

CONSULTANT ADVICE NOTICE

Project: Network Building

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Name	Company	Email
To: Don Findlater	Blackburn & Co.	donald@blackburnltd.com

Public Health - Rainwater Harvesting and Greywater System Analysis

This consultant advice notice (CAN) has been prepared to provide an estimated cost and Return On Investment (ROI) period for installing either a rainwater or greywater harvesting system to serve the landlord toilet areas for WC flushing purposes in the Network Building. The information below is a guide to both systems with budget costs to be considered by the client.

This CAN has also been prepared to confirm indicative spatial requirements of the systems and its impact in the building plant rooms and areas designed previously in Stage 2. Due to limited plant space because of other systems and equipment, office NIA may be lost to include the greywater and rainwater attenuation plant.

OFFICE WATER CONSUMPTION

The analysis of water consumption has been based on the water fittings serving the main toilet core areas and end of trip facility as shown in the tables below. The calculation is based on use by around 1550 building occupants daily with 253 days operation per year. Building occupancy has been calculated based on 8 m² per person and Piercy & Co's Office Scheme Master Area Schedule with an office NIA of about 12,300 m² (132,354 ft²).

GREYWATER HARVESTING SYSTEM USE

WATER FITTING	MAXIMUM CONSUMPTION	TIMES USED PER DAY	DAILY DEMAND	ANNUAL YIELD (LITRES)
Showers	8 L/min	5% of occupancy for 5 mins a day	1550 X 5% X 40 L/person = 3100 L/Day	784,300
Wash hand basins	2 L/min	Use 3 times for 10 seconds use	1550 X 1 L/person = 1550 L/Day	392,150
			TOTAL	1,176,450 (1176 m ³)

WATER FITTING	MAXIMUM CONSUMPTION	TIMES USED PER DAY	DAILY DEMAND	ANNUAL DEMAND
110 WCs	6/4 litre dual flush (avg.4.5 L)	3 times	1550 x 13.5L = 20,925 L/d	5294 m ³

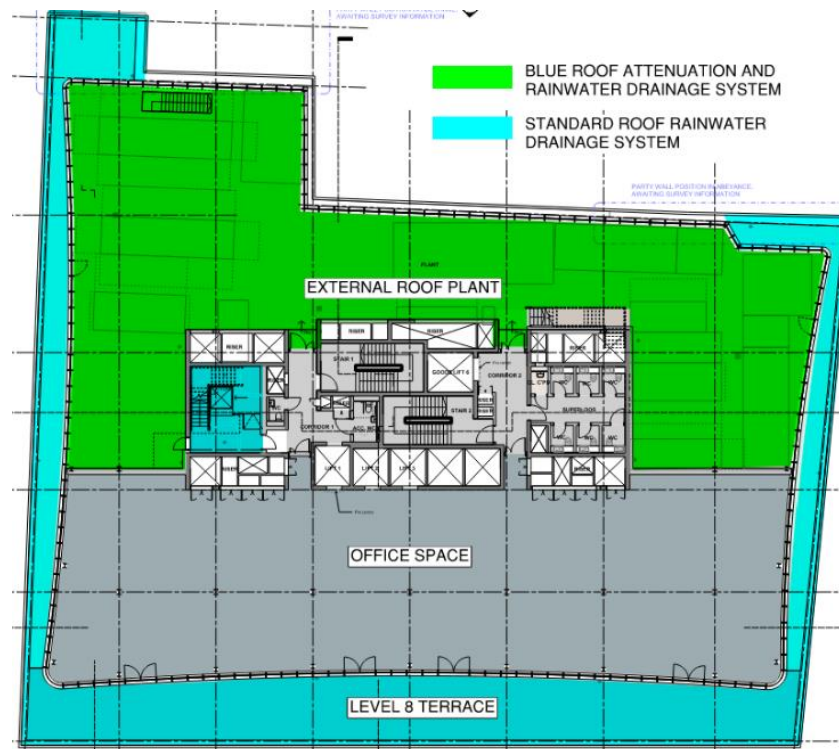


RAINWATER HARVESTING SYSTEM DATA

TOTAL ROOF AREA	ANNUAL AVE RAINFALL	ROOF RUN OFF COEFFICIENT	FILTER COEFFICIENT	ANNUAL YIELD
2000 m ²	**600 mm	0.7	0.95	798 m ³

Recommended rainwater harvesting tank volume 22 m³ actual (24 m³ nominal)

** Average London average rainfall



Rainwater Drainage System Types on Level 8

TOTAL NPW (NON-POTABLE WATER) YIELD

Greywater yield = 1176 m³

Rainwater yield = 798 m³

Total = 1974 m³ p.a.

