ST. MARK'S SCHOOL

Sustainability

CLIMATE ACTION PLAN

"Lions Live Green"

CONTENTS

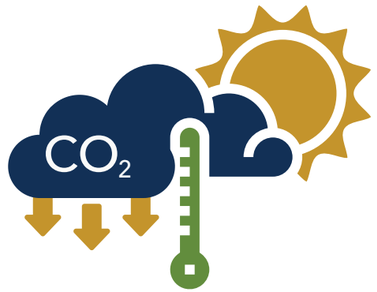
WELCOME

Head of School **JOHN C. WARREN '74**

"As a school community, we recognize the urgent need to combat climate change. I am proud to lead a school that has identified measurable goals to help us achieve our shared vision for climate action. St. Mark's pledges to be a leader among our peers by making our commitment to sustainability explicit and visible. This Climate Action Plan is the natural next step in formalizing our School's commitment to sustainability. I look forward to the continuing evolution of our campus culture, as we prioritize educating our students and modeling responsible global citizenship. We recognize at St. Mark's that every member of our school community has a role to play in ensuring we reach the ambitious and essential carbon reduction goal outlined in this Plan. With a committed community-wide effort, we will indeed reach our goal!"

John C. Warren '74, Ed.D.
Head of School

EXECUTIVE SUMMARY



WHAT IS CLIMATE ACTION?

Taking urgent steps to combat climate change is one of the UN Sustainable Development Goals. Collective action is needed across the globe to avoid the most catastrophic impacts facing our communities and the ecosystem on which we depend.

ST. MARK'S CAN DEMONSTRATE OUR LEADERSHIP BY:

- **lowering our campus greenhouse gas (GHG) emissions**
- **conserving resources**
- **inspiring our students to become leaders of environmental stewardship**

OUR CARBON FOOTPRINT

Our day-to-day campus activities depend mainly on energy supplied by fossil fuels – oil and natural gas for heating, and electricity to power and cool our buildings. **Our Climate Action Plan focuses on these GHG sources because we can manage, and therefore, influence our operations' energy use.**

NATURAL GAS	ELECTRICITY	OIL	REFRIGERANTS	GASOLINE FLEET	DIESEL FLEET	FERTILIZERS
50%	25%	19%	5%	2%	<1%	<1%

HOW WILL WE GET THERE?

We will achieve our target through a combination of energy efficiency projects, green building design, and (to a smaller extent) renewable energy. Our St. Mark's Sustainability team has carefully vetted the projects to ensure they are environmentally beneficial and based on sound business principles. Beyond reducing emissions, these actions will yield significant utility rebates and annual cost savings, benefiting our bottom line.

"Lions Live Green"

INTRODUCTION

The Moral Imperative to Act

As an educational institution, we are compelled to explore challenging environmental and social issues in the classroom, but we must also demonstrate our leadership through responsible action.

Building on a Foundation

In 2015, St. Mark's established a Sustainability Strategic Plan with the express goal of "weaving sustainability thinking, behaviors and action into existing campus operations, engagement, education and governance." Our campus community has made great strides in both our commitment to and action toward improving the sustainability of our collective ethos and our physical surroundings. The last six years of implementing the plan required partnership and engagement with a wide swath of campus constituencies.

TOGETHER, WE HAVE:

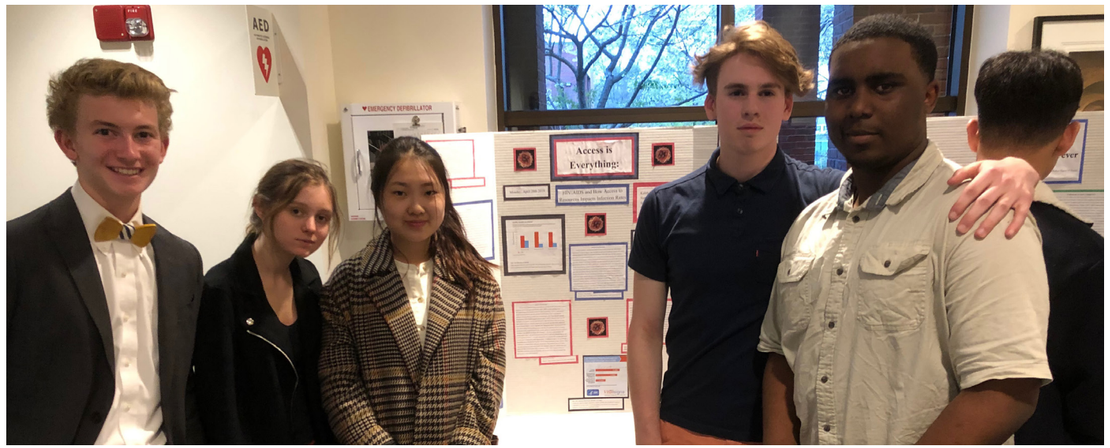
- **Reduced** our solid waste, food waste and water consumption.
- **Engaged** the Board of Trustees, school administrators, faculty, staff, and students in many initiatives from Weigh the Waste to Green Move Out.
- **Implemented** a Sustainable Purchasing Policy as well as a Green Revolving Fund to support sustainable capital investments long-term.
- **Partnered** with FLIK, our food service provider, to increase sustainable, local food options.
- **Installed** a 641-kW solar array on campus.
- **Encouraged** and empowered our student sustainability leaders in their grassroots efforts.

The Urgency of Now

Forging an acute awareness for the development of a sustainable campus has never been more important. Recent studies have shown that the Earth is warming faster than any other time in the last 2,000 years. The rate of Antarctic ice mass loss has tripled in the last decade,[1] and the acidity of surface ocean waters has increased by 30% since the Industrial Revolution.[2] These are only a few of the devastating and rapid changes occurring on our planet due to climate change. It is critical that we educate, motivate, and prepare the next generation of leaders to put sustainability at the forefront of their minds so that it makes its way into policies, personal habits, and the collective conscience.

