Bloomberg L.P.
City Gate House
39-45 Finsbury Square
London, England EC2A 1PQ
Tel +44 20 7330 7500
Fax +44 20 7392 6000
bloomberg.com

17 January 2017

Christine Wong, Project Manager
City of London
PO Box 270
Guildhall
London EC2P 2EJ

Re: Bloomberg Headquarters
Water Conservation

Dear Christine:

Bloomberg is deeply committed to sustainability extending from the way we design and operate our office buildings to the organizations we support through our corporate philanthropy here in London as well as globally. The London Headquarters is a proud example of this commitment and is backed up by our Outstanding rating, the highest achievable, by the Building Research Establishment Environmental Assessment Method (BREEAM). In the area of Water Conservation, the BREEAM assessment score was 100%.

As discussed, Bloomberg has implemented significant measures to reduce water usage in our building and by extension, wastewater discharge to the City's combined sewer overflow (CSO) system serving this area. This means less clean water to be treated and distributed to the building and less wastewater to be captured and treated by the Agency's wastewater plants. In fact, two of our water conservation measures were deemed Innovative in the BREEAM assessment. We have taken a three-pronged approach to water conservation in the design and construction of the building:

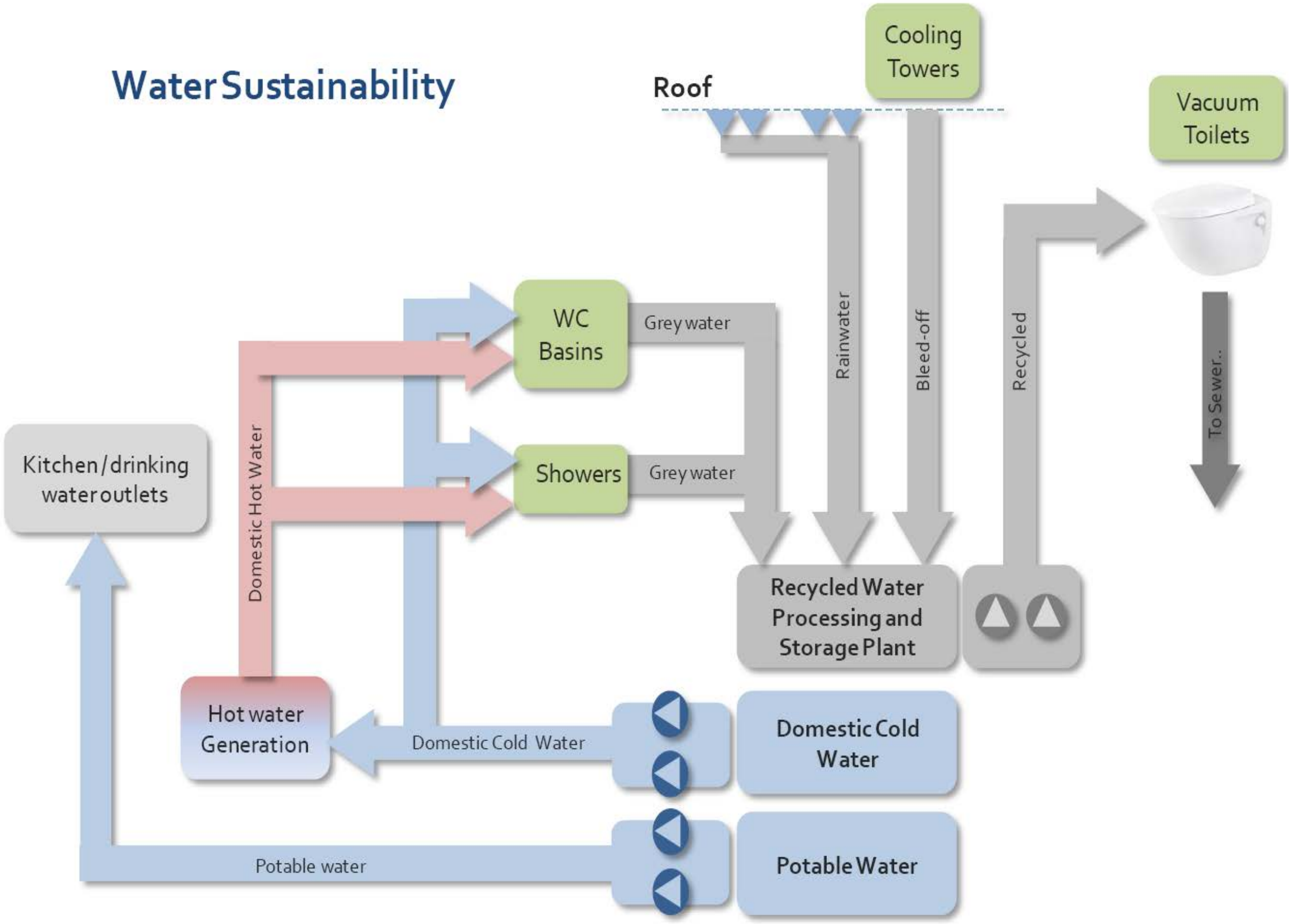
1. Utilization of water efficient fixtures, most notably, our vacuum flush toilets which utilize approximately 20% of the water of a standard water efficient toilet (1 L/flush vs. 5 L/flush). Incorporation of these toilets in the building earned the project an Innovation point in the BREEAM assessment.

