REPORT

PPS KELLOGG MIDDLE SCHOOL ECO-CHARRETTE

JANUARY 23, 2018

SUBMITTED TO

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Green Building Services is a consultancy within RWDI.
We help our clients access their buildings' full potential by pushing the bounds of building science.

1. INTRODUCTION

Green Building Services (GBS) facilitated an eco-charrette with the design team and Portland Public Schools on December 6, 2017 for the new Kellogg Middle School. An eco-charrette provides an opportunity for design professionals, contractors, building owners and users to strategize sustainable design goals and identify specific actions to achieve them. The workshop process fosters an environment in which members of the project team can contribute ideas, express concerns, and recommend actions for the project.

The sustainability workshop brought various members of the project team and PPS leadership together to establish the project's sustainable design goals. Next the participants worked to identify and explore specific green building opportunities and strategies in support of the overarching sustainability goals.

The outcomes of the sustainability workshop, summarized within this report, will guide future design decisions and serve to assist in the prioritization of green strategies to be utilized in the design, construction and operations phases of the project.

This sustainability workshop report is composed of three primary sections:

- Sustainable Vision and Goals
- Project Overview
- Green Building Strategies and Practices

PPS Kellogg Middle School Project Team at Eco-charrette held at PPS Boardroom

Project Team

Owner: Portland Public Schools Leadership: Project Management, Maintenance, Operations, Facilities, and Sustainability

Architect: Oh Planning + Design, architecture (Oh P+D)

Structural and Civil Engineering: KPFF

Mechanical, Electrical & Plumbing Engineering: Interface

Landscape Architect: Ecotone

Acoustic: Listen Engineers

Sustainability: RWDI/Green Building Services (GBS)

2. VISION

IMAGINE VISITING KELLOGG MIDDLE SCHOOL

15 YEARS FROM NOW,

WHY IS IT WILDLY SUCCESSFUL?

Eco-charrette participants were asked to write down their answer to the question above. The goal is to start engaging conversations with the end in mind so that we design with a goal. Responses were grouped into three primary themes - Learning Environment, Design Excellence and Community Impact – and have been summarized on the following slides.

LEARNING ENVIRONMENT

One is always at the center of the activity

Indoor and outdoor gathering and learning spaces

Teachers love it, students love it

Active, engaging, energizing, inspiring

Building as curriculum Interactive

Space that fosters **diverse** learning styles

A space people will remember for the rest of their lives

Timeless and modern

Easily maintained and still in great shape

Resiliency:
Resources, water, security, earthquake preparedness

Adaptable, ***Durable,*** Flexible

Welcomes bicyclists and pedestrians

Honest materials, well built

Energy neutral

Open, bright and beautifully daylight

DESIGN EXCELLENCE

COMMUNITY IMPACT

Woven into the neighborhood

Cornerstone and focal point for the community

High student achievement, families want their kids to go to school there

Meets criteria for **21st century learning**

Model of innovative middle school education

Source of **pride** for students, teachers and the community

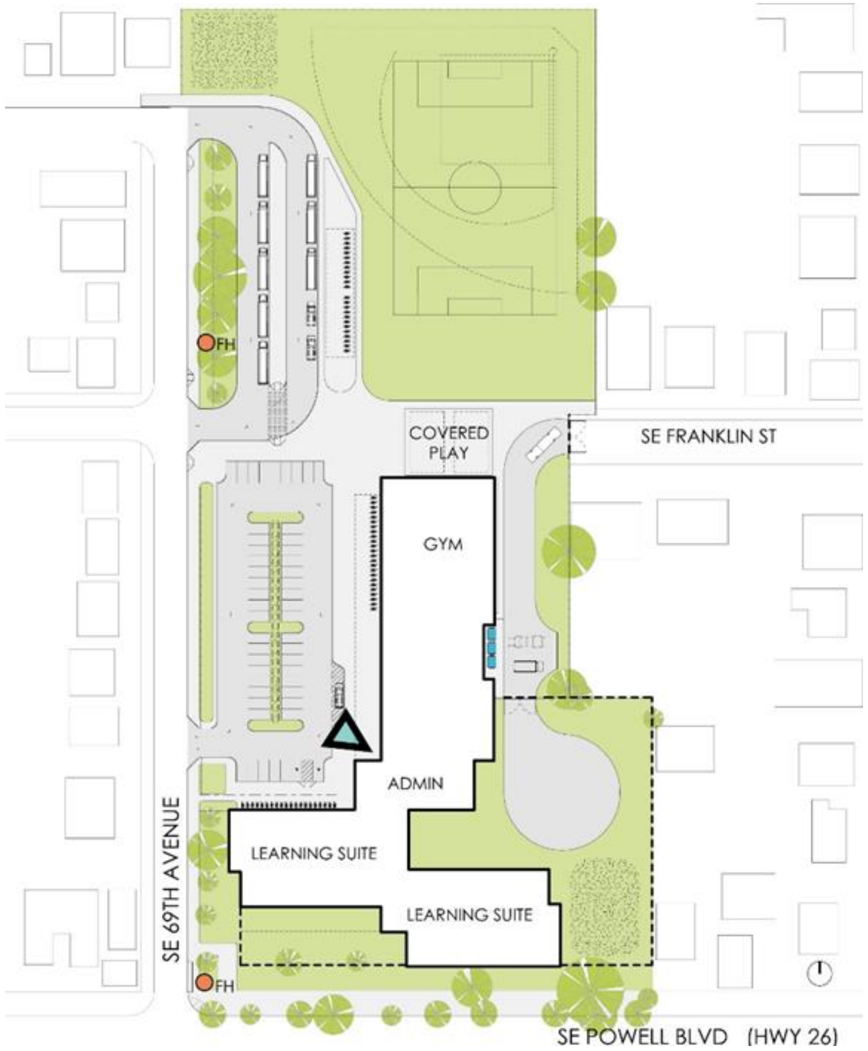
3. PROJECT OVERVIEW

Deb France, OhP+D, provided the group an overview of the current design direction for the new Kellogg Middle School. The existing Kellogg Middle School was built in 1917 but has been vacant for the last decade. After extensive feasibility studies and a voter approved bond measure it was determined and approved by the PPS Board that the existing school will be demolished and rebuilt from the ground up to accommodate the growing population in Portland Public School District boundaries.

Located on S.E. 69th and Powell Boulevard, Kellogg Middle School will act as a cornerstone for subsequent school building projects and renovations by head-starting innovative ideas and creating an overall building-as-education on experience. Programming for Kellogg Middle School takes into consideration Leadership in Energy and Environmental Design (LEED) and sustainable design strategies such as solar energy, stormwater capture, and natural daylighting, and analyzes them with the newest educational curriculum trends such as collaborative, active learning environments, cutting-edge STEM laboratories and exploratory programs, and multi-purpose interior and exterior spaces.

The overall goal of this new middle school building is to incorporate the programming and educational goals of PPS while meeting all current building codes to ensure the life, safety, and welfare of all students and faculty. The facility will also advocate for the local neighborhood and its residents, providing a framework that is student centered, culturally relevant, and intellectually, socially, and emotionally engaging. The building itself will contribute to the middle school curriculum, providing the most cutting-edge design solutions meant to support the Portland Public School system as it strives to lead in innovative course opportunities, modern technologies, and progressive community partnerships.

Excerpted from OhP+D Programming Report for KMS dated 11/03/17



KMS Proposed Site Plan

4. ENVIRONMENTAL IMPERATIVE

To ensure the team had a firm understanding of why sustainability is important and part of the District's mission, GBS presented on the environmental imperative. The PowerPoint presentation has been included as an appendix to this report but the basic message is we know the climate in Oregon is changing. Over the past 30 years, average temperatures in the Pacific Northwest have generally exceeded the 20th century average, and the region has seen an increase in temperature of about 1.3 °F. Regional temperature, snowpack, snowmelt timing and river flow changes have been observed that are consistent with projected trends[1].

Carbon emissions are the biggest factor in climate change therefore in order to mitigate increasing levels of climate change carbon emissions must be cut. About half of all carbon dioxide emissions between 1750 and 2010 occurred in the last 40 years. The energy, industry and transportation sectors have dominated these emissions increases[2]. In response to this, the City of Portland and Multnomah County have developed a Climate Action Plan. This Plan calls for an 80% reduction in carbon emissions levels by 2050. The Plan provides a road map for building climate resiliency in Multnomah County.

Buildings are the single largest contributor to carbon emissions in Multnomah County, accounting for nearly half of all sector-based emissions. The Plan calls for reducing carbon emissions from building energy through two strategies:

- Improving energy efficiency
- Reducing the carbon intensity of energy supplies, primarily by increasing renewable sources of electricity such as solar and wind power

REDUCE LOCAL CARBON EMISSIONS 80% BELOW 1990 LEVELS BY 2050

- City of Portland Climate Action Plan

1,2 - City of Portland and Multnomah County Climate Action Plan

GREEN BUILDING SERVICES

5. SUSTAINABILITY PRIORITIES AND GOALS

PPS Design Guidelines and Standards, Appendix P, Sustainability established the following as priorities for the design and construction of new schools:

- Facilitate educational mission
- Conserve existing facilities and resources
- Consider life-cycle costs including longevity and maintainability
- Use an integrated design approach
- Use passive systems and simple technologies
- Incorporate biophilic principles
- Incorporate opportunities for passive and active educational tools
- Provide a healthy indoor environment
- Avoid harmful chemicals, provide excellent ventilation, daylighting, create appropriate acoustics

The following are requirements for new schools:

- ✓ LEED v4 for Schools Gold Certification
- ✓ Achieve minimum of 10% additional energy savings above current Oregon energy code
- ✓ Commissioning
- ✓ 1.5% for Green Energy Technology

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6. NET ZERO ENERGY

Given the imperative to cut emissions, it is important to design with the end in mind and consider what would it take to have a net zero energy project. Generally speaking, net-zero buildings have the potential to create as much energy as they consume over the course of each year. GBS prepared a snapshot of what it would take to get to net zero to set the stage for exploring specific strategies in the breakout sessions which followed the morning's presentations.

Data was presented from the Commercial Buildings Energy Consumption Survey (CBECS) showing that the average school in the US will have an Energy Use Intensity (EUI) of 65. In Oregon, our climate is mild compared to other parts of the country meaning we require less heating and cooling. The average EUI for Portland Public Schools is 49.8, which is substantially lower than the national average given that we have less heating and cooling demands than other parts of the country.

Using the PV Watts software GBS estimated the maximum annual solar energy using solar photovoltaics (PV) that could be produced on the roof of the proposed design. To meet all of the building's energy needs with the PVs, the building can only have an EUI of 22.8. This was calculated by taking the annual PV energy production and dividing it by the building square footage as shown in the image to the right. This would achieve net zero by having the annual onsite energy production equal the annual consumption.

Achieving a 22.8 EUI is a challenging goal but it is not impossible. Many energy efficiency measures in combination with renewables would be required to meet this goal. These have been discussed within this report in the energy section as well as in the appendix slides, which includes a "Path to Net Zero".

Roof area - - - - - - - - - - - - - - - - - 57,400 sf
Coverage - 75%
Array size - - - - - - - - - - - - - - - - -43,050 sf

Array output - - - - - - - - - 2,295,344 kBTU
Building - - - - - - - - - - - - - - - - - 100,412 sf

2,295,344 kBTU / 100,412 ft^2
= 22.8 kBTU/ft^2/yr

22.8 kBTU /ft^2/yr*

7. RESILIENCY

One of the dominant themes of the day, was the concept of resiliency and how the design of KMS can be adaptive and usable in the event of a disaster. While not a comfortable topic, the reality is a large Cascadia subduction zone earthquake will strike the Pacific Northwest. While we cannot predict or avoid this earthquake, we can ensure that our infrastructure and buildings are designed such that the earthquake is a manageable disaster without lasting impact.

In 2013 the state of Oregon adopted Oregon Resiliency Plan (ORP) which outlines a 50-year strategy to address the threat posed by the Cascadia Subduction Zone. The central finding of the Oregon Resilience Plan is that “very large earthquakes will occur in Oregon’s future, and our state’s infrastructure will remain poorly prepared to meet the threat unless we take action now to start building the necessary resilience.” The Plan reviews policy options, summarizes relevant reports, and makes recommendations on policy direction to protect lives and keep commerce flowing during and after a Cascadia earthquake and tsunami.

One of the key recommendations of the report is to provide ready access to the best available Cascadia earthquake information for emergency responders and planners, architects and engineers, and the general public. It is the responsibility of the Kellogg Middle School team to design a school that will keep children safe during an earthquake. Further to that, the team is looking at ways to adopt the findings of the Oregon Resilience Plan (ORP) for schools. The ORP’s goals were to ensure that schools can be reopened thirty days after a Cascadia earthquake, and recommended that they be used for community shelters following the earthquake.

IF WE CANNOT CONTROL THE VOLATILE TIDES OF CHANGE, WE CAN LEARN TO BUILD BETTER BOATS.

- Andrew Zolli and Ann Marie Healy, Resilience: Why Things Bounce Back (2012)

Oregon's current seismic design standard for new buildings, the Oregon Structural Specialty Code (OSSC), classifies buildings according to four distinct occupancy categories based on their relative importance to life safety in the event of a natural disaster. Occupancy Categories III and IV are structures that have large assembly areas, such as schools. Category type III buildings are designed for a 25-percent higher seismic load than Category I and II buildings. Category IV buildings are designed for a 50-percent higher load.

However, we also understand that OSCC standards are changing. School gymnasiums and cafeterias with an occupancy of 250 or greater people will be defined "earthquake relief shelters" , which would place these structures as Risk Category IV. This increase in Risk Category is intended to provide a higher level of seismic performance, with a high likelihood that these portions of the building will be safe to occupy immediately after an earthquake.

In anticipation of this change, the gymnasium/arts wing will be designed as a Risk Category IV building. The change from Risk Category III to Risk Category IV requires using higher seismic design forces and may have special detailing requirements. The learning suites wing would only be required to meet the Risk Category III requirements but the team is evaluating the cost to design to Category IV. Risk Category III buildings are designed to a higher seismic performance level than typical commercial (Risk Category II) buildings, which are designed for life safety only; however, Risk Category III buildings are not expected to provide immediate occupancy after an earthquake.

In addition to seismic considerations, the design team is also exploring how to reduce the amount of time needed to repair a building and restore most of its functionality, so as to meet the recommended targets in the ORP. Given its potential use as an emergency shelter for students and the community, the gym should be designed such that it could be occupied within 72 hours. The learning suites would be considered as would have recovery of 30 days. For this to occur, the school buildings need to be "safe and usable" immediately after the event and served by the infrastructure systems they depend on (including transportation, energy, water, wastewater, communication, and information systems). Current code does not adequately address this, therefore the team explored opportunities throughout the day to meet this tremendously important goal.

CRITICAL BUILDINGS	**Goal for Level of Service**	**Current Level of Service**
Primary K-8	30 days	18 months
High School 30 days	30 days	18 months
Emergency Shelters	72 hours	18 months

Level of Service Goals and Current Performance Expectations for Critical Buildings and Infrastructure that Supports Critical Buildings for Willamette Valley (Oregon Seismic Safety Policy Advisory Commission, 2013)

8. BEAVERTON SCHOOL DISTRICT – RESILIENCY CASE STUDY

“RESILIENCE PLAN FOR HIGH SCHOOL AT SOUTH COOPER MOUNTAIN AND MIDDLE SCHOOL AT TIMBERLAND”

This report summarizes resilience planning activities completed in 2015 that were conducted in support of the design of the new High School at South Cooper Mountain and the new Middle School located at the Timberland Development. The key resilience features that are recommended for both schools to support that population and allow the schools to re-open quickly include the following. These recommendations represent an affordable balance between permanent and temporary (brought in after the earthquake) solutions:

- Design structural systems of the schools as essential facilities (Risk Category IV) resulting in improved seismic performance over typical Risk Category III school design (which is intended to achieve life-safety performance, and will likely require lengthy and costly repair prior to re-occupation);
- Design seismic bracing or anchorage for nonstructural components per Risk Category III requirements, provided that those components needed for use of the school as an emergency shelter satisfy Risk Category IV seismic design requirements; xii July 10, 2015 150710_Beaverton School Report
- Confirm equipment that is expected to be operational after an earthquake (emergency generator, automatic transfer switch, ventilation fans, etc.) satisfy the special certification requirements of ASCE 7-10 Section 13.2.2 (i.e., seismic rated);
- Increase the size and fuel capacity of the emergency generator to the level needed to support shelter operations including additional outlets in the kitchen;
- Provide building connection points to hook up an external water supply tank, in lieu of adding bulk water storage on site;
- Provide water piping from the school building to the utility piping that is better able to resist earthquake ground displacement to allow water to be supplied to the school more reliably after water utility system resilience improvements are completed;
- Provide wastewater piping from the school building to the utility piping that is better able to resist earthquake ground displacement to allow wastewater to be discharged into the wastewater utility system and minimize the need for holding tanks; and
- Plan for the use of open areas on the grounds to support community relief efforts.

Very preliminary estimates in the pre-design phase assumed these additions would cost in the range of $900,000 for the high school and $750,000 for the middle school. However if these strategies are to be implemented at Kellogg these must be examined in the early design stage.

https://www.beaverton.k12.or.us/depts/facilities/Documents/150710_Beaverton%20School%20Report.pdf

9. BUILDING AS CURRICULUM

One of PPS' and the team's objectives is to consider every interior and exterior space as a potential place for learning and discovery. The team generated ideas throughout the day to let the building serve as curriculum. One way to do this is by exposing systems such as mechanical systems, pipes, and wall assemblies rather than covering with walls as is traditionally done. Rather than covering the bones of the building let these be exposed so that the teachers are able to build it into their curriculum and display how the sustainable design features function in the building.

Numerous opportunities on the site would allow further learning outside rather than always being in a classroom. The images shown here are from Floyd E. Kellam High School in Virginia Beach, which was designed very explicitly to provide opportunities for students to interact with their environment. One example is that students learn and work in the school's expansive courtyard, which was designed (with the help of previous students) to capture and reuse rainwater.

Teachers there have found that the emphasis on sustainability provides an opportunity to make connections across different content areas, helping students dig deep with real-world examples and project-based assignments.

While the Kellogg School site is a bit size constrained there are still opportunities for outdoor learning. Two courtyards are planned where lessons involving storm water, native plants or other ecological issues. On the interior there are opportunities to create interactive displays showing for example solar energy production, water usage patterns. Other thoughts include exposing elements of the construction so they can be understood, such as a wall assembly.

Virginia Beach Public Schools – Floyd E. Kellam High School in Virginia Beach
http://plus.usgbc.org/building-curriculum/

10. BREAKOUT SESSIONS

After exploring a sustainable vision and learning about the current design direction, charrette participants(29 in total) broke into 4 small working groups to take a deeper dive into possible strategies to meet energy, site, water and indoor environmental goals. Each group spent thirty minutes on each of the three topic areas – Energy, Site and Water and Indoor Environment/Occupant Experience. In between each of the topics, the groups rearranged themselves so that by the end of the workshop all participants had the opportunity to work with all of the various design, construction and operation team members.

Following the breakout sessions, the full team regrouped to share what had been discussed and to find common themes across the various groups. Finally as a group the team began to prioritize strategies that should receive additional consideration and potentially may become part of the final design. This process will be ongoing and iterative, with the team considering through the design process whether the decisions support sustainability goals of the project.

11. BREAKOUT SESSIONS - ENERGY

Breakout groups were provided with the following questions to help them start thinking about what strategies might be beneficial for this project:

- What strategies might support a net zero energy goal?
- How will the building respond in the event of a natural disaster?
- How will this project address resiliency and emergency preparedness?
- How will this project prepare for long-term adaptability?

Teams reported back with the following measures or strategies for consideration.

Passive strategies - these measures focus on building orientation and massing to take advantage of the climate and reduce energy needs for heating, cooling and daylighting.

