



CULTIVATING EXCELLENCE



what is
SUSTAINABILITY
at Bristol Aggie?



Environmental Master-Plan

Sustainable Campus + Sustainable Buildings



COMMUNITY VISIONING – Goal Setting Process

Sustainability Goal NET ZERO WASTE

Reducing, reusing, and recovering waste streams to convert them to valuable resources with zero solid waste sent to landfills. -EPA

CURRENT	BASE PROJECT	FUTURE
Cafeteria food waste to pigs Recycling Washing placessettings Hand dryers in restrooms Manure fertilizes fields Farm uses/sells what it grows Drinking fountains/bottle filling stations	Minimize construction waste Infrastructure for waste management (recycling center) Use of recycled building materials Selection of materials that can be re-used	School purchasing program Minimizing excess consumption Facilities waste management plan <u>Zero construction waste</u> <u>Composting toilets</u> <u>Living machine</u> Life-cycle costing of materials Comprehensive composting system

HOET COMPOSTING

RAIN GARDENS

STORM-WATER TREATING

WHAT STRATEGIES SUPPORT ACADEMIC PROGRAMS?
 Zero construction waste - Understanding of impact by humans on natural resources
 Composting toilets - Understanding of composting & waste management
 Living machine - Understanding of waste/water cycle
 Composting system - Understanding of waste to energy (composting)
 Recycling - Material Awareness

WHAT STRATEGIES SUPPORT PUBLIC ENGAGEMENT?

WHAT STRATEGIES SUPPORT SUSTAINABLE AGRICULTURAL PRACTICES?

Bristol County Agricultural High School
VISIONING

Sustainability Goal NET ZERO WATER

Limit the consumption of water resources and return it back to the same watershed so as not to deplete the resources of that region in the quantity or quality over the course of the year. - EPA

CURRENT	BASE PROJECT	FUTURE
Bioswale RAIN GARDENS STORM-WATER TREATING	Native plants - min irrigation Efficient plumbing fixtures On-site stormwater retention Building water metering	Living machine Green roof <u>Capture, treat, & reuse water</u> Grey-water system Composting toilets <u>Water sub-metering</u>

GATE WATER

WHAT STRATEGIES SUPPORT ACADEMIC PROGRAMS?
 Living machine - Understand water treatment/monitoring
 Grey-water system - Understand system & water treatment/monitoring
 Rainwater capturing - Understand water treatment/monitoring
 Green roof - Plant identification

WHAT STRATEGIES SUPPORT PUBLIC ENGAGEMENT?

WHAT STRATEGIES SUPPORT SUSTAINABLE AGRICULTURAL PRACTICES?

Bristol County Agricultural High School
VISIONING

Sustainability Goal NET ZERO ENERGY

Producing, from renewable resources, as much energy on site as is used. -EPA

CURRENT	BASE PROJECT	FUTURE
HE Boiler - Ag Mech Light management Window replacement	Reduce plug loads Efficient envelope LED lighting Daylight harvesting Efficient windows Efficient MEP systems Lifecycle costing - systems Occupancy sensors	Photovoltaics Geothermal system Wind power Solar thermal

CO-GEN

METERING

SCHEM AS A SUPPORTIVE BUSINESS OPPORTUNITY

WHAT STRATEGIES SUPPORT ACADEMIC PROGRAMS?
 Photovoltaics - Metering & use of system
 Wind power - Metering & use of system
 Geothermal system - Metering
 Efficient envelope - Understanding of R & U values based on wall composition

WHAT STRATEGIES SUPPORT PUBLIC ENGAGEMENT?

WHAT STRATEGIES SUPPORT SUSTAINABLE AGRICULTURAL PRACTICES?

Bristol County Agricultural High School
VISIONING

Sustainability Goal HEALTH & WELLBEING

Optimization

CURRENT	BASE PROJECT	FUTURE
Public education Environmental education Practice sustainable farming	Positive acoustic experience Positive indoor air quality Thermal Control Outdoor light pollution reduction Access to light & views Landscape as teaching tool Awareness of natural & cultural resources Center for Science & the Environment to become a model for sustainable agriculture and resource management	Increase environmental education across curriculum

LIVING LAB

STUDENT INVOLVEMENT IN PROJECT

FALL/SPRING SHOW

WHAT STRATEGIES SUPPORT ACADEMIC PROGRAMS?

WHAT STRATEGIES SUPPORT PUBLIC ENGAGEMENT?

WHAT STRATEGIES SUPPORT SUSTAINABLE AGRICULTURAL PRACTICES?

