NEW MANCHESTER

LOW CARBON SUSTAINABLE INFRASTRUCTURE

EVDS 616 URBAN INFRASTRUCTURE + LAND USE
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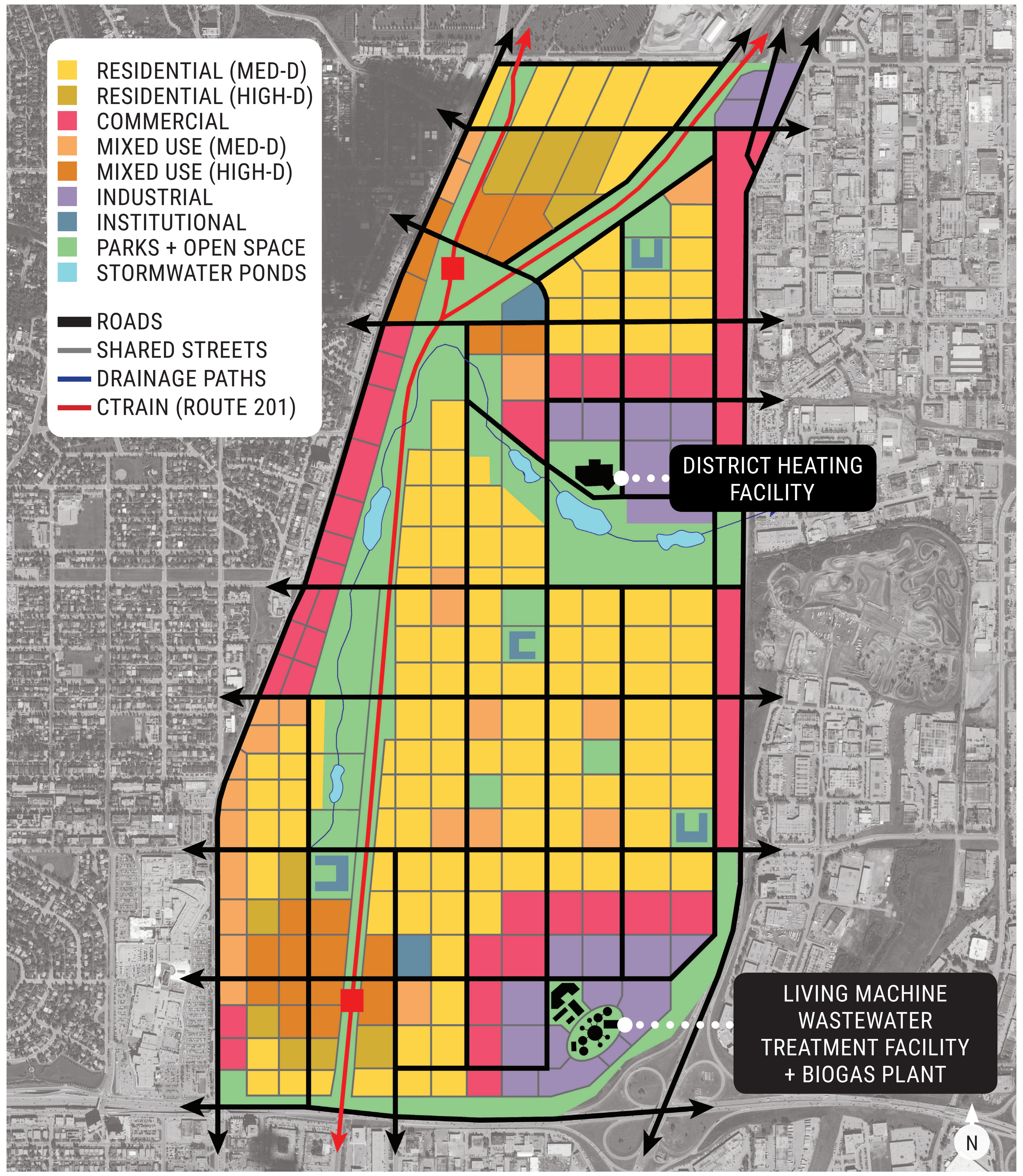
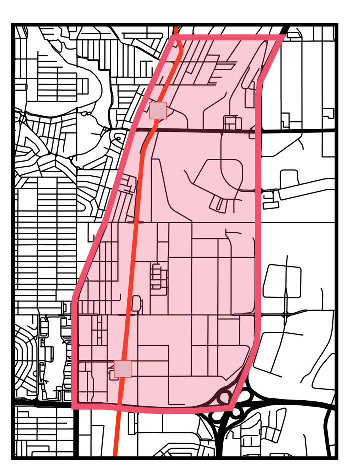
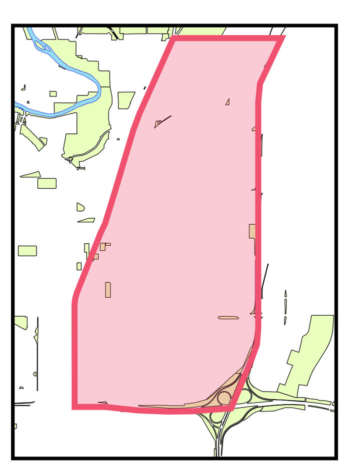
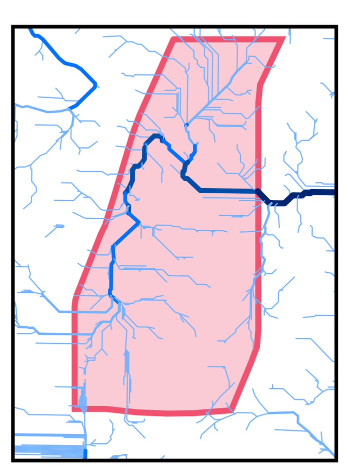
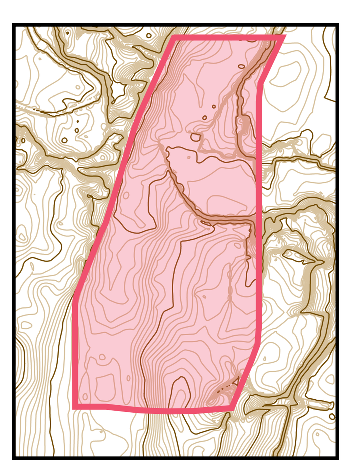
WINTER 2019