As we turn our attention to the next phase of St. Mark's planning, we are more motivated than ever to make sustainability a guiding principle for our campus operations, our curricula, and community expectations. From a global standpoint, a lack of collective action depletes resources and weakens ecosystems, but it also impacts the most vulnerable populations. Across countries and cultures, there is a "vicious cycle, whereby initial inequality causes the disadvantaged groups to suffer disproportionately from the adverse effects of climate change, resulting in greater subsequent inequality."[3] Our community places a high priority on educating our students about both social justice and the sustainability movement. It is critical that we emphasize the climate justice connection and prioritize this work moving forward.

[1] "Climate Change: How Do We Know?" NASA Global Climate Change Website. January 25th, 2021.
[2] "What is Ocean Acidification?" PMEL Carbon, NOAA Website. Not dated.
[3] "Climate Change and Social Inequality" by S. Nazrul Islam and John Winkel, United Nations DESA. October 2017.



Climate Stewardship

This Climate Action Plan represents a critical next step in the evolution of our sustainability program. We are taking a strategic approach to manage our environmental impacts, promote operational excellence, mitigate risk, and prepare for the future.

Climate change is sometimes described as a "heat-trapping blanket," wrapping our planet in greenhouse gases (GHG). This build-up of GHGs causes global temperatures to rise and negatively affects the environment and human well-being. Climate change is explicitly linked to human activities, primarily through the burning of fossil fuels such as coal, oil, and natural gas for energy.

Through this plan's development, St. Mark's has taken an in-depth look at our energy use and other activities that contribute to climate change. We have proposed a goal and supporting management approach to reduce our carbon footprint. Our engagement included presentations and feedback cycles with the Sustainability Steering Committee, Students for Sustainability, and the senior administration. The success of this plan is contingent upon broad community support and participation.

EACH YEAR III FORM STUDENTS PARTICIPATE IN THE

GLOBAL SEMINAR

ON INFECTIOUS DISEASE.

THE LINK BETWEEN HEALTH, CLIMATE, AND SOCIOECONOMIC STATUS IS A PROMINENT THEME.

OUR CARBON FOOTPRINT

How Do Our Activities Affect the Climate?

To understand the School's contribution to climate change, we developed our first campus carbon footprint. Carbon accounting methods categorize emissions into "Scopes" based on the level of control that an organization has over the source:

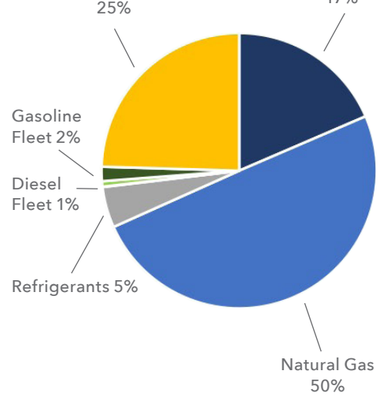
Scope 1 includes direct emissions such as fossil fuels burned on-site.
Scope 2 covers indirect emissions from purchased energy. This category includes the upstream emissions from power plants that supply our regional electric grid.
Scope 3 includes other indirect (optional) sources such as commuting, air travel, and off-site solid waste processing. Scope 3 sources are typically the most difficult to track and influence.

Due to the impacts of the COVID-19 on Fiscal Year 2020, this report considers Fiscal Year 2019 (FY 2019) to be a "typical" year.[4] St. Mark's greenhouse gas (GHG) inventory consists of Scope 1 and 2 sources under the School's operational control. The proportions of emissions by source for FY 2019 are shown in Figure 1.

As you can see, campus GHG emissions are caused primarily by burning fuels to heat campus buildings. St. Mark's uses natural gas and oil at the power plant to provide steam heating for most of the academic buildings. Individual buildings and faculty homes use boilers or furnaces. A smaller amount of scope 1 emissions occur from refrigerants used in air conditioning equipment, fuel used by campus vehicles, and fertilizers used in landscaping.

After fuel combustion, the next largest source of emissions is electricity. St. Mark's uses electricity for lighting, power, and cooling for our buildings. Our electricity is supplied by the New England power grid, which is 44% less carbon-intensive than the national average.[5] New England's grid is cleaner because it relies on natural gas and nuclear sources rather than dirtier fossil fuels such as coal. This trend is likely to continue as regional energy policies drive an aggressive transition to more renewable resources such as wind and solar in the coming years.

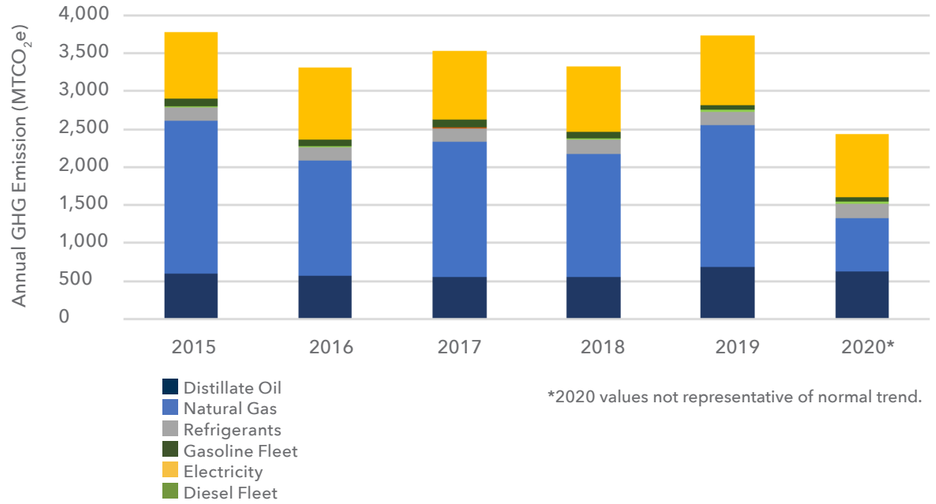
Figure 1. St. Mark's School
GHG Emissions By Source (FY 2019)



[4] While Fiscal Year 2020 is the most recent year in the GHG inventory, it showed a large reduction in GHG emissions caused by the COVID-19 campus shutdown.
[5] EPA Power Profiler Website. Not Dated.

