

# Manchester District Redevelopment

## EVDS 616 | Assignment 3 | Final Deliverable | Winter 2019

The Redevelopment of Manchester aims to achieve 100% renewable energy, zero waste sent to the landfill, net zero water, 80% reduction in green house gas emissions, a Fair Share Ecological Footprint, and high levels of walk-ability. This redevelopment will allow the district to accommodate 100,000 residents and 35,000 jobs. For this proposal, we looked at the generation of renewable energy for the district, as well as wastewater management, potable water, rainwater collection, transportation, and food production.

### Energy Calculation

Electricity = 135,000 people x 6,208KWh/cap/year = **838,080 MWh/year**  
 With 60% site coverage of solar panels (on rooftops, as well as vertical faces of some buildings), passive strategies, and efficient appliances, 100% of electricity needs can be reduced.

Enmax generates 55 MW of Heat Energy for 2.5 times less area  
 Heat Energy = 55 MW x 2.5 x 24 hr x 365 days x 0.85 eff. = **1,023,825 MWh/year**  
 With passive building design and geothermal wells, 100% of heat energy needs can be reduced.

### Wastewater Calculations

[Bonnybrook avg. flow/# people] x Manchester pop. x 1.1  
 [531ML/day / 850,870 people] x 135,000 people x 1.1  
 = 92.7 ML/day (**33,835 ML/year**)  
 -68% by using water efficient appliances = **10,827 ML/year**

### Stormwater

Rainfall = 209mm/year  
 209mm x 4,912,790m<sup>2</sup> = **1,027 ML/year**

### Potable Water Calculations

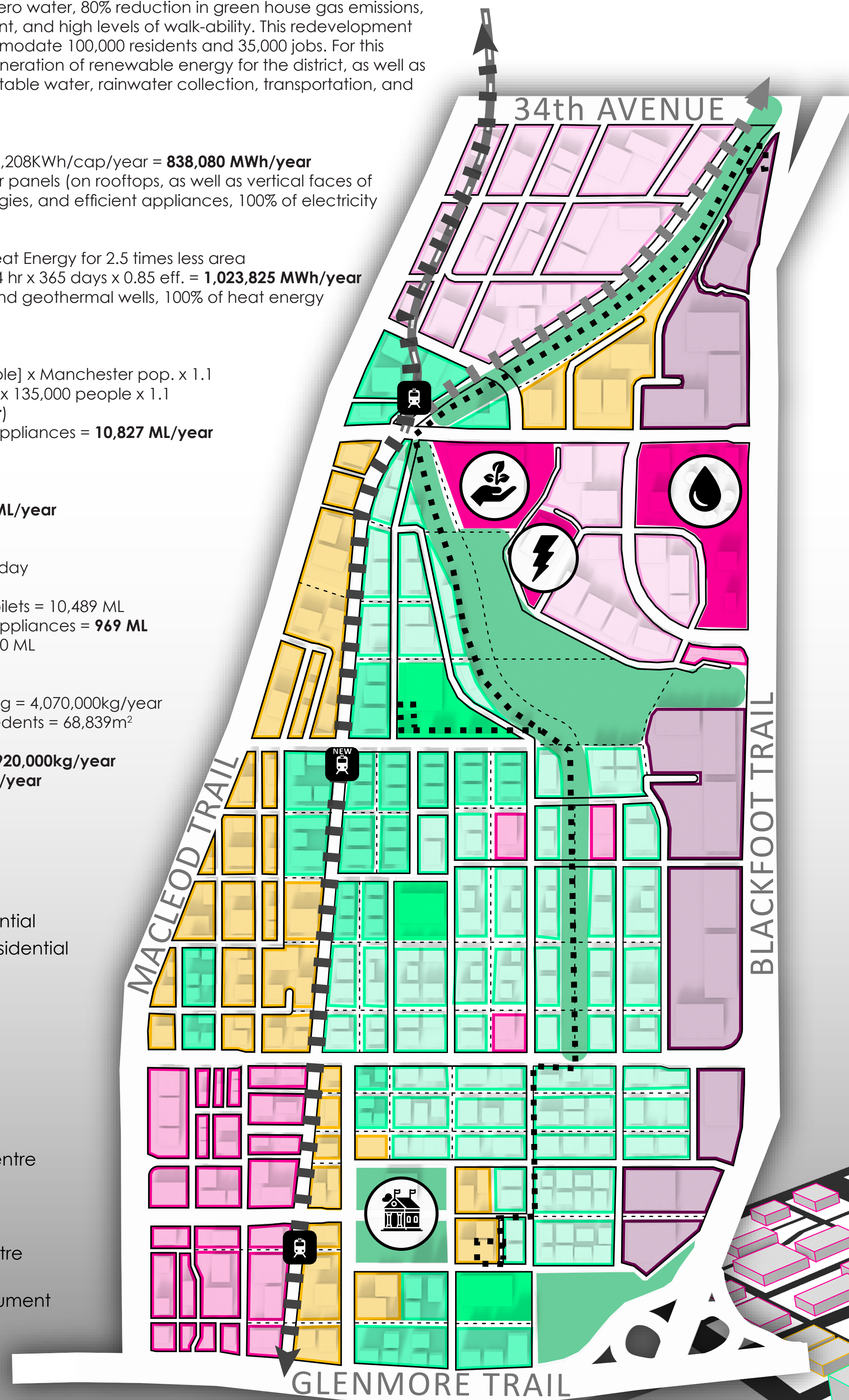
378 L/day x 100,000 = 37.8 ML/day  
**13,797 ML** is required per year.  
 -24% by using grey water for toilets = 10,489 ML  
 -69% by using water efficient appliances = **969 ML**  
 -7% by purifying storm water = 0 ML