Bristol County Agricultural High School
VISIONING



EDUCATIONAL GOALS

- All new facilities should be highly energy efficient, set net zero as a goal!
- Promote sustainable agricultural practices and sustainability curriculum
- Grow more food for students

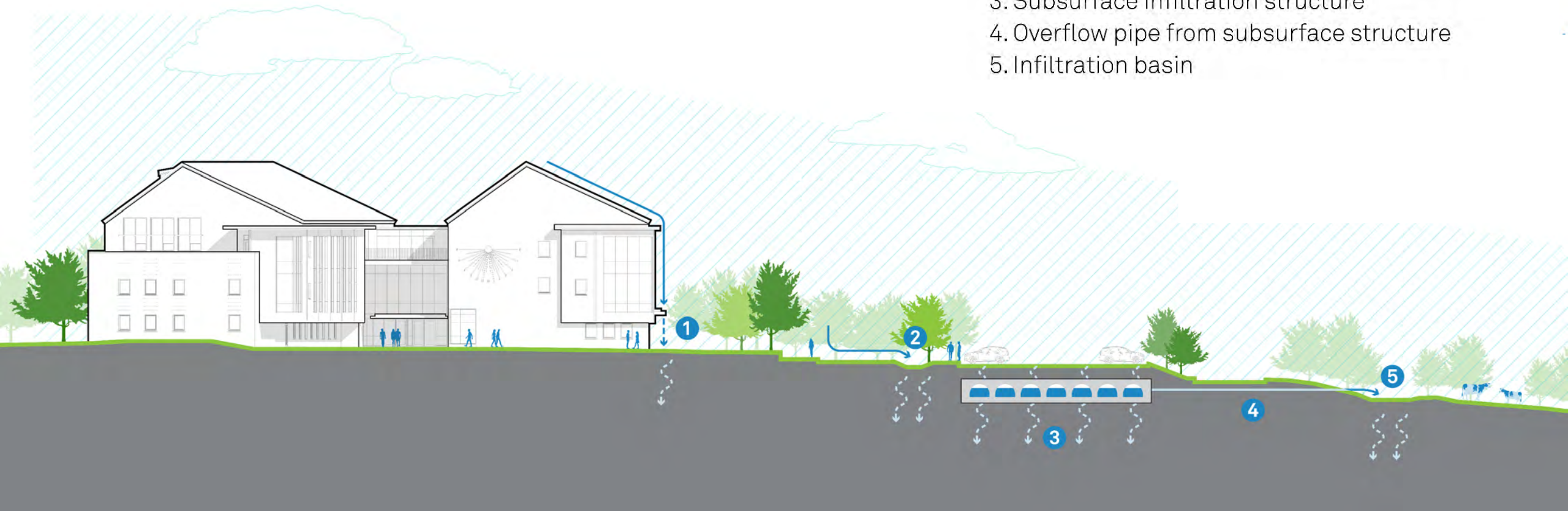
SUSTAINABILITY GOALS

- Achieve **10%** better than code
- Make each building /structure a champion for specific sustainability measures
- Center for Science and the Environment will be a *'living lab'* for the students and the community
- Design the dairy barn to be **Net Zero Energy**
- No impact on the Taunton River watershed