The School's GHG emissions are not static. They are influenced by the dynamics of campus activities, growth, grid efficiency, and weather (which drives demand for heating and cooling). Data were gathered as far back as FY 2015 to create a multi-year trend. FY 2015 was also selected as the "base year" for the GHG inventory, and it will be used as a benchmark for goal-setting. Figure 2 presents our annual GHG emissions from FY 2015 to FY 2020:

Figure 2. St. Mark's School GHG Emissions (2015 to 2020)



*2020 values not representative of normal trend.

Understanding these trends helps to inform our energy efficiency efforts and GHG goals. Aside from the impact of COVID-19 on 2020 values, we see that overall, annual emissions have remained relatively stable over the last several years. The one exception is electricity emissions, which had a slight upward trend caused by rising electricity usage.

CARBON JARGON

Throughout this report, you will see **GHG** emissions measured in units of metric tons of CO_2 equivalent ($MTCO_2e$). This unit refers to metric tons of carbon dioxide equivalent.

While CO_2 is the largest by volume, there are several others greenhouse gases, each with its own global warming potential. $MTCO_2e$ allows us to report all GHGs in a single unit.

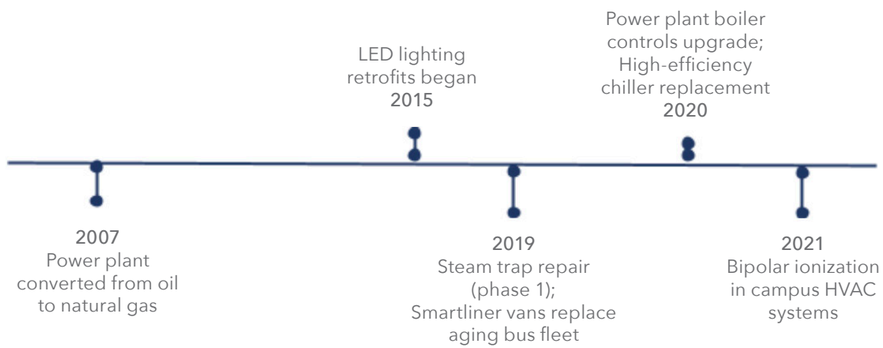
FIGHTING VAMPIRE POWER

As we become more dependent on electronics – everything from smart phones to laptops and audio/video equipment, our plug load goes up. Many devices draw power even when they are not in use. Simple steps such as using an advanced power strip can help reduce this "phantom load" in your room, home, or office.

Our Commitment to Efficiency

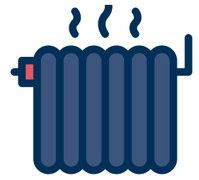
While this may be St. Mark's first climate action plan, it is not the first time we have considered our energy use impacts. St. Mark's has a long history of pursuing efficiency within our operations (see Figure 3 below). These capital investments have stabilized our GHG emissions and helped to reduce operating costs and improve facilities' performance for a better campus experience.

Figure 3. Timeline of Major Projects



Highlights of recent efforts illustrate the value gained from these initiatives:

Uncovering Hidden Energy Savings



The main academic campus is heated by steam. St. Mark's has more than 300 steam traps throughout its buildings that act as valves to separate the condensed water and release air. When steam traps fail, they waste a tremendous amount of thermal energy and often go undetected. St. Mark's began a steam trap replacement program in 2019. Once the two phases of work are complete, **THE PROJECT IS EXPECTED TO REDUCE GHG EMISSIONS BY MORE THAN 230 $MTCO_2E$ AND SAVE OVER $38,000 YEARLY.**

Partnering for Renewable Energy

In 2017, St. Mark's teamed up with SolarCity (now Tesla) to install a 641-kW solar array on West Campus. This system generates approximately 761,000 kWh of solar power per year, which is fed directly into the regional electric grid. While St. Mark's does not retain the GHG savings from this project, the School benefits financially by receiving net metering credits on its electric bill. The array also offers opportunities for students to study renewable energy here on campus.

Driving Down Fleet Emissions

In 2019, St. Mark's aging fleet of Volkswagen mini-buses was replaced with Mercedes Smartliners. The Smartliners were cost-neutral with other models on the market but offered the advantage of better fuel efficiency. These four new vehicles avoid approximately 18 $MTCO_2e$ of GHG emissions per year and save over $5,000 through reduced fuel consumption.

Healthy and Sustainable Airflow

When COVID-19 emerged as a global health crisis in 2020, the St. Mark's Facilities team sought the best solutions for making the campus safe for our community to return. Bipolar ionization technology was selected to improve air quality by neutralizing microbes and causing them to fall out of the air. Removing particles from the air also has the added benefit of keeping HVAC ducts and coils cleaner –thus improving energy efficiency.

Predicting the Future - A GHG Emissions Forecast

St. Mark's developed a projection of future GHG emissions to forecast how much our carbon footprint will change over the next few years. Three factors influence the near-term emissions forecast:

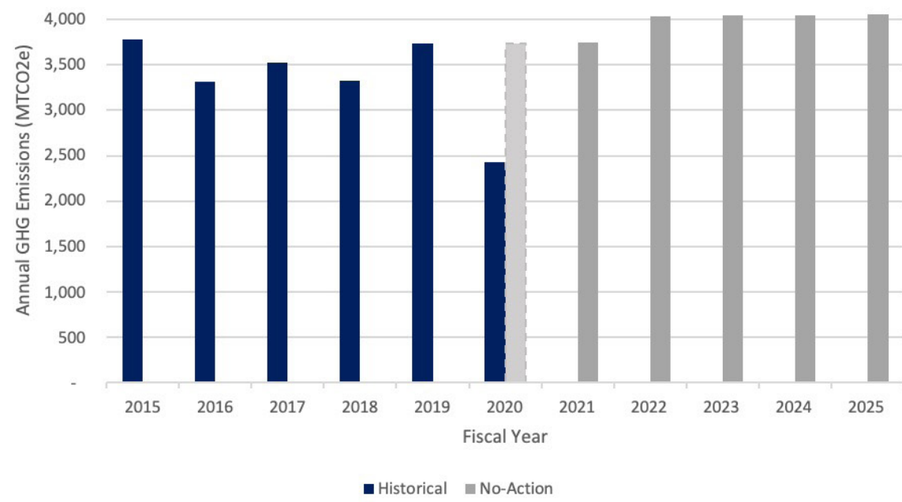
GROWTH: The campus master plan calls for constructing a new residence hall - increasing campus square feet by nearly 20%, adding energy consumption and thus GHG emissions.