### Food Production Calculations

Consumption = 100,000 x 40.7kg = 4,070,000kg/year  
 Required Footprint = 10x Precedents = 68,839m<sup>2</sup>  
 Lufa Farms = **705,000kg/year**  
 Sky Greens Vertical Farms = **2,920,000kg/year**  
 Deepwater Farms = **471,640kg/year**

### LEGEND

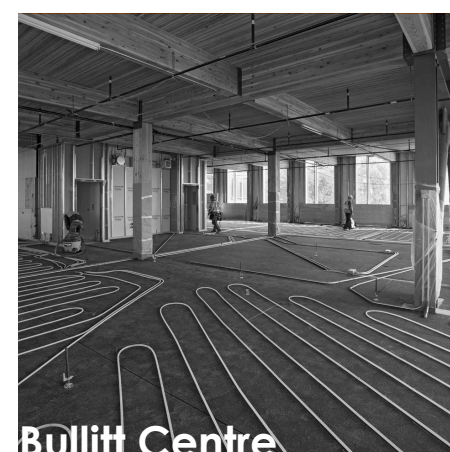
- Commercial
- Industrial
- High Density Residential
- Medium Density Residential
- Mixed Use
- Triple Mix Use
- Institutional
- LRT Tracks
- CP Rail Tracks
- Streetcar System
- 🌱 Food & Farming Centre
- 💧 Water Treatment
- ⚡ District Energy Centre
- 🏛️ Town Square/Monument



### Precedents



**Solar Roof**  
 Solar roofs with large overhangs will be used to offset energy requirements for electricity and heating throughout the district.



**Radiant Slab**  
 Radiant slabs will be integrated into building throughout the district, using geothermal wells to provide heating to the system.



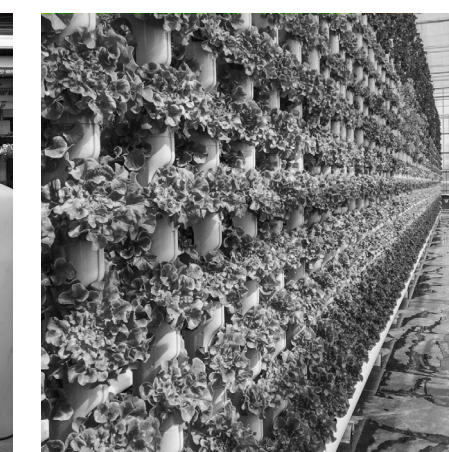
**Passive Cooling and Daylighting**  
 Large operable windows will be implemented to save energy on lighting and ventilation requirements.



**Composting Toilets**  
 Composting toilets will be utilized in select buildings to minimize the wastewater generated in the district.



**Rainwater Collection & Filtration**  
 Rainwater will be collected in the district to supply our food production center with the necessary irrigation.