STORMWATER MANAGEMENT GROUNDWATER RECHARGE STRATEGIES

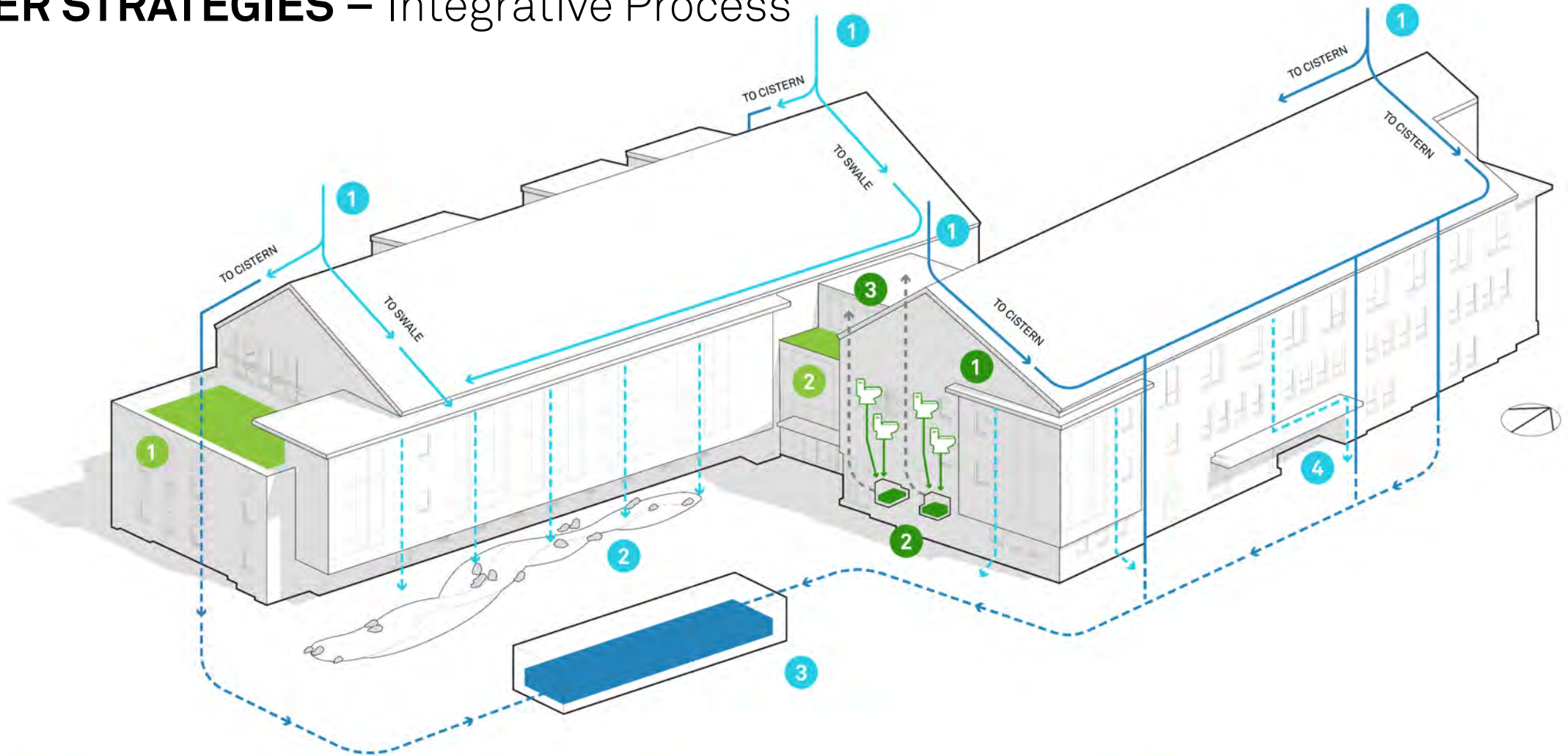
1. Rain chain and splash block
2. Surface water run-off captured in bioswale
3. Subsurface infiltration structure
4. Overflow pipe from subsurface structure
5. Infiltration basin



