Total Pollution Reduction in Cars Removed from the Road =**	**0.90**	
*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**							
Assumptions	102 classrooms would have set-back power strip						
	Each classroom would have set-back savings of 182 kWh/ year.						
	Laser printers and other peripheral devices would add to savings.						
Energy Savings Factor of Safety	1.14	Estimated annual savings with energy savings factor of safety =	$1,978.80				
Discussion:	Considering the low cost and easy installation, this is a recommended energy reduction measure. The simple payback of under three years is also another attractive benefit that this investment offers.						

Marlboro High School					
Number of Classrooms: 102	264,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	Motor upgrades, standard efficiency to high efficiency - VFD (4) 10 HP, (2) 5 HP Motor	P4P	$32,000.00	$6,224.00	1,600.00	5,760.00	3,542.40	42,902.40	10,725.60	32,176.80	5.17

Cost Basis:	The $32,000 cost for the motor upgrades is based on vendor pricing and typical installation and construction costs in the Central NJ region.
Saving Projection:	The savings projection is based on $0.122 per kWh multiplied by 61,200 kWh projected to be saved for a total savings of $7,466.40. See details below.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kW)	61,200.00	$7,466.40	33,843.60	101.32	83.73	2.96
Gas Savings (Therms)	0	0	0.00	0.00	0.00	0.00
Total Savings Kbtu	208,823.07	$7,466.40	33,843.60	101.32	83.73	
					Total Pollution Reduction in Cars Removed from the Road =	**2.96**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Pumps run at 65% of current load with VSD
	10% premium efficiency savings
	From site visit and Haglid Engineering evaluation of (4) 10HP motors and (2) 5 HP motors, upgrading to high efficiency motors along with Variable Speed Drives is estimated to reduce energy consumption by 3 kW per 10 HP motor and 1.65 kW per 5 HP motor. They are considered to run for 4,000 hours/year [savings = (4 x 3kW x 4,000 hours) + (2 x 1.65kW x 4000) = 61,200kWh)].

Energy Savings Factor of Safety	1.2	Estimated annual savings with energy savings factor of safety =	$6,224

Discussion:	The implementation of this involves installing the motor upgrades and also making sure that these motors are efficiently controlled and are either shut down or effectively cycled during low use or low occupancy times. The savings are conservative and we believe that with reasonable commissioning this can easily be exceeded. The recommendation would be to hold off on this energy reduction measure for the simple reason that the payback is not that attractive and it takes away from some of the larger projects that also have a poor payback but can possibly be brought into one of the incentive programs by putting this together with other items that have a quicker payback.

Marlboro High School					
Number of Classrooms: 102	264,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Conservative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
1	**Switching out steam heating for HYDRONIC heating, piping, radiant panels, cabinets, VAV, Valves**	CM OR P4P	$28,200.00	$4,692.10	1,410.00	5,076.00	3,121.74	37,807.74	9,451.94	28,355.81	6.04

Cost Basis:	The cost has been estimated based on engineering analysis and RS Means and Known Construction Costs to be $28,200.
Saving Projection:	The savings projection for this energy reduction measure is based on the limited replacement of electric resistive with gas heating for an annual savings of $4,921.91

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	0.00	$0.00	0.00	0.00	0.00	0.00
Gas Savings (Therms)	4,692.00	$4,921.91	224,895.53	460.12	556.42	19.64
Total Savings Kbtu	469,200.00	$4,921.91	224,895.53	460.12	556.42	
					Total Pollution Reduction in Cars Removed from the Road =	**19.64**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From Haglid engineers site visit we found opportunity to replace inefficient over heating of classrooms of 46 Therms x 102 classrooms.
	Currently windows are left open even in very cold working environment.
	Windows to be closed and comfort controls to work to provide reasonable comfort.
	On/off controls for more efficiency and effectiveness.

Energy Savings Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$4,692
Discussion:	Savings would also support the boiler upgrades and boiler savings.		

Marlboro High School					
Number of Classrooms: 102	264,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
3	**Envelope upgrades: roof insulation with a roof project (min R20; Avg. R25)**	P4P	$627,988.00	$8,280.00	31,399.40	113,037.84	69,518.27	841,943.51	210,485.88	631,457.63	76.26

Cost Basis:	The budgetary cost for evaluating the envelope, roof and insulation is provided with RS Means and known construction costs for working on similar high school projects in the Central NJ area. The estimate installed hard costs at $627,988.00 is typical of a roof this size.
Saving Projection:	The savings projection is based on computer modeling of "like kind" high schools in the area and we believe is relatively conservative but typically envelope upgrades do not have tremendously attractive energy savings and we believe this is reasonable and typical for this type of envelope upgrade.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	0.00	$0.00	0.00	0.00	0.00	0.00
Gas Savings (Therms)	8,290.00	$8,696.21	397,353.78	812.95	983.10	34.70
Total Savings Kbtu	829,000.00	$8,696.21	397,353.78	812.95	983.10	

Total Pollution Reduction in Cars Removed from the Road = **34.70**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Haglid Engineering projects gas heating savings of 8,290 therms		
Energy Savings Factor of Safety	1.05	Estimated annual savings with energy savings factor of safety =	$8,280
Discussion	Given an estimated payback in excess of 75 years, this is not an energy reduction measure we would recommend until the roof needs to be repaired. Until that time, generally the cost of adding excess insulation or improving the roof to an R20 rating is something that is not as expensive as replacing the insulation and adding a new roof. The recommendation is to wait until the roof needs to be repaired and at that time evaluate adding thermal insulation to have the roof at least approach R20 and an average of R25.		

Preliminary ESMs

Prepared for:

Colts Neck High School

Prepared by:

Haglid Engineering and Associates, Inc.

80 Broadway
Hillsdale, NJ 07642

Telephone: (201) 722-1233
Fax: (201) 722-0999

Engineer: Klas C. Haglid, P. E.

Assumptions	
$/kWh	0.109
$/Therm	1.049

	Energy Use	Expense
Current Electric Usage (kWh)	3,622,182.00	$394,817.84
Current Gas Usage (Therms)	89,378.00	$93,757.52
Total kBtu	21,297,192.09	$488,575.36

Total Annual Savings	$163,901.00
% savings of Current Utility Bill	33.55%

Colts Neck			5.0%	GC Allowance	25.0%
Number of Classrooms: 82	220,000	Gross SF Area	**18.0%**	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI
Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Lighting upgrades, at least T-8 or LED**	P4P	$486,200.00	$99,000.00	24,310.00	87,516.00	53,822.34	651,848.34	162,962.09	488,886.26	4.94

Cost Basis: The $486,200 is based on doing the common areas, hallways and some of the longer run time lighting. These are based on known construction numbers for our area, RS Means and costs from other high school projects in Central NJ.

Saving Projection: The annual saving is based on the change in Wattage from the existing fixture of mainly T8 and some T12's to high efficiency LED lighting. These are then estimated with something on the order of 4000 run hours a year. In some areas such as hallways, this would be higher as the lighting in these areas are used late into the night for custodial purposes. Stairways and other areas would run 24/7, so it is a mixture of run hours throughout the facility.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	1,003,525.60	$109,384.29	554949.66	1661.46	1373.03	48.47
Gas (Therms)	-5,482.11	($5,750.74)	-262766.96	-537.60	-650.12	-22.95
Total Savings Kbtu	2,875,960.19	$103,633.55	292182.70	1123.87	722.91	
					Total Pollution Reduction in Cars Removed from the Road =	**25.52**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions: There are 4 separate groups to categorize the types of spaces such as hallways, stairwells, classrooms and bathrooms. Each may have different fixtures and run hours. A summary table is shown below to explain in further detail.

Run hours are assumed to be the following as stated in the "Assumption Details" below

Assumption Details

Group	Run Time	Existing Total (kW)	Number of Fixtures	Retrofit Total (kW)	Savings Kwh	$ Savings	Comments
101	4,428	93	752	39	239,019	26,053	Recommended
102	4,200	246	2,974	100	610,810	66,578	Recommended
103	5,812	12	117	5	37,732	4,113	Recommended
104	8,760	25	266	11	115,965	12,640	Recommended
	Totals =	**375.11**	**4,109.00**	**155.97**	**1,003,525.60**	**103,633.55**	An additional gas heating cost is considered as shown in row labeled "Assumptions"

Energy Savigns Factor of Safety 1.05 Estimated annual savings with energy savings factor of safety = $99,000.00

Discussion: Recently a lighting audit has been done that is more comprehensive in nature and covers a larger amount of lighting going into the classrooms. We believe that this will have additional benefits and savings. However, before we can recommend this we are going to have to see sampling, test cases done in some of the classrooms where the lighting is installed. Specifically this is CPL rated, high performance, LED lighting. It has been represented that the light levels will be well in excess of 50ft candles but there are many parameters to lighting (color rendering index, quality of light, temperature, light levels at the desk height). At this point in time we recommend that there be several test sites in several classrooms to evaluate the lighting going into the individual classrooms.

TRI-STATE LED

255 Mill Street, 2nd Floor
Greenwich, CT 06830

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f: (203) 813-3794

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Project Name	COLTS NECK HS
Street Name	59 FIVE POINTS RD.
City/State	COLTS NECK NJ
Zip Code	7722
Site Contact	PAT LAGRAVANIS
Phone #	
Cell Phone #	
Fax #	
Email Address	
Proposal Date	5/29/2013

Hours of Operation

Group 101		Group 102	
Hrs/Day	16	Hrs/Day	13
Days/Wk	6	Days/Wk	6
Wks/Yr	52	Wks/Yr	46
Total Hrs	5006	Total Hrs	3598

Group 103		Group 104	
Hrs/Day	18	Hrs/Day	24
Days/Wk	7	Days/Wk	7
Wks/Yr	46	Wks/Yr	52
Total Hrs	5812	Total Hrs	8760

Project Description

Supply LED Lamps & Fixtures as per Lighting Audit Worksheet

Sales Person	CHRIS ANASTASI	Cell Phone Number	914-482-4442
Sales Person		Cell Phone Number	

