Creating an Eco-District at Lincoln High School

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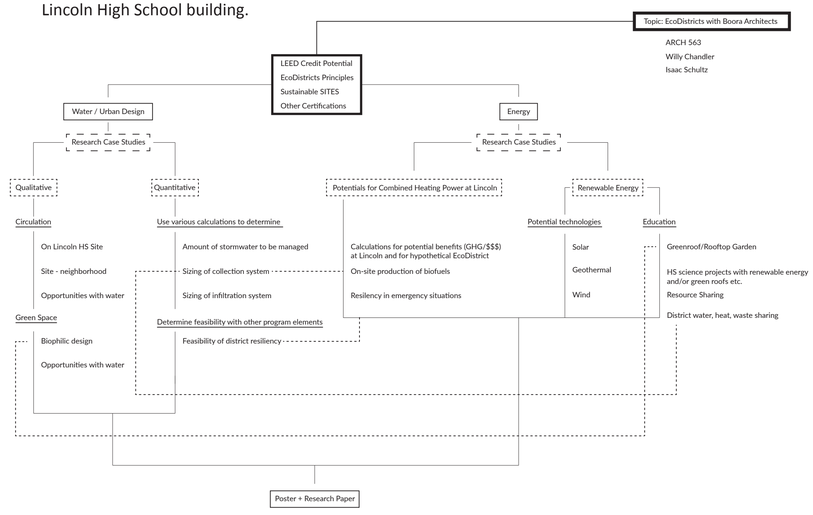
WHAT IS AN ECODISTRICT?

The EcoDistrict protocol is a list of concepts centered around connectivity, sustainability, and resiliency in neighborhoods and urban environments. Initial research consisted of reviewing precedents for EcoDistricts and other high performance neighborhoods and schools. Lincoln High School, Providence Park and the Multnomah Athletic Club were identified as the stakeholders of a potential EcoDistrict due to their location and energy demand. Calculations and estimates were made for the potential employment of "green" energy and water technologies on site and in the surrounding neighborhood. Estimates were made to determine what would be necessary to achieve net zero annual energy and water consumption in the new Lincoln High School building.



METHODOLOGY

Research was conducted through case studies and articles to determine the potential of creating an EcoDistrict at the Lincoln High School (LHS) site. Topics including energy, water, circulation, green space, and parks were weighed to determine the applicability of each to the project. Additionally, potential stakeholders were chosen based on proximity to the site and intensity of use. Water and energy were chosen as focus areas through which to determine the feasibility of district utility plans. Circulation, green space, and parks would then represent the route and location of various current and historic infrastructure, would be integrated as 'soft' or 'green' infrastructure, and would be implemented to address difficult circulation connections and other issues of urban design. Lincoln High School, Providence Park, and Multnomah Athletic Club were chosen as stakeholders, given their close proximity and high intensity of energy and water usage.

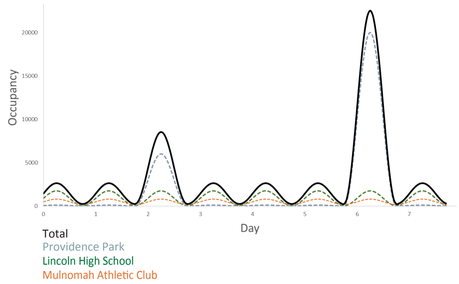
ANALYSIS

Assuming the new building is highly efficient via LED lighting, natural ventilation, high performance HVAC systems etc. the energy usage intensity is estimated to be reduced to 25 kBTU/yr/ft.2 (compared to the current national average of 58 kBTU/yr/ft.2). Installing a geothermal system will reduce this annual demand by about 40% in the pacific northwest. After the reduction in demand from efficient building practices and geothermal, two thirds of the remaining demand can be met with 85,000 ft.2 of photovoltaic panels installed on the roof. The remaining portion of the energy supply could come from on-site renewable sources such as solid waste incineration. With all of these ideas implemented, the new Lincoln high school building could achieve net zero annual purchased energy, and would potentially be eligible for LEED certification along with various tax incentives.

OCCUPANCY ANALYSIS

Current building EUI would reduce by at least half when employing high-performance building systems.