2. Capture, treatment and reuse of our grey water systems, most notably, our cooling tower bleed-off flows to serve the vacuum toilet system. The recycle of cooling tower water earned the project its second BREEAM Innovation point.

3. Capture and treatment of rainwater from the roof. This rainwater would otherwise be discharged to the CSO system. Even more importantly, this water is captured during rain events when the system is most vulnerable to sewer surcharges.

Bloomberg

The schematic below represents the various flow paths of domestic, potable, and wastewater flows in the Bloomberg building. As shown, sufficient rooftop rainwater, cooling tower, and grey water waste streams are captured and treated and used as flushing water in the toilets. When coupled with the extremely low water utilization rates of the vacuum flush system, the net overall discharge reduction for the toilets alone is over 80% as compared to a typical office building. As toilets represent the majority of water demand of an office building, the vacuum flush system reduces our overall wastewater flow by 70% as compared to a typical office building (as measured by BREEAM).



Bloomberg

Additional supporting information on the overall water conservation measures incorporated into the building can be found in the following attachments:

Attachment 1. Extracted Pages of the BREEAM Assessment pertaining to Water Conservation and Innovation

Attachment 2. BREEAM Innovation Report – Vacuum Drainage

Attachment 3. BREEAM Innovation Report – Cooling Tower Water Recycle

If you have any questions or require further information regarding our water conservation efforts, please do not hesitate to reach out.

Regards,

Kathryn Mallon

Kathryn Mallon
Project Director

ATTACHMENT 1

BREEAM UK ASSESSMENT

WATER CONSERVATION EXCERPTS

BREEAM® UK

Code for a Sustainable Built Environment
www.breeam.org

Interim Certificate – Design Stage

This is to certify that:

Bloomberg,
3 Queen Victoria Street,
London,
EC4

has been assessed to:

BREEAM New Construction 2011: Offices (Fully Fitted)

by a licensed assessor for:

Bloomberg LP

and has achieved a score of **92.1%**

Outstanding ★★★★★

Certificate Number: **BREEAM-0051-9256** Issue: **01**

08 July 2014 Date of Issue	Grontmij Limited Assessor Company
Signed on behalf of BRE Global Ltd.	Kartik Amrania Licensed Assessor
Gavin Dunn Director, BREEAM	KA36 Assessor number
Bloomberg LP Developer	Sir Robert McAlpine Principal Contractor
Foster + Partners Architect	Stanhope Plc Development Managers
Grontmij UK Building Services	Mohanad Alnaimy, Grontmij UK BREEAM Accredited Professional
AKT II Structural Engineers	AECOM Cost Consultants
ARUP Façade Engineers	Sandy Brown Associates Acoustic Consultants

BREEAM® UK

Code for a Sustainable Built Environment
www.breeam.org

Interim Certificate Number: BREEAM-0051-9256 Issue: 01

**Bloomberg,
3 Queen Victoria Street,
London,
EC4**

Assessed for: Bloomberg LP

by: Grontmij Limited
Assessor Company

Kartik Amrania	KA36
Licensed Assessor	Assessor Number

**BREEAM New Construction 2011: Offices
(Fully Fitted)**

Overall Score: 92.1%
Rating: Outstanding

Category Scores	
Management	100
Health and Wellbeing	71
Energy	89
Transport	100
Water	100
Materials	92
Waste	71
Land Use and Ecology	80
Pollution	77
Innovation	60

Gavin Dunn, Director, BREEAM, BRE Global Ltd.