SEESMART® EARTH FRIENDLY LED SOLUTIONS

DURACELL® LED Lighting

CREE® LED Lighting Solutions

RAB LIGHTING

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
1											
2	104	8760		RECEIVING ROOM LOADING DOCK		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
3	104	8760		RECEIVING ROOM LOADING DOCK		4.2.4ERB	5	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
4	104	8760		RECEIVING ROOM LOADING DOCK		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
5	104	8760		MECH RM		4.2.3ELRB	22	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
6	103	5812		GRAY WATER RM		4.2.4ERB	17	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
7	101	5006		D HALL		4.3.32ELP	13	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
8	101	5006		D HALL		4.2.3ELRB	13	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
9	102	3598		D103		4.2.4ERB	33	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
10	102	3598		D103		4.1.3ERB	24	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
11	104	8760		CUSTODIANS		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
12	102	3598		APPLIED TECH RM		4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
13	102	3598		FACULTY DINING		4.2.4ERB	73	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
14	102	3598		LOUNGE		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
15	102	3598		D102		4.2.4ERB	49	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
16	102	3598		FACULTY WORK ROOM		4.2.3ELRB	10	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
17	103	5812		MENS/WOMENS		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
18	102	3598		D101		4.2.4ERB	39	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
19	102	3598		CLOSET		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
20	103	5812		WOMENS/MENS		4.2.3ELRB	6	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
21	103	5812		WOMENS/MENS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
22	102	3598		D100		4.2.4ERB	65	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
23	102	3598		CAFÉ		4.2.4ERB	206	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
24	102	3598		CAFÉ		4.2.3ELRB	22	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
25	102	3598		KITCHEN		4.3.32ELP	42	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
26	102	3598		CLOSET		4.2.4ERB	7	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
27	103	5812		WOMENS		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
28	104	8760		FRIDGE		A60	4	A LAMP 60 WATT INCANDESCENT	60	Duracell A19 Lamp, Dimmable, Energy Star Rated, 11 Watt, 120V, 2700K	11
29	101	5006		CAFÉ HALL		4.2.3ELRB	7	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
30	101	5006		CAFÉ HALL		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
31	102	3598		AUDITORIUM		4.4.4ER	12	4' FIXTURE-6-F32/T8 LAMPS, ELECRONIC BALLAST	192	Retrofit - LED Tube Lights, 6 - 4 Foot, 15W, 120-277V, Single End Power	90
32	102	3598		STAGE		4.2.4ERB	9	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
33	102	3598		AUDITORIUM		A100	10	42 WATT CFL	42	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
34	102	3598		STORAGE		4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
35	101	5006		AUDITORIUM LOBBY		4.2.3ELRB	9	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
36	101	5006		HALL		4.2.3ELRB	9	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
37	101	5006		HALL		4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
38	102	3598		E103		4.2.4ERB	33	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
39	102	3598		E103		4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
40	104	8760		OFFICE		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
41	104	8760		OFFICE		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
42	101	5006		PRACTICE ROOMS		4.2.4SR	5	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
43	101	5006		STORAGE		4.2.4ERB	6	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
44	102	3598		E102		4.2.4ERB	33	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
45	104	8760		OFFICE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
46	101	5006		STORAGE		4.2.4ERB	6	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
47	102	3598		KILN		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
48	102	3598		SINK ROOM		4.2.4ERB	20	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
49	102	3598		E100		4.2.4ERB	41	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
50	102	3598		E100		A100	4	42 WATT CFL	42	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
51	102	3598		AUDITORIUM LOBBY		4.3.32ELP	7	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
52	102	3598		AUDITORIUM LOBBY		4.2.4ERB	54	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
53	102	3598		CAFÉ HALL		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
54	102	3598		CAFÉ HALL		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
55	103	5812		MENS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
56	103	5812		MENS		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
57	103	5812		WOMENS		4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
58	103	5812		WOMENS		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
59	101	5006		STORAGE		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
60	101	5006		STORE		4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
61	101	5006		CAFÉ HALL		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
62	101	5006		CAFÉ HALL		4.2.3ELRB	9	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
63	101	5006		WEIGHT ROOM		4.2.3ELRB	20	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
64	101	5006		WEIGHT ROOM		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
65	101	5006		WEIGHT ROOM		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
66	101	5006		GYM		MH400.1	40	METAL HALIDE, 1-400 WATT LAMP	458	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
67	101	5006		STORAGE		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
68	101	5006		BOYS LOCKER		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
69	101	5006		BOYS LOCKER		4.2.4ERB	26	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
70	101	5006		BOYS LOCKER		4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
71	104	8760		OFFICE		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
72	103	5812		BATH		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
73	101	5006		GIRLS LOCKER		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
74	101	5006		GIRLS LOCKER		4.2.4ERB	26	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
75	101	5006		GIRLS LOCKER		4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
76	104	8760		OFFICE		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
77	103	5812		BATH		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
78	101	5006		ROTC STORAGE		4.2.4ERB	10	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
79	104	8760		OFFICE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
80	103	5812		BATH		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
81	101	5006		AUX GYM HALL		4.2.3ELRB	7	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
82	101	5006		AUX GYM HALL		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
83	103	5812		MENS/WOMENS		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
84	103	5812		MENS/WOMENS		3.2.3SR	4	3' FIXTURE, 3-F30/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	127	Retrofit - LED Tube Lights, 3 Foot, 15W, 120V-277V, Single End Power	15
85	101	5006		CLOSET		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
86	101	5006		CLOSET		2.3.2ERB	1	2' FIXTURE, 2-F17/T8/STD LAMPS, ELECTRONIC BALLAST	34	Retrofit - LED Tube Lights, 2 - 2 Foot, 8W, 120V-277V, Single End Power	16
87	101	5006		AUX GYM		MH400.1	30	METAL HALIDE, 1-400 WATT LAMP	458	Seesmart High Bay, DLC Listed, 154W, 120-277V " Grey, SKU: 120335-120343	154
88	104	8760		SOUTH LOFT STAIRS		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
89	103	5812		MENS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
90	103	5812		MENS		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
91	101	5006		C AUX GYM HALL		4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
92	101	5006		C AUX GYM HALL		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
93	101	5006		STORAGE		4.2.3ELRB	5	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
94	101	5006		GYM STORAGE		4.2.4ERB	9	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
95	101	5006		CLOSET		2.4.2SRB	1	2' FIXTURE, 3-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	84	Retrofit - LED Tube Lights, 3 - 2 Foot, 8W, 120V-277V, Single End Power	24
96	102	3598		C100,C101,C102		4.2.4ERB	69	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
97	101	5006		TEAM ROOM HALL		4.2.3ELRB	9	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
98	101	5006		TEAM ROOM HALL		4.3.32ELP	11	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
99	104	8760		LOFT STAIRS		4.2.3ELRB	17	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
100	104	8760		LOFT STAIRS		4.2.4ERB	8	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
101	101	5006		FOOTBALL STORAGE		4.2.4ERB	4	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
102	101	5006		MALE TEAM ROOM		4.2.4ERB	18	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
103	101	5006		FOYER		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
104	101	5006		MALE TEAM ROOM		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
105	101	5006		MALE TEAM ROOM		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
106	101	5006		MALE TEAM ROOM		4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
107	104	8760		OFFICE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
108	104	8760		OFFICE		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
109	101	5006		GYM STORAGE		4.2.4ERB	6	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
110	101	5006		GYM STORAGE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
111	101	5006		GYM STORAGE		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
112	101	5006		TRAINERS ROOM		4.2.3ELRB	11	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
113	101	5006		FEMALE COACHES		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
114	101	5006		FEMALE COACHES		2.2.3SR	1	2x2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	82	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
115	103	5812		BATH		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
116	103	5812		MENS		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
117	103	5812		MENS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
118	101	5006		CLOSET		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
119	103	5812		WOMENS		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
120	103	5812		WOMENS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
121	101	5006		GYM ENTRANCE		4.2.4ERB	14	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
122	101	5006		GUIDANCE HALL		2.2.3SR	13	2x2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	82	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
123	104	8760		OFFICE		4.2.4ERB	23	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
124	104	8760		NURSE		4.3.32ELP	10	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
125	103	5812		WOMENS/MENS		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
126	104	8760		GUIDANCE RECEPTION		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
127	104	8760		GUIDANCE RECEPTION		4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
128	104	8760		GUIDANCE RECEPTION		4.2.4ERB	22	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
129	104	8760		OFFICE		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
130	103	5812		WOMENS/MENS		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
131	104	8760		CONFERENCE ROOM		4.2.4ERB	13	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
132	104	8760		COPY ROOM/MAIN OFFICE		2.2.3ELP	5	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
133	104	8760		MAIN OFFICE		4.2.4ERB	9	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
134	104	8760		PRINCIPALS OFFICE		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
135	104	8760		ASST PRINCIPALS OFFICE		4.2.4ERB	6	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
136	104	8760		ATTENDANCE OFFICE		4.2.4ERB	10	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
137	101	5006		MAIN OFFICE		4.2.4ERB	16	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
138	104	8760		COPY ROOM		4.3.32ELP	3	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
139	104	8760		SAFE		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
140	101	5006		MAIN LOBBY/STORAGE		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
141	101	5006		WEIGHT ROOM HALL		4.2.3ELRB	10	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
142	101	5006		WEIGHT ROOM HALL		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
143	102	3598		B100,B101		4.2.4ERB	34	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
144	102	3598		B101		2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
145	103	5812		MENS/GIRLS		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
146	101	5006		GUIDANCE HALL		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
147	101	5006		GUIDANCE HALL		4.2.3ELRB	7	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
148	101	5006		ENTRANCE FOYER		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
149	101	5006		MAIN LOBBY		4.2.4ERB	24	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
150	104	8760		STAIRWELL		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
151	102	3598		A100		4.2.4ERB	5	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
152	101	5006		STORAGE		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
153	102	3598		MEDIA CENTER		4.2.4ERB	198	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
154	101	5006		STORAGE		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
155	104	8760		OFFICE		4.2.3ELRB	10	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
156	101	5006		MEDCTR,AUD,A100HALL		4.2.3ELRB	20	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
157	101	5006		MEDCTR,AUD,A100HALL		4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
158	104	8760		BREAK ROOM OFFICE		4.3.32ELP	8	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
159	102	3598		MATH ROOM,A102B		4.2.4ERB	24	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
160	101	5006		STORAGE		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
161	102	3598		ENGLISH DEPT		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
162	102	3598		ENGLISH DEPT		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
163	102	3598		SOCIAL STUDIES		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
164	102	3598		SOCIAL STUDIES		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
165	101	5006		A CROSS HALL		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
166	101	5006		A CROSS HALL		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
167	102	3598		A101B,A101A		4.2.4ERB	24	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
168	101	5006		STORAGE		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
169	102	3598		COMM ROOM		4.2.3ELRB	3	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
170	103	5812		WOMEN		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
171	103	5812		WOMEN		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
172	103	5812		MENS		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
173	103	5812		MENS		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
174	101	5006		A ELEV HALL		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
175	101	5006		A ELEV HALL		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
176	104	8760		ELEVATOR		4.2.4SR	1	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
177	102	3598		ELEVATOR ROOM		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
178	102	3598		A127		4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
179	102	3598		A125,A126,A127,A128		4.2.4ERB	49	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
180	101	5006		EXIT 33 HALL		4.2.3ELRB	8	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
181	101	5006		A129 HALL		4.2.3ELRB	6	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
182	101	5006		A129 HALL		4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
183	102	3598		A129,A130,A131,A132,A133,A134,A135, A136		4.2.4ERB	163	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
184	101	5006		A104 HALL		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
185	101	5006		A104 HALL		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
186	104	8760		COMPUTER OFFICE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
187	104	8760		COMPUTER OFFICE		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
188	102	3598		A104,A106, A107,ENGLISH STORAGE		4.2.4ERB	51	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
189	104	8760		EXIT 28 STAIR		4.2.3ELRB	5	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
190	104	8760		EXIT 28 STAIR		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
191	101	5006		NEW A108 HALL		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
192	101	5006		NEW A108 HALL		4.2.3ELRB	9	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
193	101	5006		STORAGE		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
194	101	5006		STORAGE		4.2.3ELRB	1	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
195	102	3598		A108		4.2.4ERB	40	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
196	102	3598		A109,PREP,A110,A111,A112,A113,A114 ,A115,A116,A117,A118,A119,A20,A121		4.2.4ERB	301	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
197	102	3598		A110,A111,A112,A113,A114,A115,A116, A117,A118,A119,A120,A121		A300	29	2-42 WATT CFL	84	Seesmart Par 38(2) 18 watt ea sku 18012180129	36
198	104	8760		EXIT 31 STAIRWELL		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
199	101	5006		A110 NEW HALL		4.2.3ELRB	8	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
200	101	5006		A110 NEW HALL		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
201	101	5006		A122 HALL		4.2.3ELRB	7	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
202	101	5006		A122 HALL		4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
203	104	8760		EXIT 32 STAIRWELL		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
204	102	3598		A122,A123,A124		4.2.4ERB	84	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
205	101	5006		A122 HALL		A100	10	42 WATT CFL	42	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
206	102	3598		A124		A100	2	42 WATT CFL	42	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
207	103	5812		MENS		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
208	103	5812		MENS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
209	103	5812		MENS		2.3.32ELP	1	2x2' 3-F40T8, BIAX ELECTRONIC BALLAST	120	New 2x2 Parabolic Fixture With 3 - 8 Watt LED Tube Lights SKU: PARA9C317X-2	24
210	101	5006		CLOSET		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
211	103	5812		WOMENS		2.3.32ELP	1	2x2' 3-F40T8, BIAX ELECTRONIC BALLAST	120	New 2x2 Parabolic Fixture With 3 - 8 Watt LED Tube Lights SKU: PARA9C317X-2	24
212	103	5812		WOMENS		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
213	103	5812		WOMENS		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
214	101	5006		STORAGE		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
215	101	5006		STORAGE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
216	104	8760		MAIN ENTRANCE STAIRS	EXIT 34	4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
217	104	8760		MAIN ENTRANCE STAIRS	EXIT 34	4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
218	101	5006	2ND	STORAGE		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
219	102	3598		A200		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
220	102	3598		A200		4.3.32ELP	6	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
221	101	5006		A200 HALL		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
222	101	5006		A200 HALL		4.3.32ELP	1	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
223	101	5006		A229 HALL		4.2.3ELRB	5	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
224	101	5006		A229 HALL		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
225	102	3598		A227,A228		4.2.4ERB	40	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
226	101	5006		A229		4.2.4ERB	35	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
227	101	5006		STORAGE		4.2.4ERB	1	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
228	101	5006		A229 WALL DOWN		4.1.3ERB	10	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
229	101	5006		A226 NEW HALL		4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
230	101	5006		STORAGE		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
231	101	5006		STORAGE		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
232	103	5812		WOMENS/MENS		4.2.3ELRB	6	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
233	103	5812		WOMENS/MENS		2.3.32ELP	2	2x2' 3-F40T8, BIAX ELECTRONIC BALLAST	120	New 2x2 Parabolic Fixture With 3 - 8 Watt LED Tube Lights SKU: PARA9C317X-2	24
234	103	5812		WOMENS/MENS		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
235	101	5006		CLOSET		4.2.4ERB	3	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
236	102	3598		A216,A217,A218,A219,A220,A221,A222, A223,A224, A225,A226		4.2.4ERB	276	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
237	102	3598		PREP ROOMS		4.2.4ERB	28	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
238	101	5006		A223 HALL		4.2.3ELRB	13	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
239	104	8760		OFFICE		4.2.3ELRB	8	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
240	102	3598		A226		A100	2	42 WATT CFL	42	Seesmart Household Bulb, 18Watt,SMD 120-277V SKU: 140049-140050	18
241	104	8760		ELECTRIC ROOM		2.3.32ELP	1	2x2' 3-F40T8, BIAX ELECTRONIC BALLAST	120	New 2x2 Parabolic Fixture With 3 - 8 Watt LED Tube Lights SKU: PARA9C317X-2	24
242	101	5006		A215 HALL		4.2.3ELRB	12	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
243	102	3598		A208,A209,A210,A211,A212,A213,A214, A215		4.2.4ERB	184	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
244	102	3598		PREP ROOM		4.2.4ERB	8	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
245	101	5006		A207 & A210 HALLS		4.2.3ELRB	14	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
246	101	5006		A207 & A210 HALLS		4.3.32ELP	9	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
247	101	5006		STORAGE		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
248	104	8760		STORAGE OFFICE		4.3.32ELP	5	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
249	102	3598		A201,A202,A203,A204,A205,A206,A207		4.2.4ERB	213	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
250	102	3598		BUS PREP,PREP,CHEMSTRGE,PREPSTR,SCIPREPRM		4.2.4ERB	34	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
251	103	5812		WOMENS, MENS		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
252	103	5812		WOMENS, MENS		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
253	101	5006		CLOSET		4.2.3ELRB	2	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
254	102	3598		PREP ROOM, A204		4.1.3ERB	18	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
255	102	3598		A204		4.1.3ERB	15	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
256	101	5006		STORAGE		4.2.4ERB	2	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
257	104	8760		CONF RM		4.3.32ELP	4	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
258	102	3598		A202 PREP RM		4.2.4ERB	13	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
259	102	3598		A202 PREP RM		4.1.3ERB	3	4' FIXTURE, 1-F32/T8 LAMP, ELECTRONIC BALLAST -	34	Retrofit - LED Tube Lights, 1 - 4 Foot, 15W, 120-277V, Single End Power	15
260	104	8760		OFFICE		4.3.32ELP	2	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
261	102	3598		FACULTY LOUNGE		4.2.3ELRB	6	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
262	102	3598		FACULTY LOUNGE		2.2.3ELP	2	2x2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	64	Retrofit 2x2 Fixture with 3 - 8 Watt LED Tube Lights, Single End Power - Includes brackets and Sockets	24
263	103	5812		WOMENS/MENS		4.2.3ELRB	4	4' FIXTURE, 3-F32/T8 LAMPS, ELECTRONIC BALLAST	96	Retrofit - LED Tube Lights, 3 - 4 Foot, 15W, 120-277V, Single End Power	45
264	102	3598		COURTYARD A	EXTERIOR	HPS225	4	HIGH PRESSURE SODIUM, 1-250 WATT LAMP	295	RAB 78W LED WALL PACK - ALED4T78	78

Location Information						Existing Fixture Information				Proposed Fixture Information	
Loc. #	Grp #	Op Hours	Floor	Location	Comments	Audit Type	Existing Qty.	Existing Fixture Description	Fixture Watts	Retrofit Fixture Description	Fixture Watts
265	102	3598		CAFÉ COURTYARD	EXTERIOR	HPS225	8	HIGH PRESSURE SODIUM, 1-250 WATT LAMP	295	RAB 78W LED WALL PACK - ALED4T78	78
266	102	3598		LOADING DOCK	EXTERIOR	4.2.4ERB	29	4' FIXTURE, 2-F32/T8 LAMPS, ELECTRONIC BALLAST	64	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
267	102	3598		WALL PACK	EXTERIOR	HPS225	4	HIGH PRESSURE SODIUM, 1-250 WATT LAMP	295	RAB 78W LED WALL PACK - ALED4T78	78
268	102	3598		WALL PACK	EXTERIOR	HPS50	2	HIGH PRESSURE SODIUM, 1-75 WATT LAMP	105	RAB 13W LED WALL PACK - WPLED13	13
269	102	3598		WALL PACK	EXTERIOR	HPS150	25	HIGH PRESSURE SODIUM, 1-150 WATT LAMP	188	New Vaportight 4' fixture with 3 - 15 Watt LED Tube Lights SKU: CITLB332X-2	45
270	102	3598		LAMP POST	EXTERIOR	MH100	26	METAL HALIDE, 1-100 WATT LAMP	128	SEESMART HIGH POWERED 22 WATT LED LAMP SKU; 130028-130039 (3000-3200 Lumens)	22
271	102	3598		LAMP POST	EXTERIOR	MH750	99	COBRA HEAD STREET LIGHT - 6 LANE ROADWAY, METAL HALIDE, 1-400 WATT	458	Cree XSP2 Street light, 100 Watt, Low Lumen, With Photocell	100
272	102	3598		GROUNDS	EXTERIOR	MH750	1	COBRA HEAD STREET LIGHT - 6 LANE ROADWAY, METAL HALIDE, 1-400 WATT	458	Cree XSP2 Street light, 100 Watt, Low Lumen, With Photocell	100
273	102	3598		GROUNDS	EXTERIOR	4.4.4SRB	7	4' FIXTURE, 4-F32/T8 LAMPS, ELECTRONIC BALLAST	128	Retrofit - LED Tube Lights, 4 - 4 Foot, 15W, 120-277V, Single End Power	60
274	102	3598		GROUNDS	EXTERIOR	8.1.6SRB	4	8' FIXTURE, 1-F96/T8/ 59 WATT LAMP, ELECTRONIC BALLAST	59	Retrofit 8' Fixture with 2 - 4 Foot, 15W LED Tube Lights ,120-277V - Includes Brackets & Sockets	30
275	102	3598		PRESS BOX	EXTERIOR	4.2.4SR	5	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	94	Retrofit - LED Tube Lights, 2- 4 Foot, 15W, 120-277V, Single End Power	30
				Total Fixture Quantity		4106					