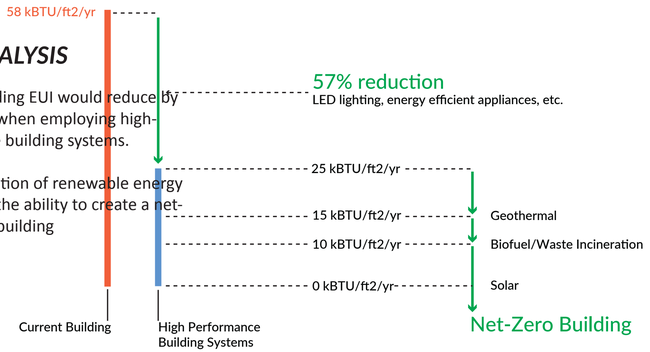
The combination of renewable energy sources has the ability to create a net-zero energy buildingGendenis quas doluptibus pore volecea sandelles



ENERGY ANALYSIS

Current building EUI would reduce by at least half when employing high-performance building systems.

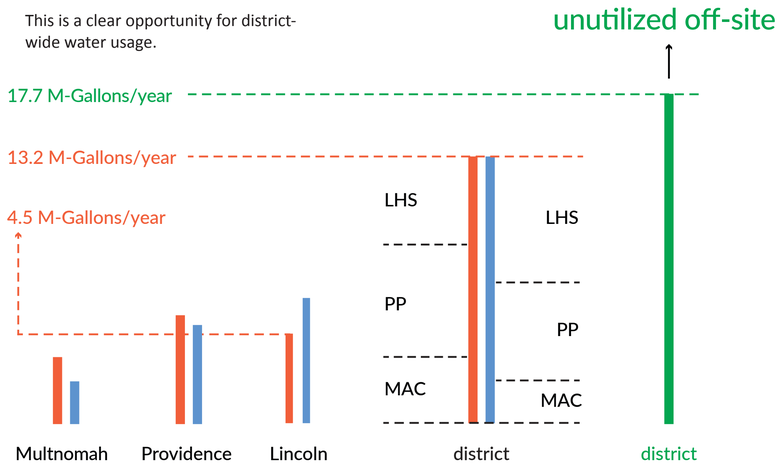
The combination of renewable energy sources has the ability to create a net-zero energy building



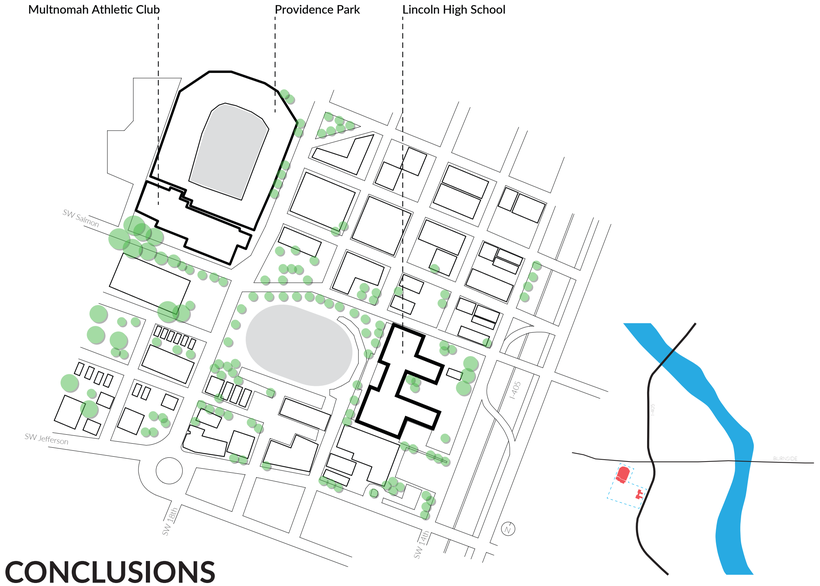
WATER ANALYSIS

Demand and collection is roughly the same when all stakeholders are compared.

This is a clear opportunity for district-wide water usage.



PROPOSAL



CONCLUSIONS

There are several options LHS EcoDistrict can take to mitigate these impacts. The first is to only recycle building water. The second is to recycle building water and collect rainwater that falls on stakeholder buildings and turf fields. Because these must already have means of catchment and conveyance, this system would not require extensive modification aside from the construction of filtration and storage facilities. The third adds to the first two options by collecting water from the Goose Hollow watershed, filtering it, storing it, and using it. This is a future-oriented district-wide option that would take into account the Goose Hollow and Portland West Quadrant plans for future commercial and cultural development in the area.

GREEN SPACE

Parks follow circulation route, which also double as the course of water movement.

WATER

Water filtration and collection are located at a central, gravity-fed location.