EXISTING ROAD NETWORK


EXISTING PARKS & OPEN SPACE NETWORK


EXISTING HYDROLOGY & DRAINAGE PATHS


EXISTING ELEVATION & CONTOURS

To transform Manchester Industrial Park into a thriving, well-connected, and diverse low-carbon district by 2060, a variety of design interventions have been introduced in the above master plan. Access to the surrounding road network is maintained by retaining existing roads through the site, with newly constructed roads falling into two major categories: wider segregated roadways adhering to the City of Calgary Complete Streets framework, and pedestrianized streets with shared multimodal right-of-ways. Following existing hydrological drainage pathways, a linear greenway system has been introduced central to the community. Serving as both a community amenity and green stormwater infrastructure, the greenway daylights existing pipes, replacing them with a naturalized stream and five stormwater retention ponds. These ponds, in combination with the naturalized greenway, slow the flow of stormwater runoff, allowing both the ground to absorb and retain water, and facilitating the settling of sediment and pollutants within the ponds, lowering runoff pollution into the Bow River. According to the principles of Transit Oriented Development, the density of residential and commercial activities have been increased around Chinook and 39th Avenue Stations, while lower density industrial uses are located at the fringe of the community.

LIVING MACHINE WASTEWATER TREATMENT FACILITY + BIOGAS PLANT

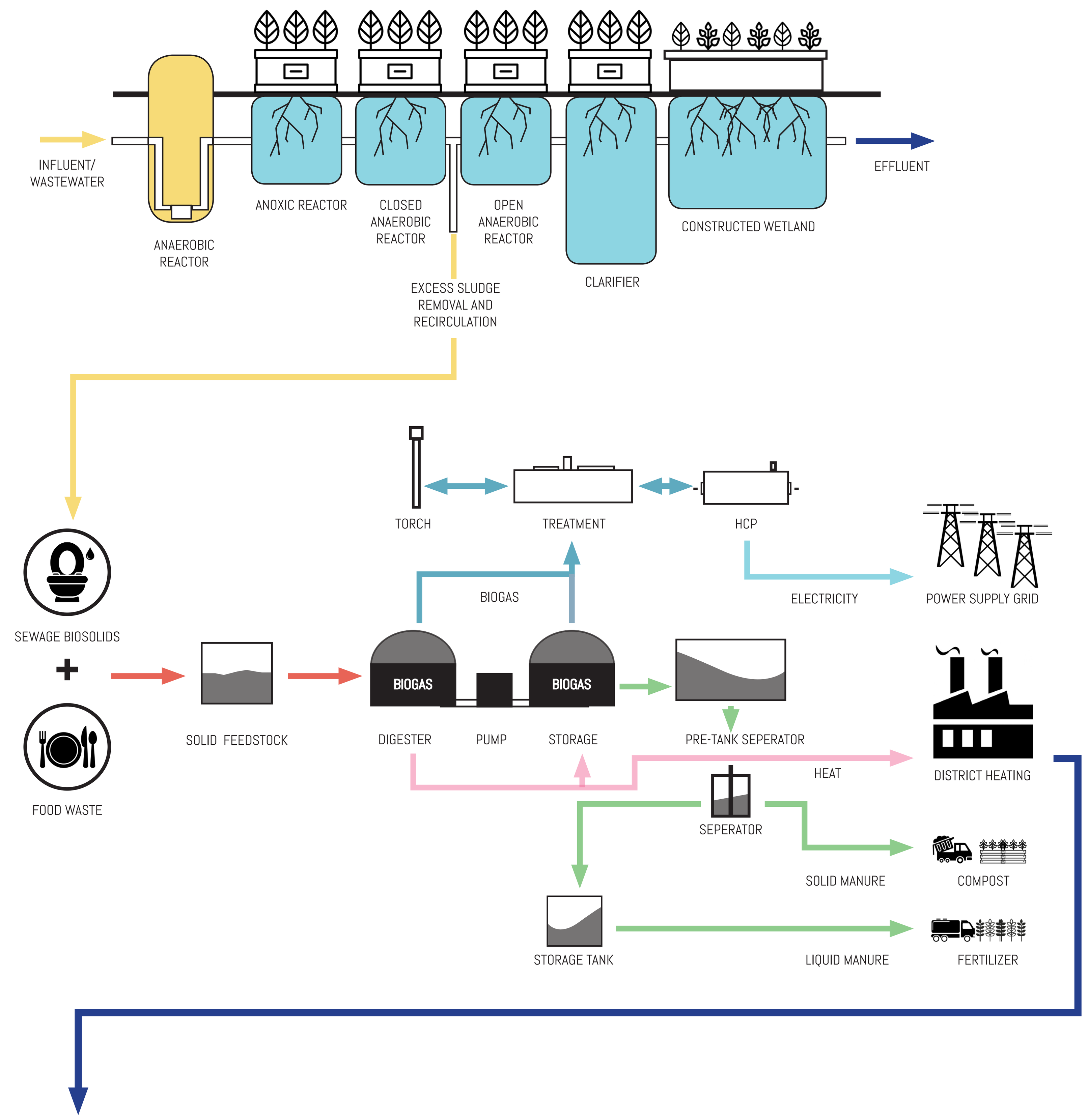



Image: Bonnybrook Wastewater Treatment Plant
Bonnybrook converts biosolids from the wastewater into biogas for energy and heat on site.


Image: Findhorn Living Machine in Ecovillage, Moray, Scotland
Living machines use plants to naturally filter waste from water.