08 July 2014
Date of Issue

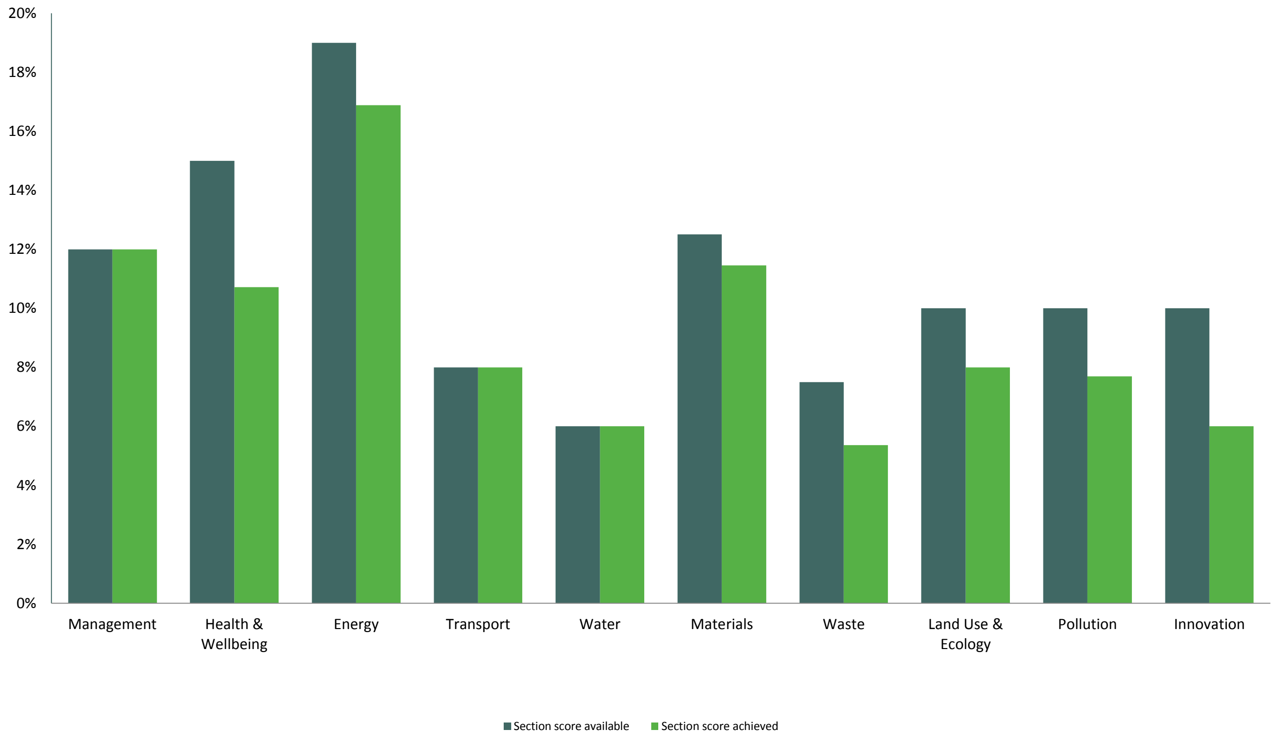
BREEAM®

BREEAM 2011 New Construction Assessment Report: Rating & Key Performance Indicators

Overall Building Performance

Building name	Bloomberg North
BREEAM rating	Outstanding
Total Score	92.11%
Min. standards level achieved	Outstanding level