ENERGY

Geothermal loops would be placed beneath the existing turf field. Solar panels would cover the roof and potentially side of the high school.

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WHAT IS AN ECODISTRICT?

The EcoDistrict protocol is a list of performance criteria centered around equity, resilience, and climate imperatives, and their subsequent implementation in the facilitation of neighborhoods and urban environments. Initial research consisted of reviewing the EcoDistricts protocol and its precedents, similar ecodistrict typologies, and its applicability to the Lincoln High School site.

Lincoln High School, Providence Park and the Multnomah Athletic Club were identified as stakeholders of a potential ecodistrict due to their location and energy demand. Water and energy were chosen as focus areas through which to implement potential performance outcomes. The possibility of employing "green" energy and water technologies on site and in the surrounding neighborhood were further researched. Water was more feasible to estimate at a district scale, whereas energy proved more difficult. For this reason, the proposal explored water solutions at a district scale and energy solutions at Lincoln High School that might be replicated and further integrated at a district scale.

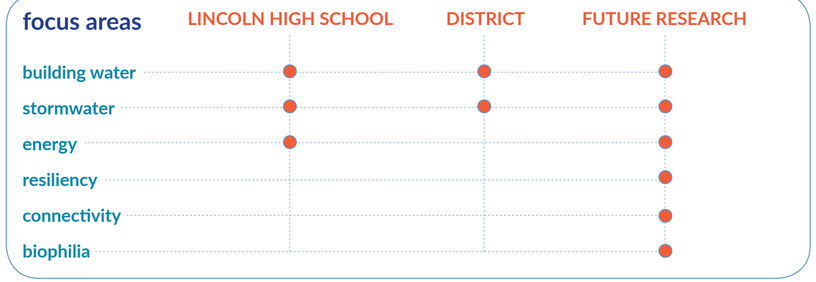
IMPERATIVES
equity resilience climate

PRIORITY AREAS
place
prosperity
health & wellbeing
connectivity
ecosystem health
resource protection

IMPLEMENTATION
formation roadmap action

RESEARCH METHODOLOGY

district stakeholders | LINCOLN HIGH SCHOOL | MULTNOMAH ATHLETIC CLUB | PROVIDENCE PARK

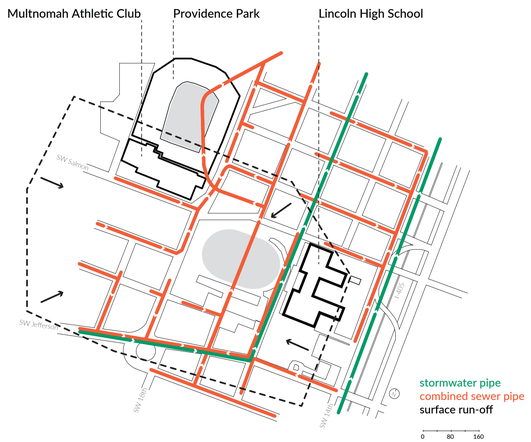


ANALYSIS

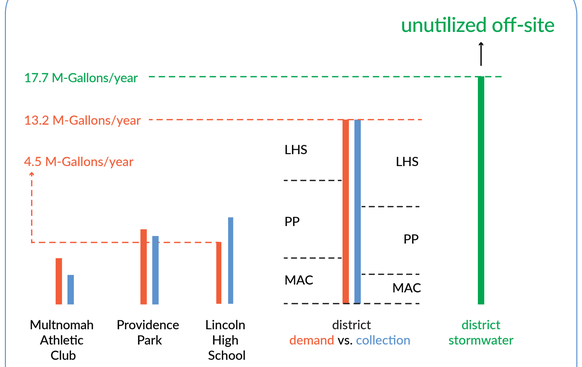
Even after installing a 14ft-diameter stormwater pipe, it is estimated that over 4 combined sewer (CSS) overflow events into the Willamette River will occur each year. A prevalence of CSS and stormwater pipes convey the majority of the stormwater off-site, taxing the city's sewage system and polluting the river.

Based on typical occupancy demands and collection areas on-site, it was estimated that while LHS might possibly collect enough water to meet its demand, Providence Park and Multnomah Athletic Club likely could not. However, by spreading the collection and demand over the three stakeholders and utilizing stormwater as an opportunity, there is the potential to significantly reduce reliance on municipal water.