Albertans are ranked with the highest waste per capita within Canada. Meanwhile, Calgary's landfills are the number one source of greenhouse gases (GHGs) caused by the decomposition of organic waste. Biogas plants provide a solution by diverting organic waste from landfills, and converting them into a renewable source of energy, as well as compost. This conversion is achieved through the anaerobic decomposition of organic waste within a digester tank, which then produces biogas. This biogas can either be burned for heat, or converted into electricity. With an average food waste per capita at 396 kg annually, the annual waste of Manchester's 100, 000 residents would be able to provide 31,680 MWh/Y annually. This energy has the capacity to power approximately 4000 single detached homes annually.

In addition, biosolids from our wastewater are another source of organic waste that can be converted to energy. Similar to Bonnybrook Wastewater Treatment Plant, Manchester's biogas plant works synergistically with the wastewater treatment plant, which provides biosolids which can be converted for electricity, heat and compost. Located on the same site of the biogas plant is the Living Machine Wastewater Treatment Facility, which is an ecological, self-sufficient, sewage treatment designed to mimic the cleansing functions of wetlands through phyto-purification. It utilizes a series of tanks, which support vegetation and a variety of other organisms. Compared with conventional treatment centres, it is less capital and energy intensive, and uses less chemicals that are harmful to the environment. From Manchester residents alone, 1,057,080 kg of biosolids can be harvested from the wastewater plant every 4 years, providing 0.85 MWh for a year. In addition, the Living Machine's integration of live plants in the wastewater filtering process offers an appealing aesthetic. This is important when integrating decentralized waste treatment centres close to residential and commercial areas as it can become an attraction, or opportunity to become infrastructure as public space.