WATER SYSTEMS – Combined site and building strategies



WATER STRATEGIES – Integrative Process



STORMWATER MANAGEMENT

1. Incoming rain
2. Dry swale
3. Underground irrigation cistern
4. Rain chain



GREEN ROOFS

1. Intensive green roof
2. Extensive green roof



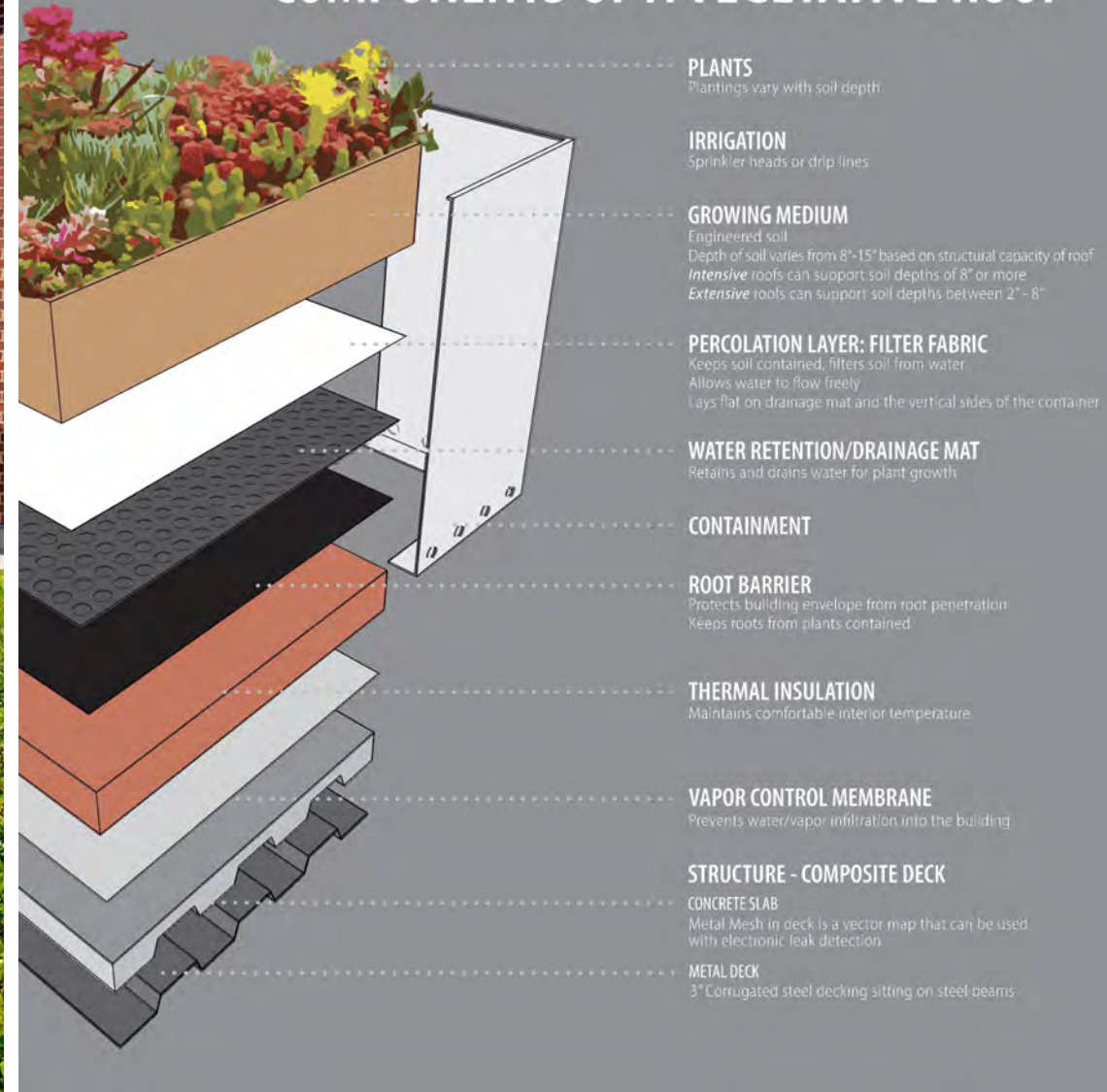
COMPOSTING TOILET SYSTEM

1. Composting toilets
2. Composters
3. Exhaust vents





COMPONENTS OF A VEGETATIVE ROOF



WATER STRATEGIES – Building Component and Teaching Tool

THE GLOBAL CARBON CYCLE

The natural carbon cycle maintains a stable level of carbon in the atmosphere, land, plants, and ocean. When we pump extra carbon into the atmosphere, the effect ripples through the others.

SLOW CARBON CYCLE

Carbon is stored in the ground and in rocks, and is released back into the atmosphere through volcanic activity. It is also released from the ground and rocks through the weathering of silicate rocks. This process is slow and takes millions of years. The carbon cycle is a complex system that involves the exchange of carbon between the atmosphere, land, and ocean. The slow carbon cycle is a key part of this system, and it plays a crucial role in maintaining the balance of carbon in the atmosphere.

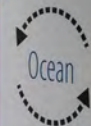
Atmospheric CO₂
+4.9 GtC

860 GtC



Ocean CO₂
2.5 GtC

90 ↓ ↑ 90



WATER

Water plays a significant role in absorbing atmospheric carbon, acting as the largest carbon sink, and storing plants and forests through photosynthesis, along with carbon.

Water on this planet is collected from the roof, carried to a cistern, located in the east at the entry of the Science Center. Site in occupation of water into the ground. Composting toilets and low flow fixtures reduce water use within the building.

Organic Carbon
700 GtC

Surface Sediments
1750 GtC

Marine Biota
3 GtC

Dissolved Inorganic Carbon
38,000 GtC



WASTE Composting Toilets

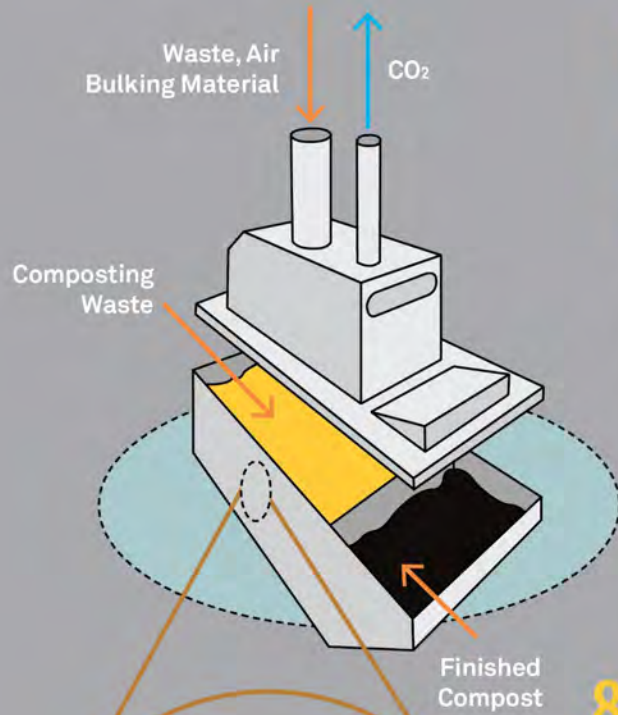
Composting toilets allow for the distribution of essential plant nutrients into the soil. Nutrients from conventional toilets that would typically be sent to the sewer system will now remain on-site to be used as compost. Soil is one of the largest carbon sinks our planet uses to regulate the natural carbon cycle. Healthy soils contribute to healthy flora and fauna.