ELECTRICITY DEMAND: Historical trends show an increase in electricity use leading to a small uptick in scope 2 emissions every year.

GRID EFFICIENCY: The regional electric grid is reducing its carbon intensity due to aggressive regional policies designed to add increasing amounts of renewable energy by 2050.[6]

A "No Action" forecast was developed based on the assumption that St. Mark's does not take any proactive measures to reduce GHG emissions. This worst-case scenario results in a projected increase of 274 $MTCO_2e$, or just over 7%, by 2025 (see Figure 4):

Figure 4. No-Action GHG Scenario



[6] " MA GHG Emissions & Mitigation Policies: Power Sector Emissions.

OUR GREENHOUSE GAS REDUCTION GOAL

GHG Reduction Opportunities

Climate action planning leads to discussions of difficult trade-offs, competing commitments, and the need for a collaborative response across disciplines. With this context in mind, we undertook a goal-setting process driven by data and informed by our culture of cooperation. We focused on setting a near-term GHG target using information gathered on energy efficiency and other sustainability projects undertaken in recent years or proposed but not yet implemented. The final list of near-term projects included:

- Building efficiency measures aimed at heating, ventilation, and air conditioning (HVAC):
  - Heating (steam trap repairs, Power Plant boiler and Cage heating controls)
  - Ventilation (variable frequency drives in air handler units)
  - Air conditioning efficiency (Library chiller replacement),
- LED lighting retrofits (starting with the Gardner Ice Rink)
- Electrical infrastructure (Main School Building transformer upgrade)
- Fleet efficiency (Smartliner Vans)

These projects demonstrate that sustainability projects can reduce our carbon footprint and provide compelling economic benefits (See the image to the right).

St. Mark's also recognized the opportunity to prioritize sustainability in the design of a large new residence hall slated for completion in FY 2022 (see story page 12). The emission reductions associated with the proposed design have also been factored into our near-term GHG target.

THE BENEFITS OF

CLIMATE ACTION

OUR GHG REDUCTION PROJECTS ADD UP TO MAJOR SAVINGS:

>514,000 KWH ELECTRICITY AND **51,000** THERMS NATURAL GAS SAVED PER YEAR

410 MTCO$_2$E GHGS AVOIDED PER YEAR

$190,000 IN UTILITY REBATES

$127,000 IN UTILITY SAVINGS PER YEAR

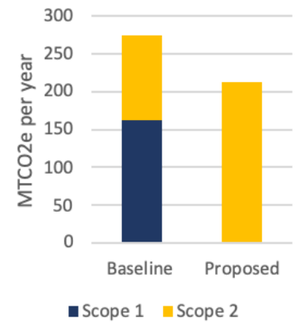
2.9 YEARS SIMPLE PAYBACK

Green Design for an All-Electric Future

The St. Mark's 2017 master plan called for additional housing. As a result, we are embarking on the construction of a 93,000 square foot student dormitory with faculty apartments. This project represents a sizable increase in building space, and thus presents a challenge for meeting St. Mark's aspirations to reduce our carbon footprint.

By adopting innovative green building strategies, St. Mark's is minimizing its impact over the life of the building. The new residence hall incorporates passive design to reduce the building's energy load by adding more insulation, windows with triple pane glazing, and LED lighting. The building will also eliminate on-site fossil fuel combustion by using all-electric systems for space heating and water heating. Lastly, solar PV panels are being installed which will further reduce scope 2 emissions. Overall, the proposed design is expected to produce 23% fewer GHG emissions than baseline (code compliant) construction. Because the building is all-electric, its annual GHG emissions will continue to decrease as the regional electric grid becomes cleaner over time.