DISTRICT HEATING

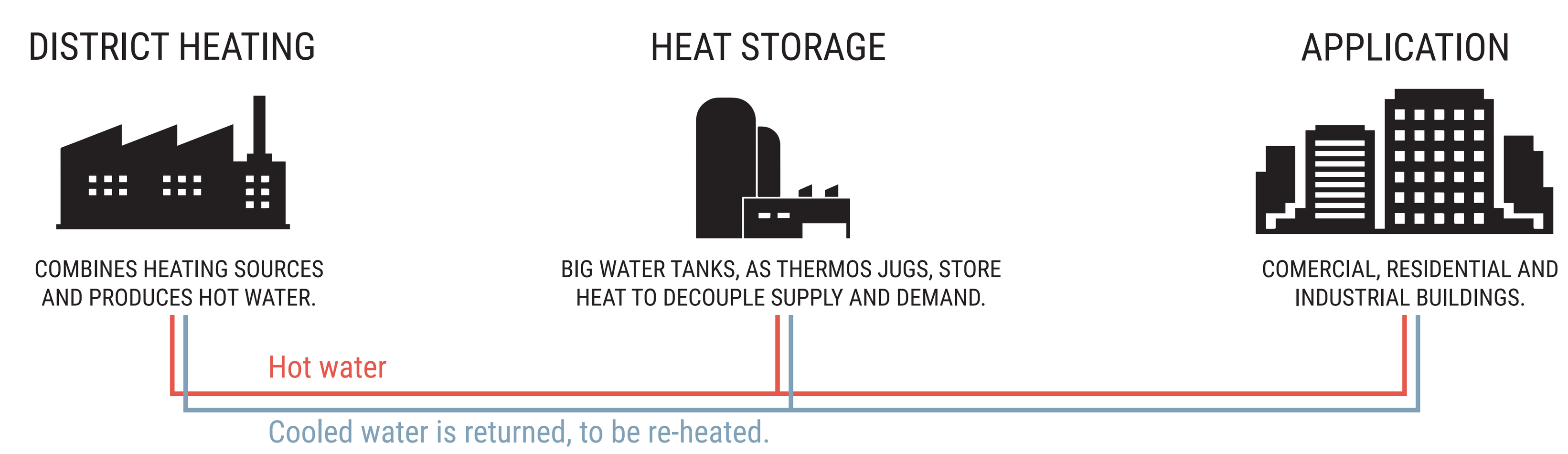


Image: Guelph Envida Community Energy
District heating strategy of Guelph.


Image: Underground Insulated Pipes
This system is used to transport hot or cool water to and from the district heating plant.

Manchester's district heating can provide 161 megawatts heat, covering the heat demands of Manchester. Heat is distributed to commercial and residential buildings via an underground, insulated piping system delivering hot water. To heat the water, the plant uses biogas, or natural gas if biogas is insufficient for demand. Cooled water is then recirculated back to district heating to be reheated. Guelph District Energy Strategic Plan utilizes a similar system, serving a similar size population to Manchester. It indicates the potential for 50% less energy use and reduce GHG emissions by 60% per resident by 2031. District heating provides greater efficiency and reduced GHGs than local boilers. Compared to fossil fuel power plants, is has a lower carbon footprint and is an inexpensive way to reduce carbon emissions.