- 8 composting toilets in the CSE
- 68% reduction from approx. 235,000 GPY in water consumption from flush fixtures
- 32% reduction from approx. 235,000 GPY in water consumption from flow fixtures
- 95% reduction in solid waste netted from decomposition cycle









Composting Waste Layers

WASTE

Composting Toilets

Composting toilets allow for the distribution of essential plant nutrients into the soil. Nutrients from conventional toilets that would typically be sent to the sewer system will now remain on-site to be used as compost. Soil is one of the largest carbon *sinks* our planet uses to regulate the natural carbon cycle. Healthy soils contribute to healthy flora and fauna.

- 8** composting toilets in the CSE
- 68%** reduction from approx. 235,000 GPY in water consumption from flush fixtures
- 32%** reduction from approx. 235,000 GPY in water consumption from flow fixtures
- 95%** reduction in solid waste netted from decomposition cycle



ANIMAL FEED

Feeding food scraps to animals reduces waste and avoids methane generation from landfills.

Using food waste for animal feed preserves resources, such as fresh water and arable land, since less feed needs to be produced.

ACCEPTABLE FOOD
VEGETABLE & FRUIT SCRAPS
DAIRY PRODUCTS
EGGSHELLS & NUTSHELLS
BREADS, CEREALS & PASTA
COOKIES
COFFEE GROUNDS
SPOILED FOOD

NO OTHER ITEMS ARE ACCEPTABLE



COMPOST

Composting diverts another 50% of trash from landfills for a variety of potential uses.

ACCEPTABLE FOOD
ALL VEGETABLE & FRUIT SCRAPS
MEAT SCRAPS & BONES
DAIRY PRODUCTS
SEAFOOD & SHELLS
EGGSHELLS & NUTSHELLS
BREADS, CEREALS & PASTA
COOKIES & CANDY
COFFEE GROUNDS
SPOILED FOOD

ACCEPTABLE PAPER PRODUCTS
NAPKINS, PAPER TOWELS & TISSUES
PAPER PLATES & PAPER BAGS
PAPER COFFEE CUPS & FILTERS
TEA BAGS
PAPER SUGAR PACKETS
WAXED PAPER
PAPER SANDWICH WRAPPERS
PAPER TAKEOUT CONTAINERS
PAPER MILK CONTAINERS
PAPER JUICE & ICE CREAM CONTAINERS
GREASY PIZZA BOXES

OTHER ACCEPTABLE PRODUCTS
COMPOSTABLE PLASTIC BAGS & PRODUCTS
CERTIFIED BY US COMPOSTING COUNCIL
HOUSEPLANTS, FLOWERS & POTTING SOIL
WOODEN COFFEE STIRRERS
PET FUR & FEATHERS
PET FOOD
SHREDDED PAPER (SHOULD BE RECYCLED)



MIXED RECYCLING

When managed properly, recycled materials can become the 'raw' materials for other industries.



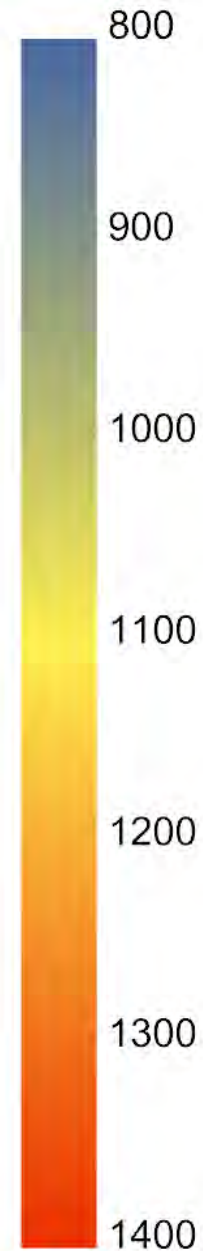
LANDFILL

At schools, landfill is first reduced 50% by recycling. The remaining trash is further reduced 50% by composting. This saves landfill space, reduces incinerated waste, and saves money.



