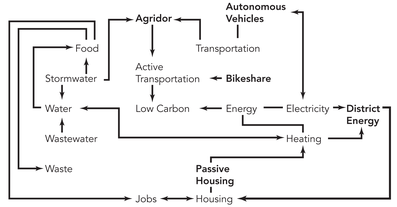
MANCHESTER**CITY**

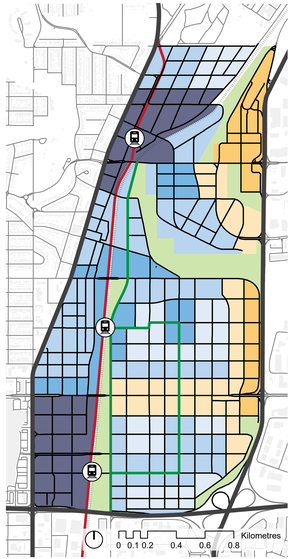
A LOW-CARBON VISION FOR MANCHESTER 2060

EVDS 616 / LOWANI MUBANGA / EDWARD SPINK / TY MCCULLOCH

Manchester City is the reimagining of Manchester Industrial into a triple-mixed use, low-carbon community by the year 2060. This district is a vibrant, high density urban neighbourhood that is characterized by a high concentration of jobs (35,000), people (100,000) and dwellings. Buildings have active frontages and are built with limited setbacks. Main floors contain street-oriented businesses with offices or housing above. The district includes high-rise and medium rise building types. Manchester City features the following precedent infrastructure systems: autonomous vehicles, dockless bikeshare, agridors, district energy, passive housing, stormwater harvesting, waste-to-energy plant, and neighbourhood energy utility.



PROPOSED LAND USE FRAMEWORK



MIXED-USE RESIDENTIAL / COMMERCIAL - HIGH DENSITY

This district is a vibrant, high density urban neighbourhood that is characterized by a high concentration of jobs and dwellings. Buildings have active frontages and are built with limited setbacks. Main floors contain street oriented businesses with offices or housing above. The district includes high-rise and medium rise building types.

*PRECEDENT: **EIXAMPLE, BARCELONA***

650-1050people+jobs/ha

MIXED-USE RESIDENTIAL / COMMERCIAL - MEDIUM DENSITY

This district is a mid-rise area with a mix of employment and housing uses. Buildings range from 4 to 12 storeys in height and include either retail or townhouse podiums at grade. Commercial uses are interspersed throughout the district.

*PRECEDENT: **PEARL DISTRICT, PORTLAND***

220-340people+jobs/ha

RESIDENTIAL - MIDRISE

This a predominantly residential district with some small scale neighbourhood commercial use. Buildings range in height from 4 to 12 storeys with mainly residential at grade.

*PRECEDENT: **OLYMPIC VILLAGE, VANCOUVER***

220-340people+jobs/ha

RESIDENTIAL - LOWRISE

This residential district is comprised of townhomes, stacked townhomes, and low rise apartment buildings ranging in height from 2-4 storeys. Small neighbourhood commercial uses are present.

*PRECEDENT: **GARRISON WOODS, CALGARY***

80-195people+jobs/ha

MIXED-USE RES. / COMMERCIAL / LIGHT INDUSTRIAL - MEDIUM DENSITY

This triple mixed-use district includes housing, commercial and non-intrusive light industrial uses. The non-prescriptive and can include a variety of building types ranging from 2 to 12 storeys.

*PRECEDENT: **STRATHCONA VILLAGE, VANCOUVER***

90-200people+jobs/ha

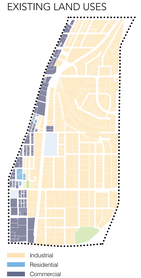
NET ZERO LIGHT INDUSTRIAL - LARGE SCALE

This district provides a buffer between Manchester and the industrial areas to the east of the neighbourhood. Distribution and fabrication uses would be located here.