TRI-STATE LED
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Demand		Usage	
Existing Demand: kW	374.71	Existing Use: kWh	1,632,047.82
Proposed Demand: kW	155.79	Proposed Use: kWh	685,735.48
Demand Reduction: kWr	218.92	Use Reduction: kWh	946,312.34

Total Lighting Energy Savings	58.0%

Combined Unit Use Cost: kWh	$0.15	Supply Savings: KWH Per Year	$141,946.85
		*Delivery Savings: KW Per Year	$39,405.60
		*Maintenance Savings Per Year (Lamps & Ballast only)	$26,000.00
		*15% HVAC Savings Per Year	$31,684.58

Total Monthly Savings	$19,919.75
Total Annual Savings	$239,037.03
Total Cost Savings 5 Years	$1,195,185.15

Financial Summary

Material Cost	*$710,928.64*
Estimated Baypoint Electric Labor Cost	*$207,000.00*
One Time Approx. Rebate	*$128,000.00*
Total Job Cost (After Rebate & Labor)	*$789,928.64*
Simple Payback (months)	**39.6**
First Year Return on Investment	*30.26%*
CO_2 Reduction (lbs)	1,258,595.41

School : Coltsneck

Summary of Lighting Quote and Audit

Group	Run Time	Existing Total (W)	Number of Fixtures	Retrofit Total (W)	Savings Kwh	Area Served	Comments
101	4,428	93,020	752	39,041	239,019		Recommended
102	4,067	245,816	2,974	100,385	591,468	Classrooms	Not part of Project Work
103	5,812	11,628	117	5,136	37,732		Recommended
104	8,760	24,646	266	11,408	115,965		Recommended
total		375,110	4,109	155,970	984,183		

Group	Run Time	Existing Total (W)	Number of Fixtures	Retrofit Total (W)	Savings Kwh	$ Savings	Comments
101	4,428	93.02	752.00	39.04	239,019.01	$ 26,053.07	Recommended
102	4,200	245.82	2,974.00	100.39	610,810.20	$ 66,578.31	Not part of Project Work
103	5,812	11.63	117.00	5.14	37,731.50	$ 4,112.73	Recommended
104	8,760	24.65	266.00	11.41	115,964.88	$ 12,640.17	Recommended
	Totals =	375.11	4,109.00	155.97	1,003,525.60	$ 109,384.29	

	kWh	Therms	$ Amount	Factor of Safety
Lighting Savings =	1,003,525.60		$ 109,384.29	1.05
Heating Costs =		-5482.11	$ (5,750.74)	
Total Net Savings =			$ 103,633.55	

Colts Neck		
Number of Classrooms: 82	220,000	Gross SF Area

5.0%	GC Allowance		**25.0%**
18.0%	Contingency & Soft Costs		

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
	NJDOE ROD GRANT - 5 YEAR LEASE PURCHASE (ALT FUNDING SOURCE)										
3	Motor upgrades, standard efficiency to high efficiency	P4P	$35,000.00	$7,280.00	1,750.00	6,300.00	3,874.50	46,924.50	11,731.13	35,193.38	4.83

Cost Basis:	The $35,000 cost for the motor upgrades is based on vendor pricing and typical installation and construction costs in the Central NJ region.
Saving Projection:	The savings projection is based on $0.109 / kWh times 80,000 kwh projected to be saved for a total savings of $8,720.00.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	80,000.00	$8,720.00	44,240.00	132.45	109.46	3.86
Gas Savings (Therms)		$0.00	0.00	0.00	0.00	0.00
Total Savings Kbtu	272,971.33	$8,720.00	44,240.00	132.45	109.46	
					Total Pollution Reduction in Cars Removed from the Road =	**3.86**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Upgrade would include replacing (2) 40HP circulator pumps with high efficiency pumps
	Pumps would be integrated with Variable Speed Drives
	10kW is projected to be saved per motor with increased efficiencies and VSD reduction in power consumption. With an annual run time of 4000 hours the yearly savings is projected to be 2 x 10kW x 4000 hours = 80,000 kWh

Energy Savings Factor of Safety	1.20	Estimated annual savings with energy savings factor of safety =	$7,280

Discussion	The implementation of this involves installing the motor upgrades and also making sure that these motor are efficiently controlled and are either shut down or effectively cycled during lo use or low occupancy times. The savings are conservative and we believe that with reasonable commissioning this can easily be exceeded. This would not be considered a primary upgrade because the payback seems to be in excess of 10 years. The recommendation would be to hold off on this energy reduction measure for the simple reason that the payback is not that attractive and it takes away from some of the larger projects that also have a poor payback but can possibly be brought into one of the incentive programs by putting this together with other items that have a quicker payback.

Colts Neck					
Number of Classrooms: 82	220,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
1	**Other ERMs - Controls Upgrade**	P4P	$296,840.00	$57,200.00	14,842.00	53,431.20	32,860.19	397,973.39	99,493.35	298,480.04	5.22

Cost Basis:	The cost of this controls upgrade was provided with vendor pricing from one of the existing controls vendors that are currently providing controls automation for the school. This is based on a quote with vendor pricing with labor costs built in.
Saving Projection:	Based on typical energy savings from other projects of the same kind for high schools, we believe that the savings projection of $73,286.30 is reasonable and relatively conservative.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	543,327.30	$59,222.68	300,460.00	899.55	743.38	26.24
Gas (Therms)	13,406.70	$14,063.63	642,605.91	1,314.71	1,589.89	56.12
Total Savings Kbtu	3,194,579.68	$73,286.30	943,065.90	2,214.26	2,333.27	
					Total Pollution Reduction in Cars Removed from the Road =	**82.36**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	From observations and the current operation of the existing pneumatic controls, Haglid Engineers estimate projected savings of 15%.		
Factor of Safety	1.28	Estimated annual savings with energy savings factor of safety =	$57,200.00
Discussion:	With a payback of 5.22 years this would have a relatively long payback. The expense is excessive, part of it involves upgrading controls that currently are not functioning. We would recommend upgrading the controls especially for the large exhaust fans that are running wild 24/7. Part of this can be addressed with the DOAS and other components we would evaluate as the project goes forward and try to address them as a part of the other energy reduction measures. Due to the cost of this energy reduction measure and the payback estimated at 5.22 years, we cannot recommend this energy reduction measure at this time.		

School/Building	ATC	Mechanical*	Contigency	Total
BOE	$ 85,500	$ 15,000	10%	**$ 110,550**
Tranporation	$ 34,000	$ -	10%	**$ 37,400**
Coltsneck HS	$ 225,000	$ -	10%	**$ 247,500**
Howell HS	$ 570,000	$ 50,000	10%	**$ 682,000**
Freehold Boro HS	$ 670,000	$ 50,000	10%	**$ 792,000**
Freehold Twp HS	$ 565,000	$ 75,000	10%	**$ 704,000**
Manalapan HS	$ 525,000	$ 75,000	10%	**$ 660,000**
Marlboro HS	$ 820,000	$ 100,000	10%	**$ 1,012,000**

* ATC contractor provides the valve and the Mechanical Contractor will install.

Colts Neck					
Number of Classrooms: 82	220,000	Gross SF Area	**5.0%**	GC Allowance	**25.0%**
			18.0%	Contingency & Soft Costs	

Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)
2	**Soda vending machines off at night or weekends**	P4P	$880.00	$421.00	44.00	158.40	97.42	1,179.82	294.95	884.86	2.10

Cost Basis:	Based on 4 USAT vending machines at 189.00 each plus a $31.00 labor to install (total of $220.00 each), for a total of $880.00.
Saving Projection:	This is based on conservative estimates on weekends and late nights that the machines can be used to go into deep set back where the refrigeration can be shut off. It can be noted that this should only be used for things like soda; ice cream and milk would not be a good candidate for this type of energy savings measure. The savings is estimated to be 1092 kWh/year per vending machine, therefore with 10 installations, an annual savings is projected to be $476.11.

Energy Savings	Savings per Year	Estimated Annual Savings ($)	C02 Reduced (lbs.)	SO2 (lbs.)	NOX (lbs.)	Cars Removed
Electric (kWh)	4,368.00	$476.11	2,415.50	7.23	5.98	0.21
Gas (Therms)		$0.00	0	0	0	0
Total Savings (kBtu)	14,904.23	$476.11			**Total Pollution Reduction in Cars Removed from the Road =**	**0.21**

*** Equivalent number of passenger cars taken off the road in 1 year, based on estimated average 12,500 miles traveled per year, releasing an estimated 11,450 pounds of CO2 per year.**

Assumptions	Assumes savings of 91 kWh per vending machine each month		
	Two vending machines can use this upgrade		
Energy Savigns Factor of Safety	1.13	Estimated annual savings with energy savings factor of safety =	$421.00
Discussion:	There are candy machines and soda machines that do not need to keep all components refrigerated to keep them in a saleable fashion. For instance; coca cola, diet coke sodas can have the refrigeration shut off over long weekend, night or times where there is no one in the school. It would not be recommended to use this technology for any dairy products or foods that can potentially spoil with elevated temperatures. This is a good way to tie an occupancy sensors to when people are in the area and when the machines runs.		

VOLUME I of II - Energy Savings Improvement Plan for the Freehold Regional High School Board of Education

Prepared by

Fraytak Veisz Hopkins Duthie, PC Architects – Planners

In conjunction with

French & Parrello Associates, Inc.
Consulting Engineers

Haglid Engineering Associates
Energy Consultant

September 27, 2013 - (Addendum #2 Final ESIP - March 6, 2014)

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March 6, 2014

Via E-mail and Hand Delivered

Mike Thulen
ESIP Coordinator
Division of Economic Development & Energy Policy
State of New Jersey
Board of Public Utilities
7th floor
44 South Clinton Avenue
Trenton, New Jersey 08625

RE: Freehold Regional High School District
Energy Savings Investment Plan (ESIP); FVHD # 4415

SUBJECT: Submission of Updated Financial Analysis and Project Schedule
Addendum #2 - 3/6/2014 (to District Final ESIP Plan - 1/30/14)

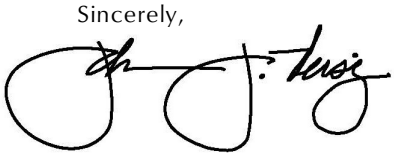
Dear Mr. Thulen,

Pursuant to your request in the 3/19/2014 E-mail, we are transmitting herewith PDF of the Updated Financial Analysis (dated 3/6/14) prepared by Phoenix Financial on behalf of the Freehold Regional H.S. District. This analysis reflects the removal of projected Operations & Maintenance savings. The escalated electric and gas savings Summary at the prescribed BPU rates (2.2 Electric; 2.4 Gas over 15 years after completion of construction) and preliminary project schedule have been provided again in the comprehensive document, for your convenience.

As requested, (2) hard copies of the above has also been transmitted to your attention.

Please call if you have any questions or require additional information.

Sincerely,



John J. Veisz, AIA, CSBA
Principal - President

enclosures

c hard copy (ltr via E-mail):
Charles B. Sampson, Superintendent of Schools, FRHSD
Sean Boyce, Business Administrator/Board Secretary, FRHSD
c ltr only (via E-mail):
Klas Haglid, PE, RA, Haglid Engineering & Associates, Inc.
Kevin Dwyer, PE, French & Parrello Associates, P.A., Consulting Engineering

Proposed Energy Reduction Measures Plan - ESIP

	Priority 1 Projects			Priority 2 Projects			Priority 3 Projects			*All Priorities/School*		
High School Buildings	**Final Project Costs (Hard/Soft - After Incentive)**	**Conservative Estimated Incentive at 25%**	**Simple Payback (In Years)**	**Final Project Costs (Hard/Soft - After Incentive)**	**Conservative Estimated Incentive at 25%**	**Simple Payback (In Years)**	**Final Project Costs (Hard/Soft - After Incentive)**	**Conservative Estimated Incentive at 25%**	**Simple Payback (In Years)**	***Final Project Costs (Hard/Soft - After Incentive)***	***Conservative Estimated Incentive at 25%***	***Simple Payback (In Years)***
Freehold Borough High School	2,245,316	748,439	10.97	205,003	68,334	4.63	3,079	1,026	2.17	***2,453,398***	***817,799***	***5.92***
Freehold Township High School	1,961,602	653,867	8.69	10,046	3,349	1.80	603,887	201,296	17.00	***2,575,536***	***858,512***	***9.17***
Howell High School	867,608	289,203	5.87	207,017	69,006	9.88	793,221	264,407	11.84	***1,867,846***	***622,615***	***9.20***
Manalapan High School	1,579,588	526,529	5.86	599,796	199,932	31.83	673,537	224,512	7.33	***2,852,920***	***950,973***	***15.01***
Marlboro High School	2,091,635	697,212	8.21	442,723	147,574	7.74	6,467	2,156	2.13	***2,540,824***	***846,941***	***6.03***
Colts Neck High School	822,560	274,187	5.00	7,638	1,153	1.81	3,459	1,153	2.17	***833,656***	***276,492***	***2.99***
Total By Priority	**9,568,308**	**3,189,436**	**7.43**	**1,472,223**	**489,348**	**9.62**	**2,083,650**	**694,550**	**7.11**	***13,124,180***	***4,373,334***	***8.05***

Proposed Energy Reduction Measures Plan - ESIP

Priority 1, 2 & 3 Projects							
High School Building Projects - Year "1"	**Final Project Costs (Hard/Soft)**	**Conservative Estimated Incentive at 25%**		**Final Project Costs (Hard/Soft) *After Incentive***	**Estimated Annual Savings**		**Simple Payback (In Years)**
Freehold Borough High School	3,271,197	817,799		2,453,398	239,029		10.26
Freehold Township High School	3,434,048	858,512		2,575,536	238,876		10.78
Manalapan High School	3,803,893	950,973		2,852,920	285,682		9.99
Subtotals Year (1) Projects	**10,509,138**	**2,627,285**		**7,881,854**	**763,587**		***10.34*** ***Average***

Priority 1, 2 & 3 Projects							
High School Building Projects - Year "2"	**Final Project Costs (Hard/Soft)**	**Conservative Estimated**		**Final Project Costs (Hard/Soft) *After***	**Estimated Annual Savings**		**Simple Payback (In Years)**
Howell High School	2,490,462	622,615		1,867,846	180,371		10.36
Marlboro High School	3,387,765	846,941		2,540,824	247,449		10.27
Colts Neck High School	1,111,542	277,885		833,656	169,969		4.90
Subtotals Priority	**6,989,769**	**1,747,442**		**5,242,327**	**597,789**		**8.51** ***Average***

High School Building Projects - Year "1" & "2" Totals	***17,498,907***	***4,374,727***		***13,124,180***	***1,361,376***		***9.43*** ***Average***