Figure 5. Residence Hall GHG Comparison

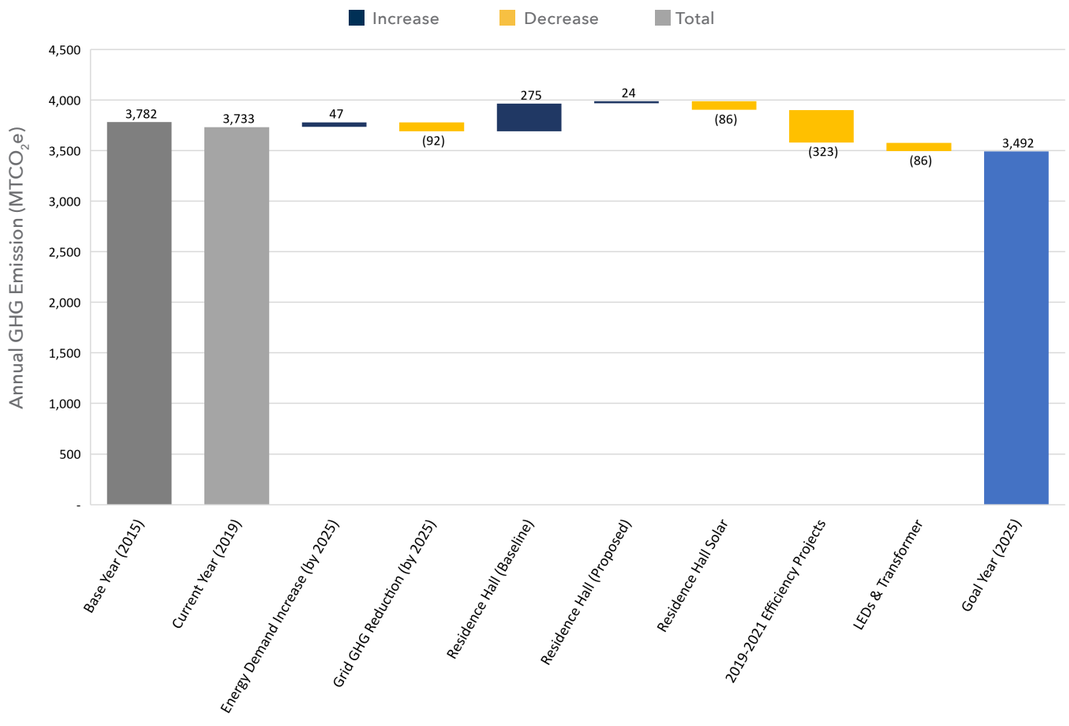


Our Greenhouse Gas Goal

Pulling it all together, the near-term GHG reduction pathway below (Figure 6) shows the factors affecting St. Mark's GHG emissions over the next five years:

- GHG increases due to rising campus electricity demand and growth from the residence hall (baseline case)
- GHG decreases attributed to the efficiency projects, solar PV on the new residence hall, and a slight reduction in the regional electrical grid's carbon intensity

Figure 6. Near-Term GHG Pathway



The pathway above shows that our GHG reduction efforts will lead to a net reduction of approximately 8% from the base year of FY 2015. This finding is notable, given the growth in square footage and associated energy demand from the new residence hall. Based on this analysis, St. Mark's has established a near-term GHG goal of 10% below 2015 levels by 2025. We feel this target is achievable with our current resources and reflects our ongoing commitment to energy efficiency. While a small percentage of GHG reductions are yet to be defined, we have a prioritized list of other efficiency projects which are undergoing review by the utilities and will be measured in the coming fiscal years.

Our Management Approach

Climate action calls for continuous improvement. Recognizing that St. Mark's has a small team dedicated to sustainability, we will be internally reviewing the climate action plan on a three-year cycle and providing campus-wide triennial updates. This cycle will allow St. Mark's to implement projects, capture lessons learned, take advantage of utility incentives and available technology, and adjust our goals as needed. Our approach will incorporate the following best practices:

- **Capital planning** will include the evaluation of environmental impacts and prioritization of sustainability benefits, where feasible. As capital projects are proposed for facilities renewal and upgrades, we will seek out options that are high efficiency, improve indoor environmental quality, reduce waste, or incorporate renewable resources.
- **Dedicated funding**, including a Green Revolving Fund will allow us to pursue projects that demonstrate measurable environmental benefits and favorable economics.
- **Our partnership with utilities** will maximize incentives for efficiency projects and conduct energy audits to identify additional measures with a good payback.
- We will **optimize operations** by ensuring our Facilities team has the training and resources needed to maintain our buildings and grounds and respond to campus needs.

The technologies and market dynamics for climate change solutions are rapidly changing. Projects which may be out of reach today can quickly become cost-competitive in the next few years. For this reason, St. Mark's will utilize its three-year review cycle to assess opportunities as they arise and establish new goals based on project economics. Such opportunities could include smart building technology, thermal electrification, other renewable energy systems, energy storage, and more.

How We Will Measure Success

We will track progress against our goal using a series of Key Performance Indicators (KPIs).

GHG Project Indicators

These indicators will be tracked for energy efficiency measures and other sustainability projects considered for their carbon reduction potential:

Table 1. GHG Project Indicators

INDICATOR	DEFINITION
Capital cost	Total first cost
Incentive eligibility	Utility rebates to offset first cost
Energy savings potential	Annual kWh of electricity, therms of natural gas, etc.
GHG reduction potential	Annual scope 1 and/or scope 2 reductions ($MTCO_2e$)
Cost savings potential	Utility cost savings and reduced maintenance costs
Simple payback	(Capital cost – incentives) divided by annual cost savings. Projects with a payback of 3 years or less are preferable.
Feasibility	Qualitatively ranked - Low, moderate, high; Based on ease of implementation, timing, and other considerations

Each year, St. Mark's will use these indicators to evaluate and prioritize projects for implementation based on funding availability. Where feasible, the School will consider bundling projects to improve the overall payback (for instance, coupling a boiler replacement with variable speed drives for HVAC fans).

Campus-Wide Performance Indicators

We will also monitor the campus-wide indicators below to track the major drivers of emissions (energy use and growth), ongoing costs associated with energy, and the results of GHG reduction projects:

Table 2. Campus-Wide KPIs

INDICATOR	DEFINITION
Energy consumption	Total Fiscal Year energy consumption by fuel type
Utility costs	Total Fiscal Year expenditures by fuel type
GHG emissions	Total Scope 1 and 2 emissions (calculated in SIMAP tool)
GHG intensity	GHG Emissions ($MTCO_2e$) / Square Foot; Accounts for growth in building area; can also be used to benchmark St. Mark's against peers and third-party campus averages

ENGAGING OUR COMMUNITY

While much of this plan centers on operational improvements that result in measurable GHG reduction, St. Mark's recognizes that a culture of sustainability is critical for catalyzing our students to be stewards of the environment and climate leaders as they advance beyond graduation. To foster this mindset, we seek opportunities to use the campus as a living laboratory for sustainability. Initiatives range from actively studying the campus's green features to stimulating dialogue about government policies and the role of business in adopting the triple bottom line (environmental, social, and economic prosperity).

Integrating Sustainability

Courses ranging from Biology to Studio Art to Spanish, have incorporated environmental content and awareness into the curriculum. Whether presenting about sustainable architecture or technology in a second language, learning about the impact of climate change and globalization on the spread of disease, or creating a painting to help educate the public about the value of protected marine areas, students are exposed to the interdisciplinary nature of sustainability throughout their academic experience at St. Mark's.

"Green Sea Turtle *Chelonia mydas*" by Catie Summers '21.