Given an annual demand of 5294 m³ per annum for WC cisterns this will give a total NPW ratio of 37.3%

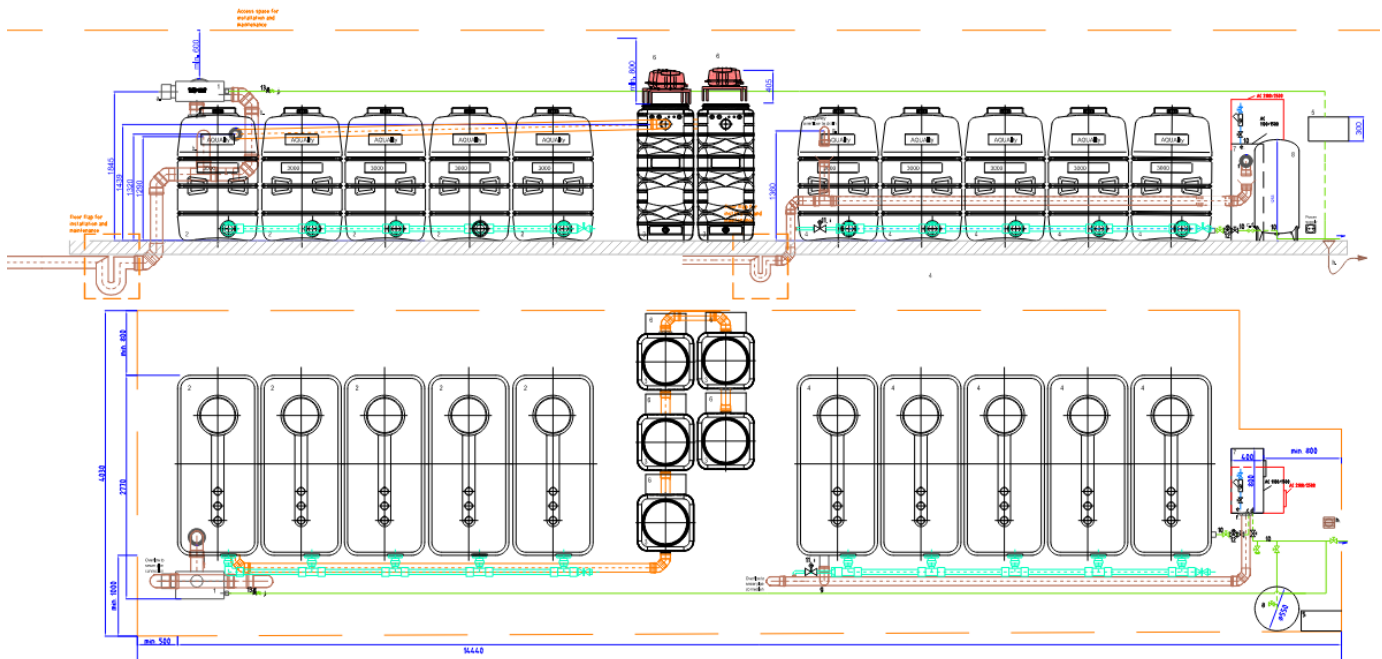
Greywater system components

- Coarse filtration
- Buffer tank(s) to accept fluctuating volumes of screened wastewater for treatment
- Membrane Bio-Reactor (MBR) including aeration and submerged membrane
- Non-potable water storage tanks to store treated water
- Control system
- Automatic drain system to discharge any stagnant process water after a defined time period
- Booster pump system
- Ancillary items such as pipework, valves, meters, power supplies, vent pipework
- Commissioning
- Remote monitoring (or an equivalent in-person attendance)



Grey water plant space

Greywater recycling system plant space = approximately 14 metres x 4 metres = 56 m². Please note this is indicative only, and actual equipment selections with exact sizes to be determined with supplier and manufacturer.



Example Greywater Plant for Spatial Requirements



Example Greywater Treatment Plant with Aqua Control

Budget cost and payback period

Grey water system budget cost excluding installation and duplication of pipework distribution in risers of approx. £50,000.

Water saving 1176 m³ = £2940 PA saving in first year less ongoing maintenance and replacement parts of £1500 = £1440.

The water saving is based on approximate local authority metered charges for both water supply and wastewater supply of £2.50 per m³.

Assuming an initial capital outlay of £50,000 with a saving of £1440 PA this would mean a payback period of around 34 years.

A payback period of 20 years would be considered acceptable if considering a grey water system viable for this building.



Rainwater system components

- Rainwater filter TF4
- Sect. GRP tank 24 m³
- Calmed inlet DN 100
- Transfer pump
- Aqua-Recycling-Control

Rainwater harvesting system plant space

If the entire roof area is considered for rainwater harvesting, the tank plant space = 24 m³ allowing for rainwater storage using a sectional GRP tank of dimensions 3 x 4 x 2 m high. The tank itself will require 12 m² of space, plus access and maintenance clearances, which may come to a total of 24 m² of plant area. This can also include utilising blue roof areas for attenuation, however this also reduces overall rainwater harvesting in the tanks.