Freehold Borough High School			5.0%	GC Allowance	25.0%	Concervative Incentive	Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.
Number of Classrooms: 73	203,000	Gross SF Area	**18.0%**	Contingency & Soft Costs			Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
VRF and VRV variable refrigeration volume	P4P	$302,400.00	$21,453.00	15,120.00	54,432.00	33,475.68	405,427.68	101,356.92	304,070.76	14.17	Past project pricing, based on 12 Classrooms
DOAS ventilation system	P4P	$525,600.00	$104,274.07	26,280.00	94,608.00	58,183.92	704,671.92	176,167.98	528,503.94	5.07	Past project pricing, based on 73 Classrooms
AV Equipment on off mode at night times power strips	P4P	$5,978.70	$4,184.48	298.94	1,076.17	661.84	8,015.64	2,003.91	6,011.73	1.44	Vendor pricing with delivery and Installation
Other ERMs - Controls Updrade	P4P	$792,000.00	$34,318.00	39,600.00	142,560.00	87,674.40	1,061,834.40	265,458.60	796,375.80	23.21	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
Building "A" - (3) 2,000 MBH Condensing Boilers, Pumps, Gas Serv	P4P	$303,500.00	$20,000.00	15,175.00	54,630.00	33,597.45	406,902.45	101,725.61	305,176.84	15.26	Work includes replacement of piping, pumps, valves, insulation and radient panels - see below.
Building "C" - (3) 2,000 MBH Condensing Boilers, Pumps, Gas Serv	P4P	$303,500.00	$20,000.00	15,175.00	54,630.00	33,597.45	406,902.45	101,725.61	305,176.84	15.26	Work includes replacement of piping, pumps, valves, insulation and radient panels - see below.
Subtotal		$2,232,978.70	$204,229.55	$111,648.94	$401,936.17	$247,190.74	$2,993,754.54	***$748,438.64***	$2,245,315.91	10.97	
Lighting upgrades, at least T-8 or LED	P4P	$201,883.50	$32,561.85	10,094.18	36,339.03	22,348.50	270,665.21	67,666.30	202,998.91	6.23	Construction numbers from other projects based on sqft with like kind T-8 light to LED upgrade.
Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	P4P	$1,540.00	$739.20	77.00	277.20	170.48	2,064.68	516.17	1,548.51	2.09	Vendor Pricing
Soda vending machines off at night or weekends	P4P	$453.00	$82.00	22.65	81.54	50.15	607.34	151.83	455.50	5.55	Vendor Pricing
Subtotal		$203,876.50	$33,383.05	$10,193.83	$36,697.77	$22,569.13	$273,337.22	***$68,334.31***	$205,002.92	4.63	
Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$3,062.35	$1,416.20	153.12	551.22	339.00	4,105.69	1,026.42	3,079.27	2.17	Purchase Energy Star rated PCs and printers
Subtotal		$3,062.35	$1,416.20	$153.12	$551.22	$339.00	$4,105.69	***$1,026.42***	$3,079.27	2.17	
Note: Replacement of Steam Piping with Hydronic Hot Water Piping to accommodate new high efficiency boiler system to be funded independently by the School District with NJDOE ROD Grant.											
TOTAL OF ALL PRIORITIES		**$2,439,917.55**	**$239,028.80**	**$121,995.88**	**$439,185.16**	**$270,098.87**	**$3,271,197.46**	**$817,799.36**	**$2,453,398.09**	**10.26**	

Freehold Township High School		
Number of Classrooms: 97	256,000	Gross SF Area

5.0% GC Allowance

18.0% Contingency & Soft Costs

25.0% Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
1	VRF and VRV variable refrigeration volume	P4P	$324,000.00	$28,173.91	16,200.00	58,320.00	35,866.80	434,386.80	108,596.70	325,790.10	11.56	Office RTU Replacement, based on 12 rooms, past project pricing
1	Lighting upgrades, at least T-8 or LED	P4P	$367,744.00	$54,887.16	18,387.20	66,193.92	40,709.26	493,034.38	123,258.60	369,775.79	6.74	Construction numbers from other projects based on SF with like kind T-8 light to LED upgrede.
1	DOAS ventilation system	P4P	$482,400.00	$79,081.96	24,120.00	86,832.00	53,401.68	646,753.68	161,688.42	485,065.26	6.13	Past project pricing, based on 67 Classrooms
1	Motor upgrades, standard efficiency to high efficiency	P4P	$69,600.00	$13,384.61	3,480.00	12,528.00	7,704.72	93,312.72	23,328.18	69,984.54	5.23	Recommended to be done with boiler upgrades
1	Other ERMs - Controls Updrade - Un-occupied Mode	CM OR P4P	$704,000.00	$34,960.00	35,200.00	126,720.00	77,932.80	943,852.80	235,963.20	707,889.60	20.25	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
1	Soda vending machines off at night or weekends	P4P	$3,080.00	$1,386.00	154.00	554.40	340.96	4,129.36	1,032.34	3,097.02	2.23	Vendor Pricing
	Subtotal		$1,950,824.00	$211,873.64	$97,541.20	$351,148.32	$215,956.22	$2,615,469.74	***$653,867.43***	$1,961,602.30	8.69	
2	Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	P4P	$2,046.70	$982.61	102.34	368.41	226.57	2,744.01	686.00	2,058.01	2.09	Cost to be Confirmed
2	Laser Points on off mode at night, times power strips	P4P	$7,944.30	$5,296.20	397.22	1,429.97	879.43	10,650.92	2,662.73	7,988.19	1.51	Vendor Pricing
	Subtotal		$9,991.00	$6,278.81	$499.55	$1,798.38	$1,106.00	$13,394.93	***$3,348.73***	$10,046.20	1.80	
3	Boiler Upgrades: Replace (2) 10 MBH Boilers with (3) MBH Modular Condensing Boilers	P4P	$596,500.00	$18,841.60	29,825.00	107,370.00	66,032.55	799,727.55	199,931.89	599,795.66	31.83	
3	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$4,069.15	$1,881.80	203.46	732.45	450.45	5,455.51	1,363.88	4,091.63	2.17	Purchase Energy Star rated PCs and printers
	Subtotal		$600,569.15	$20,723.40	$30,028.46	$108,102.45	$66,483.00	$805,183.06	***$201,295.76***	$603,887.29	17.00	

	TOTAL OF ALL PRIORITIES		**$2,561,384.15**	**$238,875.85**	**$128,069.21**	**$461,049.15**	**$283,545.23**	**$3,434,047.73**	**$858,511.93**	**$2,575,535.80**	**10.78**	

Howell High School		
Number of Classrooms: 104	249,000	Gross SF Area

5.0% GC Allowance

18.0% Contingency & Soft Costs

25.0% Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
1	VRF and VRV variable refrigeration volume	P4P	$340,200.00	$26,372.00	17,010.00	61,236.00	37,660.14	456,106.14	114,026.54	342,079.61	12.97	Office RTU Replacement, based on 12 rooms, past project pricing
1	Lighting upgrades, at least T-8 or LED	P4P	$201,883.50	$32,561.00	10,094.18	36,339.03	22,348.50	270,665.21	67,666.30	202,998.91	6.23	Construction numbers from other projects based on SF with like kind T-8 light to LED upgrede.
1	DOAS ventilation system	P4P	$309,600.00	$48,375.00	15,480.00	55,728.00	34,272.72	415,080.72	103,770.18	311,310.54	6.44	Past project pricing, based on 67 Classrooms
1	Laser Points on off mode at night, times power strips	P4P	$8,517.00	$5,678.60	425.85	1,533.06	942.83	11,418.74	2,854.69	8,564.06	1.51	Vendor Pricing
1	Soda vending machines off at night or weekends	P4P	$2,640.00	$1,200.00	132.00	475.20	292.25	3,539.45	884.86	2,654.59	2.21	Vendor Pricing
	Subtotal		$862,840.50	$114,186.60	$43,142.03	$155,311.29	$95,516.44	$1,156,810.26	***$289,202.56***	$867,607.69	5.87	
2	Replace (2) 7,500 MBH w/ (4) 2,856 MBH	P4P	$170,880.00	$18,316.85	8,544.00	30,758.40	18,916.42	229,098.82	57,274.70	171,824.11	9.38	Cost to be Confirmed
2	Motor upgrades, standard efficiency to high efficiency	P4P	$35,000.00	$3,390.00	1,750.00	6,300.00	3,874.50	46,924.50	11,731.13	35,193.38	10.38	Recommended to be done with boiler upgrades
	Subtotal		$205,880.00	$21,706.85	$10,294.00	$37,058.40	$22,790.92	$276,023.32	***$69,005.83***	$207,017.49	9.88	
3	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$4,362.80	$2,017.60	218.14	785.30	482.96	5,849.21	1,462.30	4,386.90	2.17	Purchase Energy Star rated PCs and printers
3	Replace Boiler HW Heat Exchanger with <500gal. Gas fired AO Smith HW Boiler	P4P	$102,500.00	$7,500.00	5,125.00	18,450.00	11,346.75	137,421.75	34,355.44	103,066.31	13.74	Haglid Engineering to confirm savings
3	Other ERMs - Controls Updrade - Un-occupied Mode	CM OR P4P	$682,000.00	$34,960.00	34,100.00	122,760.00	75,497.40	914,357.40	228,589.35	685,768.05	19.62	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
	Subtotal		$788,862.80	$44,477.60	$39,443.14	$141,995.30	$87,327.11	$1,057,628.36	***$264,407.09***	$793,221.27	11.84	
	TOTAL OF ALL PRIORITIES		**$1,857,583.30**	**$180,371.05**	**$92,879.17**	**$334,364.99**	**$205,634.47**	**$2,490,461.93**	**$622,615.48**	**$1,867,846.45**	**10.36**	

Manalapan High School		
Number of Classrooms: 156	256,000	Gross SF Area

5.0% GC Allowance

18.0% Contingency & Soft Costs

25.0% Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
1	VRF and VRV variable refrigeration volume	P4P	$324,000.00	$26,776.00	16,200.00	58,320.00	35,866.80	434,386.80	108,596.70	325,790.10	12.17	Office RTU Replacement, based on 12 rooms, past project pricing
1	Lighting upgrades, at least T-8 or LED	P4P	$565,760.00	$79,684.00	28,288.00	101,836.80	62,629.63	758,514.43	189,628.61	568,885.82	7.14	Construction numbers from other projects based on SF with like kind T-8 light to LED upgrede.
1	DOAS ventilation system	P4P	$596,400.00	$96,193.54	29,820.00	107,352.00	66,021.48	799,593.48	199,898.37	599,695.11	6.23	Past project pricing, based on 67 Classrooms
1	Motor upgrades, standard efficiency to high efficiency - VFD (3) 25 HP	CM or P4P	$32,000.00	$6,224.00	1,600.00	5,760.00	3,542.40	42,902.40	10,725.60	32,176.80	5.17	Recommended to be done with boiler upgrades
1	Motor upgrades, standard efficiency to high efficiency - VFD (2) 10 HP	CM or P4P	$16,000.00	$2,256.00	800.00	2,880.00	1,771.20	21,451.20	5,362.80	16,088.40	7.13	Recommended to be done with boiler upgrades
1	400 CFM Wing ERV Upgrade	P4P	$22,000.00	$4,230.00	1,100.00	3,960.00	1,980.00	29,040.00	7,260.00	21,780.00	5.15	Recommended to be done with boiler upgrades
1	Laser Points on off mode at night, times power strips	P4P	$12,448.00	$8,299.00	622.40	2,240.64	1,377.99	16,689.03	4,172.26	12,516.78	1.51	Vendor Pricing
1	Soda vending machines off at night or weekends	P4P	$2,640.00	$1,108.00	132.00	475.20	292.25	3,539.45	884.86	2,654.59	2.40	Vendor Pricing
	Subtotal		$1,571,248.00	$224,770.54	$78,562.40	$282,824.64	$173,481.76	$2,106,116.80	***$526,529.20***	$1,579,587.60	5.86	
2	Boiler Upgrades: Replace (2) 10 MBH Boilers with (3) MBH Modular Condensing Boilers	P4P	$596,500.00	$18,841.60	29,825.00	107,370.00	66,032.55	799,727.55	199,931.89	599,795.66	31.83	Haglid to confirm energy savings
	Subtotal		$596,500.00	$18,841.60	$29,825.00	$107,370.00	$66,032.55	$799,727.55	***$199,931.89***	$599,795.66	31.83	
3	Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	P4P	$3,291.60	$1,580.28	164.58	592.49	364.38	4,413.05	1,103.26	3,309.79	2.09	
3	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$6,544.20	$3,026.40	327.21	1,177.96	724.44	8,773.81	2,193.45	6,580.36	2.17	Purchase Energy Star rated PCs and printers
3	Other ERMs - Controls Updrade - Un-occupied Mode	CM OR P4P	$660,000.00	$37,463.41	33,000.00	118,800.00	73,062.00	884,862.00	221,215.50	663,646.50	17.71	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
	Subtotal		$669,835.80	$42,070.09	$33,491.79	$120,570.44	$74,150.82	$898,048.86	***$224,512.21***	$673,536.64	7.33	
	TOTAL OF ALL PRIORITIES		**$2,837,583.80**	**$285,682.23**	**$141,879.19**	**$510,765.08**	**$313,665.13**	**$3,803,893.21**	**$950,973.30**	**$2,852,919.90**	**9.99**	

Marlboro High School		
Number of Classrooms: 102	264,000	Gross SF Area

5.0% GC Allowance

18.0% Contingency & Soft Costs

25.0% Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
1	Lighting upgrades, at least T-8 or LED	P4P	$262,548.00	$41,674.28	13,127.40	47,258.64	29,064.06	351,998.10	87,999.53	263,998.58	6.33	Construction numbers from other projects based on SF with like kind T-8 light to LED upgrede.
1	DOAS ventilation system	P4P	$734,400.00	$114,750.00	36,720.00	132,192.00	81,298.08	984,610.08	246,152.52	738,457.56	6.44	Past project pricing, based on 67 Classrooms
1	Motor upgrades, standard efficiency to high efficiency - VFD (4) 10 HP, (2) 5 HP Mug	CM or P4P	$32,000.00	$6,224.00	1,600.00	5,760.00	3,542.40	42,902.40	10,725.60	32,176.80	5.17	Recommended to be done with boiler upgrades
1	Switching out steam heating for HYDRONIC heating or gas fired - UPDATE	CM or P4P	$28,200.00	$4,692.10	1,410.00	5,076.00	3,121.74	37,807.74	9,451.94	28,355.81	6.04	Recommended to be done with boiler upgrades
1	Other ERMs - DDC Control Upgrades - UnOccupied Mode	P4P	$1,012,000.00	$34,434.78	50,600.00	182,160.00	112,028.40	1,356,788.40	339,197.10	1,017,591.30	29.55	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
1	Laser Points on off mode at night, times power strips	P4P	$8,353.80	$5,569.20	417.69	1,503.68	924.77	11,199.94	2,799.98	8,399.95	1.51	Vendor Pricing
1	Soda vending machines off at night or weekends	P4P	$2,640.00	$1,108.00	132.00	475.20	292.25	3,539.45	884.86	2,654.59	2.40	Vendor Pricing
	Subtotal		$2,080,141.80	$208,452.36	$104,007.09	$374,425.52	$230,271.70	$2,788,846.11	***$697,211.53***	$2,091,634.58	8.21	
2	VRF and VRV Variable Regrigeration Volume	P4P	$438,400.00	$35,354.84	21,920.00	78,912.00	48,530.88	587,762.88	146,940.72	440,822.16	12.47	Cost to be Confirmed
2	Plug Loads on Timers, Reduce Plug Loads, Vending Machines (10 +/-)	P4P	$1,890.00	$630.00	94.50	340.20	209.22	2,533.92	633.48	1,900.44	3.02	Vendor Pricing
	Subtotal		$440,290.00	$35,984.84	$22,014.50	$79,252.20	$48,740.10	$590,296.80	***$147,574.20***	$442,722.60	7.74	
3	Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	P4P	$2,152.20	$1,033.26	107.61	387.40	238.25	2,885.45	721.36	2,164.09	2.09	Confirm Costs
3	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$4,278.90	$1,978.80	213.95	770.20	473.67	5,736.72	1,434.18	4,302.54	2.17	Purchase Energy Star rated PCs and printers
	Other											
	Subtotal		$6,431.10	$3,012.06	$321.56	$1,157.60	$711.92	$8,622.18	***$2,155.54***	$6,466.63	2.13	

	TOTAL OF ALL PRIORITIES		**$2,526,862.90**	**$247,449.26**	**$126,343.15**	**$454,835.32**	**$279,723.72**	**$3,387,765.09**	**$846,941.27**	**$2,540,823.82**	**10.27**	

Colts Neck High School		
Number of Classrooms: 82	220,000	Gross SF Area

5.0% GC Allowance

18.0% Contingency & Soft Costs

25.0% Concervative Incentive

Notes: Funding *; P4P = Pay for Performance, CM = Custom Measure Insentives, PM = Prescriptive Measure Funding, DI = Direct Install.