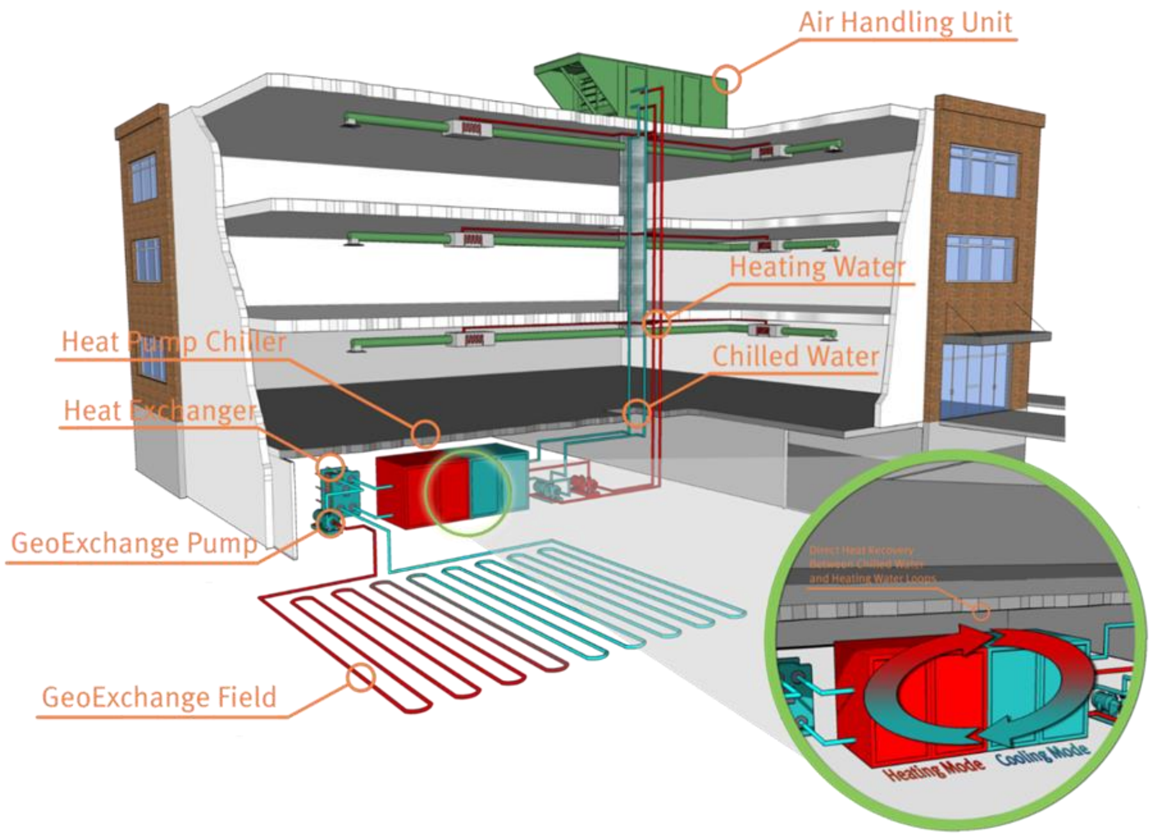
- Efficient building envelope and enclosure
- Ample daylighting with glare control devices; particularly with south facing glazing
- Light monitories and/or clerestories in gym
- Combine seismic with thermal storage – shear wall acting as thermal mass or tilt-up walls with built in radiant cooling and heating.
- Natural ventilation only in parts of the buildings; possibly gym and corridors
- Solar wall along south facing gym – this system using the sun to pre-heat air with the collector and then the solar heated air is then distributed throughout the building via the conventional ventilation system or dedicated fans and ducting.

Solar Wall – image courtesy of http://www.taitem.com/news/lou-cherry-road-solar-wall-1/

11. BREAKOUT SESSIONS - ENERGY

Optimized strategies – the next tier of measures after taking advantage of all passive opportunities is to consider using the most efficient, least energy intensive systems.

- Radiant Systems (usually in floor, can be in ceiling) – low-energy and comfortable.
- Displacement ventilation – supplying cool air at bottom of room, and works its way upward as it warms and becomes more buoyant.
- Geo-exchange – system that takes advantage of the moderate temperatures in the ground to boost efficiency and reduce the operational costs of heating and cooling systems.
- Variable Air Volume (VAV) - a type HVAC system that varies the airflow at a constant temperature. The advantages of VAV systems over constant-volume systems include more precise temperature control, lower energy consumption by system fans, less fan noise, and additional passive dehumidification.
- Gym – consider as a standalone building; does not have the same requirements as learning suites and should be able to serve as emergency shelter. Possibly design with no active cooling.



Geo-exchange system with Variable Air Volume

11. BREAKOUT SESSIONS - ENERGY

Renewable Strategies – after implementing all possible strategies to minimize energy use, renewable technologies can be employed at the building to generate energy.

- Solar Photovoltaic array on roof – converts sunlight into energy that can be fed to the building. Having storage with a battery would be helpful in the event of power loss from grid. Required to spend 1.5% of budget on renewable energy.

Other Considerations

Reduce Heat Island Effect – dark colors, like the asphalt on the site, absorb the sun's warmth and radiate heat. Not only does this make uncomfortable outdoor environments but it can increase the building's cooling load. Consider use of light colored paving or pervious paving rather than asphalt.

Resiliency – the gym is intended to serve as an emergency shelter in the event of an emergency such as a natural disaster. Consider opportunities to passively heat and cool this space as long as possible without energy as would likely be the case in an emergency. Consider storage of water and possible renewable energy systems that could help sustain the community throughout an emergency.

Solar Photovoltaic

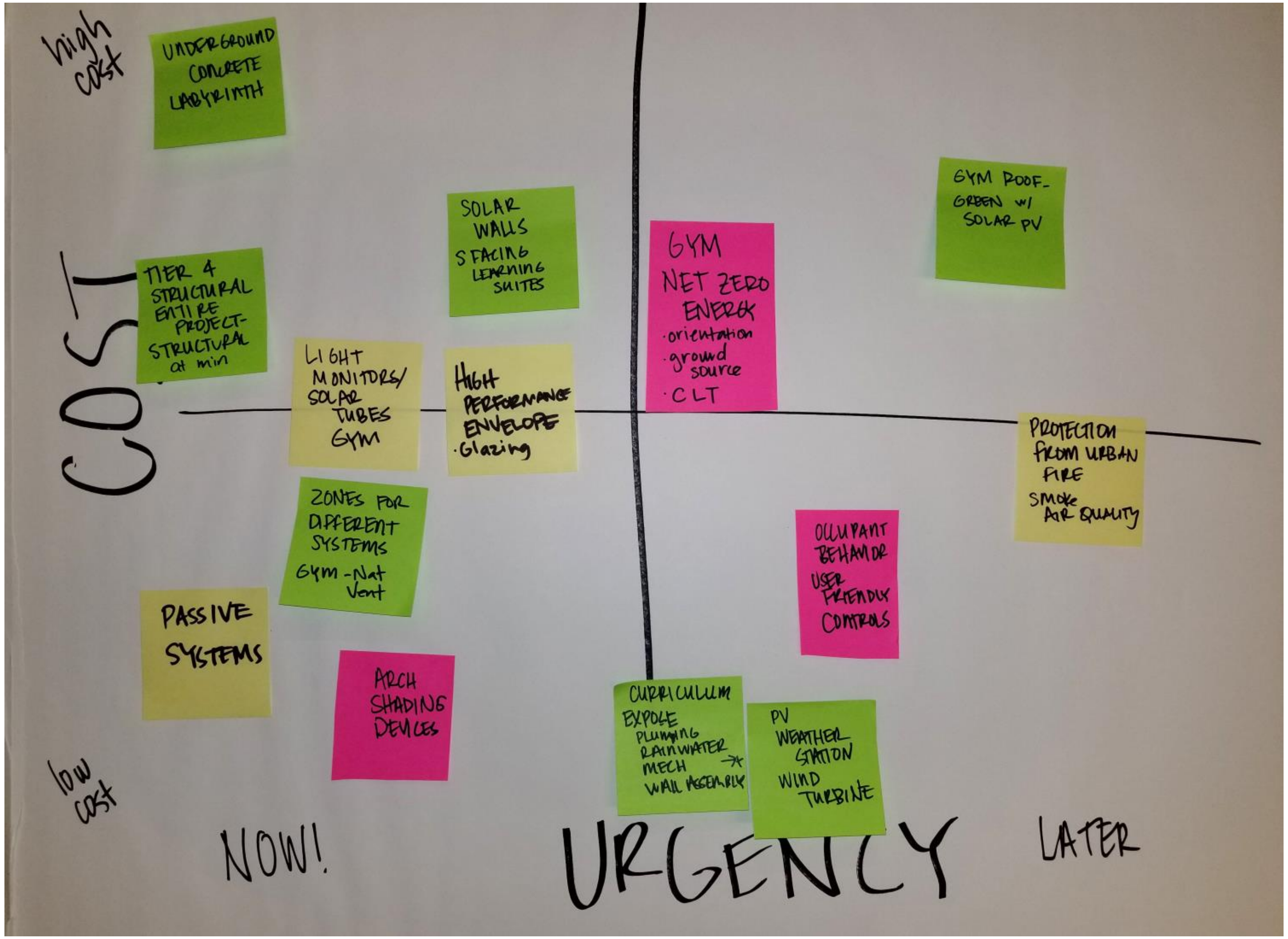
Light colored pervious paving

ENERGY -
COST URGENCY MATRIX

To help prioritize the multitude of strategies from the brainstorming sessions, the group completed a cost/urgency matrix. On the Y axis, the strategy is weighed as to the cost to implement from low to high. Along the x axis is urgency – whether it is something that needs to decided during schematic design or if the item can wait until a later design stage. This approach acknowledges that all projects are constrained by a schedule and budget. In order to move toward buildings that are low-impact and sustainable, we need to begin with the end in mind, determine what we can do today, what we can prepare the facility for what we can integrate in the future.

Some of the high urgency/low Cost items included:

- Passive systems
- Architectural shading devices
- Daylight Monitors in the gym
- Zones for different HVAC systems (Gym, Commons, Classrooms)



12. BREAKOUT SESSIONS - SITE AND WATER

Breakout groups were provided with the following questions to help them start thinking about what strategies might be beneficial for this project:

- How will this project protect or restore habitat, soil health, and healthy vegetation?
- How will this project manage pollution in stormwater and groundwater?
- How will it minimize potable water use to protect freshwater availability?
- How will it handle rainwater?
- How will it welcome students on foot or bicycle?
- How will it weave into the neighborhood?

Teams reported back with the following measures or strategies for consideration.

- **Tree Preservation–** each group noted that the site includes numerous established trees that are important to the larger community. There is a large maple that cannot likely be preserved – in this case, consider opportunities for reuse such as benches. Preserve a ring and display as dendrochronology to provide students an opportunity to learn the scientific method of dating trees by their rings.

Kellogg Middle School - Photo by Sean Sperry. Willamette Week

Counting rings to determine age of tree

12. BREAKOUT SESSIONS - SITE AND WATER

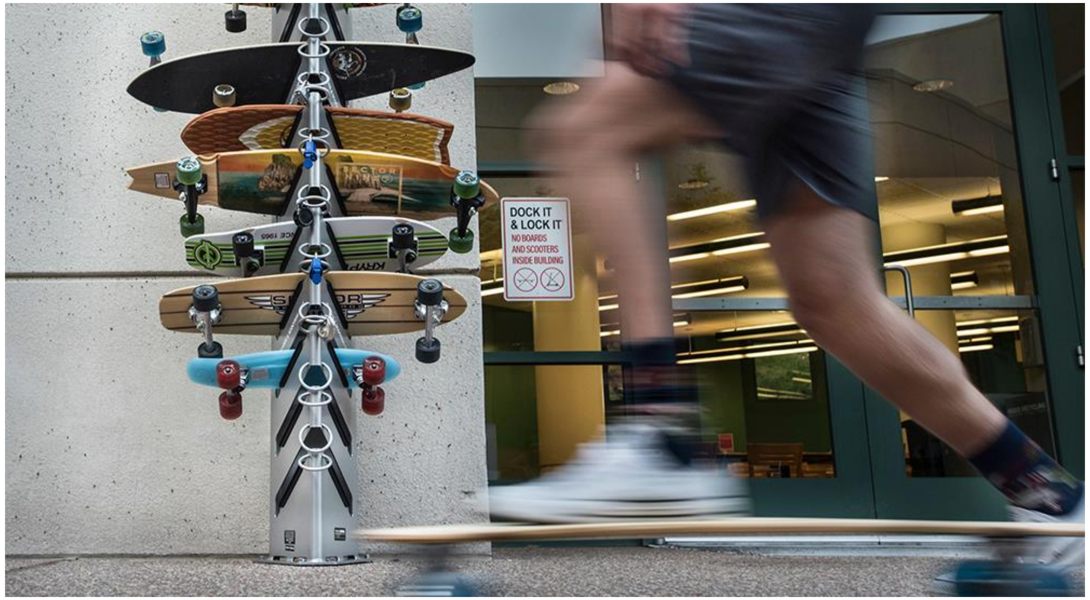
- **Safe Routes to School** – create an environment that makes walking, biking and rolling around our neighborhoods and schools fun, easy, safe and healthy for students and families while reducing congestion around schools. Provide ample bike parking distributed throughout the site to support the differing uses throughout the day and year – not only student parking for school days. Consider covering the bicycle racks given the amount of rain in Oregon. Provide good linkages to existing walking, skating and biking routes.

- **Paving and Pathways** - Design curved pathways that provide the most direct route; no right angles. Consider porous paving for parking areas to mitigate heat island, (research issues with snowplows and durability of this paving).

- **Site access –** demarcate public space from areas that are intended primarily for student use. There are some concerns about homeless population using areas along SE Powell although once the school is open again this will be less of an issue.

- Soften areas along **Powell** - work with city to help promote safe bike and pedestrian access. Consider traffic calming ideas beyond ODOT stoplights and crosswalks.

- **Heat Island Effect** – mitigate heat gain from parking on west façade with deciduous planting and covered walkways that shade the windows of the school. Green walls would be another strategy to consider.



Skateboard and bike parking – images courtesy of https://www.groundcontrolsystems.com

12. BREAKOUT SESSIONS - SITE AND WATER

- **Biowsales** – treat rainwater throughout the site with multiple swales to allow water to infiltrate and provide learning opportunities. Multiple swales throughout the site is the best approach to provide diversity.

- **Rainwater** - celebrate, educate, and reuse rainwater. Consider the opportunity to show the entire water cycle flow from roof, to greenroof to rainwater downspouts and access to that (external vs. internal – locate in a shaft – use with stair tower), educate.

- **Play Fields** – current PPS direction is for artificial turf. This has environmental benefits in terms of not requiring irrigation or mowing but it does limit the ability to infiltrate rainwater on site. Another concern is that PPS policy requires the turf to be hosed down due to the heat collection. It is also a loss of habitat that could support plants and beneficial insects. One potential option is to collect and store rainwater under turf field and then allow it to evaporate up through field, cooling it.

- **Acoustic** considerations for neighborhood – coordinate with acoustics engineer on ideal placement for garbage dumpsters to mitigate the noise of the trucks coming to service the site. This may actually be closer to the neighbors but designed correctly will reduce the sound transmission.

- **Gardens** – consider whether height increases and rezoning on Powell might affect the solar access to gardens as currently shown on the site plan. It could be advantageous to move the gardens towards the area that is currently shown as a covered play area.

- **Plantings** – consider vegetable and food gardens for learning opportunities as well as other areas of planting that introduce new species which are compatible and enhance the habitat.

- Provide **adequate sloping** and drainage to keep play areas less wet and muddy.

Virginia Beach Public Schools – Floyd E. Kellam High School in Virginia Beach
Rainwater from hardscape directed to planted and decorative swales for infiltration on site
http://plus.usgbc.org/building-curriculum/

13. BREAKOUT SESSIONS - INDOOR ENVIRONMENT

Breakout groups were provided with the following questions to help them start thinking about what strategies might be beneficial for this project:

- How will this project promote students' comfort, well-being, and productivity?
- How will this project establish quality indoor air, thermal comfort, lighting and effective acoustic design?
- How will this project connect students with the natural outdoor environment, reinforce circadian rhythms, and introduce daylight into the space?
- How will this project impact the functional aspects of the community such as growth, development, job creation, and general improvement of quality of life?
- How can the building provide a curriculum for students?

Teams reported back with the following measures or strategies for consideration.

- **Daylighting** – all groups were highly focused on the desire to provide natural light into learning areas. This needs to be balanced with the maintenance concerns over keeping glazing clean from fingerprints. Thoughtful use of windows to bring light into spaces. Glazing higher up which cannot be as easily reached by students is one possible solution. Adequate glare control must also be in place to ensure the daylight can be controlled. Exterior shades and deciduous trees were both mentioned as possible solutions.

Top: Machias Elementary School in Snohomish, Washington
Bottom: Samuel Brighthouse Elementary School Richmond, VA

13. BREAKOUT SESSIONS - INDOOR ENVIRONMENT

- **Acoustic Considerations** – Noise, whether it is from the traffic on SE Powell or the classroom activity next door, can be a huge distraction for students. Ensure the design provides sound absorptive materials like carpets and acoustic ceiling tiles and clouds.

- **Air Quality** – it is important that students have a healthy interior space that is adequately ventilated with outside air. It is equally important that the outside air being provided has been filtered of outside contaminants. Air testing will be conducted to determine the local air quality. If needed, consider upgrading beyond code to higher filtration media.

- **Material Selection** - Bring the outdoor environment indoors by using materials that are local to the region. This also aids in the building as curriculum discussions being able to point to local industries such as sustainably harvested local wood.

- **Flexible** – provide a classroom design that can allows multiple configurations and suit differing learning styles.

Top: West Middle School, Rochester NY
Bottom: Strongsville Middle School, Ohio

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15. CONCLUSIONS AND NEXT STEPS

At the end of the day, prior to closing up with next steps, we asked participants for their big takeaways from the day. It was extremely inspiring and the feedback indicated PPS was grateful to have been included in these early design discussions and likewise the design team was excited to have direct input from the users.

The primary takeaways from the break out sessions focused on the following:

- Focus first on passive design strategies including a high-performance envelope, use of thermal mass to heat and cool and natural ventilation opportunities
- Learning suites and gymnasium have differing requirements and should be looked at individually to maximize opportunities for resiliency and energy performance.
- Net zero goal for the gymnasium focusing heavily on passive strategies; supports dual goals of energy efficiency and the ability for the space to remain comfortable longer in the event of a disaster where there is a sustained loss of power
- Site design that supports walking and bicycling through traffic calming techniques, plantings and pathways
- Thoughtful acoustic design, air quality measures and good daylighting design should be incorporated for a healthy learning environment
- Utilize opportunities to showcase building features as an educational tool – expose mechanical systems, wall sections or rainwater traveling from roofs to planted areas

The sustainability workshop is one in a series of project meetings that will shape the creation of the Kellogg Middle School into a leading example of sustainable and resilient design for PPS. This workshop helps to foster the interaction of members of the project team and launch the exploration and implementation of integrated design strategies. However, it is most essential in the post-charrette work for all project team members to work together to incorporate the concepts developed in the charrette process.

Next Steps

- Oh Design to have air quality tested at site so baseline conditions are understood
- GBS to research permeable paving performance – durability, plowing
- GBS to research green walls and green roof performance
- Interface to issue early design modeling results at end of SD
- GBS to schedule ETO meeting with Mechanical, Oh, and GBS
- Engage PGE Partnership for Schools
- GBS to research whether there is any available funding for resiliency
- Oh to get clarity from PPS about their expectations for a resilient design as it relates to structural, energy and water considerations
- GBS to draft a LEED NCv4 Schools scorecard and approach for inclusion in the SD documents

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APPENDIX

1. Attendee List

2. PowerPoint Presentation from Charrette

Charrette participants working in small groups

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PORTLAND PUBLIC SCHOOLS Kellogg Middle School
Integrative Design Workshop
December 6, 2017

GREEN BUILDING SERVICES T: +1.503.467.4710

ATTENDEE LIST

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Aaron Presberg – Portland Public Schools

Rolando Aquilizan – Portland Public Schools

Frank Leavitt – Portland Public Schools

Tim Ayersman – OH P+D

Bryan Thompson – OH P+D

Christine Nelson – OH P+D

Samantha Aleo – OH P+D

Juan Carlos Garduno – OH P+D

Colin McNamara – OH P+D

Sheena Hewett – OH P+D

Deb France – OH P+D

Michael Thrailkill – Thrailkill

Kat Leavitt – Thrailkill

Daniel Edwards – Ecotone

Rick Silenzi – Interface Engineering

Jeffrey Glanville – Interface Engineering

Natalie Sherwood – Interface Engineering

John McMichael – Interface Engineering

Jennifer Eggers – KPFF

Mark Wharry – KPFF

Nic Cota – KPFF

Andi Camp – KPFF

Tobin Cooley - Listen Acoustics

Facilitated By:

Richard Manning – Green Building Services

Beth Shuck – Green Building Services

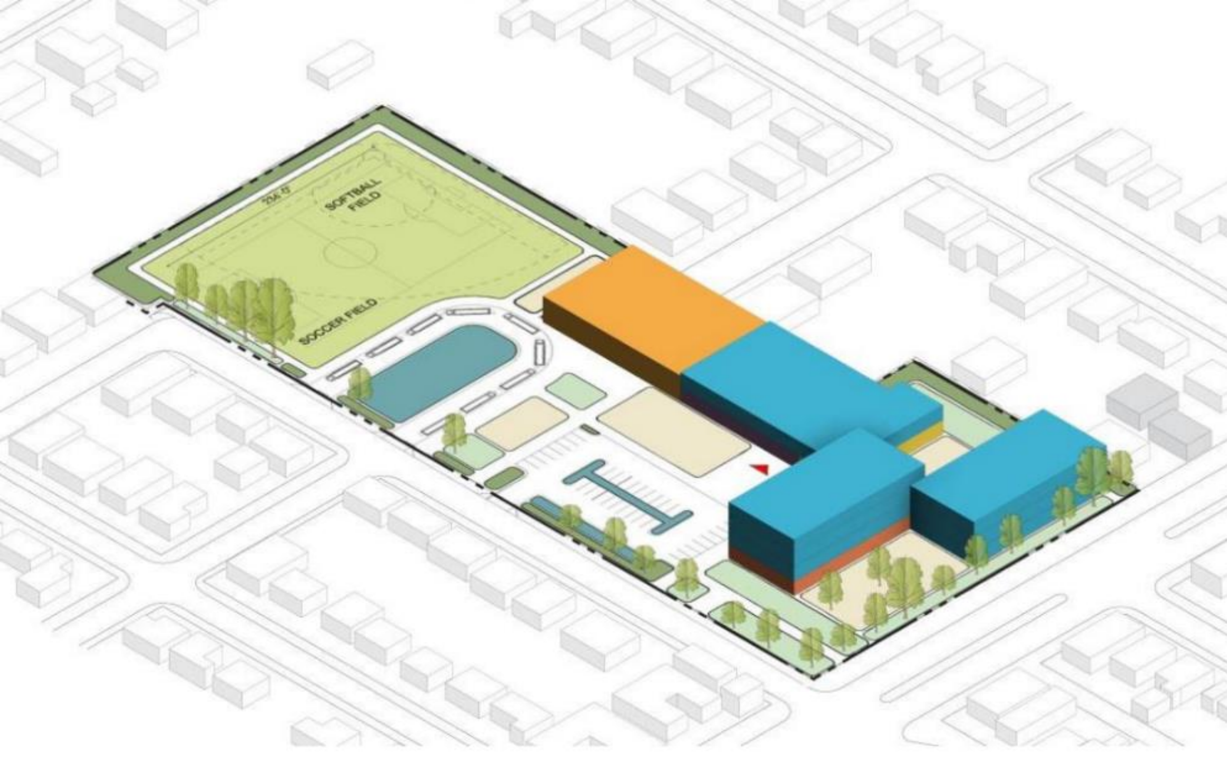
Erin Lauer – Green Building Services

GREEN BUILDING SERVICES

Portland Public School District
Kellogg School Replacement Project

December 6, 2017

Agenda



- **Introductions**
- **Visioning Exercise**
- **Project Overview**
- **Available Data**
- **Breakout Sessions**
- **Prioritizing Strategies – Urgency/Cost**
- **Big Takeaways**
- **Next Steps**

Introductions:

- Name
- Role on the project
- School Mascot

Activity

Imagine visiting Kellogg Middle School 15 – 20 years from now, why is it wildly successful?