Based on the current national average, Lincoln High School's energy usage was estimated at 58 kBTU/yr/fr^2. By employing high performance and renewable energy sources LHS has the potential to be a net-zero building

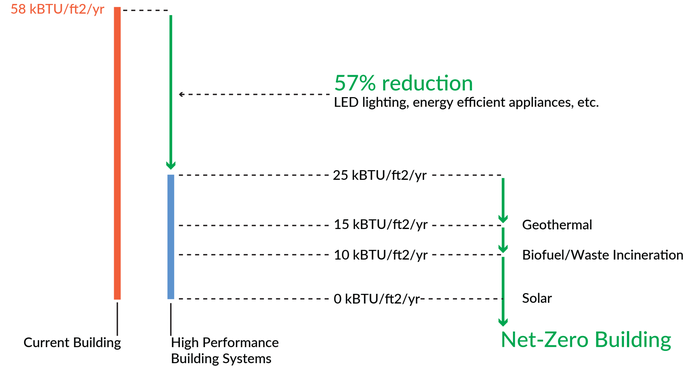


WATER



*all figures estimated

ENERGY



*all figures estimated

CONCLUSIONS

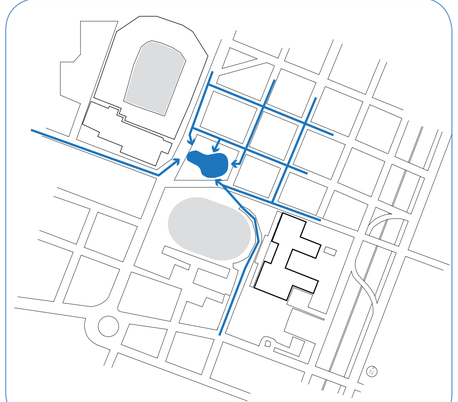
An estimated 17.7 million gallons of stormwater runoff could be kept from the sewer and waterways per year. What is currently a parking lot could be converted into a centrally-located retention pond or constructed wetland to hold that water and become an urban amenity.

Building grey and blackwater could be recycled at a district scale utilizing the same location. Given space requirements, only a portion could be recycled; however, differences in daily and yearly occupancy times might provide an opportunity towards this end.

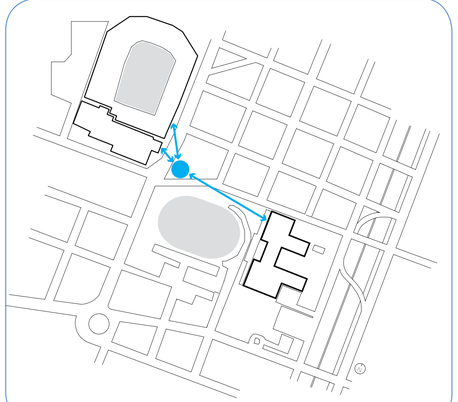
Renewable energy sources, such as geothermal, solar, and biofuel/incineration, could be deployed at one or all active stakeholders. In the future, larger geothermal systems might be tapped into and additional stakeholders might be inspired by the work of others.

Overall, integrating all systems into a holistic strategy could combine infrastructure with connectivity, resiliency, and biophilic design to synergize a vibrant, healthy, equitable public urban environment.

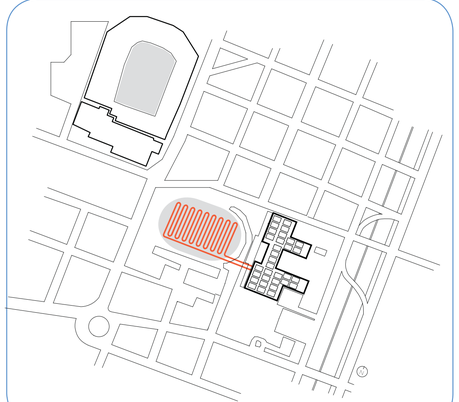
DISTRICT STORMWATER



DISTRICT BUILDING WATER



LHS ENERGY



COLLABORATION GOALS

- MANAGE ALL STORMWATER ON SITE
- RECYCLE AND COLLECT BUILDING WATER CENTRALLY
- REDUCE ENERGY USE AND PRODUCE ON SITE
- MAKE ALL SYSTEMS VISIBLE AT THE URBAN SCALE
- INTEGRATE SYSTEMS TO EMPLOY PRINCIPLES OF CONNECTIVITY, BIOPHILIC DESIGN, AND RESILIENCY
- EMPHASIZE PUBLIC PARTICIPATION