ENERGY STRATEGIES

- Solar ready roof structures at all new construction (*School engaged in a PPA*)
- Electric vehicle charging stations (*4 Stations – 8 parking spaces*)
- Efficient Envelope:
Building Envelope - Roof R-42.18, Walls R-20.69, triple-pane windows, and double-pane curtain wall
- LED lighting (*tunable white in labs*) – below code LPD
- 8 composting toilets



Radiation, kWh/m²





Architecture Supporting Student and Community Sustainability

Student and Community Sustainability

- Physical Health
- Social & Emotional Wellbeing
- Belonging/Community
- Purpose/Engagement
- Challenge Leading to Growth



Architect's Tools

- Natural Light/Acoustics/ Indoor Air Quality
- Spatial Variety & Flexibility
- Identity/Placemaking thru Design
- Connections to Nature
- Internal Visibility/Perspective
- Infrastructure for Student Engagement

The Campus:

Create a variety of places for social & academic learning

Emphasize connections with nature

Make places that reinforce identity and culture



The Student Commons:

Designing for Natural Light, Good Acoustics and Indoor Air Quality





Media Center:

Variety of spaces
Flexibility
Adaptability

Graphics:
Reinforce
identity and
culture





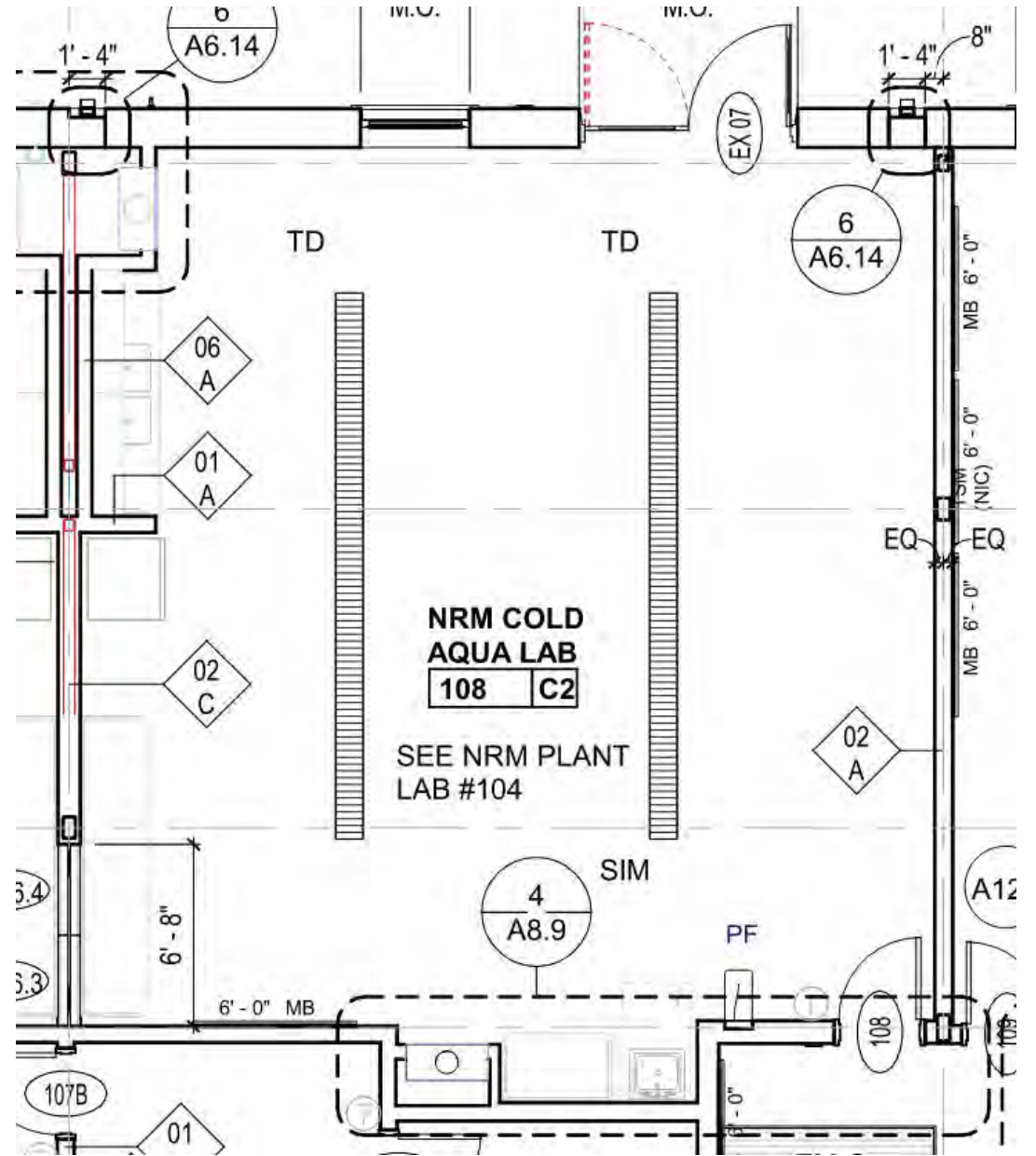
Natural History Museum:

Infrastructure for
Student
Engagement

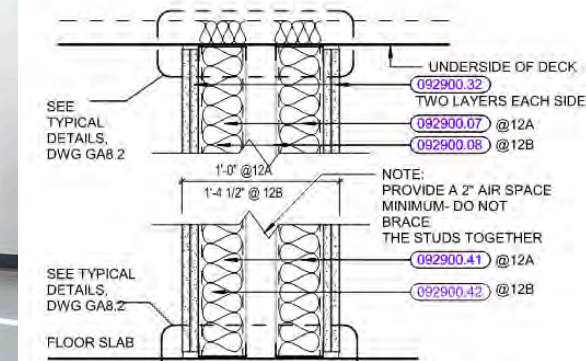
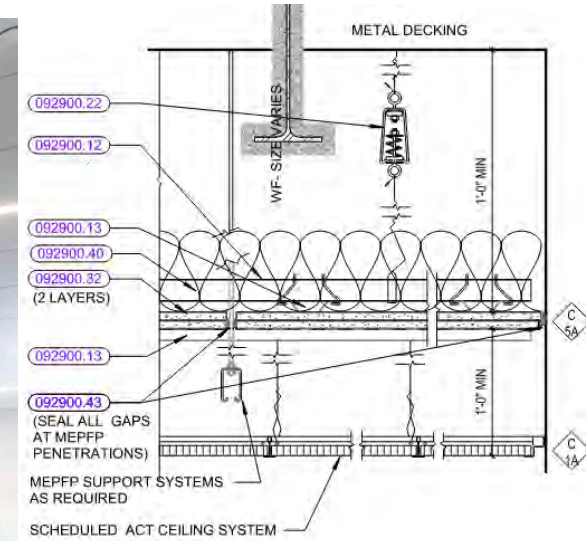
NATURAL RESOURCE MANAGEMENT– School as a lab



NATURAL RESOURCE MANAGEMENT– Flexible Lab Space

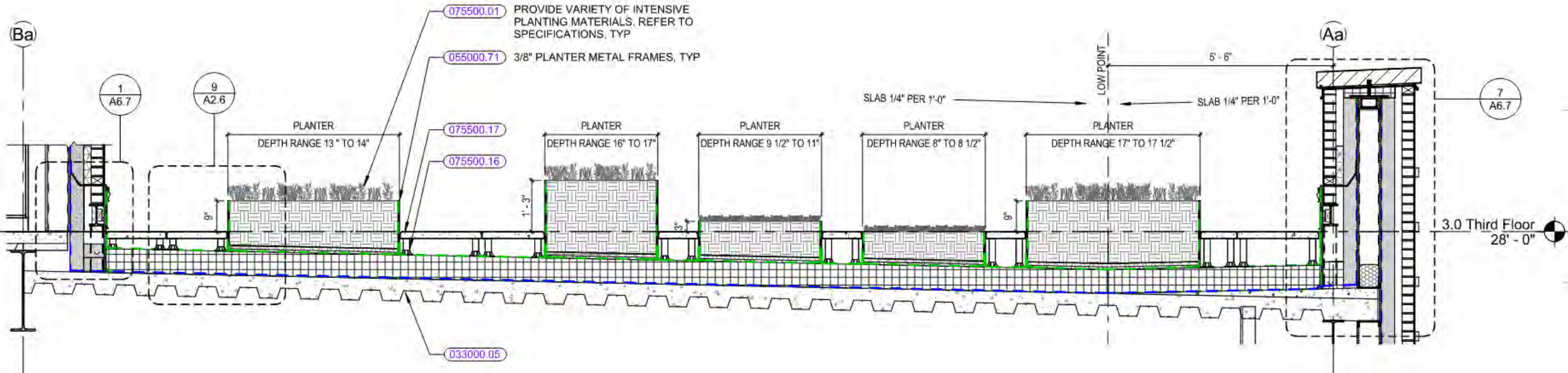
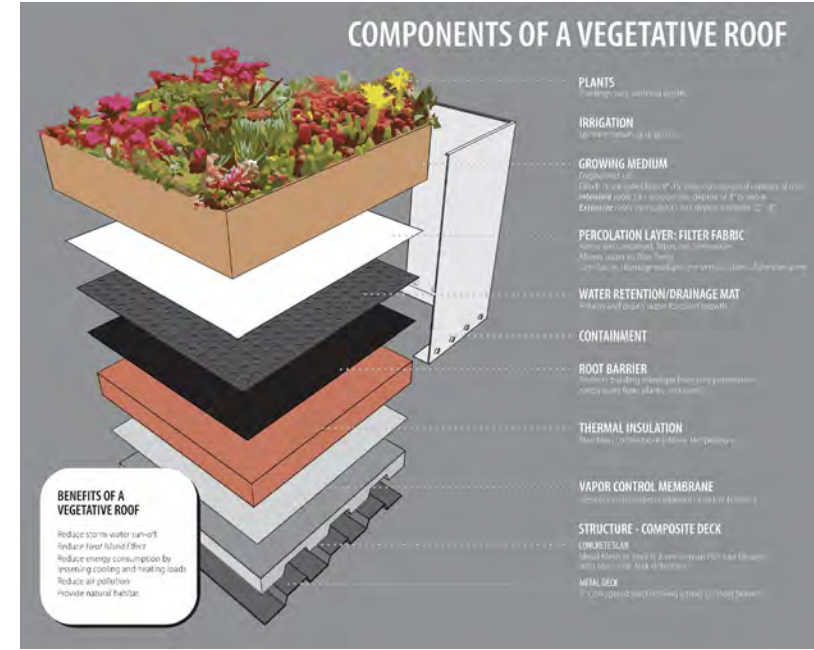