PROJECT OVERVIEW


1923
GREGORY HEIGHTS SCHOOL
PPS
TUBMAN MIDDLE SCHOOL

Sustainability **Priorities**

- Facilitate educational mission
- Conserve existing facilities and resources
- Consider life-cycle costs including longevity and maintainability
- Use and integrated design approach
- Use passive systems and simple technologies

Sustainability **Priorities**

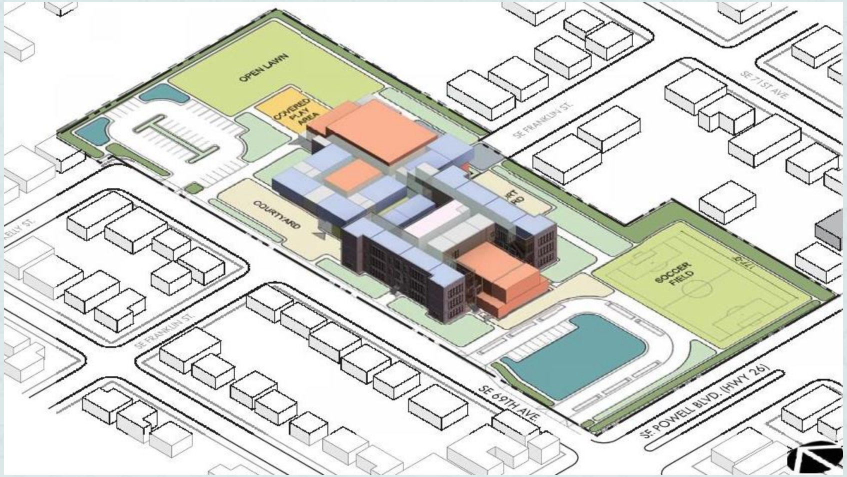
- Incorporate biophilic principles
- Incorporate opportunities for passive and active educational tools
- Provide a healthy indoor environment
  - Avoid harmful chemicals, provide excellent ventilation, daylighting, create appropriate acoustics

Sustainability Requirements

- LEED v4 for Schools Gold Certification
- Achieve minimum of 10% additional energy savings above current Oregon energy code
- Commissioning
- 1.5% for Green Energy Technology

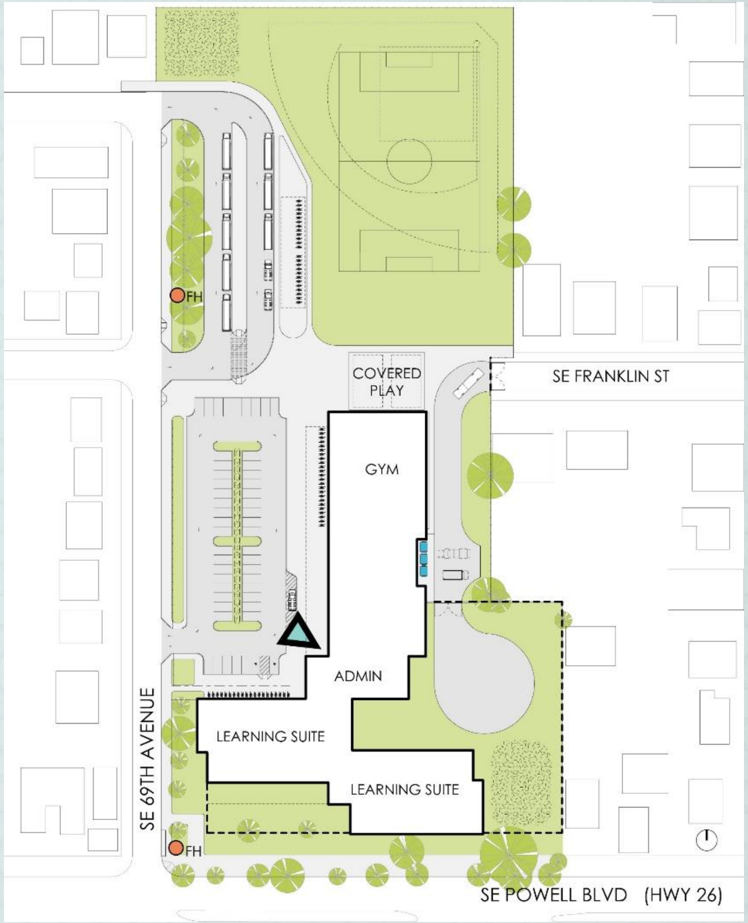
2017 BOND

Renovate 3D View



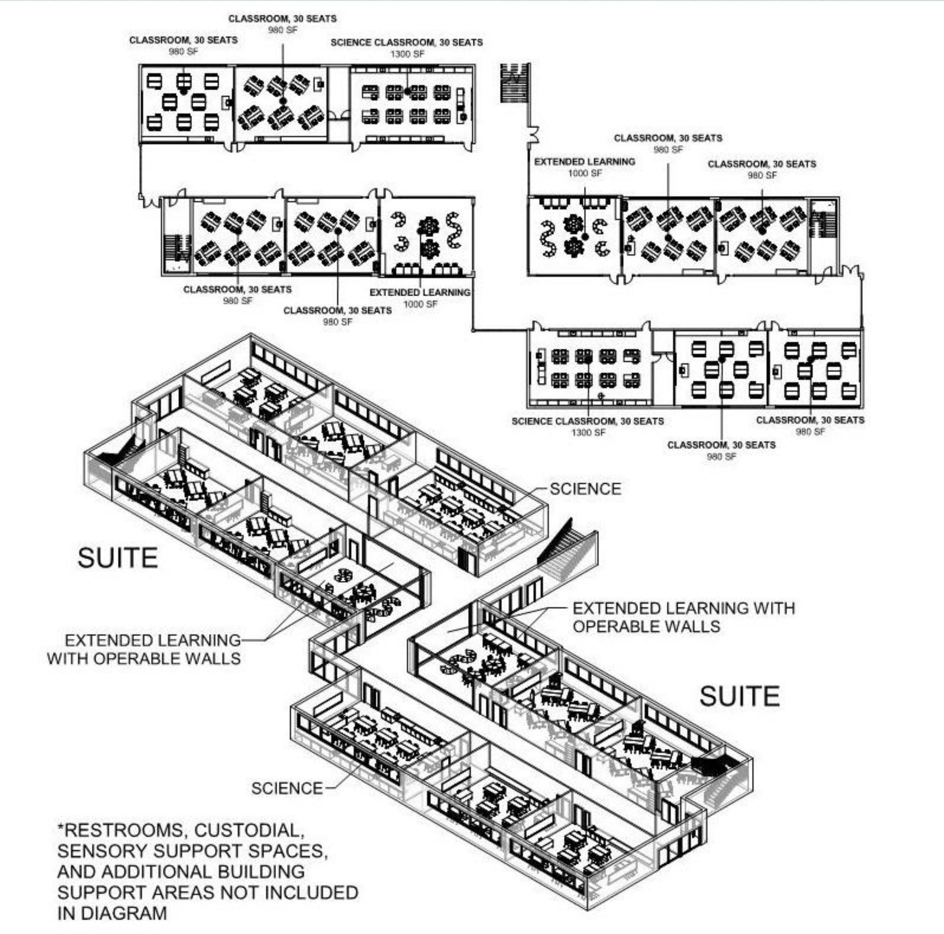
Proposed Replacement 3D View

SITE PLAN

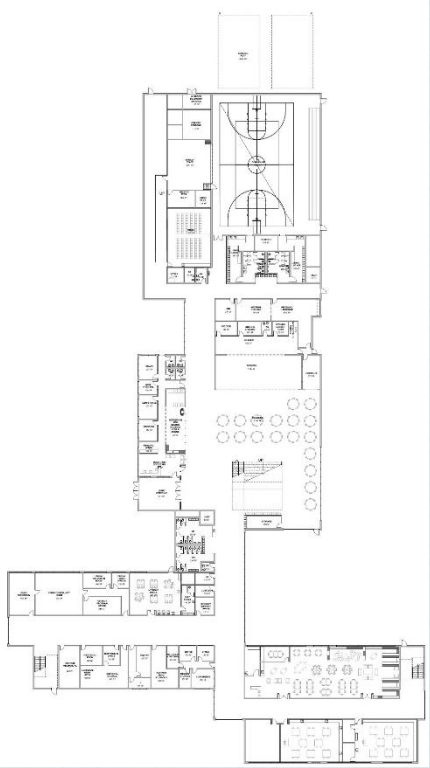


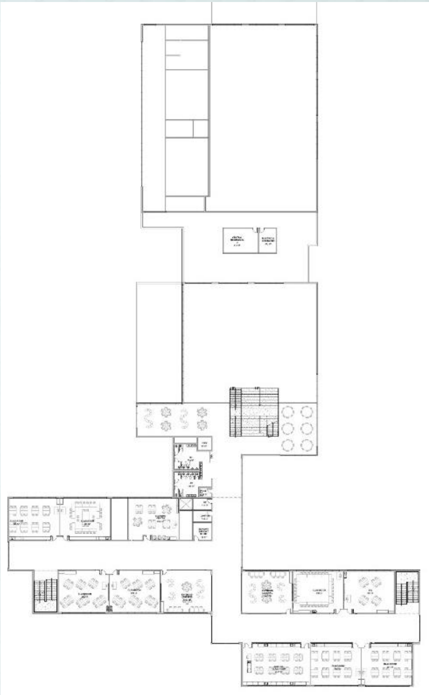
FH
COVERED PLAY
SE FRANKLIN ST
GYM
ADMIN
LEARNING SUITE
LEARNING SUITE
SE 69TH AVENUE
FH
SE POWELL BLVD (HWY 26)