If the plant is located below the sewer outfall invert, then the harvested rainwater will need to be pumped to the intended terminal location, which will be the same location as the greywater plant. The pump system, valve and pipe arrangement will need an additional 12 m² of plant area. This gives a total of 48 m² for the rainwater harvesting plant.

Budget cost and payback period

Rainwater system budget cost excluding installation and pipework distribution = £30,000.

Water saving 798 m³ p.a. = £1995 PA saving in first year less ongoing maintenance and replacement parts of £800 = £1195.

The water saving is based on approximate local authority metered charges for water supply and wastewater supply of £2.50 per m³.

Assuming an initial capital outlay of £30,000 with a saving of £1195 PA this would mean a payback period of around 25 years.

Combined Rainwater harvesting and Greywater treatment plant

Combined rainwater harvesting and greywater treatment systems amount to approximately £80,000. Combining the savings for 1974 m³ p.a. = £4935 and ongoing maintenance from previous amounts together comes to approximately £2000 = £2935. These are indicative only and considered at the higher cost rate for service and maintenance.

Assuming an initial capital outlay of £80,000 with a savings of £2935 PA would mean a total payback of 27 years.

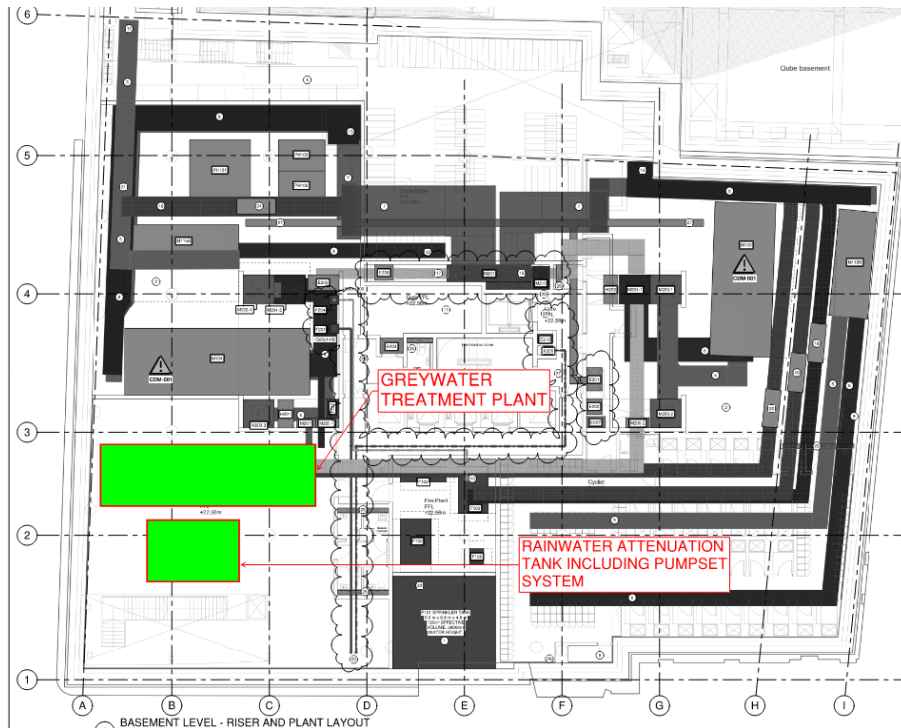
A payback period of 20 years would be considered acceptable if considering a grey water system viable for this building.

Current Basement Plant Spatial from NDY's Stage 2 Issue

Image below provides an indication of the plant areas required for both the greywater and rainwater systems located in Basement Level.

The greywater plant requires and the rainwater attenuation tank will need approx. 56 m² and 48 m² of plant space in the Basement Level. The attenuation tank will also need to be higher than the sewer outfall, so no mechanical pump systems will need to be incorporated.

It is noted there are space limitations to fit these systems in the plant areas, therefore may require losing lettable office NIA in the basement to allow the systems to fit.



NDY Stage 2 Combined Services Layout for Basement Including Plant Areas for RW and GW Systems

CONCLUSION

As per above CAN, there are limitations with the required plant space for both the greywater and rainwater harvesting systems, and may require losing lettable office NIA to fit the equipment.

The payback period exceed the expected life of the equipment, and a 20 year payback period is typically acceptable but these systems are over 25 years, and may not be deemed feasible for the overall project initial and maintenance costs.

There are sustainability advantages that may give additional credit to a building rating system, i.e., BREEAM. However a separate discussion and further analysis is required to progress the actual impact of the systems with ratings such as BREEAM.

*Please note all values and costs are indicative only. Actual costs and pay back periods will need a full assessment and feedback from all relevant parties to determine the correct savings for the building based on actual systems proposed.

Should you require further information please do not hesitate to contact us.

NORMAN DISNEY & YOUNG

Gerry Espinola | Public Health Engineer
g.espinola@ndy.com