Importance*; 1 = Immediate Need, At end of useful life, 2 = Recommended, can be scheduled, 3 = Good Idea to schedule with related work.

Priority	Energy Reduction Measure	Funding *	Estimated Installed Hard Costs (1) Budgetary Only	Estimated Annual Savings $	5% General Construction Allowance	15% Contingency and Soft Costs	Professional Fees as % of Construction	Revised Project Cost Subtotal	Concervative Estimated Incentive at 25%	Final Project Total (After Incentive)	Total Estimated Pay Back (years)	Remarks
1	Lighting upgrades, at least T-8 or LED	P4P	$486,200.00	$99,000.00	24,310.00	87,516.00	53,822.34	651,848.34	162,962.09	488,886.26	4.94	Construction numbers from other projects based on SF with like kind T-8 light to LED upgrede.
1	Motor upgrades, standard efficiency to high efficiency - VFD, HW Circ. Pump, Chilled Water	CM or P4P	$35,000.00	$7,280.00	1,750.00	6,300.00	3,874.50	46,924.50	11,731.13	35,193.38	4.83	Recommended to be done with boiler upgrades
1	Other ERMs - DDC Control Upgrades - UnOccupied Mode	CM or P4P	$296,840.00	$57,200.00	14,842.00	53,431.20	32,860.19	397,973.39	99,493.35	298,480.04	5.22	Pricing obtained from Johnson Control vendor based on detailed evaluation of existing ATC system and recommended upgrades.
	Subtotal		$818,040.00	$163,480.00	$40,902.00	$147,247.20	$90,557.03	$1,096,746.23	***$274,186.56***	$822,559.67	5.00	
2	Laser Points on off mode at night, times power strips	P4P	$6,715.80	$4,477.20	335.79	1,208.84	743.44	9,003.87	2,250.97	6,752.90	1.51	Vendor Pricing
2	(4) Soda / vending machines off at night or weekends	P4P	$880.00	$421.00	44.00	158.40	97.42	1,179.82	294.95	884.86	2.10	Vendor Pricing
	Subtotal		$7,595.80	$4,898.20	$379.79	$1,367.24	$840.86	$10,183.69	***$2,545.92***	$7,637.77	1.81	
3	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	P4P	$3,439.90	$1,590.80	172.00	619.18	380.80	4,611.87	1,152.97	3,458.91	2.17	Purchase Energy Star rated PCs and printers
	Other											
	Subtotal		$3,439.90	$1,590.80	$172.00	$619.18	$380.80	$4,611.87	***$1,152.97***	$3,458.91	2.17	

	TOTAL OF ALL PRIORITIES		**$829,075.70**	**$169,969.00**	**$41,453.79**	**$149,233.63**	**$91,778.68**	**$1,111,541.79**	**$277,885.45**	**$833,656.34**	**4.90**	

	PROJECTED ENERGY SAVINGS DISTRICT WIDE SUMMARY 100% VALUE										
	ANNUAL ELECTRICAL SAVINGS (kWh)	ANNUAL ELECTRICAL SAVINGS	ANNUAL GAS SAVINGS (Therms)	ANNUAL GAS SAVINGS	TOTAL Annual Kbtu Energy Quantity Savings	Combined Annual Electric and Gas Savings	Year	ANNUAL ESCALATED ELECTRIC SAVINGS @ 2.2%	ANNUAL ESCALATED GAS SAVINGS @ 2.4%	TOTAL ESCALATED GAS & ELEC SAVINGS EACH YEAR	ANNUAL MAINTENANCE SAVINGS
Priority 1, 2 & 3 Projects								NJ ESIP Form VI Escalation Rates			
High School Building Projects - Year "1"								1.022	1.024		
Freehold Borough High School	883,380.79	98,938.21	191,569.34	205,170.45	23,320,224.49	304,108.66	1	**$774,142.67**	**$862,169.11**	**$1,636,311.78**	$0.00
Freehold Township High School	1,295,208.70	145,818.59	144,159.13	151,367.08	18,835,347.82	297,185.67	2	*$791,173.81*	*$882,861.17*	*$1,674,034.98*	$0.00
Manalapan High School	983,715.58	120,014.30	170,809.58	178,496.01	19,705,660.43	298,510.31	3	*$808,579.63*	*$904,049.84*	*$1,712,629.47*	$0.00
Subtotals Year (1) Projects	3,162,305.07	364,771.10	506,538.05	535,033.54	61,861,232.74	899,804.64	4	*$826,368.38*	*$925,747.03*	*$1,752,115.42*	$0.00
							5	*$844,548.49*	*$947,964.96*	*$1,792,513.45*	$0.00
Priority 1, 2 & 3 Projects							6	*$863,128.56*	*$970,716.12*	*$1,833,844.68*	$0.00
High School Building Projects - Year "2"							7	*$882,117.38*	*$994,013.31*	*$1,876,130.69*	$0.00
Howell High School	891,544.78	100,743.61	118,017.65	123,092.40	14,843,841.21	223,836.01	8	*$901,523.97*	*$1,017,869.63*	*$1,919,393.59*	$0.00
Marlboro High School	1,001,567.40	122,191.23	186,587.49	195,730.28	24,872,031.02	317,921.51	9	*$921,357.49*	*$1,042,298.50*	*$1,963,655.99*	$0.00
Colts Neck High School	1,701,988.50	186,436.73	7,924.59	8,312.89	6,599,884.51	194,749.62	10	*$941,627.36*	*$1,067,313.66*	*$2,008,941.02*	$0.00
Subtotals Year (2) Priority	3,595,100.68	409,371.57	312,529.73	327,135.57	46,315,756.74	736,507.14	11	*$962,343.16*	*$1,092,929.19*	*$2,055,272.35*	$0.00
							12	*$983,514.71*	*$1,119,159.49*	*$2,102,674.20*	$0.00
High School Building Projects - Year "1" & "2" Totals	6,757,405.75	**774,142.67**	819,067.78	**862,169.11**	108,176,989.48	**1,636,311.78**	13	*$1,005,152.03*	*$1,146,019.32*	*$2,151,171.35*	$0.00
							14	*$1,027,265.38*	*$1,173,523.78*	*$2,200,789.16*	$0.00
								$1,049,865.22	*$1,201,688.35*	*$2,251,553.57*	$0.00
								$13,582,708.24	***$15,348,323.46***	***$28,931,031.70***	***$0.00***

Note: Projected estimated annual electrical and gas savings figures obtained from Volume II - Energy Savings Improvement Plan, Energy Reduction Measure Descriptions for Freehold Regional High School Board of Education, dated Rev. 1 Final ESIP -1/30/2014. Actual energy savings may vary depending on timing, implementation and interaction of individual energy reduction measures and building utilization outside test parameters.

Freehold Borough High School		
Number of Classrooms: 73	203,000	Gross SF Area

NJ ESIP Form VI Escalation Rates (Prelim. NRG Savings)

1.022 **1.024**

		PROJECTED ENERGY SAVINGS										
ERM	**Energy Reduction Measure (Note A)**	**ANNUAL ELECTRICAL SAVINGS (kWh)**	**ANNUAL ELECTRICAL SAVINGS**	**ANNUAL GAS SAVINGS (Therms)**	**ANNUAL GAS SAVINGS**	**TOTAL Annual Kbtu Energy Quantity Savings**	**Combined Annual Electric and Gas Savings**	**Year**	**ANNUAL ESCALATED ELECTRIC SAVINGS @ 2.2%**	**ANNUAL ESCALATED GAS SAVINGS @ 2.4%**	**TOTAL ESCALATED GAS & ELEC SAVINGS EACH YEAR**	**ANNUAL MAINTENANCE SAVINGS**
1	VRF and VRV variable refrigeration volume	88,386.00	$9,899.23	10,788.46	$11,554.44	1,380,431.55	$21,453.67	**1**	**$98,938.21**	**$205,170.45**	**$304,108.66**	$0.00
2	DOAS ventilation system	99,831.90	$11,181.17	101,105.00	$108,283.00	10,451,140.00	$119,464.17	**2**	***$101,114.85***	***$210,094.54***	***$311,209.39***	$0.00
3	AV Equipment on off mode at night times power strips	37,361.00	$4,184.00	0.00	$0.00	1,276,482.00	$4,184.00	**3**	***$103,339.38***	***$215,136.81***	***$318,476.19***	$0.00
4	Other ERMs - Controls Updrade	307,440.00	$34,433.28	24,026.00	$25,732.00	3,451,698.81	$60,165.28	**4**	***$105,612.84***	***$220,300.09***	***$325,912.94***	$0.00
5	Building "A" - (3) 2,000 MBH Condensing Boilers, Pumps, Gas Serv (Note B)	-19,668.00	-$2,202.82	28,832.04	$30,879.11	2,816,094.00	$28,676.29	**5**	***$107,936.33***	***$225,587.30***	***$333,523.62***	$0.00
6	Building "C" - (3) 2,000 MBH Condensing Boilers, Pumps, Gas Serv. (Note B)	-19,668.00	-$2,202.82	28,832.04	$30,879.11	2,816,094.00	$28,676.29	**6**	***$110,310.93***	***$231,001.39***	***$341,312.32***	$0.00
7	Lighting upgrades, at least T-8 or LED	368,708.89	$41,295.40	-2,014.20	-$2,157.21	1,056,666.70	$39,138.19	**7**	***$112,737.77***	***$236,545.42***	***$349,283.19***	$0.00
8	Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	6,935.00	$776.72	0.00	$0.00	23,663.20	$776.72	**8**	***$115,218.00***	***$242,222.51***	***$357,440.51***	$0.00
9	Soda vending machines off at night or weekends	768.00	$86.02	0.00	$0.00	2,620.52	$86.02	**9**	***$117,752.79***	***$248,035.85***	***$365,788.65***	$0.00
10	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	13,286.00	$1,488.03	0.00	$0.00	45,333.71	$1,488.03	**10**	***$120,343.35***	***$253,988.71***	***$374,332.07***	$0.00
	TOTAL ENERGY SAVINGS PER YEAR	883,380.79	**$98,938.21**	191,569.34	**$205,170.45**	23,320,224.49	**$304,108.66**	**11**	***$122,990.91***	***$260,084.44***	***$383,075.35***	$0.00
								12	***$125,696.71***	***$266,326.47***	***$392,023.18***	$0.00
								13	***$128,462.04***	***$272,718.31***	***$401,180.34***	$0.00
								14	***$131,288.20***	***$279,263.55***	***$410,551.75***	$0.00
								15	***$134,176.54***	***$285,965.87***	***$420,142.41***	$0.00
								TOTAL	***$1,735,918.83***	***$3,652,441.72***	***$5,388,360.56***	**$0.00**

Freehold Township High School		
Number of Classrooms: 97	256,000	Gross SF Area

NJ ESIP Form VI Escalation Rates (Prelim. NRG Savings)

1.022 **1.024**

		PROJECTED ENERGY SAVINGS										
ERM	**Energy Reduction Measure (Note A)**	**ANNUAL ELECTRICAL SAVINGS (kWh)**	**ANNUAL ELECTRICAL SAVINGS**	**ANNUAL GAS SAVINGS (Therms)**	**ANNUAL GAS SAVINGS**	**TOTAL Annual Kbtu Energy Quantity Savings**	**Combined Annual Electric and Gas Savings**	**Year**	**ANNUAL ESCALATED ELECTRIC SAVINGS @ 2.2%**	**ANNUAL ESCALATED GAS SAVINGS @ 2.4%**	**TOTAL ESCALATED GAS & ELEC SAVINGS EACH YEAR**	**ANNUAL MAINTENANCE SAVINGS**
1	VRF and VRV variable refrigeration volume	112,493.54	$12,711.77	18,662.31	$19,595.43	2,250,074.88	$32,307.20	**1**	**$145,818.59**	**$151,367.08**	**$297,185.67**	$0.00
2	Lighting upgrades, at least T-8 or LED	562,981.00	$63,616.86	-3,075.48	-$3,229.26	1,613,422.92	$60,387.60	**2**	***$149,026.60***	***$154,999.89***	***$304,026.49***	$0.00
3	DOAS ventilation system	33,165.00	$3,747.65	102,108.00	$107,213.40	10,323,963.00	$110,961.05	**3**	***$152,305.18***	***$158,719.89***	***$311,025.07***	$0.00
4	Motor upgrades, standard efficiency to high efficiency	210,760.00	$23,815.88	-7,231.95	-$7,593.55	-4,052.04	$16,222.33	**4**	***$155,655.90***	***$162,529.16***	***$318,185.06***	$0.00
5	Other ERMs - Controls Updrade - Un-occupied Mode	286,512.00	$32,375.86	11,553.00	$12,130.65	2,132,919.51	$44,506.51	**5**	***$159,080.33***	***$166,429.86***	***$325,510.19***	$0.00
6	Soda vending machines off at night or weekends	12,880.56	$1,455.50	0.00	$0.00	43,950.29	$1,455.50	**6**	***$162,580.10***	***$170,424.18***	***$333,004.28***	$0.00
7	Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	9,118.00	$1,030.33	0.00	$0.00	31,111.91	$1,030.33	**7**	***$166,156.86***	***$174,514.36***	***$340,671.22***	$0.00
8	Laser Printers on off mode at night, times power strips	49,644.60	$5,069.84	0.00	$0.00	169,394.40	$5,069.84	**8**	***$169,812.31***	***$178,702.71***	***$348,515.01***	$0.00
9	Boiler Upgrades: Replace (2) 10 MBH Boilers with (3) MBH Modular Condensing Boilers	0.00	$0.00	22,143.25	$23,250.41	2,214,325.00	$23,250.41	**9**	***$173,548.18***	***$182,991.57***	***$356,539.75***	$0.00
10	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	17,654.00	$1,994.90	0.00	$0.00	60,237.95	$1,994.90	**10**	***$177,366.24***	***$187,383.37***	***$364,749.61***	$0.00
	TOTAL ENERGY SAVINGS PER YEAR	1,295,208.70	**$145,818.59**	144,159.13	**$151,367.08**	18,835,347.82	**$297,185.67**	**11**	***$181,268.30***	***$191,880.57***	***$373,148.87***	$0.00
								12	***$185,256.20***	***$196,485.70***	***$381,741.90***	$0.00
								13	***$189,331.83***	***$201,201.36***	***$390,533.20***	$0.00
								14	***$193,497.14***	***$206,030.19***	***$399,527.33***	$0.00
								15	***$197,754.07***	***$210,974.92***	***$408,728.99***	$0.00
								TOTAL	***$2,558,457.82***	***$2,694,634.82***	***$5,253,092.64***	**$0.00**

Manalapan Township High School		
Number of Classrooms: 156	256,000	Gross SF Area

NJ ESIP Form VI Escalation Rates (Prelim. NRG Savings)