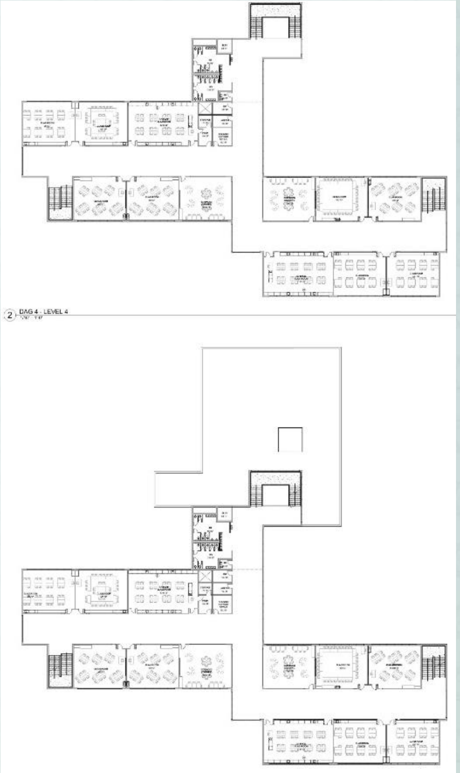
LEARNING ENVIRONMENTS



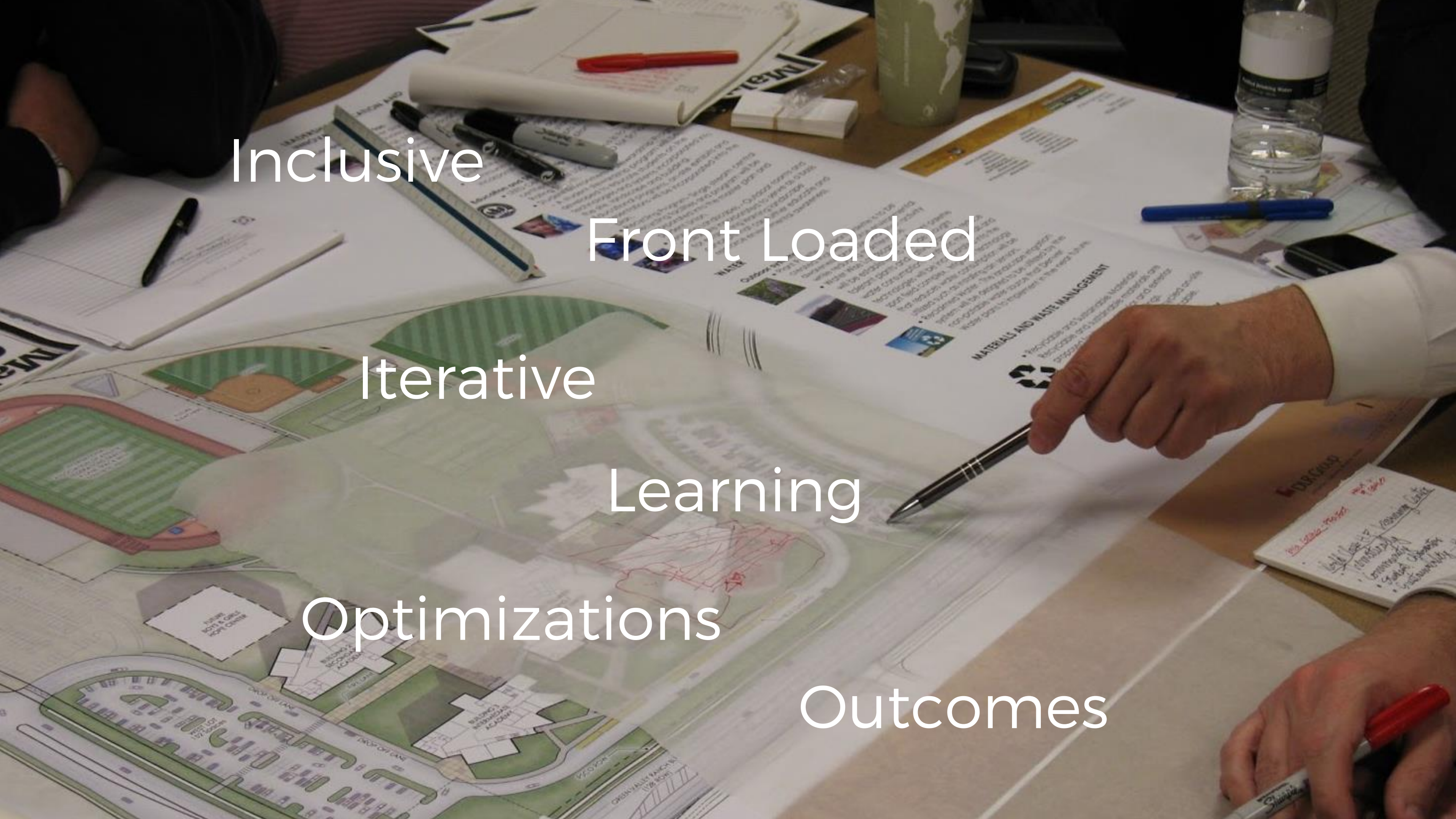
LEARNING ENVIRONMENTS



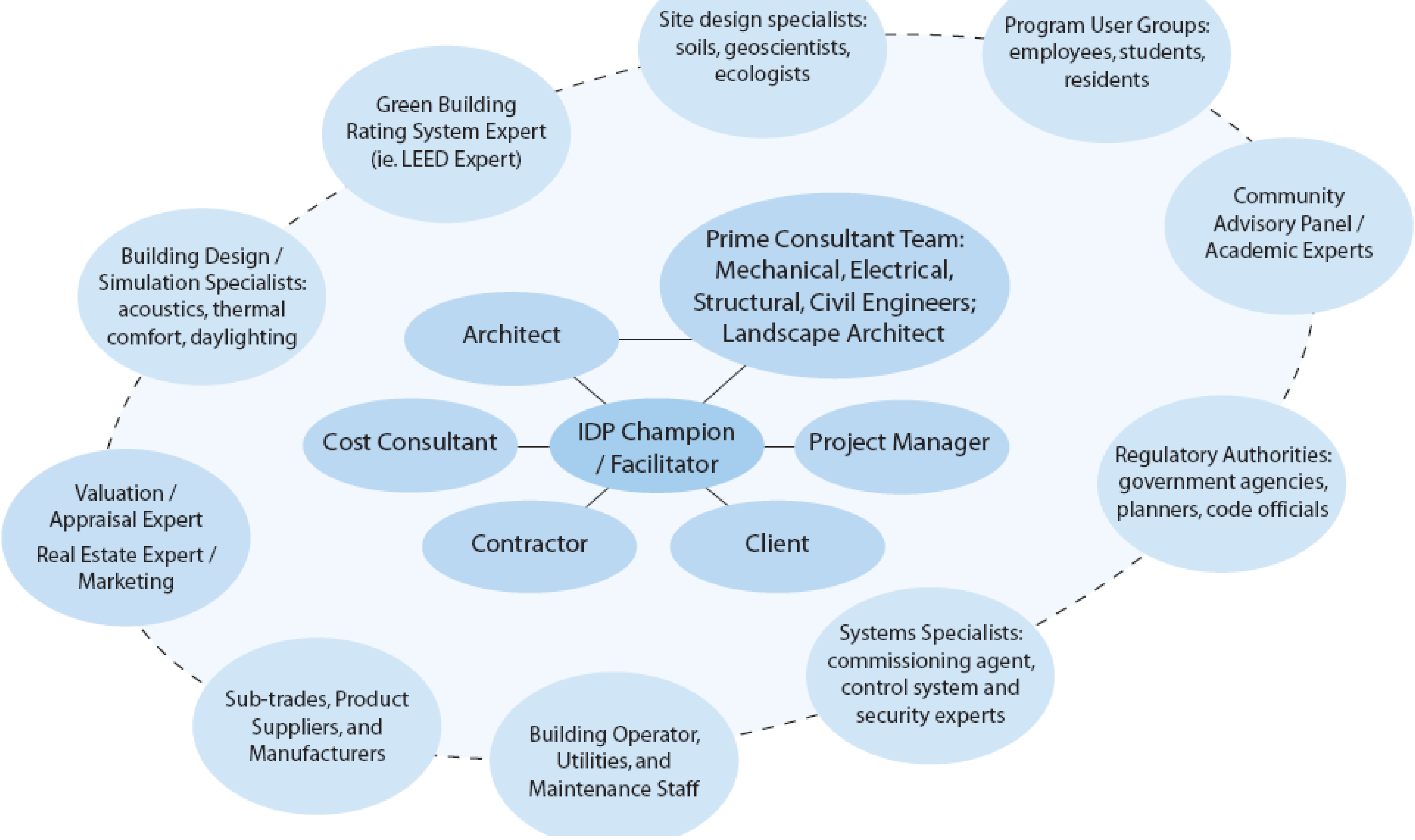




INTEGRATIVE PROCESS

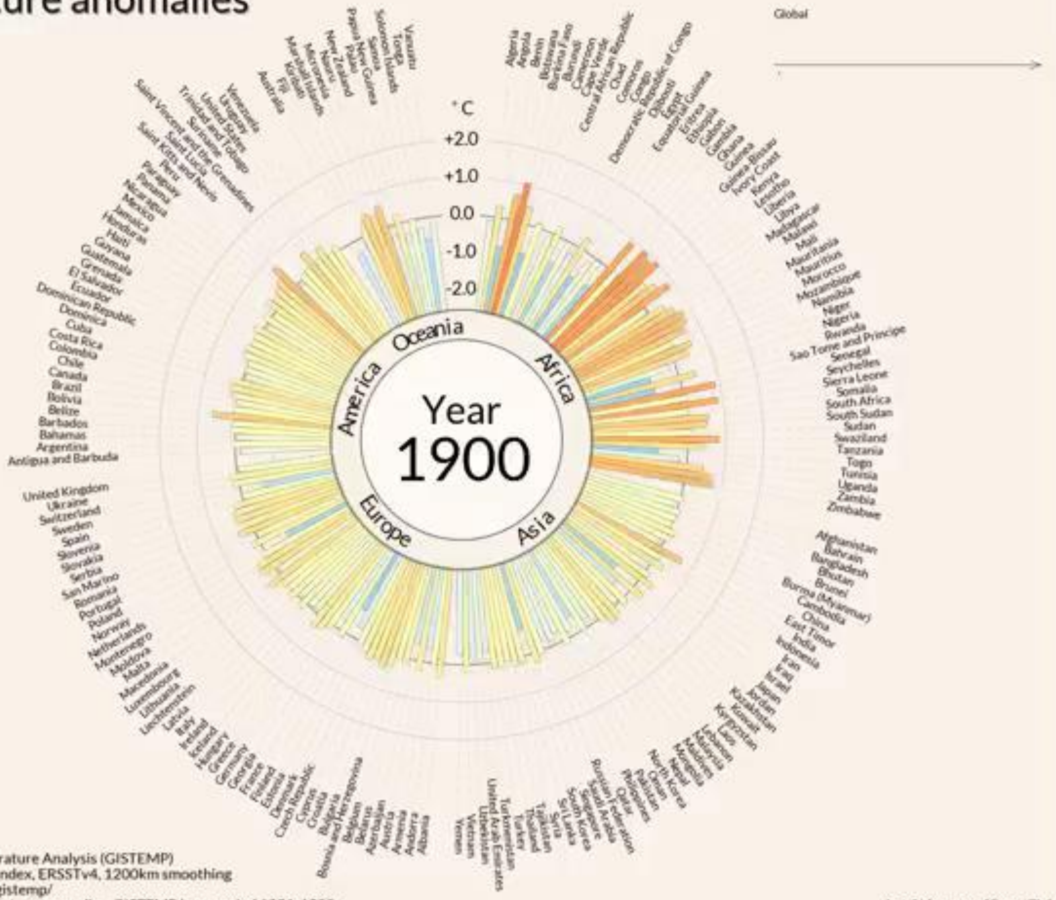

Inclusive
Front Loaded
Iterative
Learning
Optimizations
Outcomes

Front loaded – Data


Site design specialists: soils, geoscientists, ecologists
Program User Groups: employees, students, residents
Green Building Rating System Expert (ie. LEED Expert)
Community Advisory Panel / Academic Experts
Building Design / Simulation Specialists: acoustics, thermal comfort, daylighting
Prime Consultant Team: Mechanical, Electrical, Structural, Civil Engineers; Landscape Architect
Architect
Cost Consultant
IDP Champion / Facilitator
Project Manager
Regulatory Authorities: government agencies, planners, code officials
Valuation / Appraisal Expert
Real Estate Expert / Marketing
Contractor
Client
Systems Specialists: commissioning agent, control system and security experts
Sub-trades, Product Suppliers, and Manufacturers
Building Operator, Utilities, and Maintenance Staff

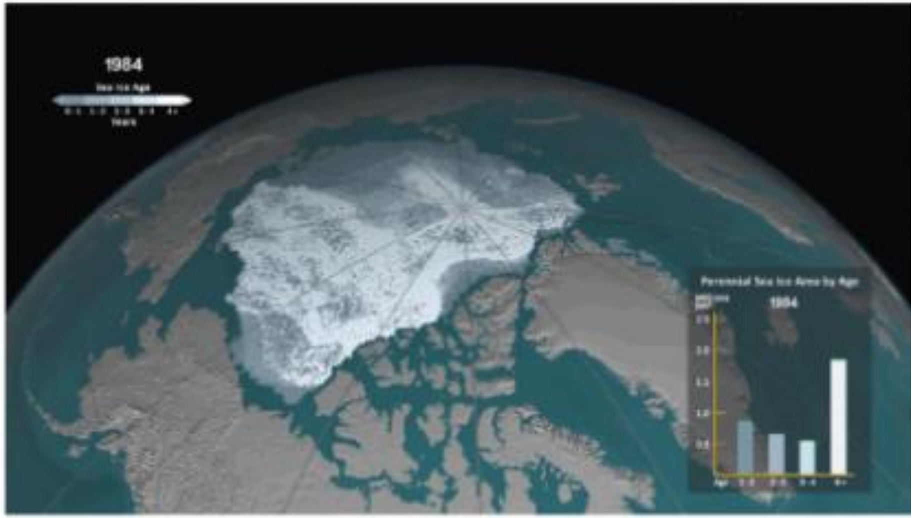
ENVIRONMENTAL IMPERATIVE

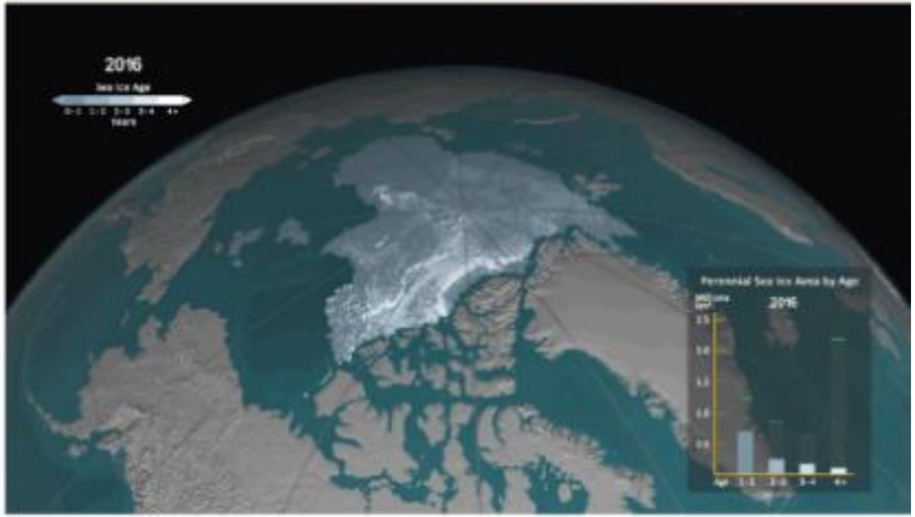
Temperature anomalies



Data source:
NASA GISS Surface Temperature Analysis (GISTEMP)
Land-Ocean Temperature Index, ERSSTv4, 1200km smoothing
https://data.giss.nasa.gov/gistemp/
Average of monthly temperature anomalies. GISTEMP base period 1951-1980.

Antti Lipponen (@anttilip)

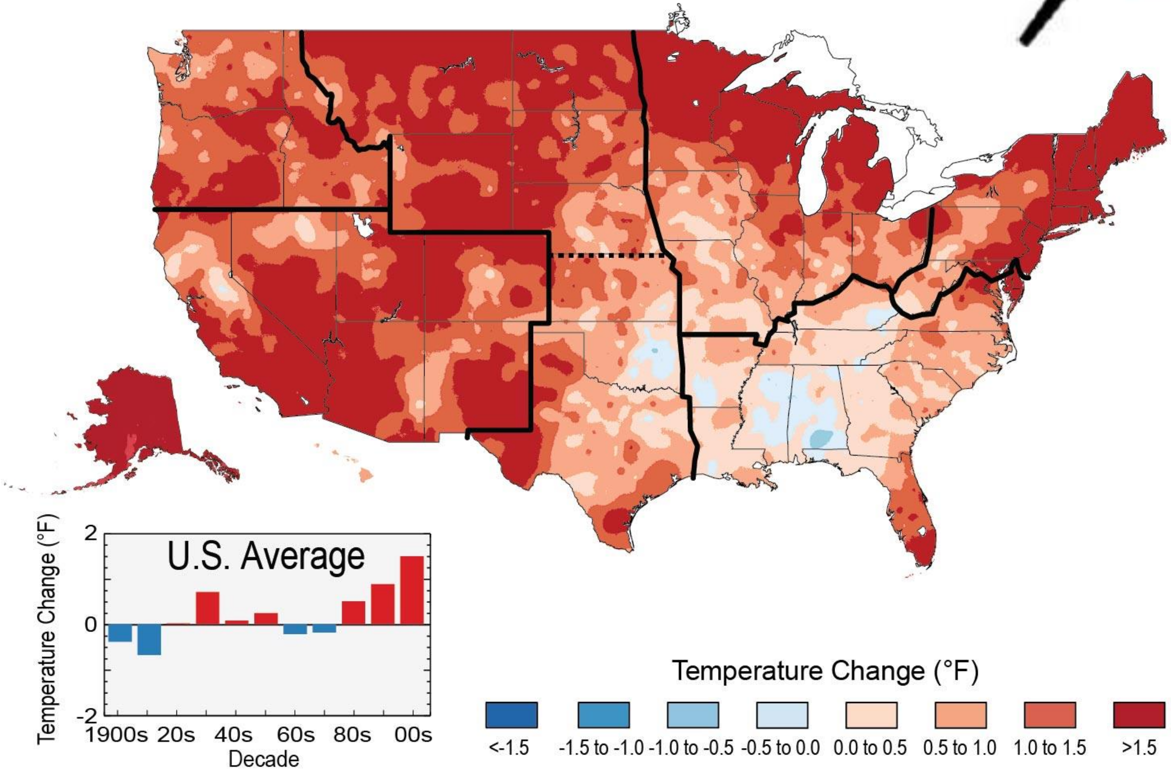




Extent of arctic sea ice
1984 - 2016

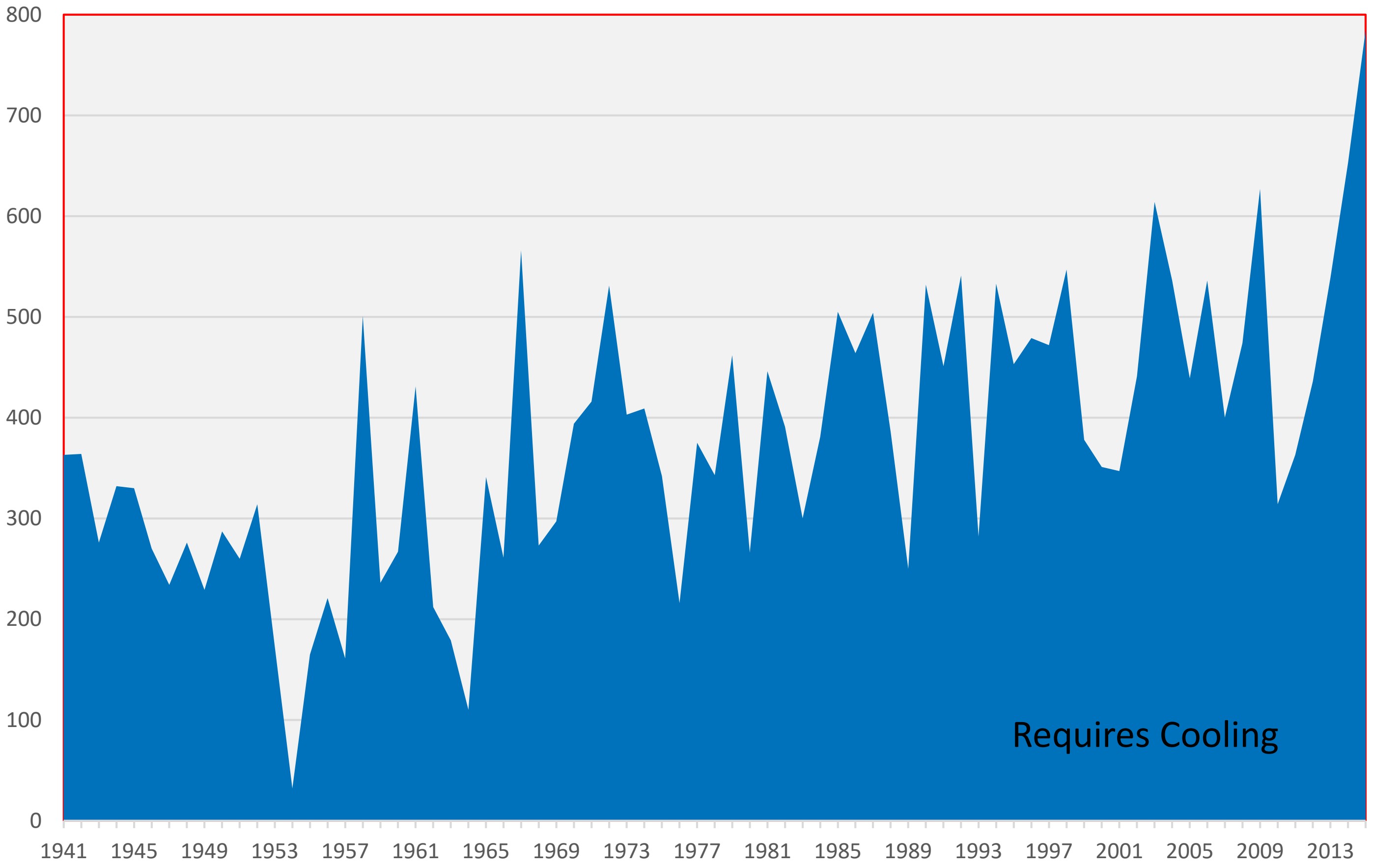
U.S. Global Change Research Program

National Climate Assessment



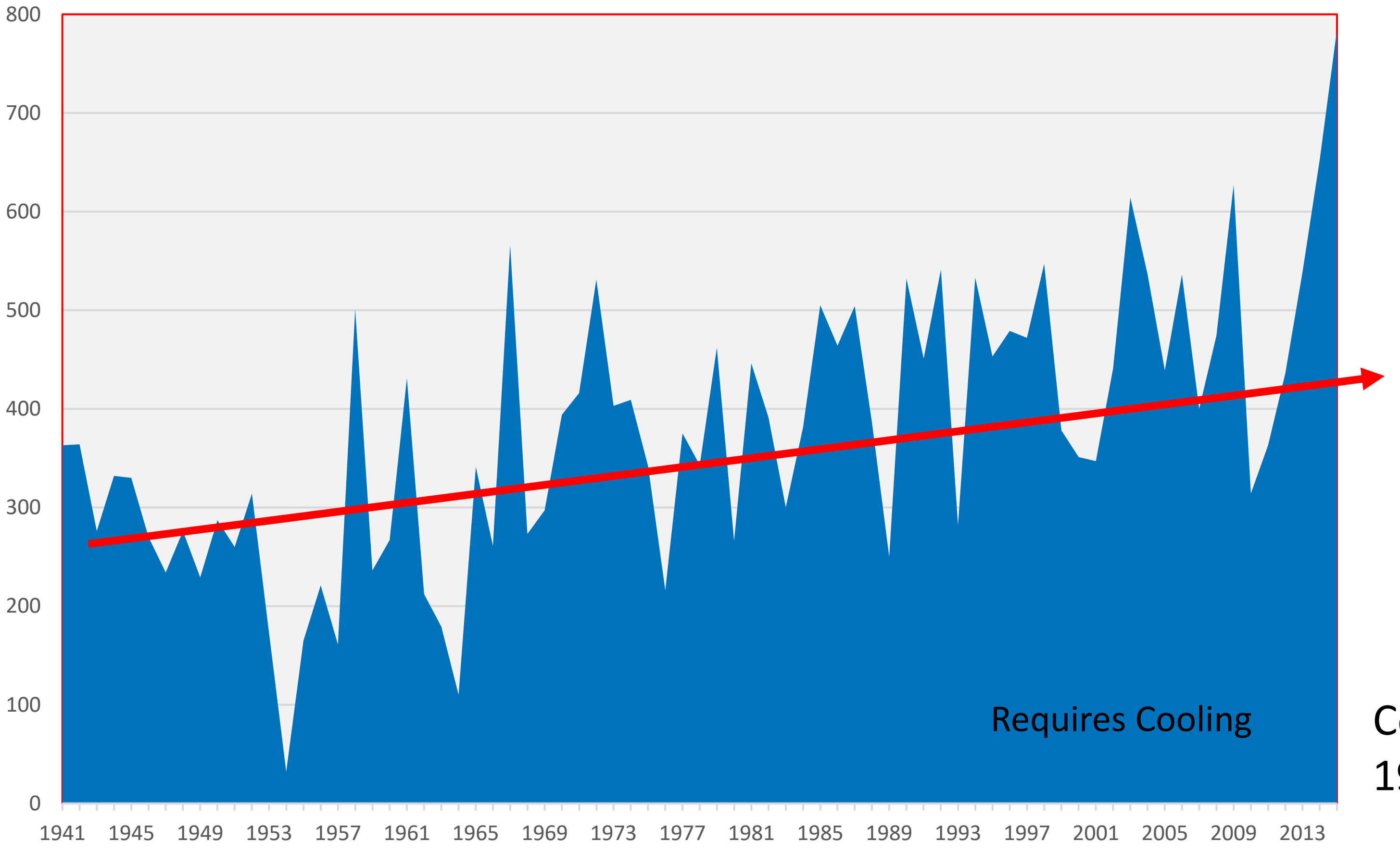
Are you designing for today or for **the future**?