GROOMING LAB – Attention to Acoustics

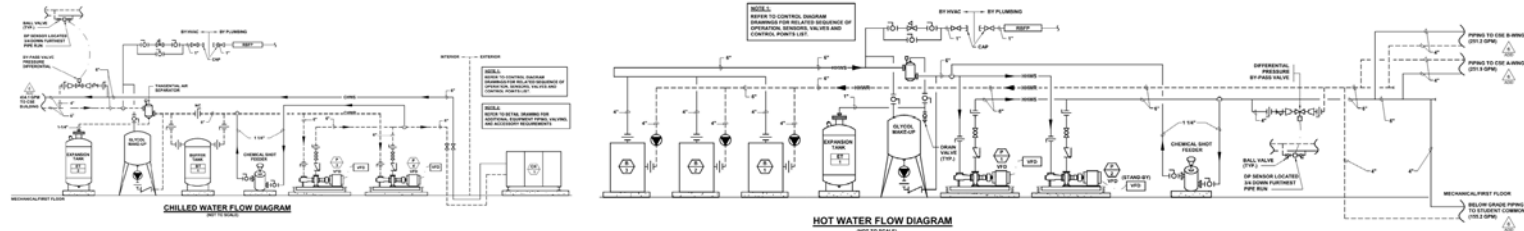


3 5/8" STUDS - SOUND ISOLATION PARTITION STC 64-66 UL U420	12 A	3 5/8" STUDS - SOUND ISOLATION PARTITION STC 64-66	12 A
6" STUDS - SOUND ISOLATION PARTITION STC 65-67	12 B	6" STUDS - SOUND ISOLATION PARTITION STC 65-67	12 B

ENVIRONMENTAL ENGINEERING– School as a learning tool



ENVIRONMENTAL ENGINEERING– School as a learning tool



CHILLED WATER FLOW DIAGRAM (NOT TO SCALE)

The Chilled Water System supports the cooling of air within the AHU which distributes air to spaces through Displacement Diffusers and Induction Units in the ceilings.

EXPANSION TANK: Allows for thermal expansion and contraction of HHW/CHW fluid within the system as it's temperature varies.

BUFFER TANK: A tank that is utilized to increase the overall water volume of a hydronic system in order to increase water cycle time through a water system such as heating or chilled water, during periods of low load condition, helping to produce rapid temperature swings in the water system, allowing for more gradual operation of the heating hot water, or chilled water plant.

HYDRAULIC PUMPS: The chilled water system uses variable frequency drive pumps to circulate water to terminal units and air handling units. The pumps are controlled by a building management system to maintain the required flow rate based on the load.

HOT WATER FLOW DIAGRAM (NOT TO SCALE)

The Hot Water System supports the heating of air within the AHU which distributes air to spaces through Displacement Diffusers at the walls and Induction Units in the ceilings. It also supports the heating of water for the Radiant Panels located typically within ceilings at the exterior walls.

BOILERS: High efficiency gas fired condensing boiler providing heating hot water throughout the building to terminal units such as radiant ceiling panels, cabinet units heaters

GLYCOL MAKEUP: Provides a reservoir of pre-mixed solution that will automatically be injected into the hot water, or chilled water, piping system should pressure drop below a certain setpoint.

CHEMICAL SHOT FEEDER: Allows for a means to insert chemicals into the water system to maintain water pH levels and help overall system cleanliness.

ABORICULTURE - School as a learning tool