Beyond the Classroom

Our student body has demonstrated a keen interest in environmental and social causes. Student organizations such as Students for Sustainability (S4S), Haiti Partnership, and Global Ambassadors offer opportunities to act on these interests and connect with their peers. In April 2019, St. Mark's hosted the Independent Schools Sustainability Coalition Conference, which featured a keynote on sustainable fashion and led to lively conversations with students, faculty, and staff from peer institutions across the region. Later that year, our students held a walkout to show solidarity and raise awareness of the Global Climate Strike, joining thousands of peaceful protest events across the world. Students also led a campaign petitioning the Board to divest from fossil fuels.

2019 Global Climate Strike

2021 Wine to Water Filter Build

In 2019, S4S began offering a sustainability workshop for SMLeads, our student leadership program. Through this interactive training, our campus leaders are given a clear understanding of campus sustainability goals. In 2021, our students took part in the Wine to Water Filter Build, a virtual program where individuals learn about the global water crisis and how to construct a simple water filtration device. The filters were donated to families in need across the globe.

St. Mark's believes in the value of immersive travel experiences for our students as they grow to become engaged global citizens. As privileged global citizens, it is our responsibility to be mindful of our impact on the planet. We are aware that the negative consequences of climate change are most heavily felt in developing countries with the fewest resources available to adapt. Air travel is particularly harmful to the climate; therefore, **WE HAVE SET A GOAL TO OFFSET 100% OF THE GHG EMISSIONS FROM OUR INTERNATIONAL TRAVEL.**

Sustainable Leadership

We have also made strides in institutionalizing sustainability across our governance structure, such as adding expectations to faculty and staff job descriptions and empowering our Sustainability Steering Committee to advise on environmental priorities. We've gained visibility by establishing a three-year reporting cycle with the Board of Trustees and integrating sustainability mandates into each of the Board's subcommittees.

Moving Forward Together

As we look to the future, we anticipate deepening our engagements with key stakeholders. For our students, we are considering the development of an orientation training to introduce our sustainability values and offer resources for green living and learning. Another important topic will be to incorporate climate justice and regional outreach initiatives. There is also an opportunity to provide faculty home sustainability guidance and pursue MassSave energy audits (with the goal of auditing 10% of homes per year) to identify efficiency opportunities. Lastly, we will collaborate with the Advancement Office to explore alumni / donor interests, which can enhance both our global perspective and our local applications of sustainability.

ST. MARK'S ALUMNI BLAZE TRAILS FOR SUSTAINABILITY

HAILY TRAN '12 (upper right) has spent her time since St. Mark's studying and consulting on sustainable food systems and urbanism. She is currently getting her PhD at Oxford in International Development with a focus on agroecology, merging environment protection and sustainable livelihoods for small farmers in developing countries.

Pictured right (standing in a large air duct for a laboratory building), **MATT ROOT '95** is a senior healthy materials and energy/building performance leader at Integrated Eco Strategy LLC, where he facilitates sustainable and regenerative building design, renovation, and construction.

KATE DANIELSEN '12 (lower right) is currently studying circular business strategies and sustainable investments in the fashion industry. She previously worked to identify overlaps between public policy and private sector innovations, specifically in Asia and Latin America, that supported progress on global sustainable development goals.

CONCLUDING REMARKS

With our climate action plan, we are confident that St. Mark's has created a roadmap for reducing our campus carbon footprint by 2025 while reinforcing the business case for sustainability over the long term. Our shared experience of responding to a global pandemic underscored the need for resilient, systems-based thinking to ensure that society can thrive in an unpredictable world. The initial steps we are implementing now will allow St. Mark's to take bold action and confront climate disruptions in the coming years.

OUR STUDENTS WILL MAGNIFY OUR ACTIONS AS THEY CARRY THESE VALUES FORWARD AND BECOME GLOBAL LEADERS FOR A SUSTAINABLE FUTURE.

APPENDICES

This Climate Action Plan was developed by Riverstone Sustainability, working with a core team from St. Mark's. Information was gathered using a data request and through a series of check-in meetings over FY 2020 to FY 2021 (with a partial hiatus due to COVID-19). The following appendices describe the methodology and data used in the development of the CAP:

- Appendix 1. GHG Inventory
- Appendix 2. Near-Term GHG Project List

GHG Inventory

This appendix provides an overview of the GHG inventory process, results, and recommendations for future tracking of the campus carbon footprint.

The St. Mark's GHG inventory was developed in accordance with "The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, Revised Edition" and in consultation with "GHG Protocol Scope 2 Guidance." GHG emissions were calculated using the Sustainability Indicator Management and Analysis Platform (SIMAP), a web-based tool that is the most widely accepted application for tracking GHG emissions at academic institutions.

GHG emissions arising from all facilities under St. Mark's operational control were included in the inventory. Emission source data were consolidated on a fiscal year basis (July – June), and the inventory covers Fiscal Years 2015 to 2020. GHG emissions were calculated for scope 1 and 2 sources. Table A-1 summarizes St. Mark's emission sources, greenhouse gases, and quantification methods.

Table A-1. St. Mark's School–GHG Emission Sources

Emission Source	Description	GHGs Tracked	Quantification Method
Scope 1: Direct Emissions			
Stationary combustion: Natural gas, #2 oil, diesel	Power plant, boilers, water heaters, and emergency generators	CO_2, CH_4, N_2O	Fuel consumption records were consolidated and entered into SIMAP.
Direct transportation: Gasoline and diesel	Mobile combustion from vehicles and off-road equipment	CO_2, CH_4, N_2O	Fuel consumption records were consolidated and entered into SIMAP.
Fugitive refrigerant emissions	Chillers, air conditioning units, refrigerators	134A and 410A	Leakage estimated using equipment type, refrigerant type, and charge capacity, following EPA Fugitive Emissions Guidance.
Fugitive laboratory gases	CO_2 cylinders used in teaching laboratories	CO_2	Cylinder purchasing records were totaled for FY 2019 and used as an estimate for other years.
Agricultural	Fertilizers	N_2O	FY 2019 fertilizer usage was totaled by product name. Manufacturer data were used to estimate nitrogen content and organic versus synthetic classification. FY 2019 values were used as an estimate for other years.
Scope 2: Indirect Emissions			
Purchased electricity	Electricity imported from the grid and consumed on campus	CO_2, CH_4, N_2O	Location-based method: Electricity records were consolidated and entered into SIMAP (based on eGRID 2018 emission factors: NPCC New England)

Small Sources

Small emission sources (in aggregate comprising less than 5% of emissions by scope) are considered de minimis. To simplify the GHG accounting process, the GHG Protocol states that de minimis emissions may be excluded from the GHG inventory after an initial estimation. St. Mark's de minimis sources include back-up generator diesel, fertilizers, laboratory gases, diesel fleet and off-road equipment, and gasoline fleet (see Table A-2 below). For future inventories, St. Mark's can either track actual data or use the estimated value for these sources.