Climate Data - PDX Weather Station



Cooling Degrees Days
1941 - 2015

Climate Data - PDX Weather Station



Cooling Degrees Days
1941 - 2015

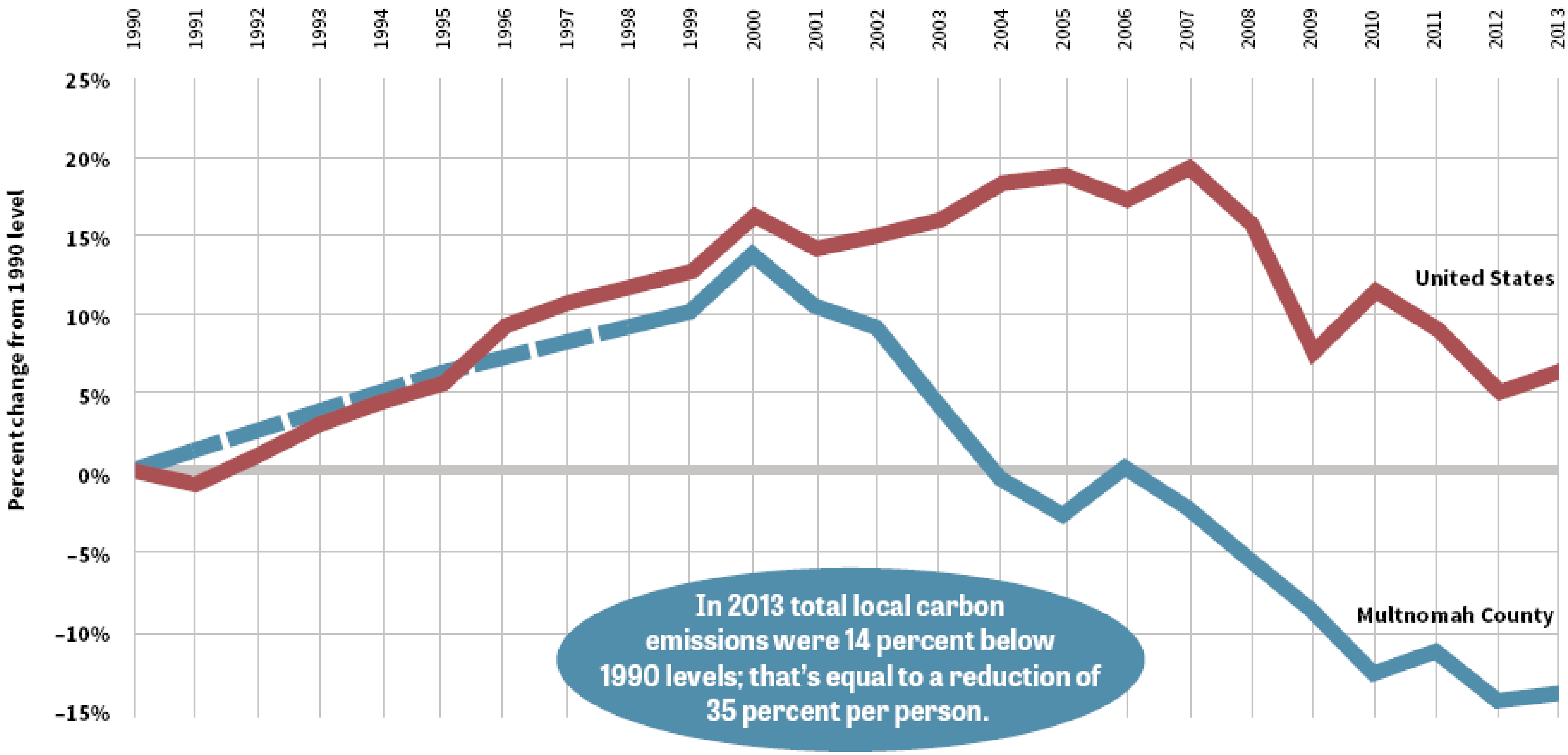

A precious resource

A destructive force

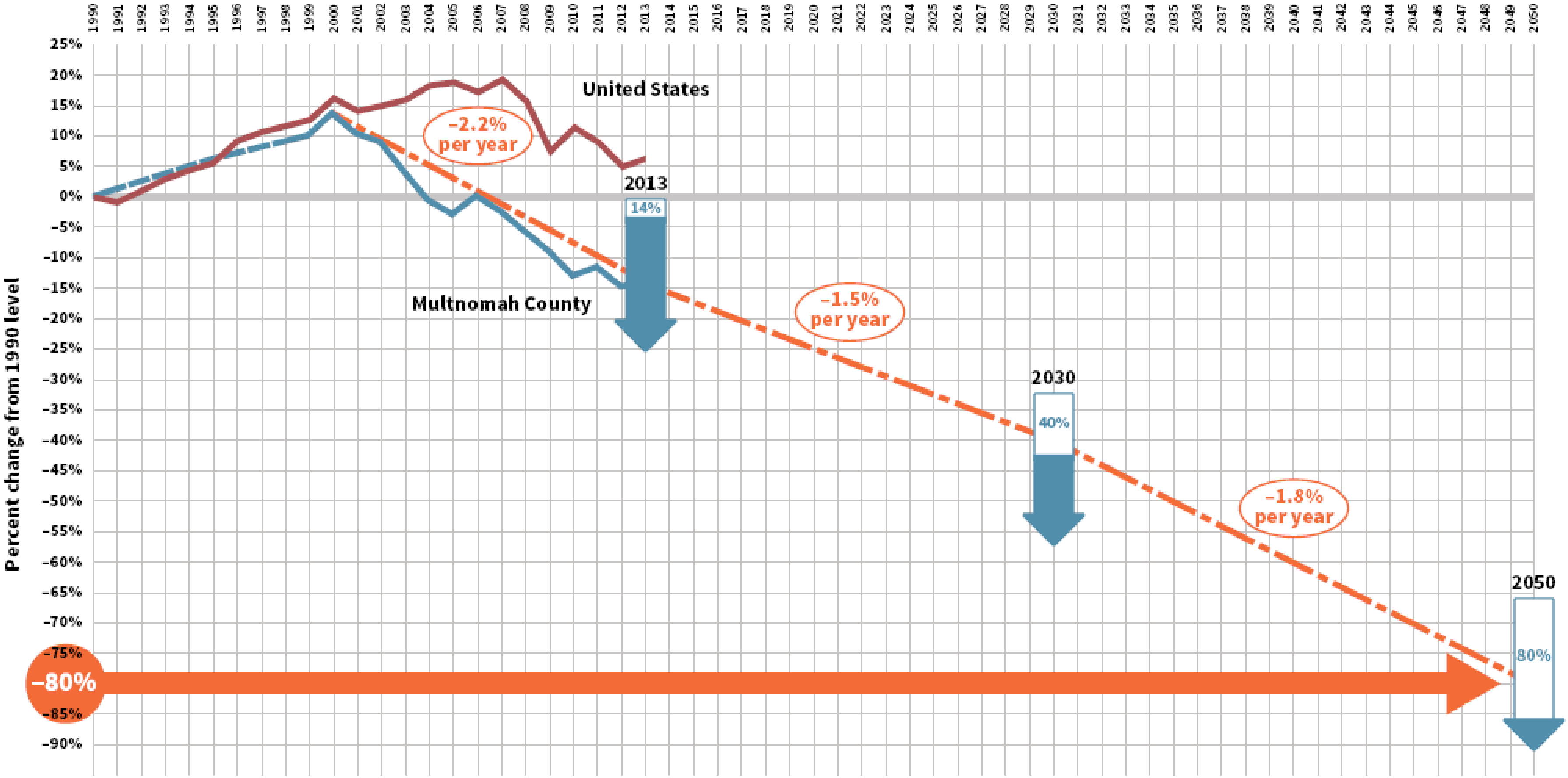
Mitigation and Adaptation

Reduce local carbon emissions 80% below 1990 levels by 2050

- City of Portland Climate Action Plan



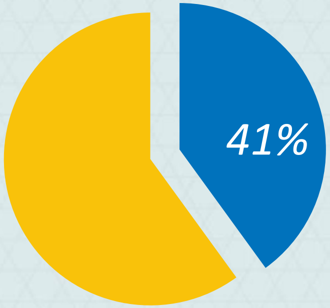
City of Portland Climate Action Plan



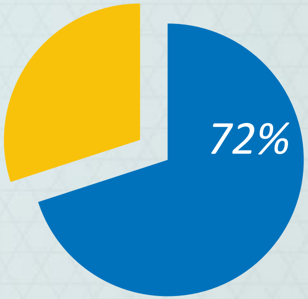
City of Portland Climate Action Plan

Buildings Matter

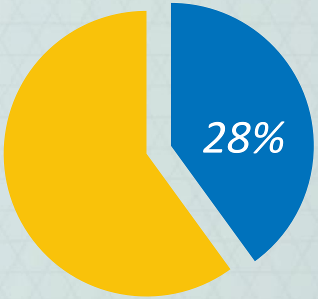
In the US, buildings account for …



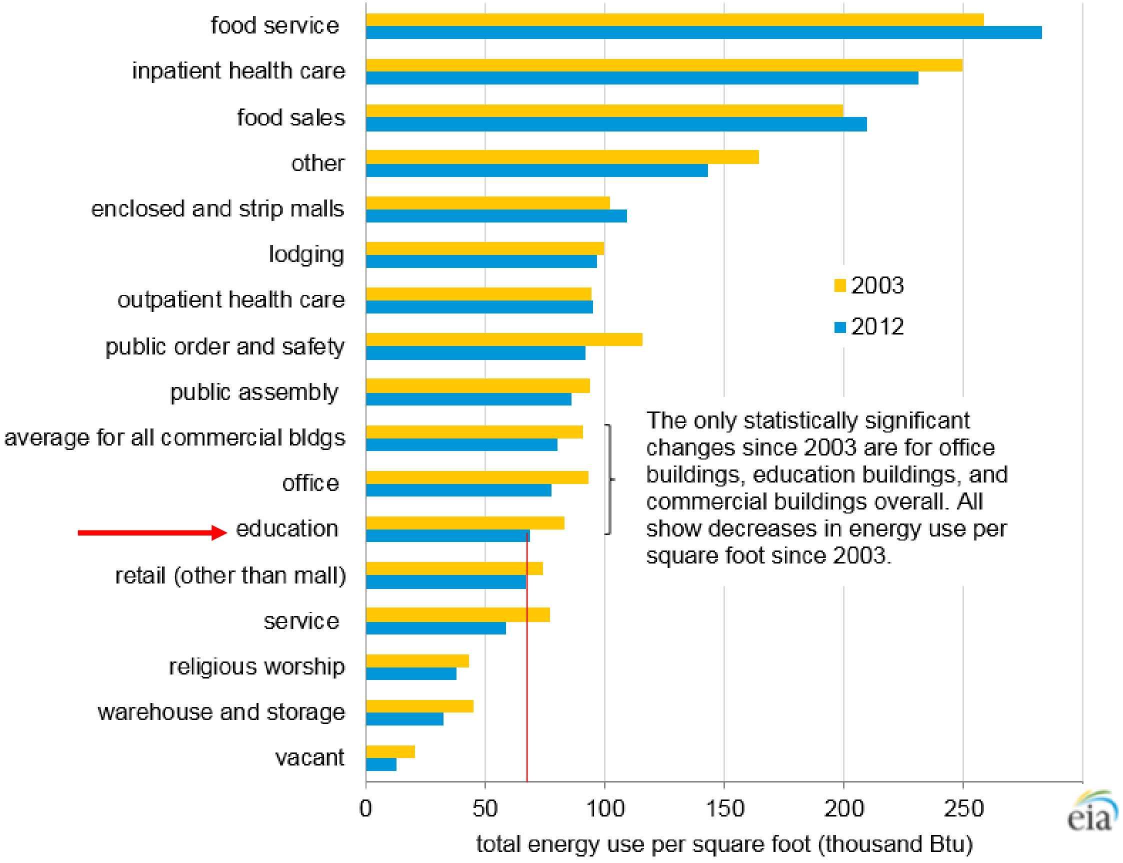
Total Energy



Electricity



CO_2 Emissions



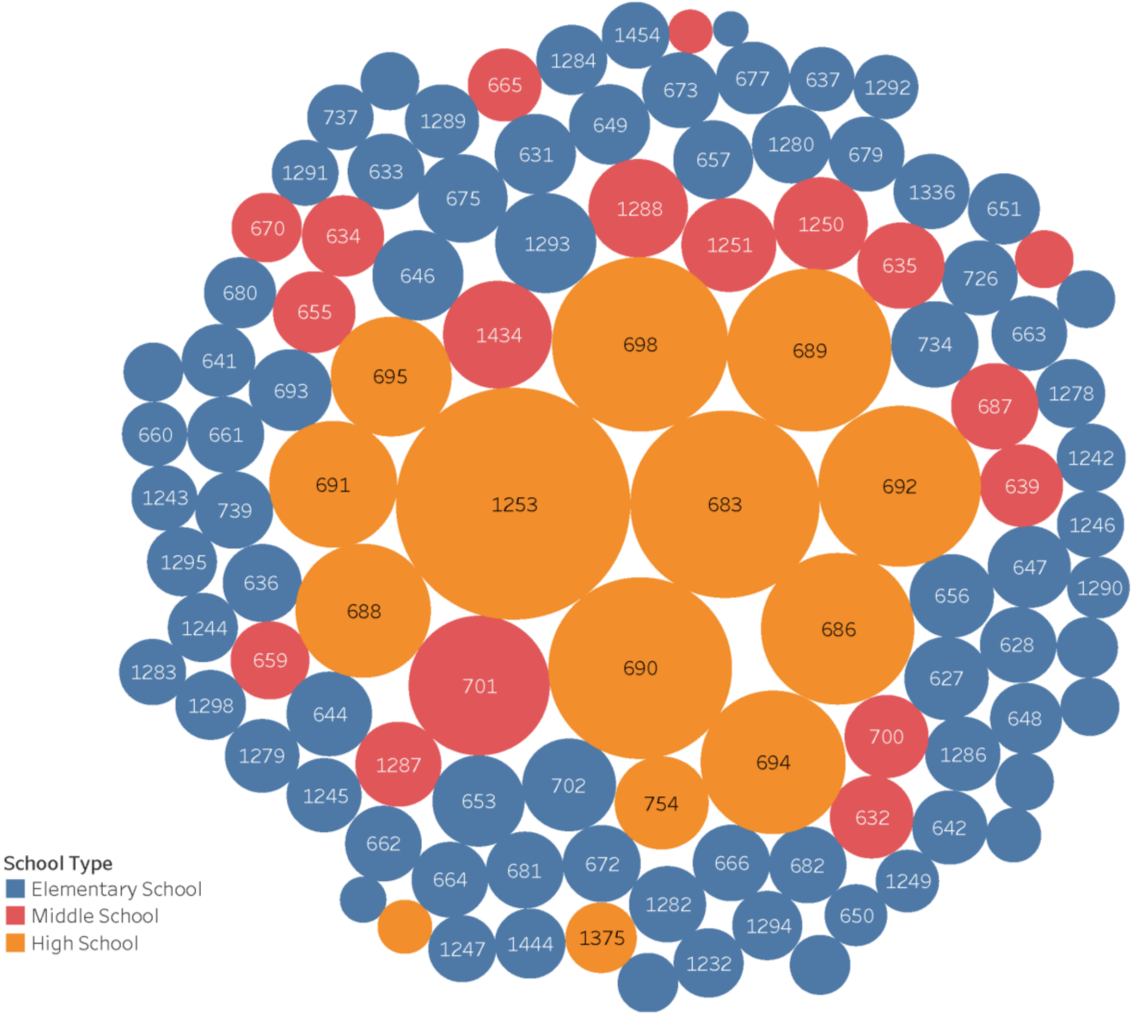
Source: U.S. Energy Information Administration, Commercial Buildings Energy Consumption Survey.

Energy Use Intensity: National vs. PPS

US average EUI for schools
65 kBTU/sf/yr

PPS average EUI for schools
49.8 kBTU/sf/yr

PPS Carbon Footprint



What does it look like to have a zero net energy building?

SITE vs SOURCE ENERGY

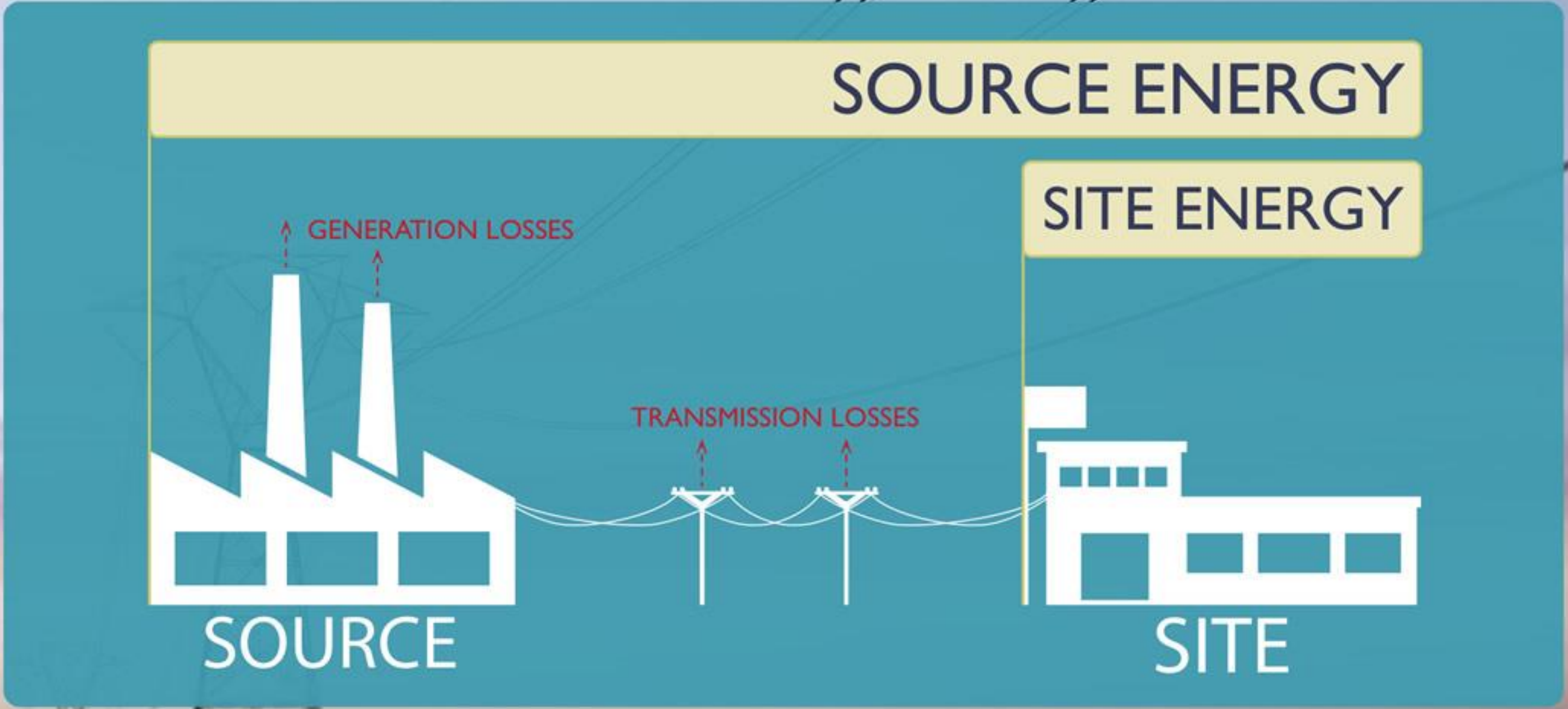
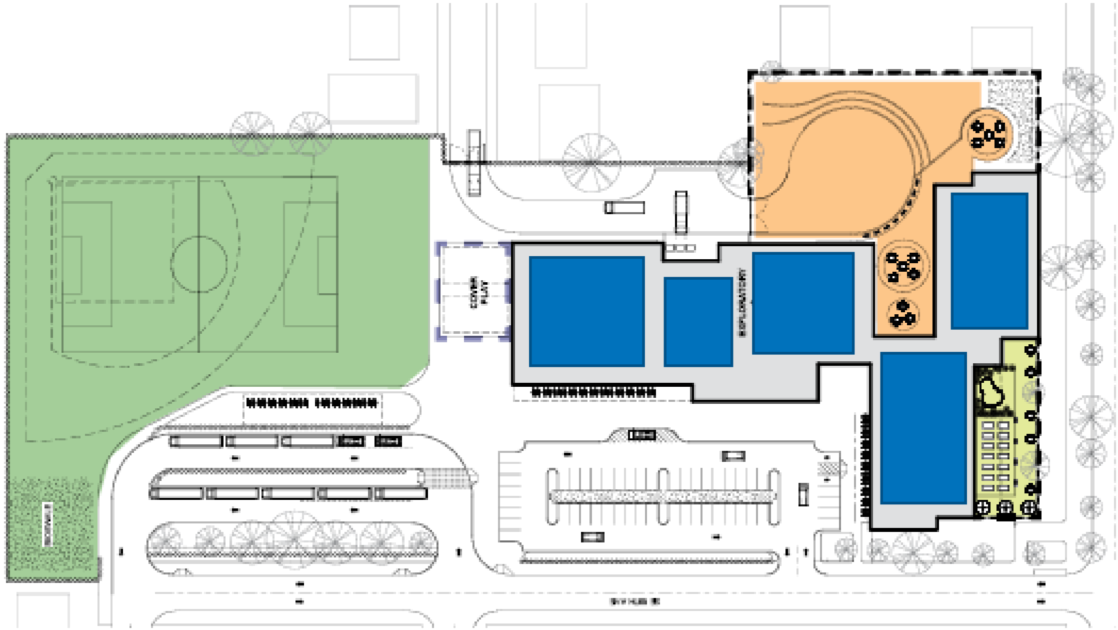


Image Courtesy Architecture 2030

Zero Net Energy Target EUI



Roof area: 57,400 sf
75% coverage
Array size: 43,050 sf

Array output: 2,295,344 kBTU
Building:100,412 sf

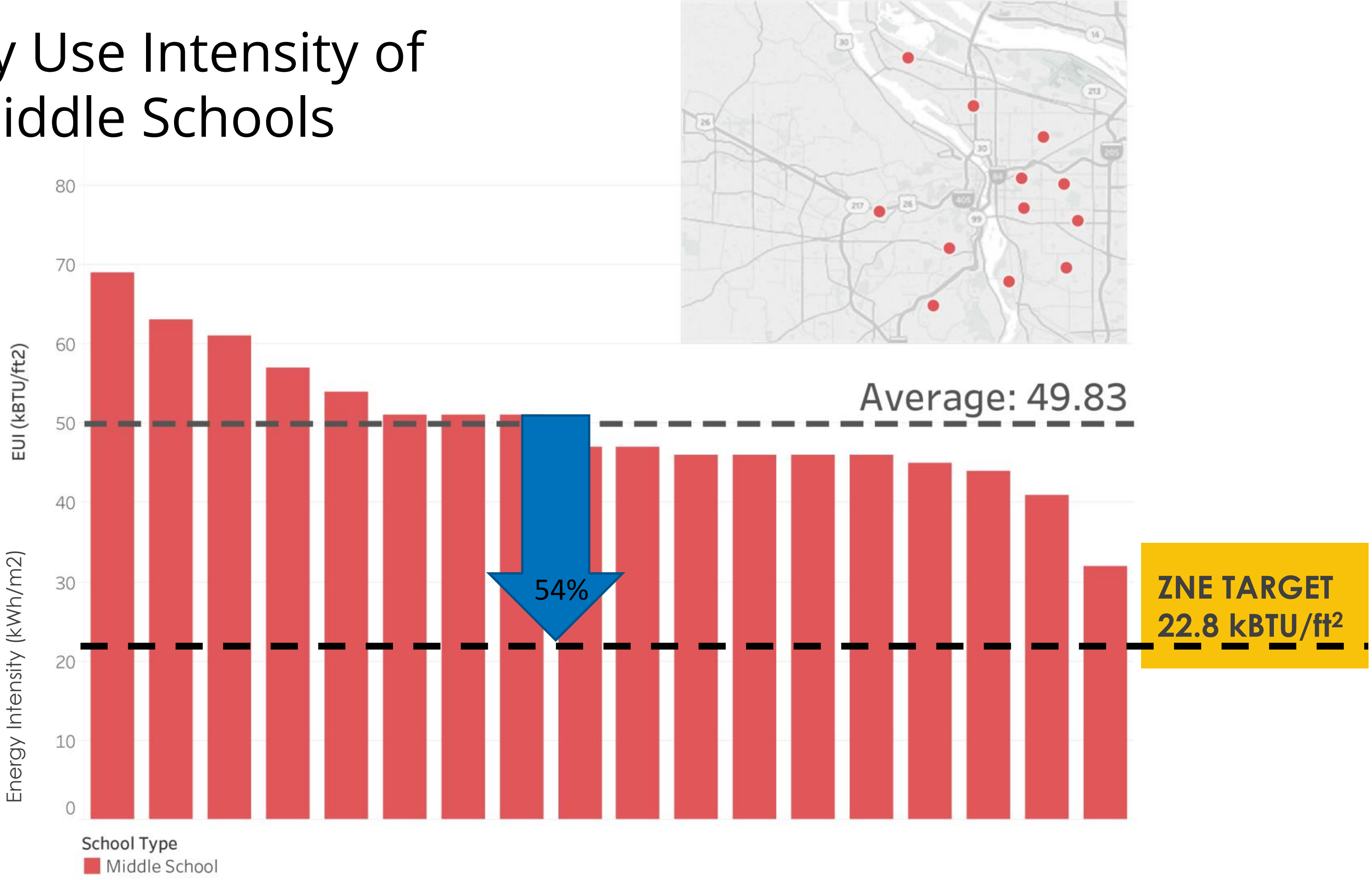
2,295,344 kBTU / 100,412 ft^2 = 22.8 kBTU/ft^2/yr