SOLAR + WIND POWER

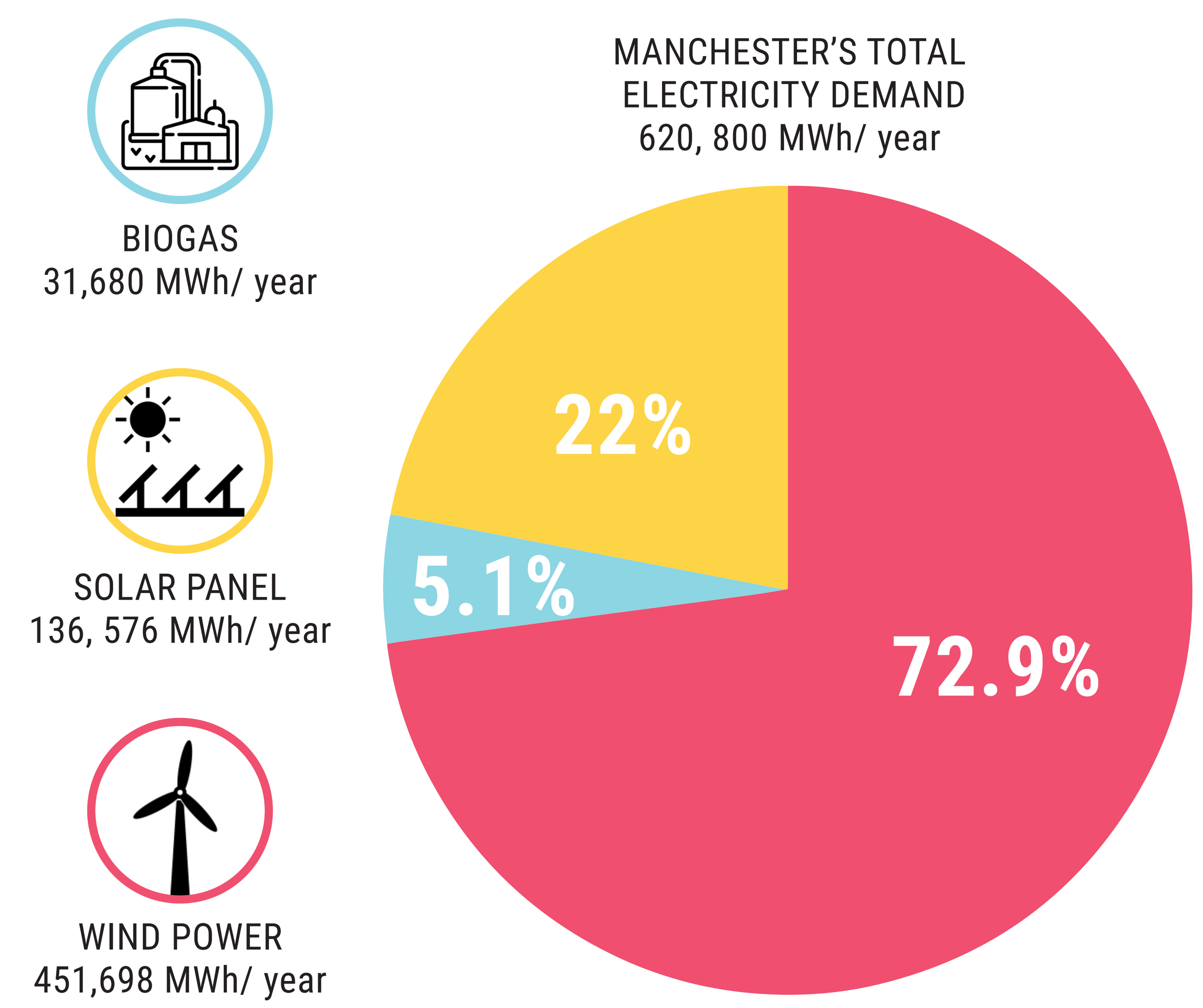



Image: Sunseap solar panels in Singapore
Apple will use surplus energy produced solar panels to power all its operations in the city.


Image: Alberta Wind Energy
Wind turbines on a farm producing renewable energy for Alberta.

To achieve the sustainability goal of 100% renewable energy, Manchester will derive all of its power from a variety of on-site and regional sources. After subtracting roads and municipal reserve lands, and accounting for building setback and parcel coverage regulations, the total buildable area of the community equates to 30% of the total land area, or 1.2M m2. Rooftop solar panels will be mandated on all buildings in Manchester, generating 22% of the community's future power requirements. In addition to the waste diversion and greenhouse gas benefits of biogas facilities, biogas plant generates small amounts of power, accounting for 5.1% of the total requirements. The remaining 72.9% will be booked from two wind projects within the First Nations Equity Wind Farms in Southern Alberta; 113 MW from the Stirling Wind Project near Lethbridge, and 113 MW from the Jenner Wind Project near Brooks.