1.022 **1.024**

		PROJECTED ENERGY SAVINGS										
ERM	**Energy Reduction Measure (Note A)**	**ANNUAL ELECTRICAL SAVINGS (kWh)**	**ANNUAL ELECTRICAL SAVINGS**	**ANNUAL GAS SAVINGS (Therms)**	**ANNUAL GAS SAVINGS**	**TOTAL Annual Kbtu Energy Quantity Savings**	**Combined Annual Electric and Gas Savings**	**Year**	**ANNUAL ESCALATED ELECTRIC SAVINGS @ 2.2%**	**ANNUAL ESCALATED GAS SAVINGS @ 2.4%**	**TOTAL ESCALATED GAS & ELEC SAVINGS EACH YEAR**	**ANNUAL MAINTENANCE SAVINGS**
1	VRF and VRV variable refrigeration volume	112,493.54	$13,724.21	18,662.31	$19,502.11	2,250,074.89	$33,226.32	**1**	**$120,014.30**	**$178,496.01**	**$298,510.31**	$0.00
2	Lighting upgrades, at least T-8 or LED	364,603.24	$44,481.60	-1,991.77	-$2,081.40	1,044,900.51	$42,400.20	**2**	***$122,654.61***	***$182,779.91***	***$305,434.53***	$0.00
3	DOAS ventilation system	40,095.00	$4,891.59	117,612.00	$122,904.54	11,898,009.82	$127,796.13	**3**	***$125,353.02***	***$187,166.63***	***$312,519.65***	$0.00
4	Motor upgrades, standard efficiency to high efficiency - VFD (2) 25 HP	71,616.00	$8,738.15	0.00	$0.00	244,363.93	$8,738.15	**4**	***$128,110.78***	***$191,658.63***	***$319,769.41***	$0.00
5	Motor upgrades, standard efficiency to high efficiency - VFD (2) 10 HP	28,646.40	$3,494.86	0.00	$0.00	28,646.40	$3,494.86	**5**	***$130,929.22***	***$196,258.44***	***$327,187.66***	$0.00
6	400 CFM Wing ERV Upgrade	849.40	$103.63	6,674.00	$6,974.33	7,523.40	$7,077.96	**6**	***$133,809.66***	***$200,968.64***	***$334,778.30***	$0.00
7	Laser Printers on off mode at night, times power strips	74,880.00	$9,135.36	0.00	$0.00	255,501.16	$9,135.36	**7**	***$136,753.48***	***$205,791.89***	***$342,545.36***	$0.00
8	Soda vending machines off at night or weekends	9,600.00	$1,171.20	0.00	$0.00	32,756.56	$1,171.20	**8**	***$139,762.05***	***$210,730.89***	***$350,492.95***	$0.00
9	Boiler Upgrades: Replace (2) 10 MBH Boilers with (3) MBH Modular Condensing Boilers	0.00	$0.00	19,191.24	$20,054.85	1,919,124.00	$20,054.85	**9**	***$142,836.82***	***$215,788.44***	***$358,625.25***	$0.00
10	Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	14,820.00	$1,808.04	0.00	$0.00	50,567.94	$1,808.04	**10**	***$145,979.23***	***$220,967.36***	***$366,946.58***	$0.00
11	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	28,392.00	$3,463.82	0.00	$0.00	96,877.52	$3,463.82	**11**	***$149,190.77***	***$226,270.57***	***$375,461.34***	$0.00
12	Other ERMs - Controls Updrade - Un-occupied Mode	237,720.00	$29,001.84	10,661.80	$11,141.58	1,877,314.30	$40,143.42	**12**	***$152,472.97***	***$231,701.07***	***$384,174.03***	$0.00
	TOTAL ENERGY SAVINGS PER YEAR	983,715.58	**$120,014.30**	170,809.58	**$178,496.01**	19,705,660.43	**$298,510.31**	**13**	***$155,827.37***	***$237,261.89***	***$393,089.27***	$0.00
								14	***$159,255.57***	***$242,956.18***	***$402,211.75***	$0.00
								15	***$162,759.20***	***$248,787.13***	***$411,546.32***	$0.00
								TOTAL	***$2,105,709.04***	***$3,177,583.68***	***$5,283,292.73***	**$0.00**

Howell High School		
Number of Classrooms: 104	249,000	Gross SF Area

NJ ESIP Form VI Escalation Rates (Prelim. NRG Savings)

1.022 **1.024**

		PROJECTED ENERGY SAVINGS										
ERM	**Energy Reduction Measure (Note A)**	**ANNUAL ELECTRICAL SAVINGS (kWh)**	**ANNUAL ELECTRICAL SAVINGS**	**ANNUAL GAS SAVINGS (Therms)**	**ANNUAL GAS SAVINGS**	**TOTAL Annual Kbtu Energy Quantity Savings**	**Combined Annual Electric and Gas Savings**	**Year**	**ANNUAL ESCALATED ELECTRIC SAVINGS @ 2.2%**	**ANNUAL ESCALATED GAS SAVINGS @ 2.4%**	**TOTAL ESCALATED GAS & ELEC SAVINGS EACH YEAR**	**ANNUAL MAINTENANCE SAVINGS**
1	VRF and VRV variable refrigeration volume	112,493.54	$12,711.77	18,662.31	$19,464.79	2,250,074.89	$32,176.56	**1**	**$100,743.61**	**$123,092.40**	**$223,836.01**	$0.00
2	Lighting upgrades, at least T-8 or LED	365,341.04	$41,283.54	-1,995.80	-$2,081.62	1,047,014.94	$39,201.92	**2**	***$102,959.97***	***$126,046.62***	***$229,006.59***	$0.00
3	DOAS ventilation system	21,285.00	$2,405.21	62,436.00	$65,120.75	6,316,227.43	$67,525.96	**3**	***$105,225.09***	***$129,071.74***	***$234,296.83***	$0.00
4	Laser Printers on off mode at night, times power strips	53,227.20	$6,014.67	0.00	$0.00	181,618.74	$6,014.67	**4**	***$107,540.04***	***$132,169.46***	***$239,709.50***	$0.00
5	Soda vending machines off at night or weekends	11,150.00	$1,259.00	0.00	$0.00	38,045.38	$1,259.95	**5**	***$109,905.92***	***$135,341.53***	***$245,247.45***	$0.00
6	Replace (2) 7,500 MBH w/ (4) 2,856 MBH	0.00	$0.00	21,952.13	$22,896.07	2,195,212.80	$22,896.07	**6**	***$112,323.85***	***$138,589.72***	***$250,913.57***	$0.00
7	Motor upgrades, standard efficiency to high efficiency	36,000.00	$4,068.00	0.00	$0.00	122,837.10	$4,068.00	**7**	***$114,794.98***	***$141,915.88***	***$256,710.85***	$0.00
8	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	18,928.00	$2,138.86	0.00	$0.00	64,585.02	$2,138.86	**8**	***$117,320.47***	***$145,321.86***	***$262,642.32***	$0.00
9	Replace Boiler HW Heat Exchanger with <500gal. Gas fired AO Smith HW Boiler	0.00	$0.00	8,647.81	$9,019.66	864,780.80	$9,019.66	**9**	***$119,901.52***	***$148,809.58***	***$268,711.10***	$0.00
10	Other ERMs - Controls Updrade - Un-occupied Mode	273,120.00	$30,862.56	8,315.20	$8,672.75	1,763,444.11	$39,535.31	**10**	***$122,539.35***	***$152,381.01***	***$274,920.36***	$0.00
	TOTAL ENERGY SAVINGS PER YEAR	891,544.78	**$100,743.61**	118,017.65	**$123,092.40**	14,843,841.21	**$223,836.01**	**11**	***$125,235.22***	***$156,038.15***	***$281,273.37***	$0.00
								12	***$127,990.39***	***$159,783.07***	***$287,773.46***	$0.00
								13	***$130,806.18***	***$163,617.86***	***$294,424.04***	$0.00
								14	***$133,683.91***	***$167,544.69***	***$301,228.61***	$0.00
								15	***$136,624.96***	***$171,565.77***	***$308,190.73***	$0.00
								TOTAL	***$1,767,595.45***	***$2,191,289.33***	***$3,958,884.78***	**$0.00**

Marlboro Township High School		
Number of Classrooms: 102	264,000	Gross SF Area

NJ ESIP Form VI Escalation Rates (Prelim. NRG Savings)

1.022 **1.024**

		PROJECTED ENERGY SAVINGS										
ERM	**Energy Reduction Measure (Note A)**	**ANNUAL ELECTRICAL SAVINGS (kWh)**	**ANNUAL ELECTRICAL SAVINGS**	**ANNUAL GAS SAVINGS (Therms)**	**ANNUAL GAS SAVINGS**	**TOTAL Annual Kbtu Energy Quantity Savings**	**Combined Annual Electric and Gas Savings**	**Year**	**ANNUAL ESCALATED ELECTRIC SAVINGS @ 2.2%**	**ANNUAL ESCALATED GAS SAVINGS @ 2.4%**	**TOTAL ESCALATED GAS & ELEC SAVINGS EACH YEAR**	**ANNUAL MAINTENANCE SAVINGS**
1	Lighting upgrades, at least T-8 or LED	412,254.42	$50,295.04	-2,252.09	-$2,362.44	1,181,461.94	$47,932.60	**1**	**$122,191.23**	**$195,730.28**	**$317,921.51**	$0.00
2	DOAS ventilation system	50,490.00	$6,159.78	148,104.00	$155,361.10	14,982,679.00	$161,520.88	**2**	***$124,879.44***	***$200,427.81***	***$325,307.24***	$0.00
3	Motor upgrades, standard efficiency to high efficiency - VFD (4) 10 HP, (2) 5 HP Mug	61,200.00	$7,466.40	0.00	$0.00	208,823.07	$7,466.40	**3**	***$127,626.78***	***$205,238.07***	***$332,864.86***	$0.00
4	Switching out steam heating (control) for HYDRONIC heating or gas fired	0.00	$0.00	4,692.00	$4,921.91	469,200.00	$4,921.91	**4**	***$130,434.57***	***$210,163.79***	***$340,598.36***	$0.00
5	Other ERMs - DDC Control Upgrades - UnOccupied Mode	230,304.00	$28,097.09	11,160.50	$11,707.36	1,901,879.86	$39,804.45	**5**	***$133,304.13***	***$215,207.72***	***$348,511.85***	$0.00
6	Laser Printers on off mode at night, times power strips	52,203.60	$6,368.84	0.00	$0.00	178,126.08	$6,368.84	**6**	***$136,236.83***	***$220,372.70***	***$356,609.53***	$0.00
7	Soda vending machines off at night or weekends	10,920.00	$1,332.24	0.00	$0.00	37,260.59	$1,332.24	**7**	***$139,234.04***	***$225,661.65***	***$364,895.68***	$0.00
8	VRF and VRV Variable Regrigeration Volume	149,991.38	$18,298.95	24,883.08	$26,102.35	3,000,099.83	$44,401.30	**8**	***$142,297.18***	***$231,077.53***	***$373,374.71***	$0.00
9	Plug Loads on Timers, Reduce Plug Loads, Vending Machines (10 +/-)	5,950.00	$725.90	0.00	$0.00	2,816,094.00	$725.90	**9**	***$145,427.72***	***$236,623.39***	***$382,051.11***	$0.00
10	Reduce appliance heating plate plug loads (safety issue - $21.10/CR, 10.13/CR savings)	9,690.00	$1,182.18	0.00	$0.00	33,063.65	$1,182.18	**10**	***$148,627.13***	***$242,302.35***	***$390,929.48***	$0.00
11	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	18,564.00	$2,264.81	0.00	$0.00	63,343.00	$2,264.81	**11**	***$151,896.93***	***$248,117.61***	***$400,014.54***	$0.00
	TOTAL ENERGY SAVINGS PER YEAR	1,001,567.40	**$122,191.23**	186,587.49	**$195,730.28**	24,872,031.02	**$317,921.51**	**12**	***$155,238.66***	***$254,072.43***	***$409,311.09***	$0.00
								13	***$158,653.91***	***$260,170.17***	***$418,824.08***	$0.00
								14	***$162,144.30***	***$266,414.25***	***$428,558.55***	$0.00
								15	***$165,711.47***	***$272,808.19***	***$438,519.67***	$0.00
								TOTAL	***$2,143,904.34***	***$3,484,387.94***	***$5,628,292.27***	**$0.00**

Colts Neck High School		
Number of Classrooms: 82	220,000	Gross SF Area

NJ ESIP Form VI Escalation Rates
(Prelim. NRG Savings)

1.022 **1.024**

		PROJECTED ENERGY SAVINGS										
ERM	**Energy Reduction Measure (Note A)**	**ANNUAL ELECTRICAL SAVINGS (kWh)**	**ANNUAL ELECTRICAL SAVINGS**	**ANNUAL GAS SAVINGS (Therms)**	**ANNUAL GAS SAVINGS**	**TOTAL Annual Kbtu Energy Quantity Savings**	**Combined Annual Electric and Gas Savings**	**Year**	**ANNUAL ESCALATED ELECTRIC SAVINGS @ 2.2%**	**ANNUAL ESCALATED GAS SAVINGS @ 2.4%**	**TOTAL ESCALATED GAS & ELEC SAVINGS EACH YEAR**	**ANNUAL MAINTENANCE SAVINGS**
1	Lighting upgrades, at least T-8 or LED	1,003,525.60	$109,384.29	-5,482.11	-$5,750.74	2,875,960.19	$103,633.55	1	**$186,436.73**	**$8,312.89**	**$194,749.62**	$0.00
2	Motor upgrades, standard efficiency to high efficiency - VFD, HW Circ. Pump, Chilled Water	80,000.00	$8,720.00	0.00	$0.00	272,971.33	$8,720.00	2	***$190,538.34***	***$8,512.40***	***$199,050.74***	$0.00
3	Other ERMs - DDC Control Upgrades - UnOccupied Mode	543,327.30	$59,222.68	13,406.70	$14,063.63	3,194,579.68	$73,286.31	3	***$194,730.18***	***$8,716.70***	***$203,446.88***	$0.00
4	Laser Printers on off mode at night, times power strips	52,203.60	$6,368.84	0.00	$0.00	178,126.08	$6,368.84	4	***$199,014.25***	***$8,925.90***	***$207,940.14***	$0.00
5	(4) Soda / vending machines off at night or weekends	4,368.00	$476.11	0.00	$0.00	14,904.23	$476.11	5	***$203,392.56***	***$9,140.12***	***$212,532.68***	$0.00
6	Computer on deep set back or off ($41.95/CR Cost, $19.40/CR Savings)	18,564.00	$2,264.81	0.00	$0.00	63,343.00	$2,264.81	6	***$207,867.20***	***$9,359.48***	***$217,226.68***	$0.00
	TOTAL ENERGY SAVINGS PER YEAR	1,701,988.50	**$186,436.73**	7,924.59	**$8,312.89**	6,599,884.51	**$194,749.62**	7	***$212,440.27***	***$9,584.11***	***$222,024.38***	$0.00
								8	***$217,113.96***	***$9,814.13***	***$226,928.09***	$0.00
								9	***$221,890.47***	***$10,049.67***	***$231,940.13***	$0.00
								10	***$226,772.06***	***$10,290.86***	***$237,062.92***	$0.00
								11	***$231,761.04***	***$10,537.84***	***$242,298.88***	$0.00
								12	***$236,859.79***	***$10,790.75***	***$247,650.53***	$0.00
								13	***$242,070.70***	***$11,049.73***	***$253,120.43***	$0.00
								14	***$247,396.26***	***$11,314.92***	***$258,711.18***	$0.00
								15	***$252,838.97***	***$11,586.48***	***$264,425.45***	$0.00
								TOTAL	***$3,271,122.76***	***$147,985.96***	***$3,419,108.72***	**$0.00**

				Data from 2012-2013 Report								Data from 2009-2010 Report						
	Energy Star Rating	Site Visit Date	Square Footage	Electric Consumption (kWh)	Annual Electric ($)	Price per kWh	Gas Consumption	Annual Gas ($)	Price per Therm	Total Cost	$ Cost/sqft	Electric Consumption (kWh)	Annual Electric ($)	Price per kWh	Gas Consumption	Annual Gas ($)	Price per Therm	Energy Star Rating
Colts Neck	2	4/25/2013	220,000	3,622,182	$395,018.79	$0.109	89,378	$93,778.64	$1.049	$488,797	$2.22	3,635,786	$558,674	0.154	143,801	$217,191	1.51	2
Freehold Borough	17	4/1/2013	203,000	2,049,600	$230,109.35	$0.112	160,178	$171,540.93	$1.071	$401,650	$1.98	2,366,100	$366,118	0.155	226,982	$337,128	1.49	5
Freehold Township	67	4/30/2013	256,000	2,387,600	$270,040.24	$0.113	96,275	$101,043.01	$1.050	$371,083	$1.45	2,505,600	$395,173	0.158	114,940	$176,033	1.53	39
Howell	20	4/30/2013	249,000	2,731,200	$308,866.43	$0.113	83,152	$86,726.42	$1.043	$395,593	$1.59	2,637,200	$414,416	0.157	142,441	$216,394	1.52	45
Manalapan	67	4/30/2013	256,000	2,377,200	$290,326.50	$0.122	106,618	$111,433.59	$1.045	$401,760	$1.57	2,421,200	$377,524	0.156	127,507	$212,830	1.67	41
Marlboro	41	4/25/2013	264,000	2,303,040	$280,207.07	$0.122	111,605	$117,034.22	$1.049	$397,241	$1.50	2,757,196	$425,088	0.154	142,751	$221,168	1.55	30

NOTES:
1. Howell HS exhibited reduction in Energy Star Rating from 45 to 20 apparently due to installation of (38) new roof top units with insufficient automatic temperature control. Resulted in increased energy comsumption even though T8 lighting was installed.