Building Performance by Environment Section



Environmental Section	No. credits available	No. credits Achieved	% credits achieved	Section Weighting	Section Score
Management	22	22	100.00%	12.0%	12.00%
Health & Wellbeing	14	10	71.43%	15.0%	10.71%
Energy	27	24	88.89%	19.0%	16.89%
Transport	9	9	100.00%	8.0%	8.00%
Water	9	9	100.00%	6.0%	6.00%
Materials	12	11	91.67%	12.5%	11.46%
Waste	7	5	71.43%	7.5%	5.36%
Land Use & Ecology	10	8	80.00%	10.0%	8.00%
Pollution	13	10	76.92%	10.0%	7.69%
Innovation	10	6	60.00%	10.0%	6.00%

BREEAM®

Building Performance by Key Environmental Performance Indicator

Energy (consumption/production)	Life cycle stage	Measurement	Intensity	Units	Total	Units
Building operation[1]	Use	Modelled	89.89	$kWh/m^2/yr$	5611293	kWh/yr
Energy production[2]	Use	Modelled	65.54	$kWh/m^2/yr$	4091268	kWh/yr
Construction process[3]	INA	INA	INA	INA	INA	INA
Transport[4]	INA	INA	INA	INA	INA	INA
Greenhouse Gas Emissions						
Building operation[1]	Use	Modelled	11.80	$kgCO_2eq/m^2/yr$	736,603	$kgCO_2eq/yr$
Embodied[5]	Cradle-to-grave	Measured	INA	$kgCO_2eq/m^2$	INA	$kgCO_2eq$
	Proportion of applicable main building elements that data reported covers					INA
Construction process[3]	INA	INA	INA	INA	INA	INA
Transport[4]	INA	INA	INA	INA	INA	INA
Direct GHG emissions - Refrigerants[6]	Use	Modelled	467.43	$KgCO_2eq/kW_{coolth}$	4,922,412	$KgCO_2eq$
Emissions to outdoor air, soil and water						
Nitrogen Oxides (NO_x)[7]	Use	Measured	300.32	mg/kWh	1,435.62	kg/yr
Use of freshwater resource						
Building operation[8]	Use	Modelled	9.01	m3/person/yr	57,934	m3/yr
Construction process[9]	INA	INA	INA	INA	INA	INA
Construction waste and recovery						
Construction waste[10]	Construction	Target	7.50	tonnes/100m2	4,682	tonnes
Construction waste diverted from landfill[10]	Construction	Target	80.00%	%	3,745	tonnes
Demolition waste diverted from landfill[11]	Construction	Target	90.00%	%	INA	INA
Demolition waste to disposal[11]	Construction	Target	INA	%	INA	INA
Material for re-use[12]	Construction	Target	INA	tonnes/100m2	INA	tonnes
Material for recycling[12]	Construction	Target	INA	tonnes/100m2	INA	tonnes
Material for energy recovery[12]	Construction	Target	INA	tonnes/100m2	INA	tonnes
Hazardous waste to disposal[12]	Construction	Target	INA	tonnes/100m2	INA	tonnes
Sourcing of materials						
Materials responsibly sourced[13]	Construction	Measured	62.15%	%	-	-
Thermal comfort						
Time out of range of reference temperature[14]	Use	Modelled	2.00%	%	INA	INA
Indoor Air Quality						
Formaldehyde concentration level[15]	INA	INA	-	INA	INA	INA
Total volatile organic compound concentration[15]	INA	INA	INA	INA	INA	INA

Notes

1 Modelled using approved software compliant with the UK's National Calculation Method which in turn is compliant with Article 3 of The Energy Performance of Buildings Directive (EPBD) 2002/91/EC. Modelling includes building energy consumption resulting from the specification of a 'controlled', 'fixed building service' (as defined in Approved Document L2A, 2010).

2 The reported impact includes technologies that produce energy (on-site and/or near-site) as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

3 The reported impact includes energy consumption from construction plant, equipment and site accommodation. This KPI is not assessed/reported at the design stage of assessment/certification.

4 The reported impact covers transport of the construction materials that make-up the main building elements and ground works and landscaping materials (from the factory gate to the site) and construction waste (from the construction gate to waste disposal processing / recovery centre gate). Main building elements are defined in the BREEAM 2011 New Construction Technical Guide (SD5073). This KPI is not assessed/reported at the design stage of assessment/certification.