Table A-2. GHG Emissions-Small Sources (in red)

Source	FY 2019 GHG Emissions (MTCO2e)	Percentage of Scope 1 GHG Emissions
Distillate Oil	686.8	24.4%
Back-Up Generator Diesel	5.2	0.2%
Natural Gas	1,857.9	65.9%
Refrigerants	179.1	6.4%
Fertilizers	1.8	0.1%
Lab Gases	<0.0	0.0%
Diesel Fleet	15.3	0.5%
Diesel (Off-Road Equip.)	8.6	0.3%
Gasoline Fleet	63.0	2.2%
Total Scope 1 Sources	2,817.7	100%
Total Small Sources	15.7	0.6%

Base Year Selection

A "base year" refers to a benchmark against which St. Mark's can compare its current GHG emissions to ensure a meaningful and consistent evaluation of emissions over time. The base year will also be used to track progress against the School's GHG reduction target. FY 2015 has been selected as St. Mark's base year as this is the earliest year that reliable data are available.

Normalization

A useful method for analyzing trends is to normalize total GHG emissions against student population and square footage of buildings. A growth in population or new buildings can result in increased GHG emissions resulting from greater energy demand. St. Mark's GHG intensity for FY 2019 was 7.7 $MTCO_2e$ per 1,000 ft2 and 10.3 $MTCO_2e$ per FTE student.

GHG Inventory Summary

The St. Mark's GHG inventory provides a robust assessment of the campus carbon footprint. Historical GHG emissions are expected to be within a reasonable range of accuracy based on the emission source activity data provided. A summary of annual GHG emissions is provided in Table A-3 below:

Table A-3. GHG Emissions Summary Table -

Fiscal Year	Scope 1						Scope 2	Total ($MTCO_2e$)
	Distillate Oil* ($MTCO_2e$)	Natural Gas ($MTCO_2e$)	Refrigerants ($MTCO_2e$)	Fertilizers ($MTCO_2e$)	Diesel Fleet** ($MTCO_2e$)	Gasoline Fleet ($MTCO_2e$)	Electricity ($MTCO_2e$)	
2015	597	2,011	179	2	11	102	880	***3,782***
2016	566	1,517	179	2	11	82	952	***3,310***
2017	549	1,787	179	2	12	101	896	***3,526***
2018	556	1,622	179	2	12	97	861	***3,330***
2019	692	1,858	179	2	24	63	916	***3,733***
2020+	630	705	179	2	24	63	826	***2,428***

Recommendations

St. Mark's can use this inventory to evaluate GHG reduction opportunities against gross campus emissions and GHG intensity. This system can also be used to track performance against GHG targets on an annual basis. To promote continuous improvement, Riverstone recommends the following steps:

- Use the Information Request, the findings of this report, and SIMAP as the basis for an inventory management plan to ensure consistent measurement of GHG emissions over time.
- Confirm that refrigerant leakage amounts have not changed since FY 2019.
- Review de minimis sources every three years or so to ensure that no significant activity changes occurred to increase these emissions.
- Changes in the campus boundaries, activity data, calculation methods, and other improvements should be documented each year.
- Consider estimating scope 3 emission sources as curricular engagement projects and to identify if these optional emissions become more significant over time.

Appendix 2. Near-Term GHG Project List

Description	Economic Indicators				Energy & GHG Indicators*			
	Capital Cost	Incentives	Utility Cost Savings ($/yr)	Simple Payback	Electricity Savings (kWh/yr)	Natural Gas Savings (therms/yr)	Diesel Savings (gal/year)	GHG Reduction (MTCO2e/yr)
Smartliner Vans	$0	$0	$5,470	0.0	-	-	1,800	18.3
Steam Trap Repairs (round 1)	$83,682	$46,916	$29,700	1.2	-	34,060	-	180.8
Boiler Controls	$68,000	$14,648	$15,447	3.5	80,751	3,824	-	38.7
Library Chiller Replacement	$29,000	$9,537	$5,279	3.7	35,195	-	-	8.0
Cage Heating Controls	$15,500	No data	$2,900	5.3	562	3,229	-	17.3
Steam Trap Repairs (round 2)	$23,072	$11,536	$9,207	1.3	-	10,559	-	56.1
20HP AHU-1 VFD	No data	$2,600	$2,866	No data	19,109	-	-	4.3
Ice Rink Lighting	$21,000	$14,000	$13,688	0.5	91,256	-	-	20.7
Energy Source LED Lighting - Phase 1	$129,575	$35,533	$13,150	7.2	87,667	-	-	19.9
Energy Source LED Lighting - Phase 2	$150,575	$49,533	$25,154	4.0	167,695	-	-	38.1
Main School Bld. Transformer Upgrade	$34,851	$6,519	$4,889	5.8	32,594	-	-	7.4
Total	**$555,255**	**$190,821**	**$127,752**	**2.9**	**514,828**	**51,672**	**1,800**	**409.6**

**Utility rates: $0.15 per kWh, $0.87 per therm and $3.04 per gal diesel. GHG reductions are based the SIMAP 2020 emissions factor set and IPCC AR5 100-year global warming potentials, except for the electricity factor, which was adjusted slightly according to the MA forcast[7] for reduced grid carbon intensity by 2025.*

[7] MA GHG Emissions & Mitigation Policies: Power Sector Emissions.