22.8

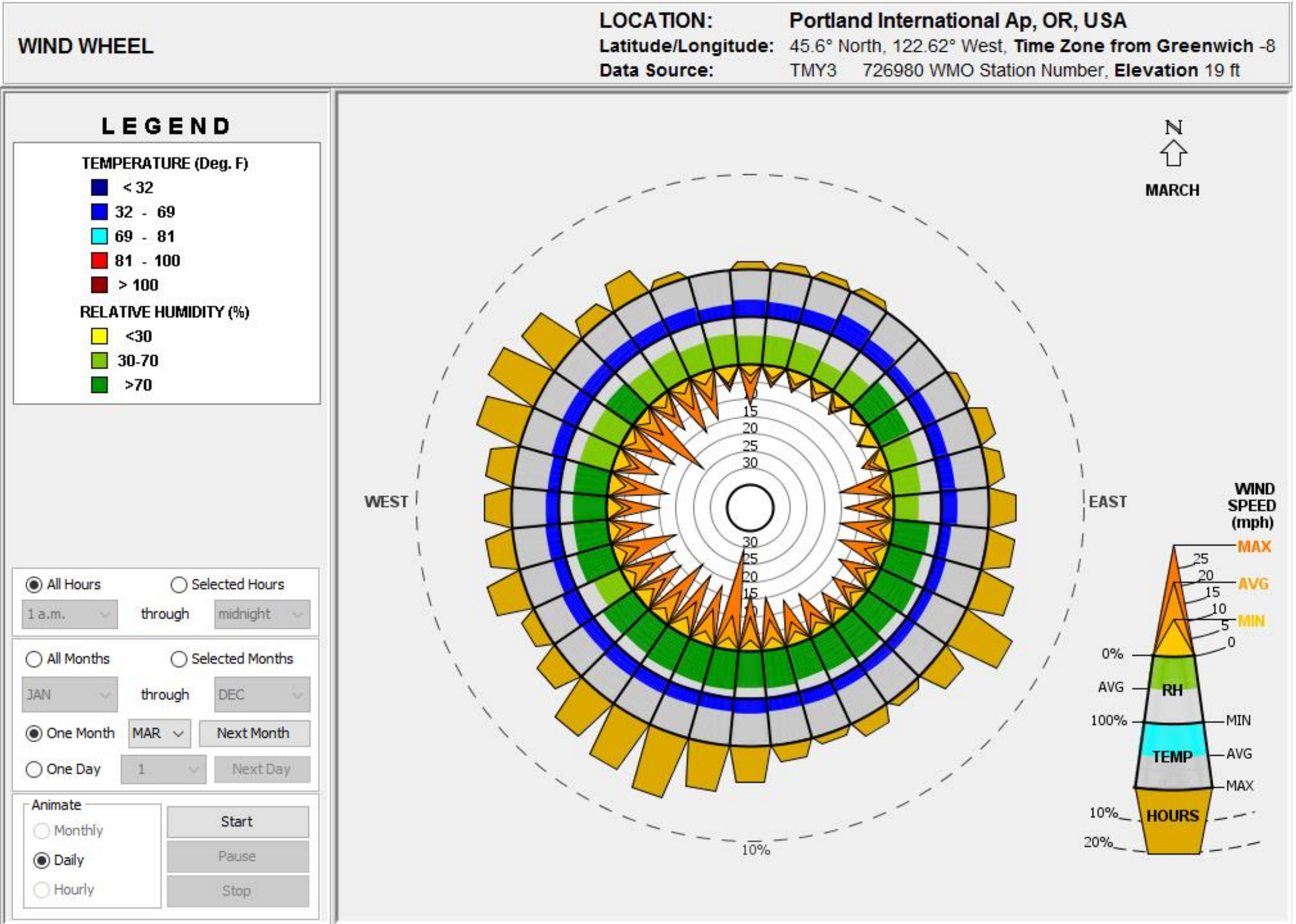
kBTU /ft^2/yr*

* PV Watts is an early stage renewable generation estimation tool, further analysis and refinement to these estimates will be required upon engagement. REF: http://pvwatts.nrel.gov/pvwatts.php