5 The reported impact covers the construction materials that make-up the main building elements (over a 60 year study period). Main building elements are defined in the BREEAM 2011 New Construction Technical Guide (SD5073). The data is quantified using BRE's Environmental Profiles Methodology. The Environmental Profiles Methodology has been peer reviewed to comply with BS ISO 14040 and represents the Product Category Rules for BRE Global's environmental labelling scheme (EPD - ISO 14025, Type III) for construction products and elements.

6 The reported impact is for a 10 year study period. The calculation of the Direct Effect Life Cycle CO_2eq emissions used by BREEAM is based on the Total Equivalent Warming Impact (TEWI) calculation method for new stationary refrigeration and air conditioning systems, as described in Annex B of BS EN 378-1:2008.

7 The reported impact covers emissions from either one or a combination of space heating, cooling and hot water heating (refer to Pol02 Assessment Issue for scope of emissions)

8 The reported impact includes net water consumption from the micro-components utilised by building occupants for sanitary purposes. The impact accounts for water recycling/rainwater collection, where used for permissible non-potable water demands (For further detail refer to BREEAM 2011 New Construction Technical Guide (SD5073)).

9 The reported impact is net water consumption i.e. accounts for any water recycling/rainwater collection used to off-set a potable site demand. This KPI is not assessed/reported at the design stage of assessment/certification.

10 The reported impact covers non-hazardous waste from new construction materials, it therefore excludes hazardous and demolition and excavation waste. Where assessed and reported at the design stage of assessment this KPI is based on a target as reported in a compliant Site Waste Management Plan.

11 The reported impact covers non-hazardous waste from site demolition. Where assessed and reported at the design stage at the design stage of assessment this KPI is based on the target demolition waste diverted from landfill, as reported in a compliant Site Waste Management Plan. If no demolition taking place on site this KPI is not applicable.

12 Where assessed and reported at the design stage of assessment this KPI is based on a target as reported in a compliant Site Waste Management Plan.

13 The reported impact covers the proportion of the key building elements present and assessed by BREEAM that are responsibly sourced, where responsibly sourced is defined as follows; where at least 80% of the materials that make-up an element achieve certification in accordance with one of the responsible sourcing schemes defined in table 10-2 of the BREEAM 2011 New Construction Technical Guide (SD5073).

14 The reported impact covers the percentage "time out of range" of the minimum and maximum temperatures for summer and winter settings, whereby winter and summer settings are defined in accordance with the appropriate industry standard (refer to the BREEAM 2011 New Construction Technical Guide (SD5073) for further detail).

15 The total volatile organic compound (TVOC) concentration is measured post construction (but pre-occupancy) over 8 hours. Formaldehyde concentration level is measured post construction (but pre-occupancy) averaged over 30 minutes. Both KPI's are measured in accordance with European and/or ISO standards (refer to the BREEAM New Construction Technical Manual for relevant standard numbers. At the design stage of assessment no data is available for this KPI as they are both measured once the building has been constructed (but pre-occupancy) for the purpose of post construction assessment.

"INA" = Indicator Not Assessed. This will be the case where either the data required for the KPI is not gathered/measured by the building's project team or not assessed/quantified in BREEAM for a particular building type or assessment stage e.g. energy consumption for construction process at the design stage of assessment.

"-" = KPI not applicable to building being assessed.

BREEAM®

WATER

Wat01 Water Consumption

No. of BREEAM credits available	5	Available contribution to overall score	3.33%
No. of BREEAM innovation credits available	1	Minimum standards applicable	Yes

Please select the calculation procedure used	Standard approach

Standard approach data

Water Consumption from building micro-components	15.53	L/person/day
Water demand met via greywater/rainwater sources	4.10	L/person/day
Total net water consumption	35.60	L/person/day
Improvement on baseline performance	67.89%	%

Key Performance Indicator - use of freshwater resource

Total net Water Consumption	9.01	m3/person/yr
Default building occupancy	6430.00	

Alternative approach data

Overall microcomponent performance level achieved	

Total BREEAM credits achieved	5
Total contribution to overall building score	3.33%
Total BREEAM innovation credits achieved	1
Minimum standard(s) level	Outstanding level

Assessor comments/notes:

Wat02 Water Monitoring

No. of BREEAM credits available	1	Available contribution to overall score	0.67%
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Assessment Criteria	Compliant?	Credits available	Credits achieved
Water meter on the mains water supply to the building(s)	Yes	1	1
Metering/monitoring equipment on supply to plant/building areas	Yes		
Pulsed output on all relevant water meters	Yes		
Existing BMS connection	Yes		

Total BREEAM credits achieved	1
Total contribution to overall building score	0.67%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	Outstanding level

Assessor comments/notes:

Wat03 Water Leak Detection and Prevention

No. of BREEAM credits available	2	Available contribution to overall score	1.33%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Leak detection on building's mains water supply	Yes	1	1
Flow control device to each sanitary area/facility	Yes	1	1

Total BREEAM credits achieved	2
Total contribution to overall building score	1.33%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Assessor comments/notes:

BREEAM®

Wat04 Water Efficient Equipment

No. of BREEAM credits available	1	Available contribution to overall score	0.67%
No. of BREEAM innovation credits available	No	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Specification/installation of water efficient equipment	Yes	1	1

Total BREEAM credits achieved	1
Total contribution to overall building score	0.67%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Assessor comments/notes:

BREEAM®

INNOVATION

Inn01 Innovation

No. of BREEAM innovation credits available	10	Available contribution to overall score	10.00%
		Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Man01 Sustainable Procurement	Yes	1	1
Man02 Responsible Construction Practices	Yes	1	1
Hea01 Visual Comfort	No	1	0
Ene01 Reduction of CO2 Emissions	No	5	0
Ene04 Low and Zero Carbon Technology	No	1	0
Ene05 Energy Efficient Cold Storage	N/A	N/A	N/A
Wat01 Water Consumption	Yes	1	1
Mat01 Life Cycle Impacts	No	3	0
Mat03 Responsible Sourcing of Materials	No	1	0
Wst01 Construction Waste Management	No	1	0
Wst02 Recycled Aggregates	Yes	1	1
Number of 'approved' innovation credits achieved?			2

Total BREEAM innovation credits achieved	6
Total contribution to overall building score	6.00%
Minimum standard(s) level	N/A

Assessor comments/notes:

1. Approved Innovation Number "INN11-0083" = Recycled water in cooling tower
2. Approved Innovation Number "INN11-0081" = Vaccuum Drainage

ATTACHMENT 2

BREEAM INNOVATION REPORT

VACUUM DRAINAGE

Vacuum Drainage - BREEAM Innovation Report

Bloomberg London - North

103938/LA/110415
Revision 01

Report Prepared For: Building Research Establishment (BRE)

Grontmij

Issue	Date	Reason for Issue	Prepared		Checked		Approved	
01	Mar 2014	For information	LA	03/14	TCF	03/14	AJD	03/14

Vacuum Drainage - BREEAM Innovation Report
103938/LA/110415
Revision 01

Grontmij
1 Bath Road
Maidenhead
Berkshire
SL6 4AQ

+44 (0)1628 623 423
building.services@grontmij.co.uk
grontmij.co.uk/buildingservices

value beyond engineering

Contents

1. Executive Summary 4
2. Introduction 5
2.1 Overview 5
2.2 The Problem 5
2.3 The Benefits 6
2.4 The Solution 6
3. The Design 7
3.1 General Design 7
3.2 Coordination with Other Water Savings Solutions 8
4. The Benefits 9
5. Why Innovative? 10

1. Executive Summary

This report provides a summary of the ***Vacuum Drainage*** for WC solution, in support of an application for a BREEAM Innovation credit for the North Building of the Bloomberg London development. The development provides a mix of office and retail space in the City of London.

The use of potable water in WC services is long established, and yet is a practice which represents an obvious area for improvement in terms of increasing the sustainability and environmental performance of building design. To this end, there have been significant developments in recent years aimed at tackling this problem, including the use of grey- and rain-water for flushing toilets, and the development of low-flush volume WC cisterns.

The design team at Bloomberg London North identified a number of solutions aimed at reducing the unnecessary consumption of potable water. Being the first of its kind for a commercial office building in the UK, one of these solutions, the provision for ***Vacuum Drainage*** for WC operation, is considered to be an innovation in the sustainable and environmental performance of commercial buildings in the UK.