*PRECEDENT: **WILKINSON PROJECT, DARTMOUTH, NS***

40-80jobs/ha

EXISTING LAND USES



PROPOSED TRANSPORTATION NETWORK

The proposed transportation network sees the splitting of existing blocks into smaller blocks, with the new roads emulating "woonerfs". The transit system will add a new C-Train station, to provide rapid transit access to a greater number of residents. Dockless bikeshare and autonomous shuttle systems will fill the first-mile/last-mile gaps between transit and housing. Dockless bikeshare clusters will be centered around C-Train stations and intersections between agridors and boulevards.

*PRECEDENT: **SUPERBLOCK, BARCELONA***

The Barcelona superblock is a model that gives the street network back to neighbourhood residents. Street spaces are allocated to parks, bike routes, street furniture and playgrounds. Vehicle traffic inside the block is limited to residents and businesses and through traffic cannot cut through the block. The scheme has reduced private car usage by 20%

AGRIDOR

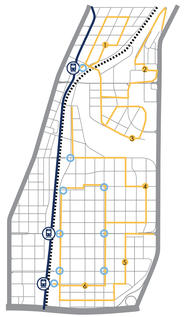
An agridor is a multi-modal road focused on growing food, and growing community. It features protected bicycle lanes, and travel lanes that can accommodate buses. The middle of an agridor features room intended for growable plots, so that food appropriate for the Calgary climate can be grown. During the winter, growable plots can be converted into temporary greenhouses. The space in the middle is also intended to be used as a gathering space, where people can host community-level events.

*PRECEDENT: **CONFLUENCE SHUTTLE, LYON***

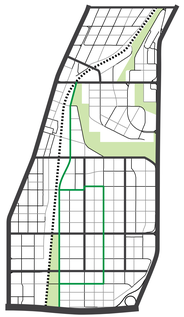
In Manchester, autonomous shuttle routes will also provide a first and last mile trip to and from LRT stations. These are based on a precedent in Lyon, France that serviced a 1.3 kilometre route in the Confluence district. The shuttles are able to transport 15 people at an average speed of 10 km/h and a maximum of 45km/h.

AGRIDOR CROSS SECTION

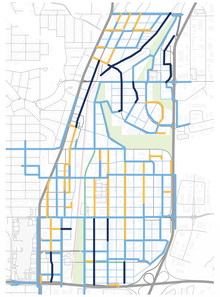
TRANSIT NETWORK



STREET HIERARCHY



DRINKING WATER



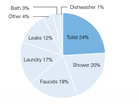
The average water consumption in Calgary per capita is about 378 litres, per day. This means for the 100,000 people expected in Bonnybrook, the total consumption per year would be about 13,797 mega litres. Of course, not all this water is used for cooking or drinking. It was surprising to learn that in the average Calgary household, 24% of the drinking water is used as toilet water, which is a waste considering the water issues that the province of Alberta faces where some municipalities have insufficient supply of clean water. We proposed that the 24% toilet water would be taken from stormwater which would save us a significant amount of clean water.

Calgary per capita daily consumption

378 litres

Manchester annual consumption

13,797 megalitres



Manchester recycled greywater

3,311 megalitres

Existing Pipes
Pipes to be Replaced
Proposed Pipes

*PRECEDENT: **SYDNEY STORMWATER HARVESTING***

Sydney, Australia has implemented an extensive program of stormwater harvesting, where various private and public sector users are able to withdraw, treat, and utilize recycled stormwater from the city's drainage network. This has resulted in decreased pressure on the city's drinking water system, and reclaimed stormwater is commonly used for watering public parks, gardens, sports fields and golf courses.

WASTE MANAGEMENT

The per capita waste generation for the City of Calgary as of 2017 was about 368kg per person. From this number, the waste generation for 100,000 people will be roughly 36,800 tonnes per year. Of the total waste generated per year in Calgary, 20% is from households, 30% is from construction and demolition sites and 50% is from ICI (Industrial, Commercial and Institutional) sites. Because there is such a high waste generation at ICI sites, we proposed recycling and composting facilities in areas on the site designated as industrial, institutional and commercial. We also proposed an energy plant in the area that will produce energy from the waste generated in Bonnybrook and distribute this energy to areas of the site, in turn, reducing the amount of waste deposited in Calgary landfills.