Energy Use Intensity of PPS Middle Schools

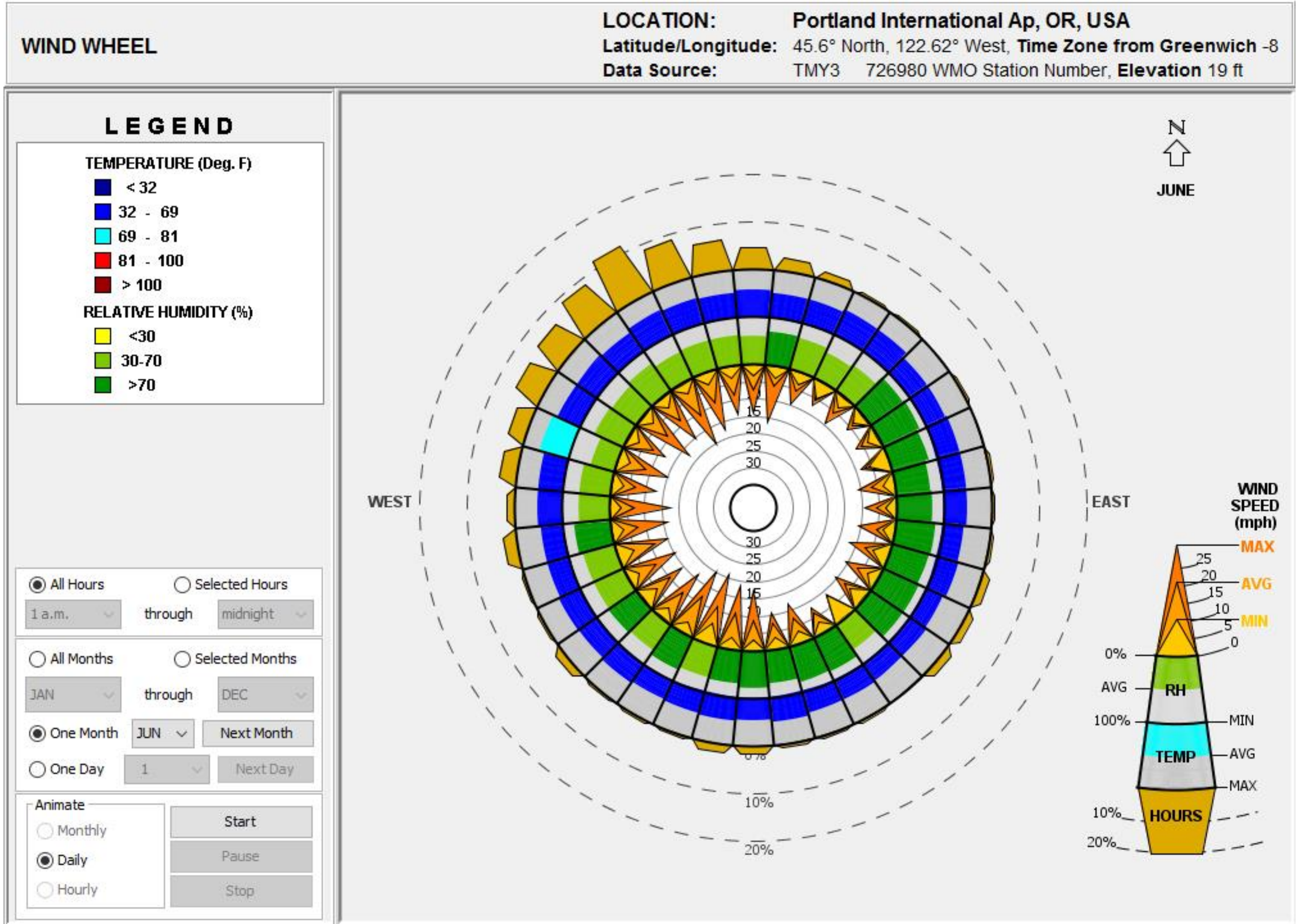


5 CLIMATE DATA



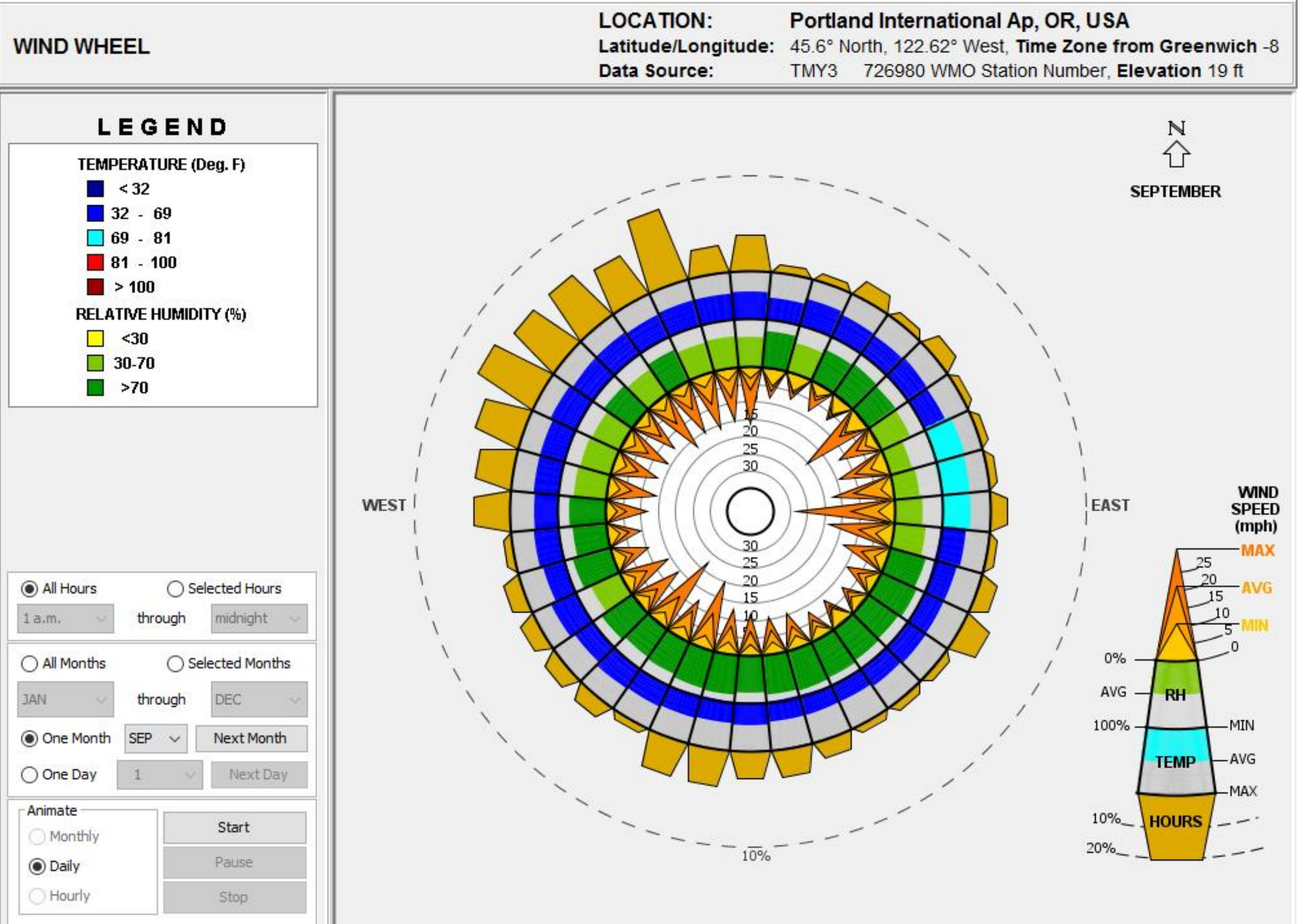
Wind Wheel

March

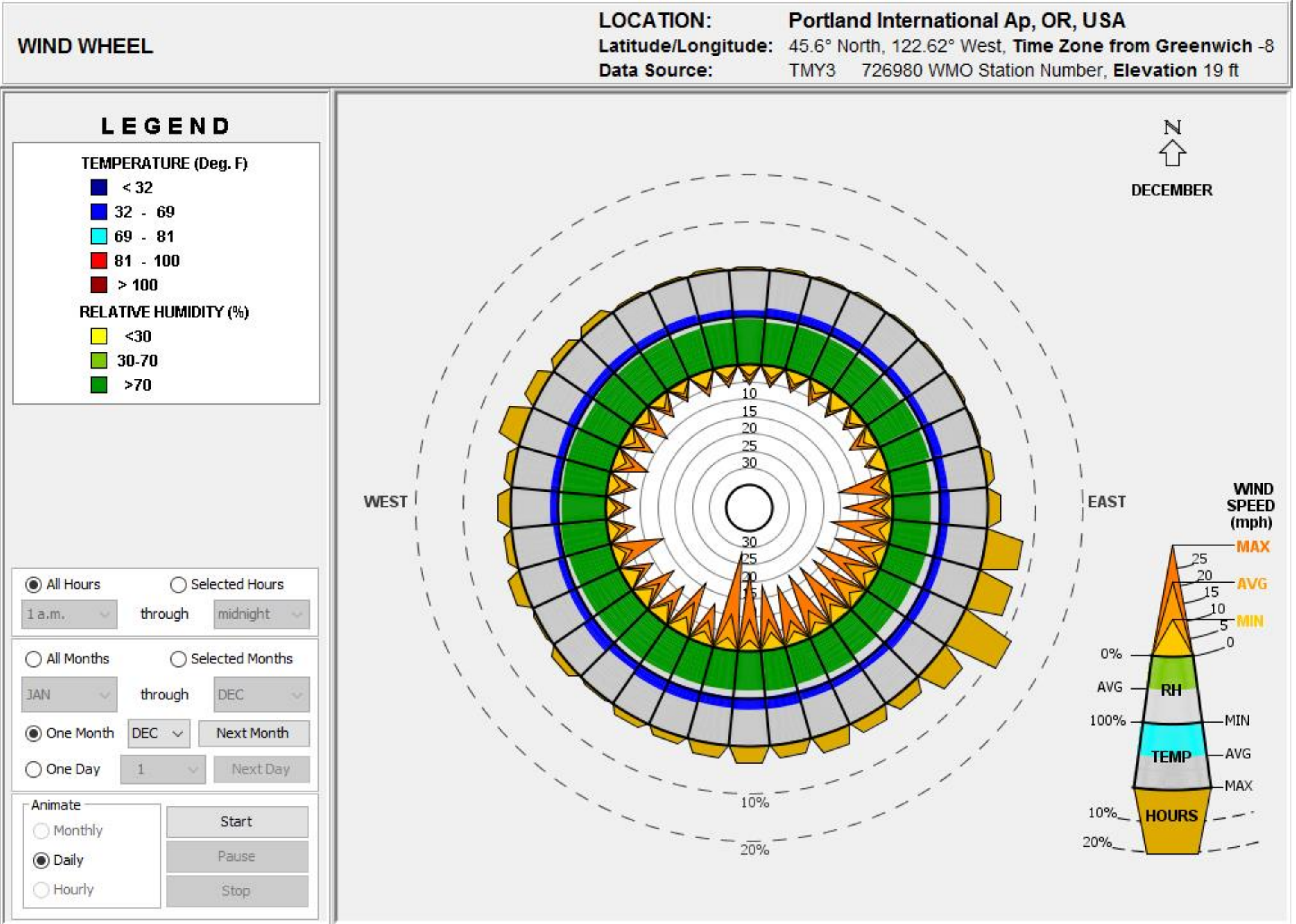


Wind Wheel

June

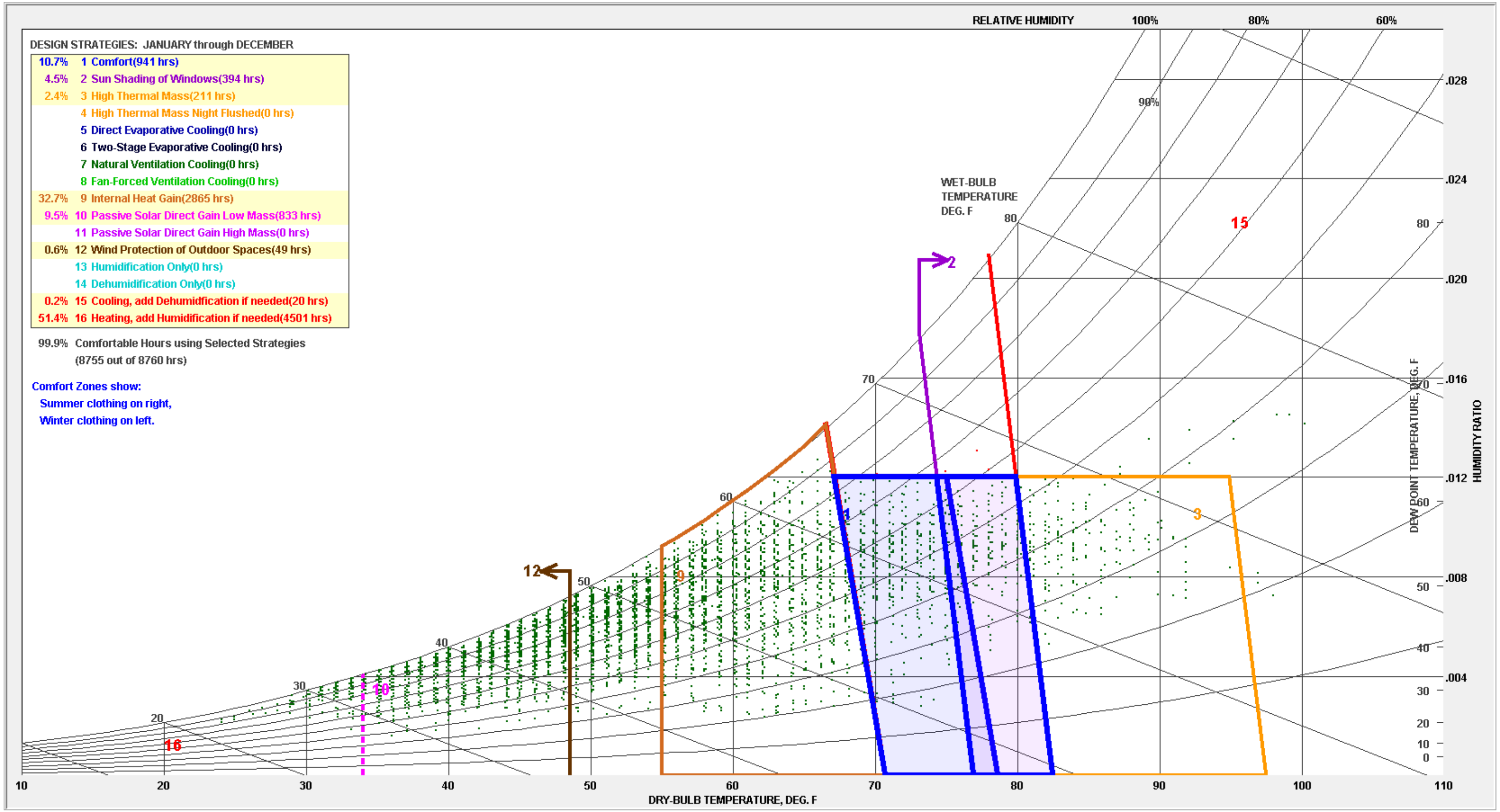


Wind Wheel
September



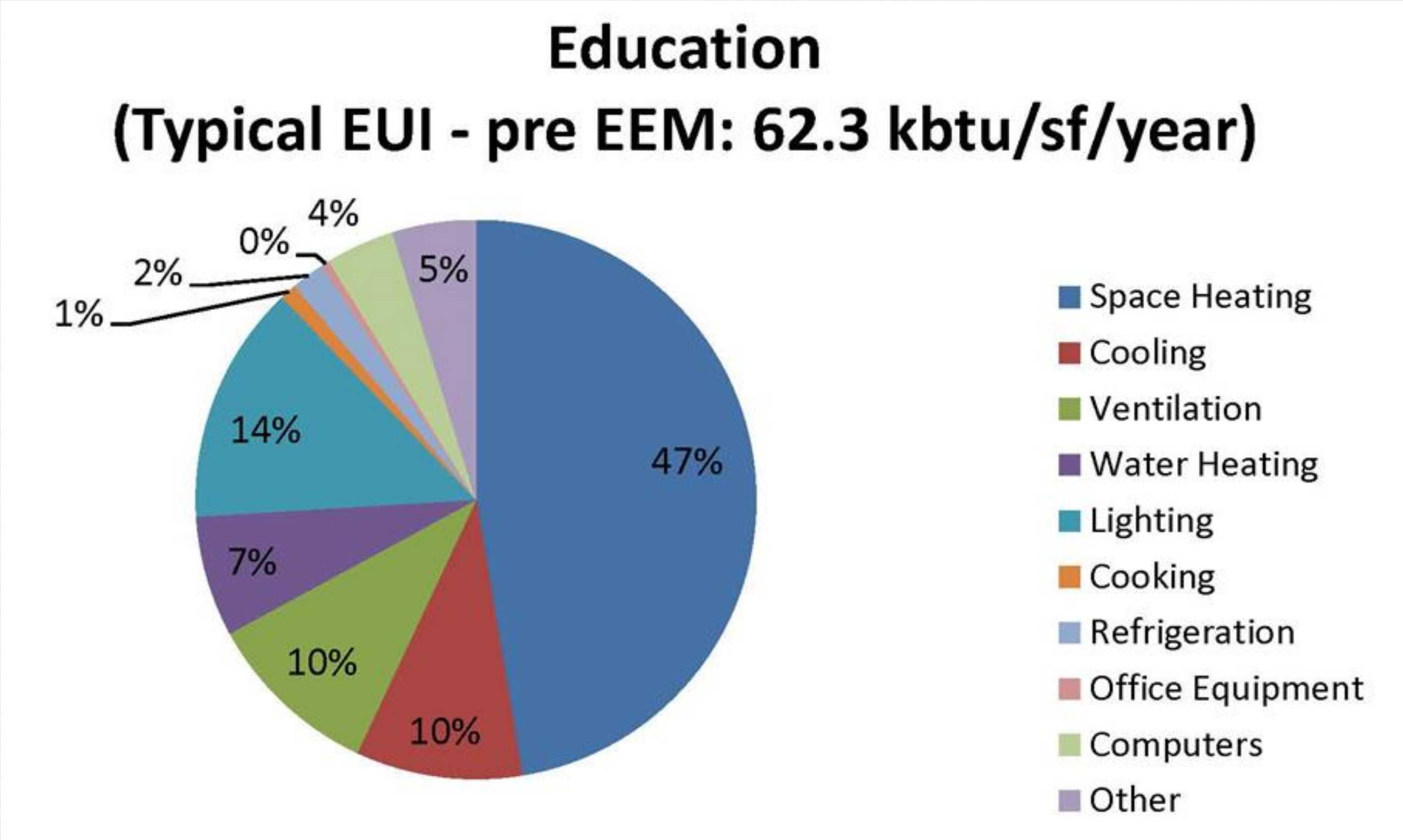
Wind Wheel
December

Psychrometric Chart – ASHRAE 55, Portland Airport



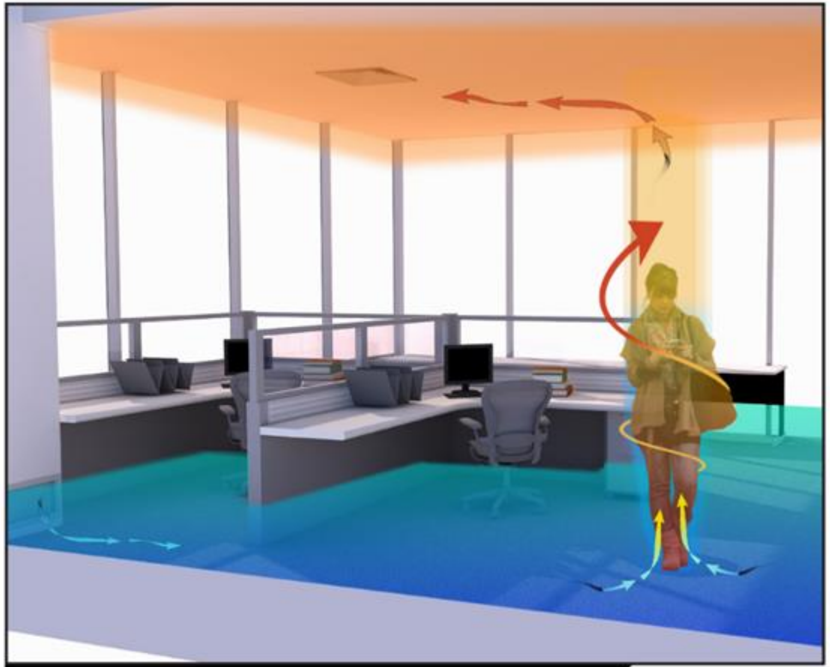
ENERGY

ENERGY USE INTENSITY



MECHANICAL SYSTEMS

RADIANT

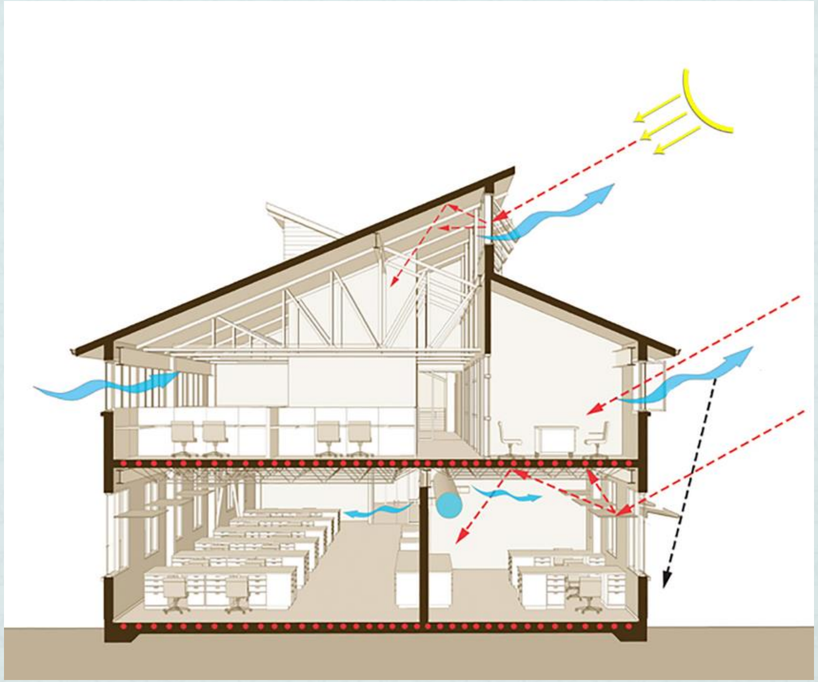


DISPLACEMENT VENTILATION

MECHANICAL SYSTEMS

SOLAR WALL

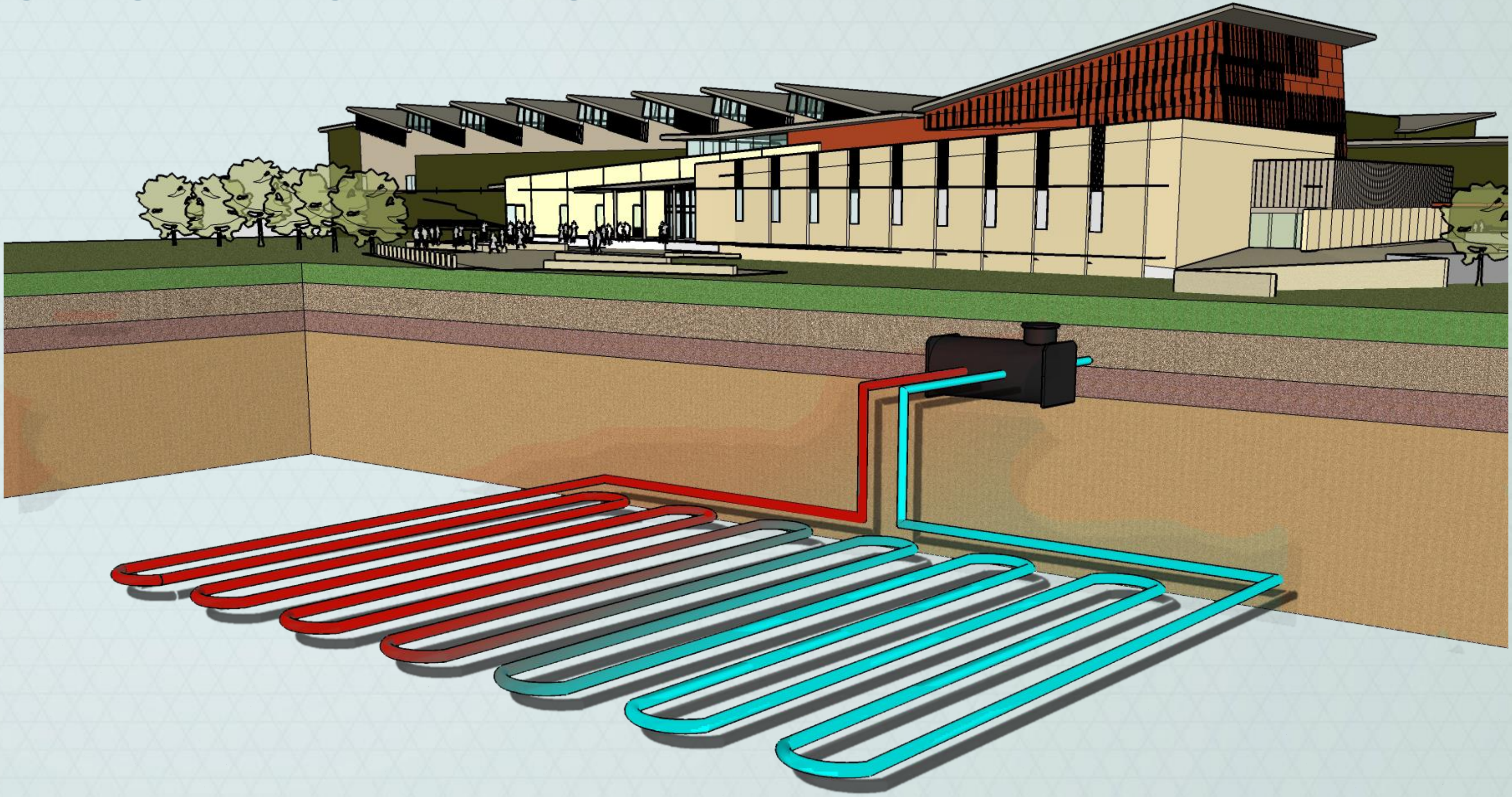
NATURAL VENTILATION + RADIANT SLAB



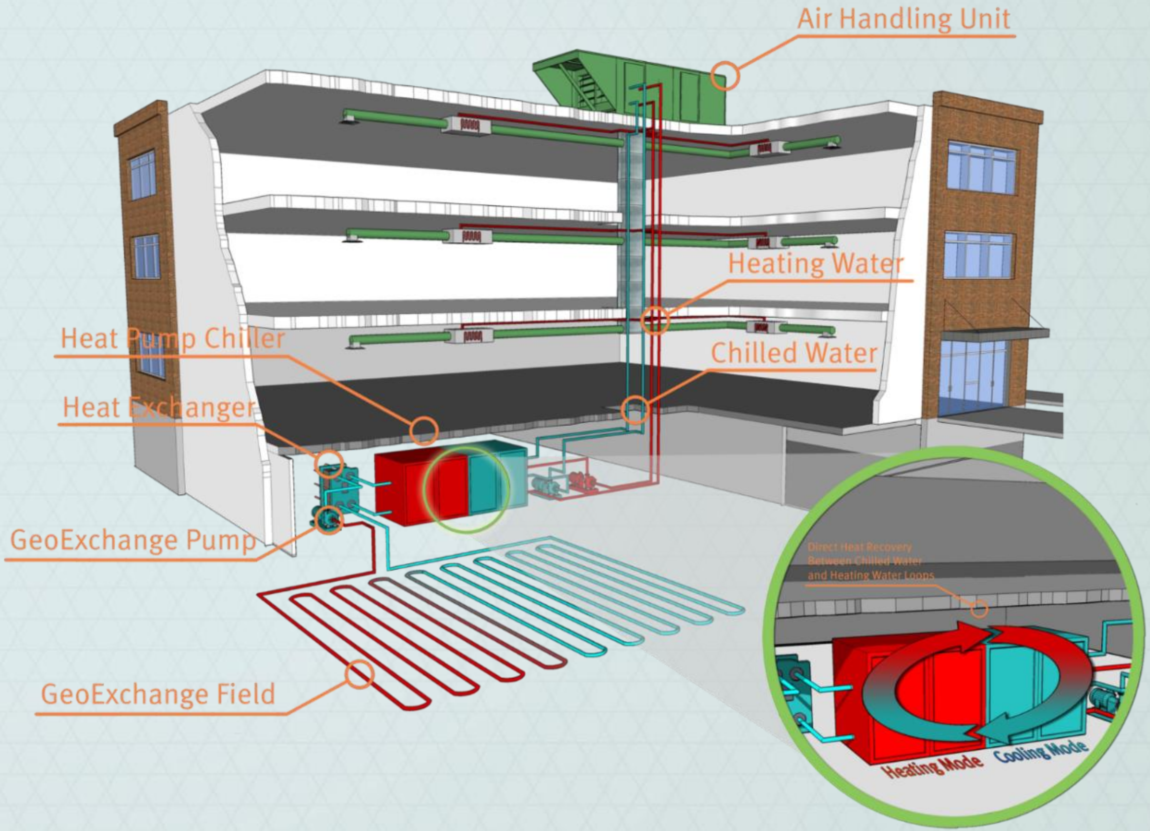
ENHANCED COMFORT

ENERGY SAVINGS

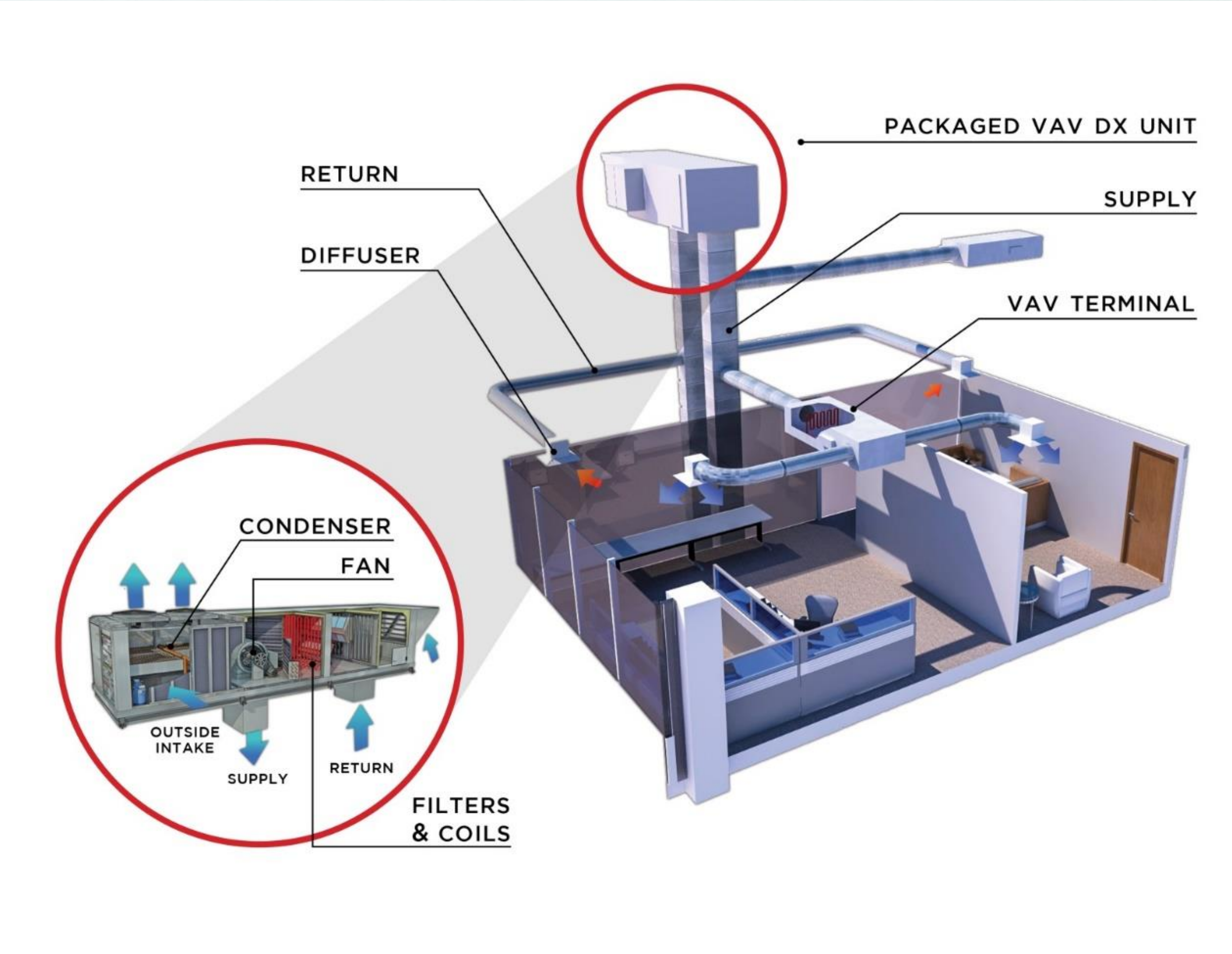
GEO-EXCHANGE



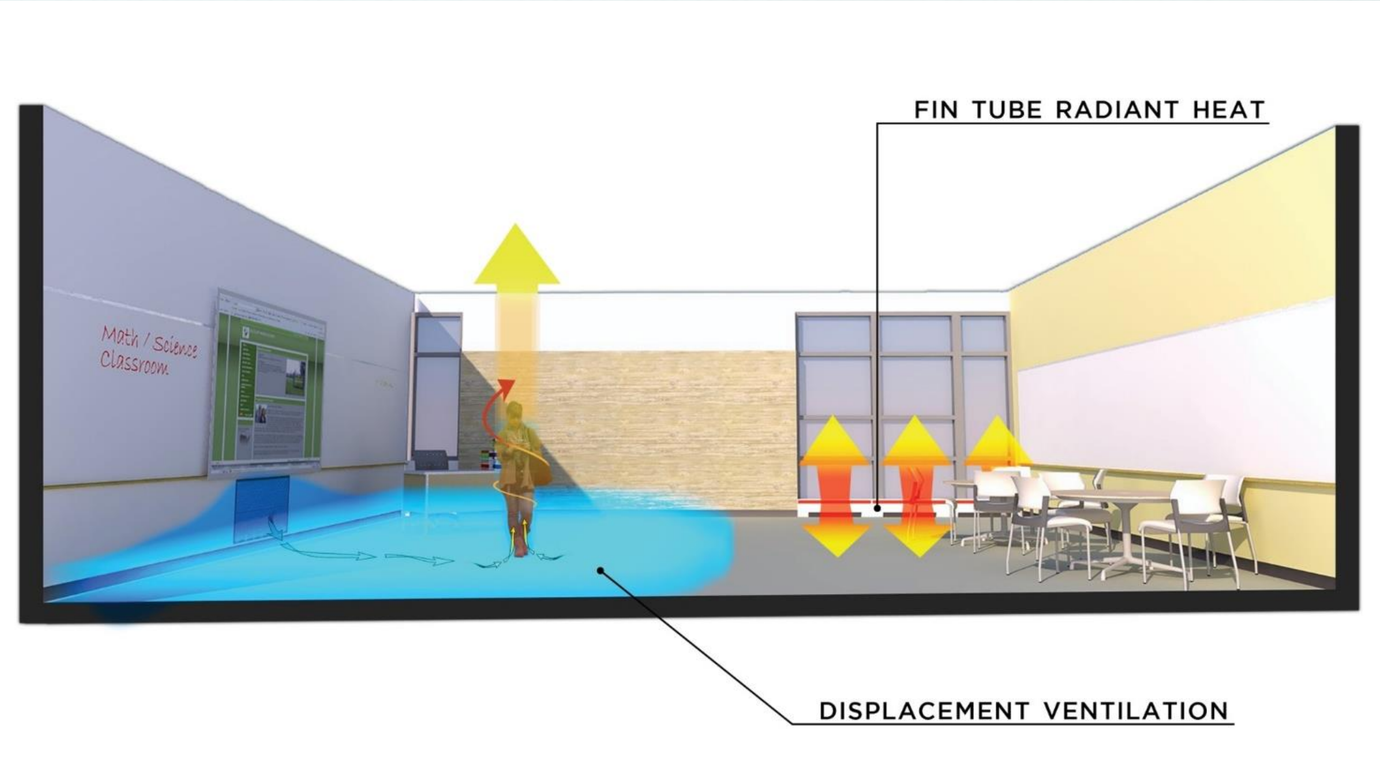
GEO-EXCHANGE + VAV



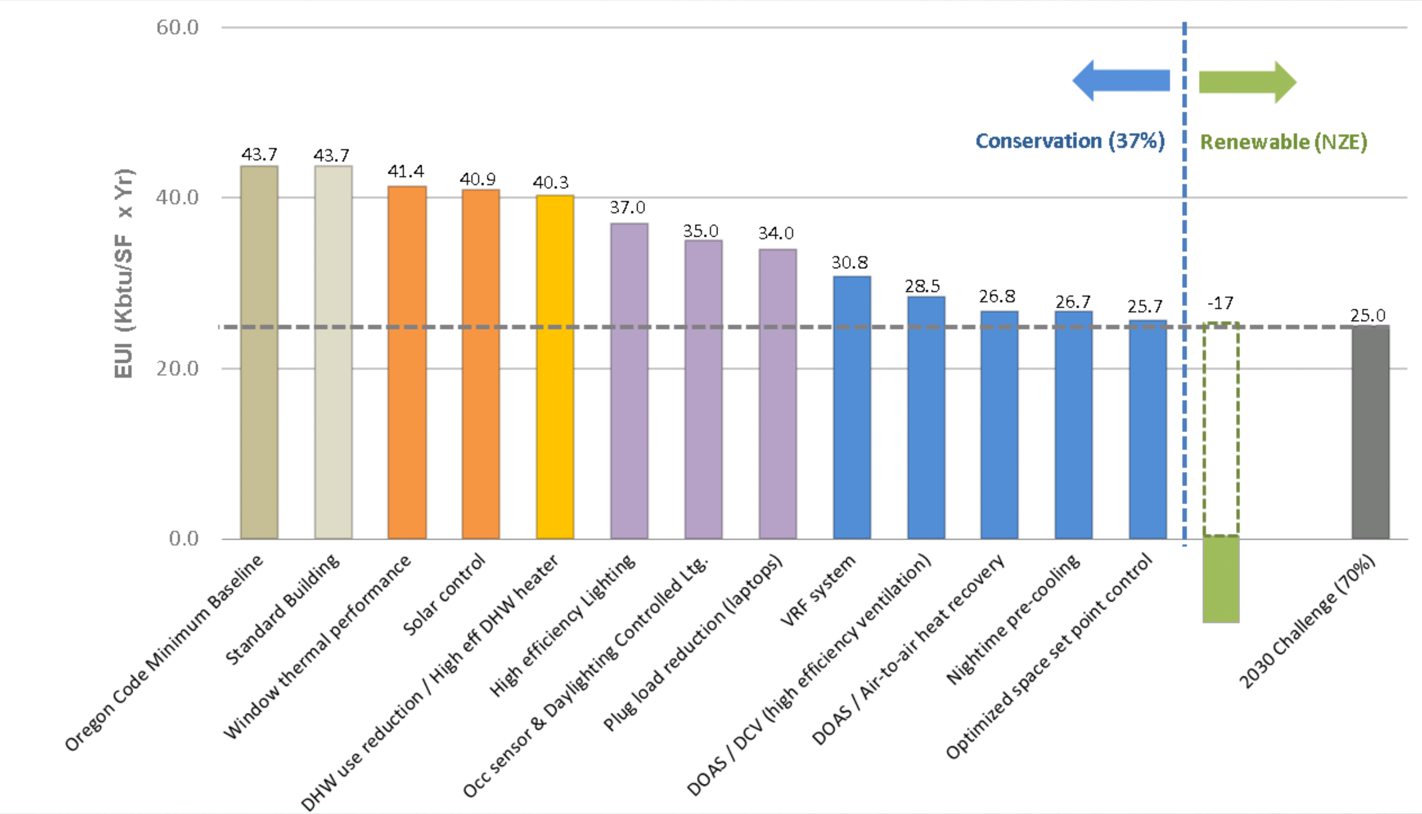
VAV SYSTEM


PACKAGED VAV DX UNIT
RETURN
SUPPLY
DIFFUSER
VAV TERMINAL
CONDENSER
FAN
OUTSIDE INTAKE
SUPPLY
RETURN
FILTERS & COILS

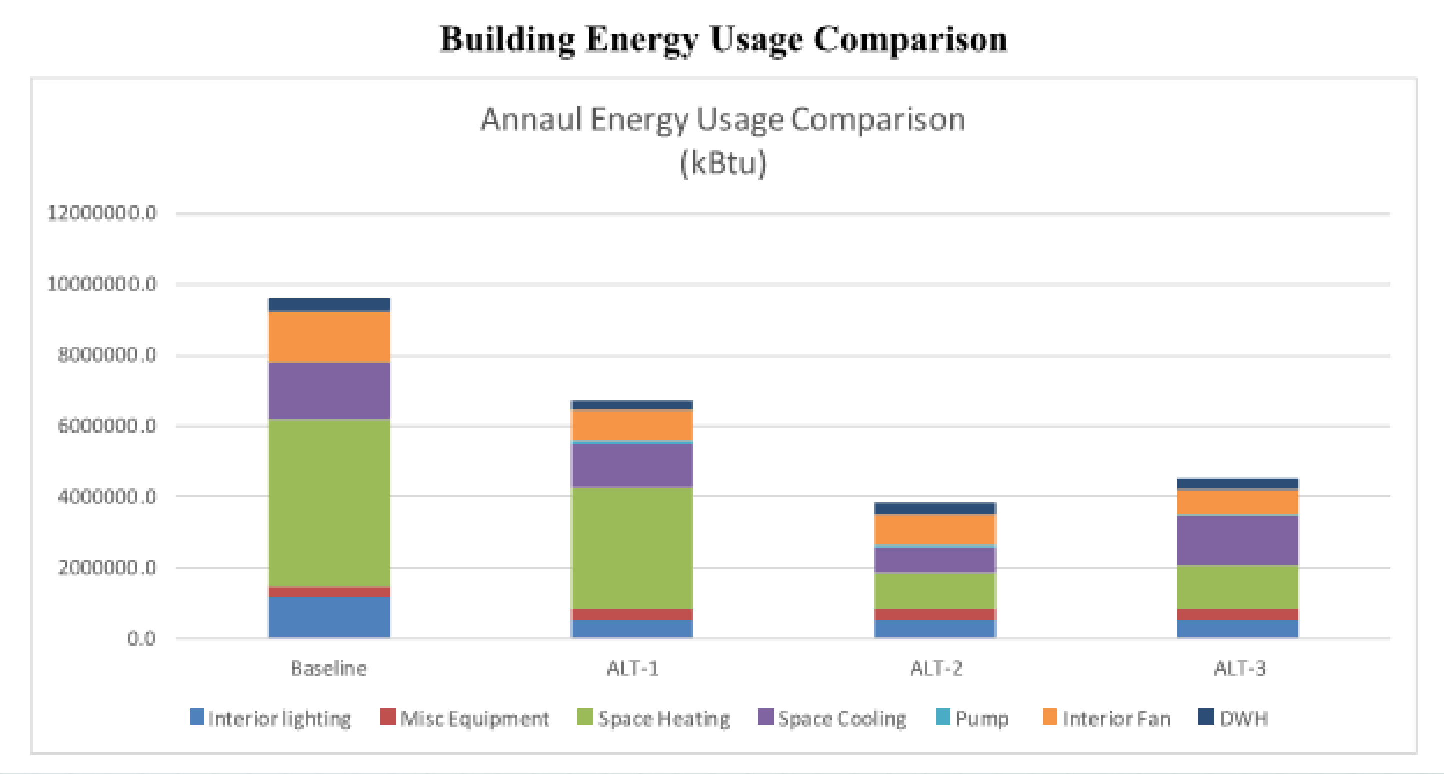
FIN TUBE + DISPLACEMENT VENTILATION



PATH TO NET ZERO GOALS



PATH TO NET ZERO GOALS



PATH TO NET ZERO GOALS

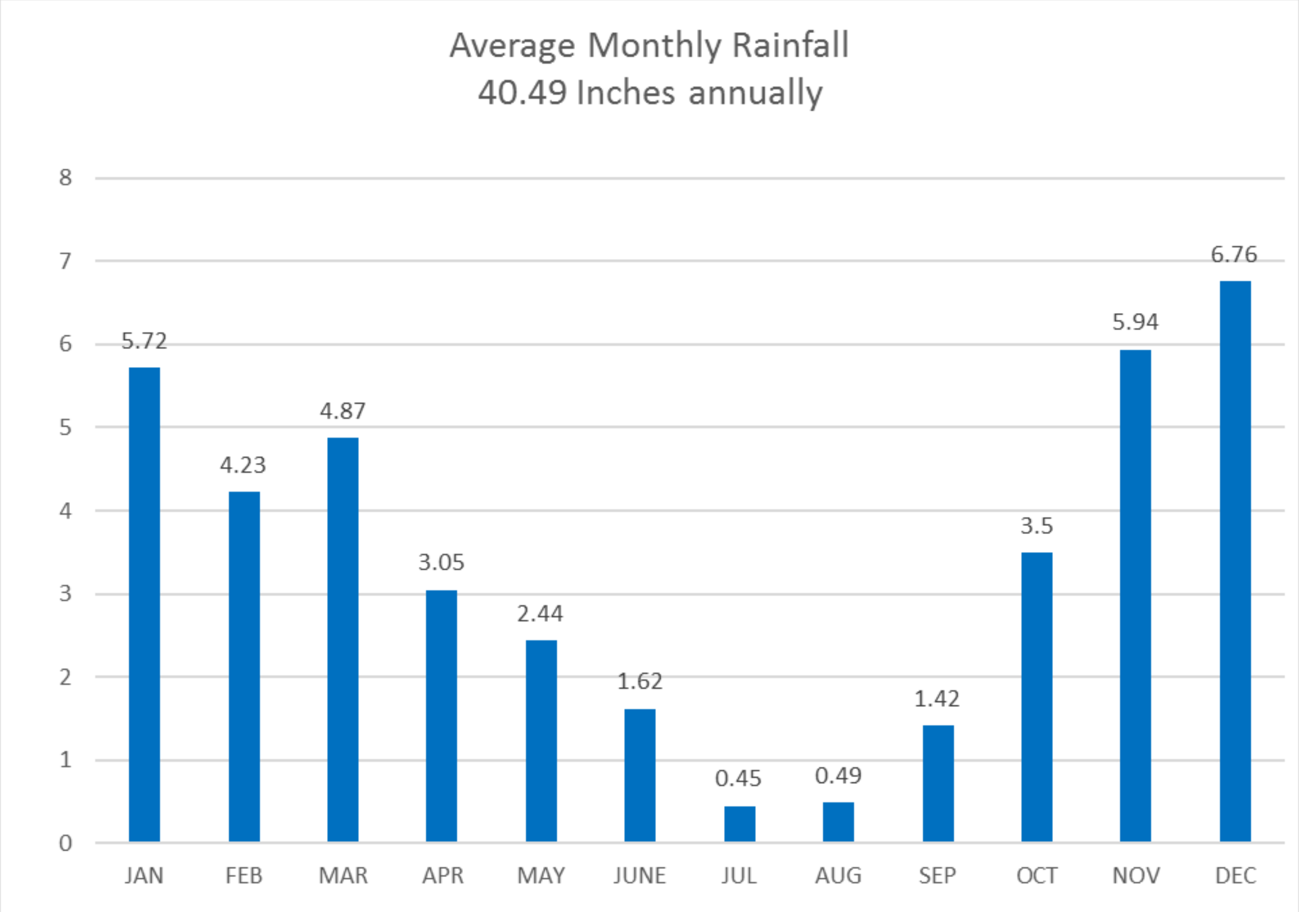
Results of the current energy analysis:

Building Energy and Energy Cost Savings

	EUI (kBtu/sf-year)	Energy Usage (MMbtu)	Energy Savings (%)	Energy cost ($)	Energy Cost Savings (%)
Baseline Building (90.1-2010 standard)	67.3	9,581	N/A	161,353	N/A
ALT-1 Building	47.4	6,742	29.6%	110,886	31.3%
ALT-2 Building	26.8	3,810	60.2%	80,498	49.9%
ALT-3 Building	31.7	4,507	52.9%	110,378	31.6%

A precious resource

Water


Average Monthly Rainfall
40.49 Inches annually
8
7
6
5