ID	Task Name	Duration	Start	Finish	Predecessors
1	Meet with District Finance Committee	1 day	Mon 1/21/13	Mon 1/21/13	
2	Meeting with District Board of Education	5 days	Tue 1/22/13	Mon 1/28/13	1
3	Execution of Owner/Architect Agreement	5 days	Tue 1/29/13	Mon 2/4/13	2
4					
5	**PHASE I - INVESTIGATION / ESIP PLAN DEVELOPMENT**	**399 days**	**Tue 2/5/13**	**Fri 8/15/14**	
6	Assemble Existing Building Construction Documents - 6 Schools	10 days	Tue 2/5/13	Mon 2/18/13	3
7	Review District's Existing Long Range Facilities Plan	5 days	Tue 2/5/13	Mon 2/11/13	3
8	Assemble Existing Energy Bills - 6 Schools (12 months)	5 days	Tue 2/5/13	Mon 2/11/13	3
9	Review Existing Energy Audits - 6 Schools	10 days	Tue 2/5/13	Mon 2/18/13	3
10	Field Verify Existing HVAC Equipment (Type/Location)	20 days	Tue 2/19/13	Mon 3/18/13	6
11	Model Existing Buildings - 6 schools	60 days	Tue 3/19/13	Mon 6/10/13	10
12	Prepare Draft Energy Report and List of Energy Reduction Measure - 6 Schools	40 days	Tue 6/11/13	Mon 8/5/13	11
13	Prepare NJDOE ROD Grant Projects to Supplement ESIP	62 days	Tue 6/11/13	Wed 9/4/13	11
14	District Explores Local Finance Options (Energy Savings Bor	40 days	Tue 6/11/13	Mon 8/5/13	11
15	Prepare Draft Energy Savings Plan - 6 Schools	38 days	Tue 8/6/13	Thu 9/26/13	12
16	Submit Final 9-27-13 Draft ESIP Plan to NJBPU	0 days	Fri 9/27/13	Fri 9/27/13	15
17	District Issues RFP and Retains Independent Energy Audit Consultant (S. Winter Assoc.)	21 days	Wed 10/16/13	Wed 11/13/13	
18	Energy Audit Consultant Review District's ESIP - Sup. Calculations Submitted by Haglid Engineering	62 days	Thu 11/14/13	Fri 2/7/14	17
19	S. Winter Assoc. Issues ESIP Approval Letter FRHSD	0 days	Fri 2/7/14	Fri 2/7/14	18
20	FVHD Submits Final District ESIP to NJBPU for Final Approv	10 days	Mon 2/10/14	Fri 2/21/14	19
21	Prepare and Subit Final Financial Summary with Escallated Energy Unit Costs to NJBPU	11 days	Mon 2/24/14	Mon 3/10/14	20
22	**Haglid Eng. Models Pay 4 Performance (P4P) and Submits Application for NJ BPU for Design Incentive - Year 1 ESIP Projects (Boro, Twp. Manalapan)**	100 days	Mon 10/21/13	Fri 3/7/14	
23	NJBPU P4P Application, Performs Pre-Installation Inspection of Buildings	100 days	Mon 3/10/14	Fri 7/25/14	22
24	Receive Incentive #1 ($.05-$.10/SI/Building) Year 1 HS School Projects	15 days	Mon 7/28/14	Fri 8/15/14	23
25	**Capital Plan Phase I Financing Time Line (Phoenix)**	**47 days**	**Tue 3/4/14**	**Wed 5/7/14**	
26	**Haglid Eng. Models Pay 4 Performance (P4P) and Submits Application for NJ BPU for Design Incentive - Year 2 ESIP Projects (Howell, Colts Neck, Marlboro))**	40 days	Mon 3/10/14	Fri 5/2/14	22
27					
28	**PHASE II - Year 1 ROD Projects for Selected High School Buildings (Freehold Boro., Marlboro, Howell)**	**148 days**	**Mon 3/10/14**	**Wed 10/1/14**	
29	Board Approvals Final ESIP Project and Financial Model	0 days	Mon 3/10/14	Mon 3/10/14	
30	FVHD Authorized to Commence with HVAC Piping Project Contract/Bid Documents - ROD (Freehold Borough HS)	36 days	Mon 3/10/14	Mon 4/28/14	29
31	FVHD Authorized to Commence with Year 1 Roof Replacement Projects - ROD (Howell, Marlboro)	36 days	Mon 3/10/14	Mon 4/28/14	29
32	Substantially Complete Contract / Bid Documents	0 days	Mon 4/28/14	Mon 4/28/14	31
33	Submit Documents to NJDCA or LCO for Plan Review	20 days	Tue 4/29/14	Mon 5/26/14	32
34	Issue Advertisement to Bid	0 days	Mon 4/28/14	Mon 4/28/14	31
35	Conduct Pre-Bid Conference	6 days	Tue 4/29/14	**Tue 5/6/14**	34
36	Project Bidding	15 days	Tue 4/29/14	Mon 5/19/14	34
37	Review and Recommend Award of Contract	5 days	Tue 5/20/14	Mon 5/26/14	36
38	Issue Notice of Award to Contractor	1 day	Tue 5/27/14	Tue 5/27/14	37
39	Receive Contractor's Bonds, Insurance	10 days	Wed 5/28/14	Tue 6/10/14	38
40	Issue Notice to Proceed	1 day	Wed 6/11/14	Wed 6/11/14	39
41	Receive Contractor's Technical Submittals	10 days	Thu 6/12/14	Wed 6/25/14	40
42	Contractor receives Tech. Submittals, Procures Equipment	5 days	Thu 6/26/14	Wed 7/2/14	41
43	Commence Construction Work	0 days	Wed 7/2/14	Wed 7/2/14	42
44	Substantially Complete Construction, Obtain TCO	42 days	Thu 7/3/14	Fri 8/29/14	43
45	Punch List Review and Close-out Phase	20 days	Thu 9/4/14	Wed 10/1/14	44
46					
47					
48					
49	**PHASE II - Year 1 ESIP Projects for Freehold Boro, Township and Manalapan**	**594 days**	**Mon 7/28/14**	**Thu 11/3/16**	
50	FVHD Authorized to Commence with Mechanical / Electrical Contract/Bid Documents - ESIP	50 days	Mon 7/28/14	Fri 10/3/14	23
51	Prepare Schematic Design Documents w/Cost Estimate	5 days	Mon 7/28/14	Fri 8/1/14	23
52	Obtain Resolution from Board of Education	5 days	Mon 8/4/14	Fri 8/8/14	51
53	Amend District LRFP	5 days	Mon 8/11/14	Fri 8/15/14	52
54	Submit Schematic Design and Applications to NJDOE	5 days	Mon 8/18/14	Fri 8/22/14	53
55	Substantially Complete Contract / Bid Documents	0 days	Fri 10/3/14	Fri 10/3/14	50
56	Submit Documents to NJDCA or LCO for Plan Review	20 days	Mon 10/6/14	Fri 10/31/14	55
57	Issue Advertisement to Bid	0 days	Mon 10/6/14	Mon 10/6/14	55
58	Conduct Pre-Bid Conference	6 days	Tue 10/7/14	Tue 10/14/14	57
59	Project Bidding	15 days	Wed 10/15/14	Tue 11/4/14	58
60	Review and Recommend Award of Contract	5 days	Wed 11/5/14	Tue 11/11/14	59
61	Issue Notice of Award to Contractor	1 day	Wed 11/12/14	Wed 11/12/14	60
62	Receive Contractor's Bonds, Insurance	10 days	Thu 11/13/14	Wed 11/26/14	61
63	Issue Notice to Proceed	1 day	Thu 11/27/14	Thu 11/27/14	62
64	Receive Contractor's Technical Submittals	10 days	Fri 11/28/14	Thu 12/11/14	63
65	Contractor receives Tech. Submittals, Procures Equipment	5 days	Fri 12/12/14	Thu 12/18/14	64
66	Commence Construction Work	180 days	Fri 12/19/14	Thu 8/27/15	65
67	Substantially Complete Construction, Obtain TCO	0 days	Thu 8/27/15	Thu 8/27/15	66
68	Haglid Engineering Prepares Installation Report, Requests 2nd Incentive Submitted to BPU	20 days	Fri 8/28/15	Thu 9/24/15	67
69	Punch List Review and Close-out Phase	20 days	Fri 8/28/15	Thu 9/24/15	66
70	District Commences with Construction Installation Monitor	260 days	Fri 8/28/15	Thu 8/25/16	67
71	Haglid Prepares Benchmarking Report and Submits Application to BPU for 3rd Incentive	20 days	Fri 8/26/16	Thu 9/22/16	70
72	District Receives 3rd BPU P4P Incentive	30 days	Fri 9/23/16	Thu 11/3/16	71
73					
74	**PHASE III - Year 2 ESIP Projects for Howell, Marlboro, Colts Neck**	1 day	Mon 1/21/13	Mon 1/21/13	
75	NJBPU P4P Application, Performs Pre-Installation Inspection of Buildings	100 days	Mon 5/5/14	Fri 9/19/14	26
76	FVHD Authorized to Commence with Mechanical / Electrical Contract/Bid Documents - ESIP	50 days	Mon 9/22/14	Fri 11/28/14	75
77	Receive Incentive #1 ($.05-$.10/SI/Building) Year 2 HS School Projects	15 days	Mon 9/22/14	Fri 10/10/14	75
78	Prepare Schematic Design Documents w/Cost Estimate	5 days	Mon 9/22/14	Fri 9/26/14	75
79	Obtain Resolution from Board of Education	5 days	Mon 9/29/14	Fri 10/3/14	78
80	Amend District LRFP	5 days	Mon 10/6/14	Fri 10/10/14	79
81	Submit Schematic Design and Applications to NJDOE	5 days	Mon 10/13/14	Fri 10/17/14	80
82	Substantially Complete Contract / Bid Documents	0 days	Mon 10/20/14	Mon 10/20/14	81
83	Submit Documents to NJDCA or LCO for Plan Review	20 days	Mon 10/20/14	Fri 11/14/14	82
84	Issue Advertisement to Bid	0 days	Mon 11/17/14	Mon 11/17/14	83
85	Conduct Pre-Bid Conference	6 days	Mon 11/17/14	Mon 11/24/14	84
86	Project Bidding	15 days	Tue 11/25/14	Mon 12/15/14	85
87	Review and Recommend Award of Contract	5 days	Tue 12/16/14	Mon 12/22/14	86
88	Issue Notice of Award to Contractor	1 day	Tue 12/23/14	Tue 12/23/14	87
89	Receive Contractor's Bonds, Insurance	10 days	Wed 12/24/14	Tue 1/6/15	88
90	Issue Notice to Proceed	1 day	Wed 1/7/15	Wed 1/7/15	89
91	Receive Contractor's Technical Submittals	10 days	Thu 1/8/15	Wed 1/21/15	90
92	Contractor receives Tech. Submittals, Procures Equipment	5 days	Thu 1/22/15	Wed 1/28/15	91
93	Commence Construction Work	180 days	Thu 1/29/15	Wed 10/7/15	92
94	Substantially Complete Construction, Obtain TCO	0 days	Thu 10/8/15	Thu 10/8/15	93
95	Haglid Engineering Prepares Installation Report, Requests 2nd Incentive Submitted to BPU	20 days	Thu 10/8/15	Wed 11/4/15	94
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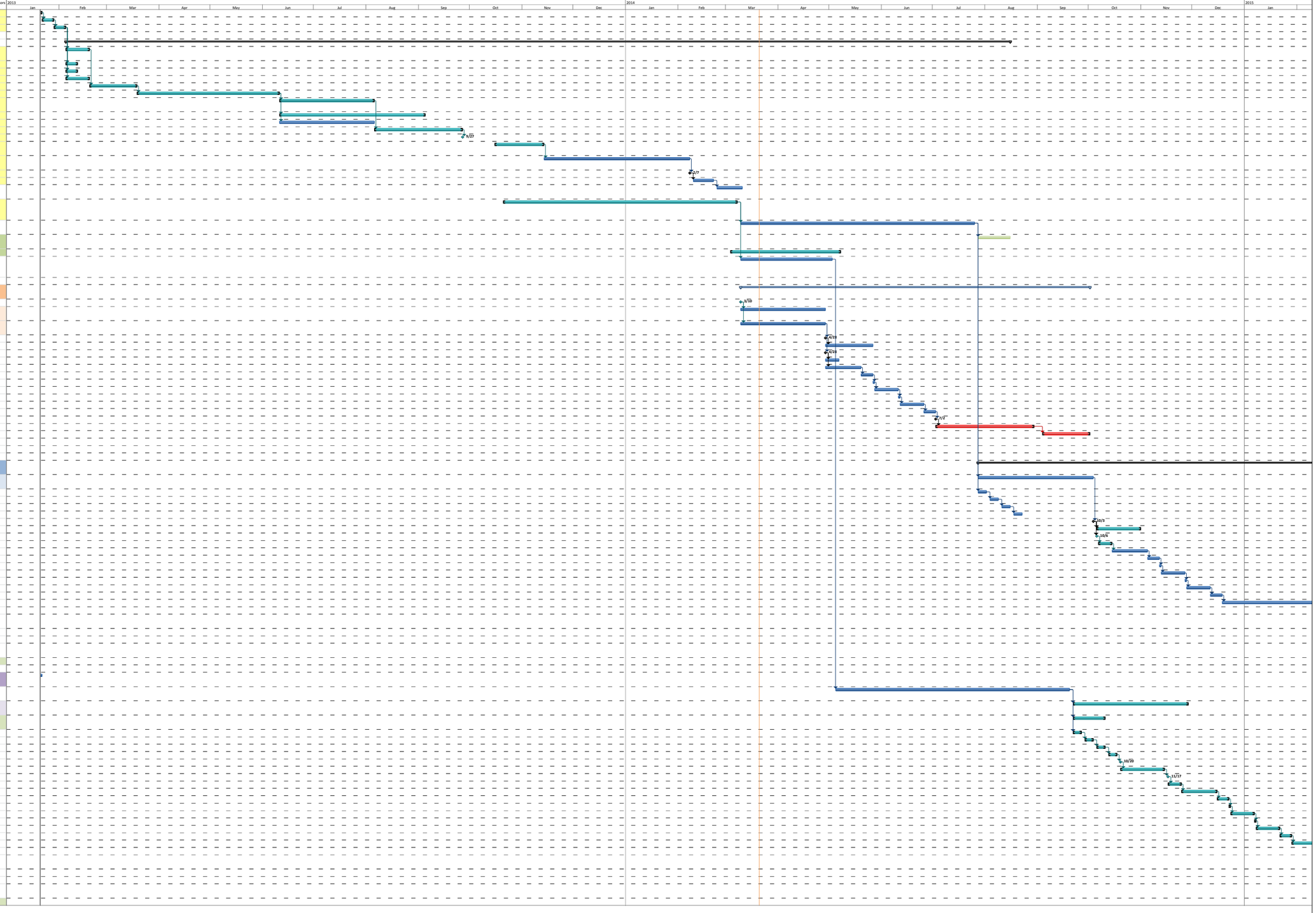
97	District Commences with Construction Installation Monitorin	260 days	Thu 10/8/15	Wed 10/5/16	94
98	Haglid Prepares Benchmarking Report and Submits Application to BPU for 3rd Incentive	20 days	Thu 10/6/16	Wed 11/2/16	97
99	District Receives 3rd BPU P4P Incentive	30 days	Thu 11/3/16	Wed 12/14/16	98