KEY TERMS YOU NEED TO KNOW TO UNDERSTAND CLIMATE CHANGE

Bipolar Ionization: Technology uses a stream of charged particles (ions) to help to clean inside air ducts used for heating, cooling, and ventilation. The particles are then caught on filters, keeping air flowing freely through ducts with less maintenance.

Carbon accounting: Process of measuring greenhouse gas emissions in a standardized way, enabling consistent and transparent reporting, and allowing for fair comparisons between organizations.

Electric grid: An interconnected system of wires, transmission equipment, and power plants that provide and distribute electricity across a region.

Emissions scopes: A way to categorize GHG emissions. Scope 1 includes emissions that occur on-site, such as burning fossil fuels in the School's boilers or vehicles. Scope 2 includes emissions from purchased energy thus the emissions occur off-site. Scope 3 is a catch-all for other emissions that aren't directly controlled by the organization, such as commuting, air travel, or solid waste that is treated off-campus.

Energy Units

kWh: Kilowatt-hours, measures electricity usage
Therms: Unit of measurement for natural gas usage
Gallons: Unit of measurement for distillate oil and gasoline
$MTCO_2e$: Unit of metric tons of carbon dioxide equivalent. This value is calculated using conversion factors and allows for reporting of all greenhouse gases in a single unit.

Steam traps: Boilers at the central plant burn fossil fuels to heat water, creating steam, which is then piped throughout campus buildings, carrying heat energy to radiators that warm up the air. Steam traps remove any steam that condenses back into water (condensate) from the pipes so the water can be returned to the power plant for re-heating. A broken steam trap can cause energy to leak from the system.

Thermal Electrification: Heating and cooling buildings using electricity. All-electric buildings can become "fossil fuel-free" by being powered using renewable resources such as solar or wind.

WHAT YOU CAN DO TO HELP

The challenges of climate change can seem vast, complex, and far away. If you are wondering what you can do, you aren't alone!

Here are some simple actions that you can take:

MEASURE YOUR CARBON FOOTPRINT

- You can't manage what you don't measure. Try an online carbon calculator to figure out how your lifestyle contributes to climate change.

CONSERVE ENERGY

- Shut off the lights!
- Unplug equipment when not in use.
- Close the blinds!
- Turn down the heat, use a programmable thermostat, and lower your water heater temperature to 120 degrees.
- For more ideas, download the Department of Energy's Energy Saver Guide.

BUY GREEN

- Buy local whenever possible!
- Review St. Mark's Sustainable Purchasing Policy for purchases.
- Use the EWG guides on healthy, less toxic products.
- Seek out reusable goods with recycled content, and Green Seal certified cleaning products.
- Buying a new laptop or appliance? Look for EPEAT or EnergyStar-rated electronics.
- Use the fashion transparency index before buying clothes or try vintage!

TACKLE TRANSPORTATION

- Stay within the speed limit, using cruise control, and gently using the gas and brake pedals can increase fuel economy by 10-40%! Check out fueleconomy.gov for more tips.
- Check your tire pressure and service your vehicle regularly.
- Consider carpooling or the healthiest, fossil fuel-free alternative – biking!
- Cut back on air travel and consider carbon offsets for the rest. Do your homework and be sure the offsets are from a reputable source.

BE WASTE-WISE

- Don't be a wish-cycler. When in doubt, check the RecycleSmartMA website to see if an item can be tossed in the blue bin.
- Opt out of junk mail by using DMAChoice.
- Don't toss it, donate it! Search the Beyond the Bin Directory for options.
- Flatten those cardboard boxes and stack them next to your recycling bin.
- Set your printer to "double-sided" by default.

SAVING WATER TO SAVE ENERGY

- Conserving water also saves a tremendous amount of energy!
- Choose short showers (5 minutes or less) over baths.
- Turn off the tap while brushing your teeth! For more ideas, check out the EPA WaterSense website.
- Wait until you have a full load of laundry to wash and use the cold-water setting.
- A leaking toilet can waste up to 200 gallons per day! Report all leaks to Facilities using SchoolDude.

DINE SUSTAINABLY

- Incorporate more plant-based meals into your diet. Try "Meatless Monday" as a starting point.
- Download the Monterey Bay Aquarium Seafood Watch app to select the most environmentally sustainable seafood.
- Eat local. It reduces food miles and helps the regional economy.
- Incorporate leftovers in your next meal or freeze what can be saved for later.

ACT ON YOUR CLIMATE VALUES

- Learn the basics of climate science and start talking with your family and friends. Focus on climate hope and try these tips from ClimateRealityProject.
- Look for civic engagement opportunities like community planning, hosting a Climate Café and campaigning in support of climate policies.
- Vote! Seek out candidates and ballot questions that support the environment.

KEEP IN TOUCH!

- Follow @sustainablelionss4s on social media.
- Students can join Students for Sustainability Club (S4S).
- Faculty & Staff can contact Lindsey Lohwater to be added to the Sustainability Steering Committee mailing list.

Sustainability Statement

In valuing cooperation over self-interest and recognizing our role as global citizens, St. Mark's School actively fosters environmental stewardship and sustainable development in its education, planning and practices.

Mission Statement

St. Mark's School educates young people for lives of leadership and service. Founded in 1865 as an intentionally small residential community, the School challenges its students to develop their particular analytic and creative capabilities by both inspiring their academic and spiritual curiosity and kindling their passion for discovery. We value cooperation over self-interest, and we encourage each person to explore his or her place in the larger world beyond our campus.

Diversity Statement

St. Mark's School seeks to reflect the increasingly diverse world in which our students presently live and will live in the future. We intend to provide our students with a superior education in a community of students, parents, faculty, and staff that represents a variety of racial, ethnic, cultural, and religious backgrounds. We strive to ensure respect for all students regardless of gender, race, religion, sexual orientation, or economic background.

St. Mark's promotes awareness around cultural difference and provides affinity opportunities for students whose social or identity needs are not reflected in the dominant culture at St. Mark's through Community and Equity Affairs.

"Lions Live Green"

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INTENTIONALLY SMALL, **THINKING BIG.**