**Vertical Farming**  
 Vegetable and leafy greens will be produced for the district in these vertical farms.

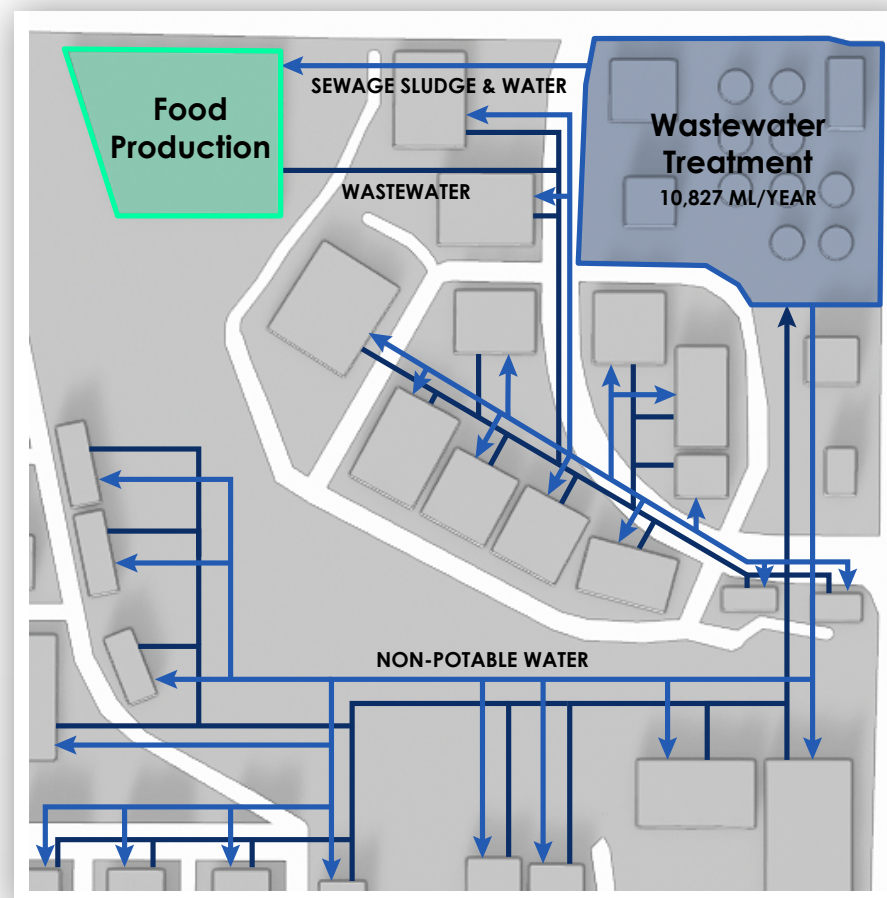


**Lufa Farms**  
 A rooftop lufa farm will help provide the district with vegetables and leafy greens.

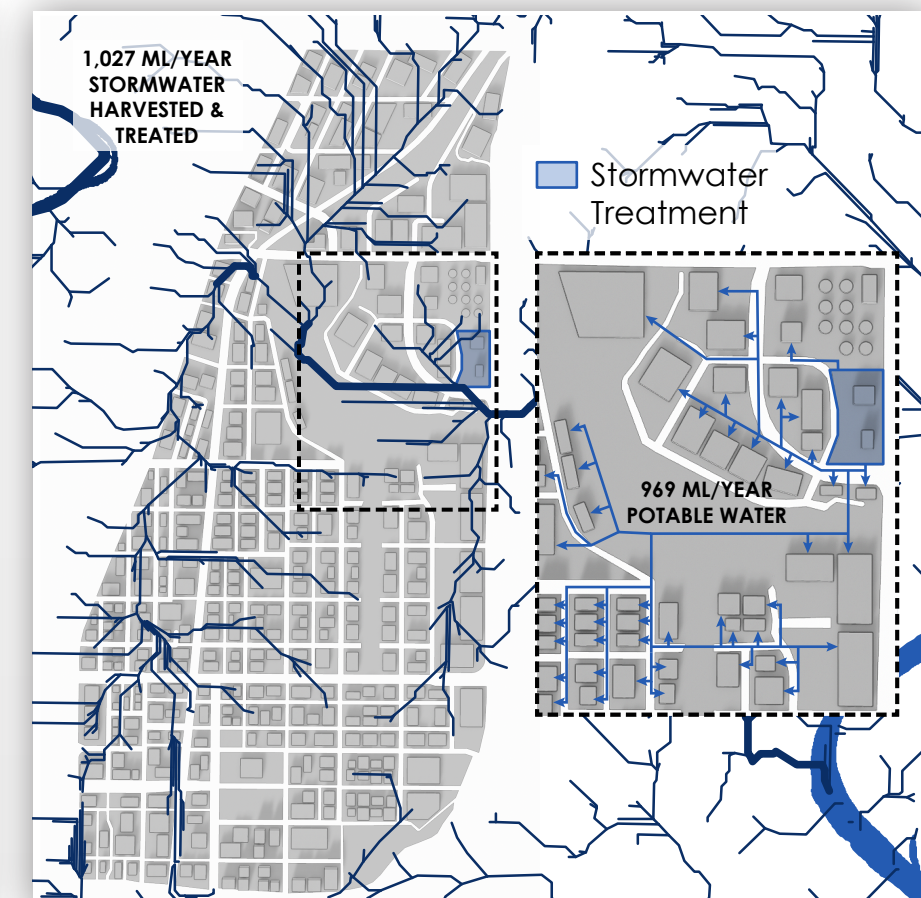


**Deepwater farms**  
 Fish will be farmed to provide a sustainable source of meat to the district.

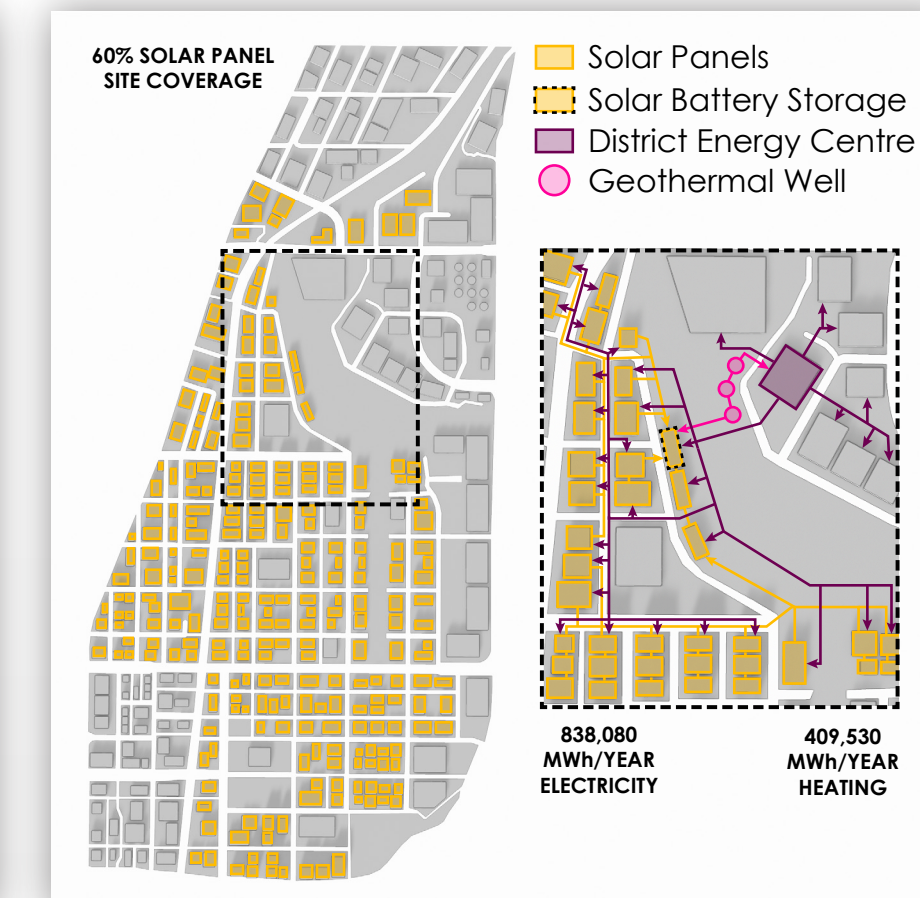
### Material and Energy Flows



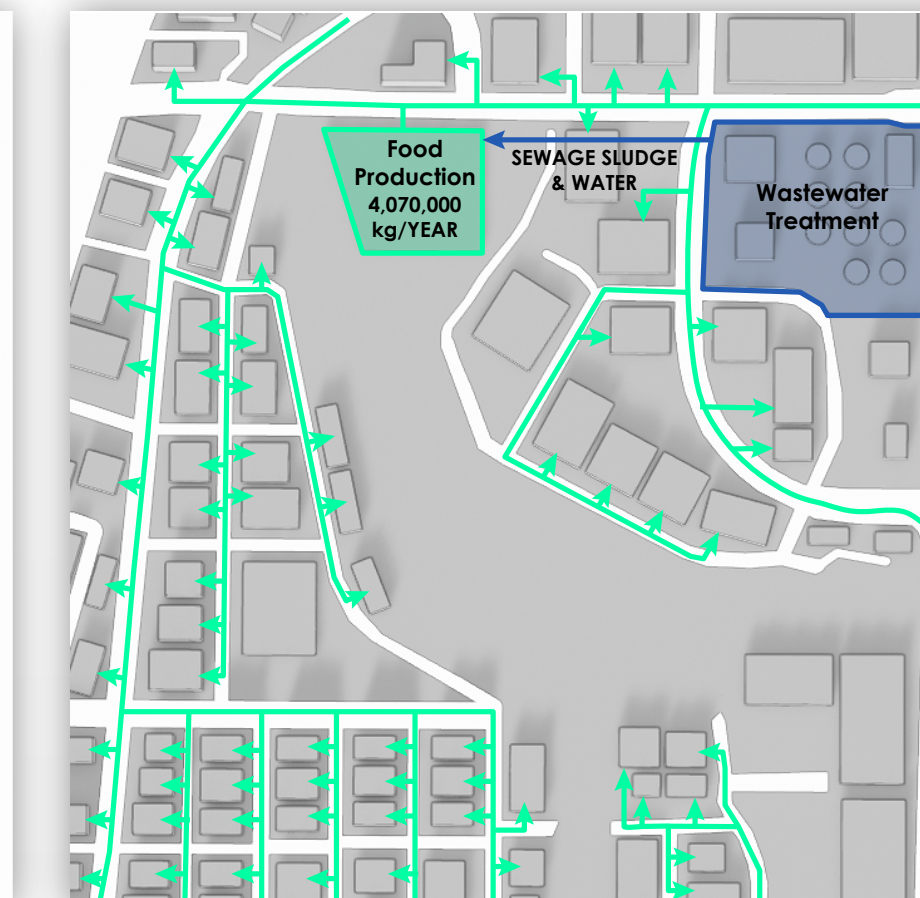
**Wastewater**  
 Wastewater outputs will be minimized by reducing flow volumes from toilets, faucets, washing machines and dish-washers. Low flow toilets alone can reduce water by up to 60%, and toilets account for 30% household water consumption. More efficient faucets can reduce water use by 1/4 the amount of a typical faucet, and faucets account for 16% household water use. Water use in showers can be cut in half, and accounts for 17% household use. Additionally, washers and dishwashers can be reduced by about half their typical water use. Finally, by using grey water in toilets, a significant amount of wastewater reductions can be achieved.



**Stormwater**  
 100% of potable water will be gathered through on-site rainwater collection. By reducing the required potable water by increasing efficiency of appliances, as well as by using grey water to supply toilet systems, 100% of the required potable water can be collected on-site. The catch basin of the Manchester district can collect water, feeding it to collection points in new and existing infrastructures, delivering it to the treatment plant to filter, purify, and store the water for use as potable water throughout the district.



**Energy**  
 100% of the required energy for electricity and heating can be generated on-site through a combination of strategies. Passive strategies will be used to reduce energy requirements by up to 70%, and 60% of the site will be covered with solar panels to produce a majority of the required energy. The remainder of energy will be generated through a selection of geothermal wells.



**Food Production**  
 100% of the required food for the district can be supplied by the vertical farming, Lufa farm, and deepwater farms of our food production sector. Vegetables and leafy greens will be grown in the farms, and fish farming can provide a sustainable source of meat to the district.