Project: 4415 Prelim Schedule 030
Date: Fri 3/21/14

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Progress

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3	Execution of Owner/Architect Agreement	5 days	Tue 1/29/13	Mon 2/4/13	2
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5	**PHASE I - INVESTIGATION / ESIP PLAN DEVELOPMENT**	**399 days**	**Tue 2/5/13**	**Fri 8/15/14**	
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8	Assemble Existing Energy Bills - 6 Schools (12 months)	5 days	Tue 2/5/13	Mon 2/11/13	3
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10	Field Verify Existing HVAC Equipment (Type/Location)	20 days	Tue 2/19/13	Mon 3/18/13	6
11	Model Existing Buildings - 6 schools	60 days	Tue 3/19/13	Mon 6/10/13	10
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16	Submit Final 9-27-13 Draft ESIP Plan to NJBPU	0 days	Fri 9/27/13	Fri 9/27/13	15
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18	Energy Audit Consultant Review District's ESIP - Sup. Calculations Submitted by Haglid Engineering	62 days	Thu 11/14/13	Fri 2/7/14	17
19	S. Winter Assoc. Issues ESIP Approval Letter FRHSD	0 days	Fri 2/7/14	Fri 2/7/14	18
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24	Receive Incentive #1 ($.05-$.10/SF/Building) Year 1 HS School Projects	15 days	Mon 7/28/14	Fri 8/15/14	23
25	**Capital Plan Phase I Financing Time Line (Phoenix)**	**47 days**	**Tue 3/4/14**	**Wed 5/7/14**	
26	**Haglid Eng. Models Pay 4 Performance (P4P) and Submits Application for NJ BPU for Design Incentive - Year 2 ESIP Projects (Howell, Colts Neck, Marlboro))**	40 days	Mon 3/10/14	Fri 5/2/14	22
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33	Submit Documents to NJDCA or LCO for Plan Review	20 days	Tue 4/29/14	Mon 5/26/14	32
34	Issue Advertisement to Bid	0 days	Mon 4/28/14	Mon 4/28/14	31
35	Conduct Pre-Bid Conference	6 days	Tue 4/29/14	**Tue 5/6/14**	34
36	Project Bidding	15 days	Tue 4/29/14	Mon 5/19/14	34
37	Review and Recommend Award of Contract	5 days	Tue 5/20/14	Mon 5/26/14	36
38	Issue Notice of Award to Contractor	1 day	Tue 5/27/14	Tue 5/27/14	37
39	Receive Contractor's Bonds, Insurance	10 days	Wed 5/28/14	Tue 6/10/14	38
40	Issue Notice to Proceed	1 day	Wed 6/11/14	Wed 6/11/14	39
41	Receive Contractor's Technical Submittals	10 days	Thu 6/12/14	Wed 6/25/14	40
42	Contractor receives Tech. Submittals, Procures Equipment	5 days	Thu 6/26/14	Wed 7/2/14	41
43	Commence Construction Work	0 days	Wed 7/2/14	Wed 7/2/14	42
44	Substantially Complete Construction, Obtain TCO	42 days	Thu 7/3/14	Fri 8/29/14	43
45	Punch List Review and Close-out Phase	20 days	Thu 9/4/14	Wed 10/1/14	44
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47					
48					
49	**PHASE II - Year 1 ESIP Projects for Freehold Boro, Township and Manalapan**	**594 days**	**Mon 7/28/14**	**Thu 11/3/16**	
50	FVHD Authorized to Commence with Mechanical / Electrical Contract/Bid Documents - ESIP	50 days	Mon 7/28/14	Fri 10/3/14	23
51	Prepare Schematic Design Documents w/Cost Estimate	5 days	Mon 7/28/14	Fri 8/1/14	23
52	Obtain Resolution from Board of Education	5 days	Mon 8/4/14	Fri 8/8/14	51
53	Amend District LRFP	5 days	Mon 8/11/14	Fri 8/15/14	52
54	Submit Schematic Design and Applications to NJDOE	5 days	Mon 8/18/14	Fri 8/22/14	53
55	Substantially Complete Contract / Bid Documents	0 days	Fri 10/3/14	Fri 10/3/14	50
56	Submit Documents to NJDCA or LCO for Plan Review	20 days	Mon 10/6/14	Fri 10/31/14	55
57	Issue Advertisement to Bid	0 days	Mon 10/6/14	Mon 10/6/14	55
58	Conduct Pre-Bid Conference	6 days	Tue 10/7/14	Tue 10/14/14	57
59	Project Bidding	15 days	Wed 10/15/14	Tue 11/4/14	58
60	Review and Recommend Award of Contract	5 days	Wed 11/5/14	Tue 11/11/14	59
61	Issue Notice of Award to Contractor	1 day	Wed 11/12/14	Wed 11/12/14	60
62	Receive Contractor's Bonds, Insurance	10 days	Thu 11/13/14	Wed 11/26/14	61
63	Issue Notice to Proceed	1 day	Thu 11/27/14	Thu 11/27/14	62
64	Receive Contractor's Technical Submittals	10 days	Fri 11/28/14	Thu 12/11/14	63
65	Contractor receives Tech. Submittals, Procures Equipment	5 days	Fri 12/12/14	Thu 12/18/14	64
66	Commence Construction Work	180 days	Fri 12/19/14	Thu 8/27/15	65
67	Substantially Complete Construction, Obtain TCO	0 days	Thu 8/27/15	Thu 8/27/15	66
68	Haglid Engineering Prepares Installation Report, Requests 2nd Incentive Submitted to BPU	20 days	Fri 8/28/15	Thu 9/24/15	67
69	Punch List Review and Close-out Phase	20 days	Fri 8/28/15	Thu 9/24/15	66
70	District Commences with Construction Installation Monitor	260 days	Fri 8/28/15	Thu 8/25/16	67
71	Haglid Prepares Benchmarking Report and Submits Application to BPU for 3rd Incentive	20 days	Fri 8/26/16	Thu 9/22/16	70
72	District Receives 3rd BPU P4P Incentive	30 days	Fri 9/23/16	Thu 11/3/16	71
73					
74	**PHASE III - Year 2 ESIP Projects for Howell, Marlboro, Colts Neck**	1 day	Mon 1/21/13	Mon 1/21/13	
75	NJBPU P4P Application, Performs Pre-Installation Inspection of Buildings	100 days	Mon 5/5/14	Fri 9/19/14	26
76	FVHD Authorized to Commence with Mechanical / Electrical Contract/Bid Documents - ESIP	50 days	Mon 9/22/14	Fri 11/28/14	75
77	Receive Incentive #1 ($.05-$.10/SF/Building) Year 2 HS School Projects	15 days	Mon 9/22/14	Fri 10/10/14	75
78	Prepare Schematic Design Documents w/Cost Estimate	5 days	Mon 9/22/14	Fri 9/26/14	75
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81	Submit Schematic Design and Applications to NJDOE	5 days	Mon 10/13/14	Fri 10/17/14	80
82	Substantially Complete Contract / Bid Documents	0 days	Mon 10/20/14	Mon 10/20/14	81
83	Submit Documents to NJDCA or LCO for Plan Review	20 days	Mon 10/20/14	Fri 11/14/14	82
84	Issue Advertisement to Bid	0 days	Mon 11/17/14	Mon 11/17/14	83
85	Conduct Pre-Bid Conference	6 days	Mon 11/17/14	Mon 11/24/14	84
86	Project Bidding	15 days	Tue 11/25/14	Mon 12/15/14	85
87	Review and Recommend Award of Contract	5 days	Tue 12/16/14	Mon 12/22/14	86
88	Issue Notice of Award to Contractor	1 day	Tue 12/23/14	Tue 12/23/14	87
89	Receive Contractor's Bonds, Insurance	10 days	Wed 12/24/14	Tue 1/6/15	88
90	Issue Notice to Proceed	1 day	Wed 1/7/15	Wed 1/7/15	89
91	Receive Contractor's Technical Submittals	10 days	Thu 1/8/15	Wed 1/21/15	90
92	Contractor receives Tech. Submittals, Procures Equipment	5 days	Thu 1/22/15	Wed 1/28/15	91
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95	Haglid Engineering Prepares Installation Report, Requests 2nd Incentive Submitted to BPU	20 days	Thu 10/8/15	Wed 11/4/15	94
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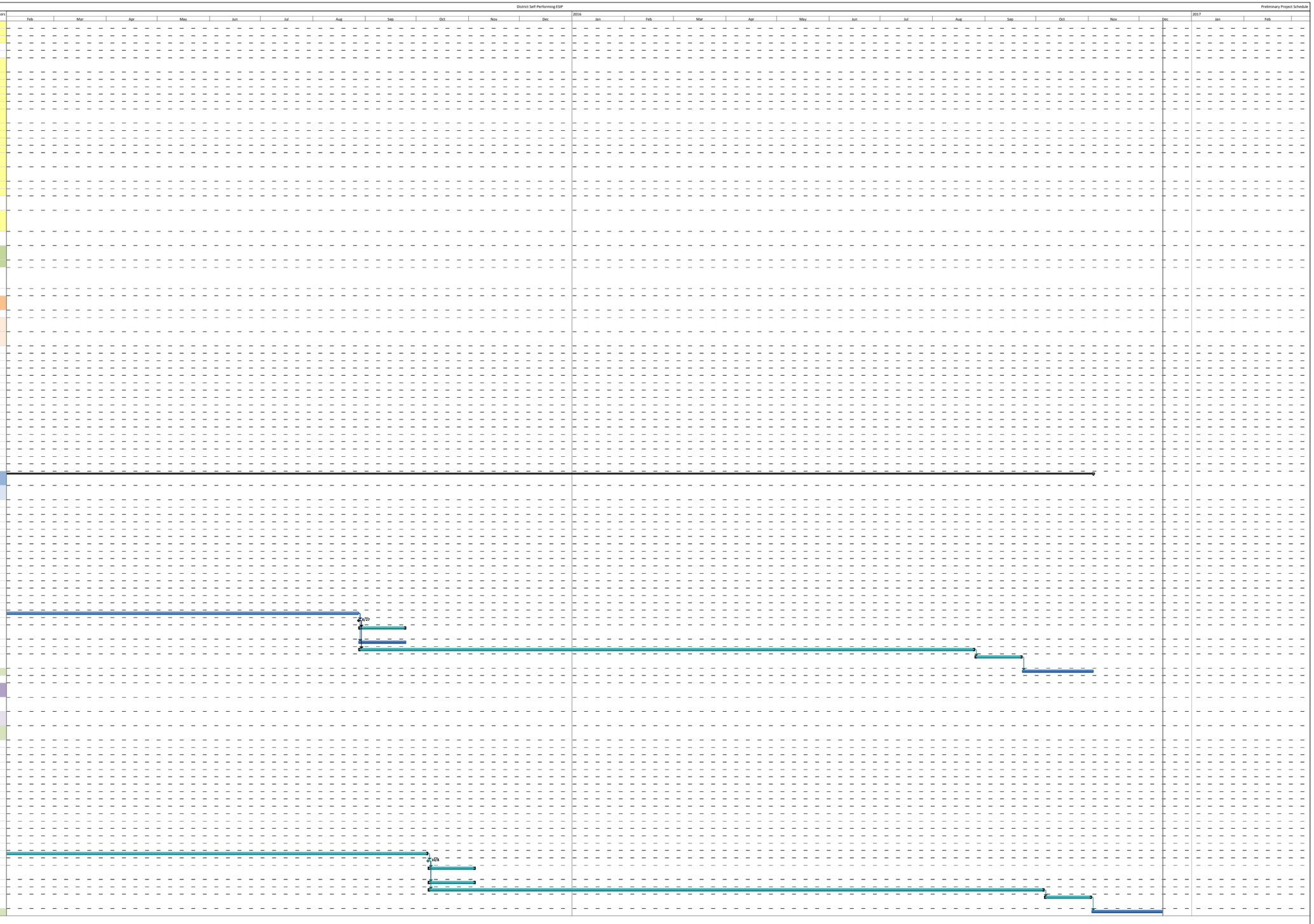
98	Haglid Prepares Benchmarking Report and Submits Application to BPU for 3rd Incentive	20 days	Thu 10/6/16	Wed 11/2/16	97
99	District Receives 3rd BPU P4P Incentive	30 days	Thu 11/3/16	Wed 12/14/16	98



Project: 4415 Prelim Schedule 030
Date: Fri 3/21/14

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Progress

Freehold Regional Board of Education

Annual Cash-Flow for ESIP - Level Payments

ESIP Cash-Flow

	Energy Savings	ESIP Incentives 10%/45%/45%			ESIP Annual Balance
		Boro, Twp, Man	Howell, Marl, CN	ESIP Payments	
6/30/2015	449,902	229,893			679,795
6/30/2016	1,268,058	1,034,517	142,912	(1,685,573)	759,913
6/30/2017	1,636,312	1,034,517	643,103	(1,403,808)	1,910,124
6/30/2018	1,674,035		643,103	(1,403,072)	914,066
6/30/2019	1,712,629			(1,403,408)	309,221
6/30/2020	1,752,115			(1,402,784)	349,331
6/30/2021	1,792,513			(1,402,184)	390,329
6/30/2022	1,833,845			(1,401,576)	432,269
6/30/2023	1,876,131			(1,400,928)	475,203
6/30/2024	1,919,394			(1,400,208)	519,186
6/30/2025	1,963,656			(1,399,384)	564,272
6/30/2026	2,008,941			(1,399,408)	609,533
6/30/2027	2,055,272			(1,398,248)	657,024
6/30/2028	2,102,674			(1,397,872)	704,802
6/30/2029	2,151,171			(1,397,232)	753,939
6/30/2030	2,200,789			(1,397,280)	803,509
6/30/2031	2,251,554			(1,395,984)	855,570
Total	30,648,992	2,298,926	1,429,119	(22,688,949)	11,688,088

Assumptions:

ESIP Total to Finance	$	17,498,000	Energy Savings	1/2 year initially for each tranche with total of 16.5 years
Issue Date		June, 2014	Annual Escalation of Savings	2.2% for electrical savings and 2.4% for gas savings
First Payment Due		July, 2015	P4P incentives	Received 10/45/45% based on both tranche schedules
Last Payment Due		July, 2030		
Interest Rate Assumed		3.20%		