Annual solid waste per capita

368 kg

Manchester annual solid waste

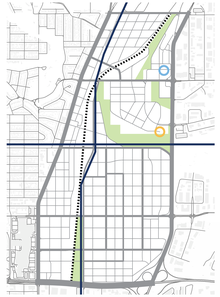
36,800 tonnes

Recycling facility
Recycling / composting facility
Waste to energy plant

*PRECEDENT: **AMAGER BAKKE WASTE-TO-ENERGY***

The Amager Bakke plant is a combined heat and electricity waste-to-energy plant that uses municipal solid waste as a fuel source. The plant is the cleanest incineration facility in the world and can burn 400,000 tonnes of solid waste per annum with an output of 57 MW electricity and 190 MW thermal.

ENERGY FLOWS



Electricity for Manchester will be provided by a waste to energy generation plant. In order to provide electricity for the residents and businesses in Manchester, 620,800 MWh/year of generation capacity is required. To meet this demand, the plant will require 540,000 tonnes of input solid waste, meaning 7% of this can be fulfilled from Manchester with the remaining 93% from the rest of Calgary.

Heating will be provided by a district energy system that harvests thermal energy from wastewater that is destined for the Bonnybrook wastewater treatment plant.

Manchester electricity demand

620,800 MWh/year

Required solid waste input

540,00 tonnes

District heating plant location
Electricity transmission lines
Waste to energy plant

*PRECEDENT: **NEIGHBOURHOOD ENERGY UTILITY***

The Southeast False Creek Neighbourhood Energy Utility is a district energy system in Vancouver that harvests thermal energy from sewage to heat the Olympic Village community via heat recovery. Heat is extracted via a heat pump system and distributed through the district through a series of hot water pipes.

STORMWATER MANAGEMENT

Manchester includes a stormwater catchment area of 8.05 square kilometres. Based on Calgary's average annual precipitation of 419 mm, this area receives average runoff of 3,371 megalitres per annum. The stormwater network is designed to harvest stormwater that falls within this basin and utilize in the neighborhood for greywater uses (toilet flushing and agridor irrigation). This is accomplished via a stormwater storage and greywater treatment plant, along with an intercept primary treatment point that provides for irrigation usage.

Drainage basin area

8.05 km²

Peak stormwater flow

100,625 litres/second

Potential stormwater harvest volume

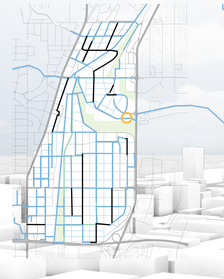
3,371 megalitres

Required storage capacity

241,500 m³

Storage and treatment location
Drainage basin area
Stormwater flow direction
Irrigation interim treatment point

WASTEWATER NETWORK



Manchester average daily wastewater flow

62 M/litres

Bonnybrook average daily wastewater flow

396 M/litres

Wastewater district heat extraction point
Existing
Proposed Pipes To Increase Capacity

We propose an increase in the wastewater infrastructure capacity to sustain the 100,000 inhabitants expected in the Bonnybrook area. We proposed the replacement of older, smaller pipes with ones that can handle higher volumes of wastewater as well added new pipes in areas previously not serviced, which we proposed new developments. According to Stantec, Bonnybrook Waste Water Treatment Plant (hereafter referred to as BWWTP) services over 600,000 people in the city of Calgary. If we take the number of people serviced in Calgary and add other areas and municipalities serviced by BWWTP which include Airdrie, Cochrane, Tsuu Tina First Nation and Ebone Valley, this brings us to about 700,000 People currently serviced. The average flow generated by the 700,000 people is about 396 mega litres per day, which means the average generation per person, per day is about 0.000566 mega litres. For the 100'000 people expected in Bonnybrook, we should have an average flow of about 57 mega litres and if we add 10% to this, we get about 62 mega litres per day. The total capacity of Bonnybrook is about 1096 mega litres/d, which will easily absorb the 62 mega litres flow expected out of the Bonnybrook area.