4
3
2
1
0
5.72
4.23
4.87
3.05
2.44
1.62
0.45
0.49
1.42
3.5
5.94
6.76
JAN
FEB
MAR
APR
MAY
JUNE
JUL
AUG
SEP
OCT
NOV
DEC

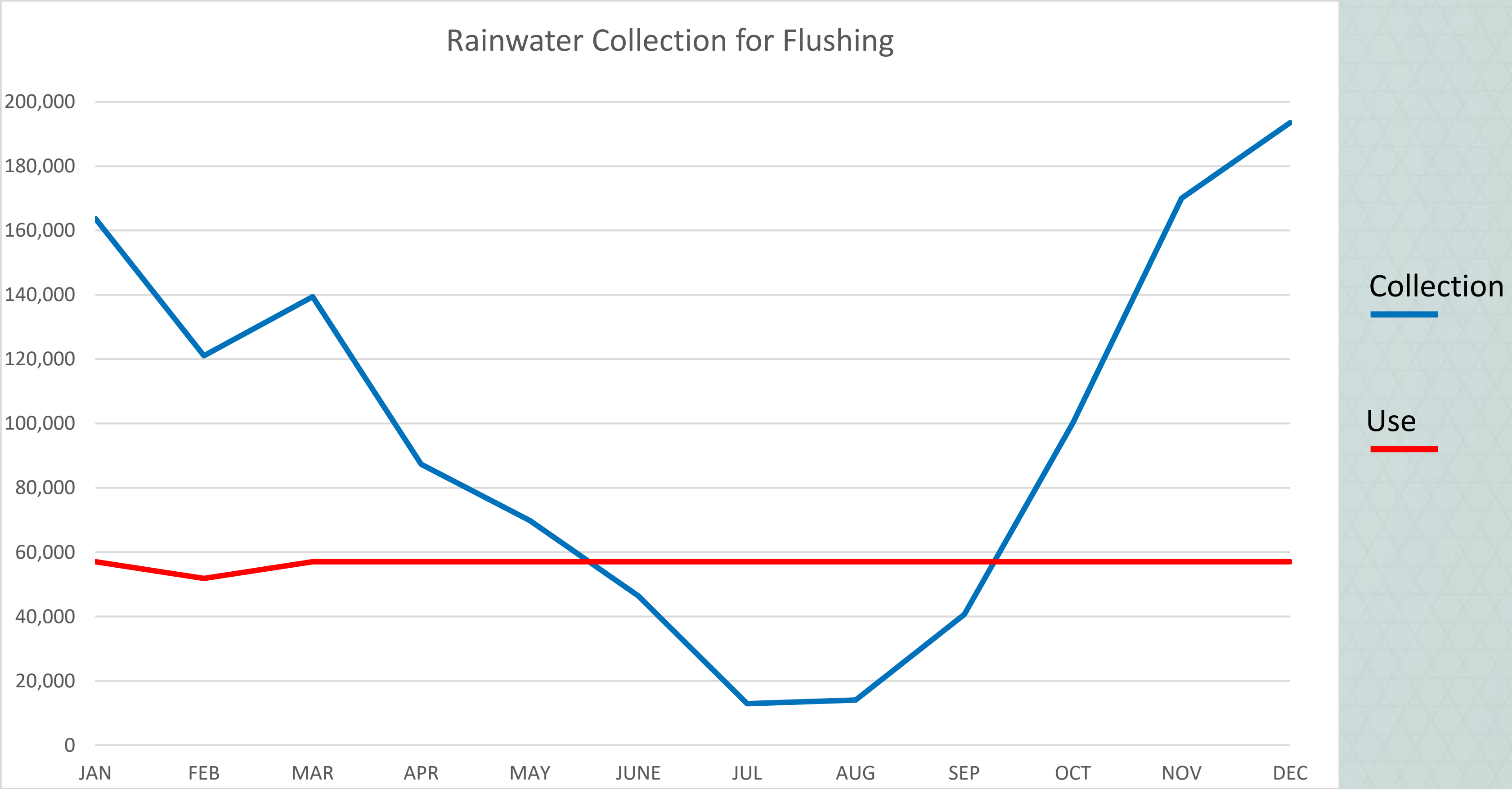
Rainwater collection

Kellogg School Cistern Calculations

Mt. Tabor Maintenance Yard Rain Gage - 6437 SE. Division St. Portland, OR

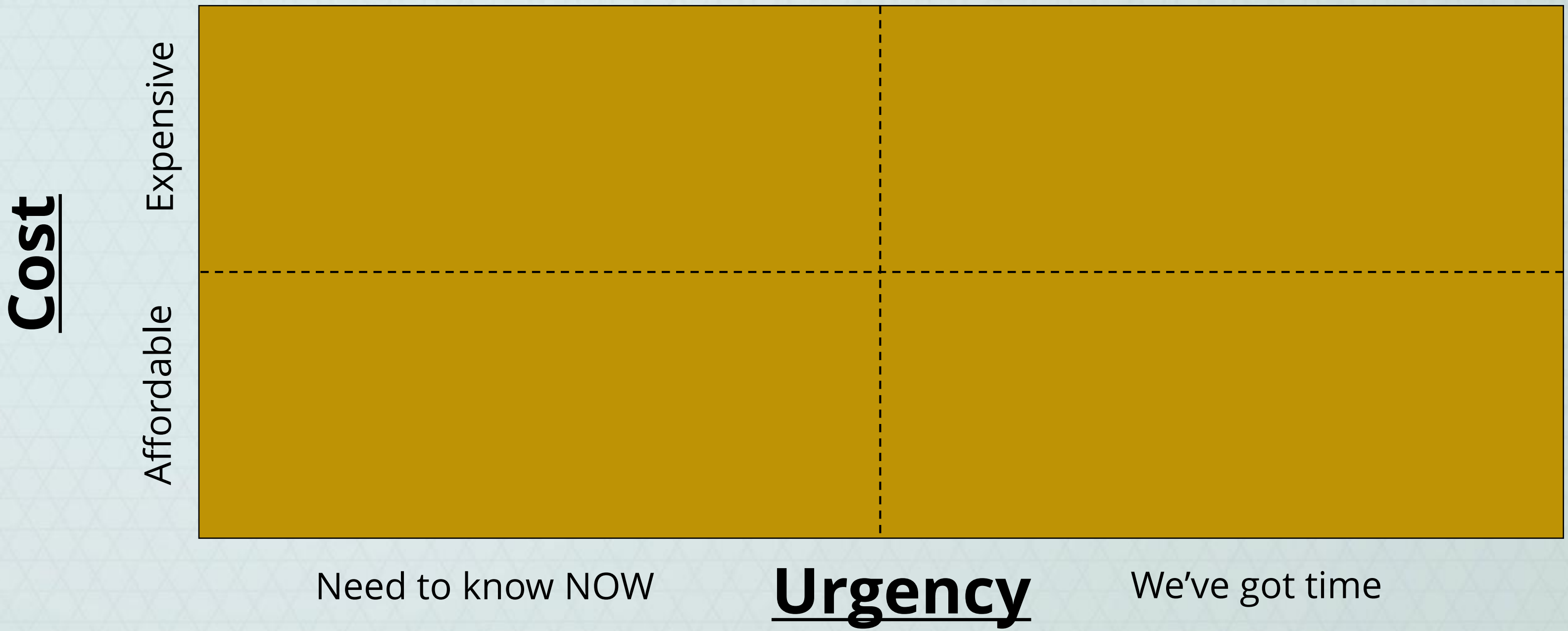
	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Rainfall Avg (IN)	5.72	4.23	4.87	3.05	2.44	1.62	0.45	0.49	1.42	3.5	5.94	6.76	**40.49**
Rainfall Avg (FT)	0.48	0.35	0.41	0.25	0.20	0.14	0.04	0.04	0.12	0.29	0.50	0.56	
Roof Area (FT2)	57,400	57,400	57,400	57,400	57,400	57,400	57,400	57,400	57,400	57,400	57,400	57,400	
Rain Volume (FT3)	27,361	20,234	23,295	14,589	11,671	7,749	2,153	2,344	6,792	16,742	28,413	32,335	
Rain Volume (Gal)	204,658	151,347	174,245	109,127	87,302	57,963	16,101	17,532	50,807	125,228	212,529	241,868	1,448,705
80% Capture Rate	163,726	121,077	139,396	87,302	69,841	46,370	12,881	14,025	40,645	100,182	170,023	193,495	1,158,964
Daily Flush Use (Gal)	2,592	2,592	2,592	2,592	2,592	2,592	2,592	2,592	2,592	2,592	2,592	2,592	
Work Days	22	20	22	22	22	22	22	22	22	22	22	22	262
Monthly Flush Use (Gal)	57,024	51,840	57,024	57,024	57,024	57,024	57,024	57,024	57,024	57,024	57,024	57,024	**679,104**
Percent Rainwater	100%	100%	100%	100%	100%	81%	23%	25%	71%	100%	100%	100%	83%
Monthly Rainwater Used (Gal)	57,024	51,840	57,024	57,024	57,024	46,370	12,881	14,025	40,645	57,024	57,024	57,024	**564,929**
Rainwater Diverted (Gal)	57,024	51,840	57,024	57,024	57,024	46,370	12,881	14,025	40,645	57,024	57,024	57,024	564,929
Percent Diverted	28%	34%	33%	52%	65%	80%	80%	80%	80%	46%	27%	24%	52%

Rainwater collection



Lightweight Ranking

Rank each measure



NEXT STEPS