2. Introduction

Bloomberg London is a new development in the City of London comprising two high-grade specification buildings (namely the North and South Buildings), with retail units at ground floor level. When completed, it will provide approximately 1,000,000 ft^2 of office and retail space and includes a new entrance to the London Underground at Bank station.

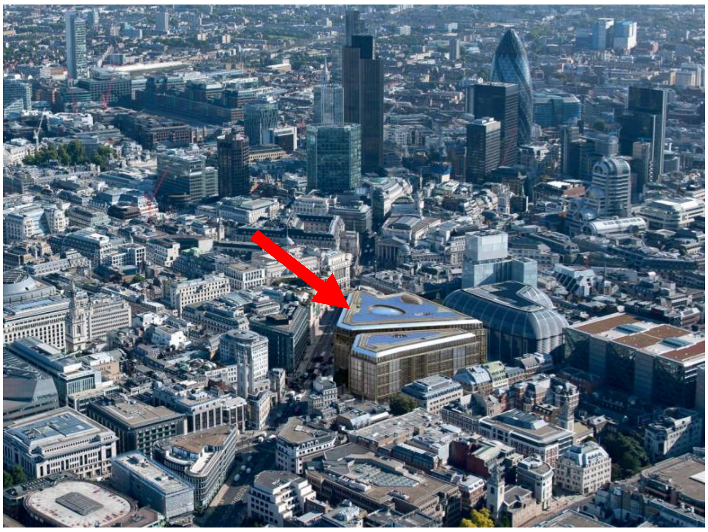


Fig. 1 Location of the Bloomberg London Development

This report is prepared in support of a BREEAM Innovation application for the North building for ***Vacuum Drainage***. The diagrams and figures used for explanatory purposes in this report have been developed for the project named above only and not any other.

2.1 Overview

The design of the commercial office building at Bloomberg London North has been led throughout by principles of environmental design, with an aspiration to develop innovative techniques and practices in order to secure the sustainable performance of the building during the design, construction and occupation of the building.

One of the areas that was identified as being appropriate for innovation was the consumption of potable water, for purposes other than those related to direct human consumption.

To this end, a number of innovative solutions were developed, including the provision of ***Vacuum Drainage*** for WC operation.

2.2 The Problem

The unsustainable use of potable water is one of the key challenges our society faces in terms of its consumption of natural resources. Even in a temperate and relatively wet climate such as the UK's, it is important to preserve clean water and secure its use for essential needs such as human consumption.

Water consuming processes in building design include those related to servicing of HVAC equipment, as well as the more commonly recognised application of WC flushing. The unnecessary consumption of potable water represents a number of risk factors, including:

- Degradation of finite quality clean water supplies
- Added pressures placed on ageing drainage systems
- Contribution to the problems associated with flood risks

Any reduction in the consumption of potable water for this purpose will have direct, as well as indirect, benefits.

2.3 The Benefits

Despite the difficulties in challenging established procedures and norms, particularly when faced with understandably conservative attitudes to water, recent advances have demonstrated the benefits in reducing the unnecessary consumption of potable water.

However, the team at Bloomberg London North recognised the numerous benefits that water-saving measures can deliver. These include:

- Sustainable use of potable water for WC flushing
- Cost savings related to water and drainage
- Preservation of clean water supplies
- Alleviation of pressures on existing drainage systems
- Reduced risk of local and regional flooding

These benefits were identified as being considerable and appropriate for the exploration of bespoke solutions that would enable them to be realised. In light of this, the innovative ***Vacuum Drainage*** for WC operation solution was developed.

2.4 The Solution

The team at Bloomberg London North incorporated a number of water-saving designs that address the concerns associated with water consuming plant, while also driving forward and delivering real and tangible benefits.

The ***Vacuum Drainage*** for WC operation solution was identified as being an innovative solution that addressed all the above.

3. The Design

3.1 General Design

The development of vacuum drainage solutions for WCs offers significant water savings over conventional systems.

The solution relies on induced flushing pressures in the drainage pipework. The following illustrates the general arrangement of the system.

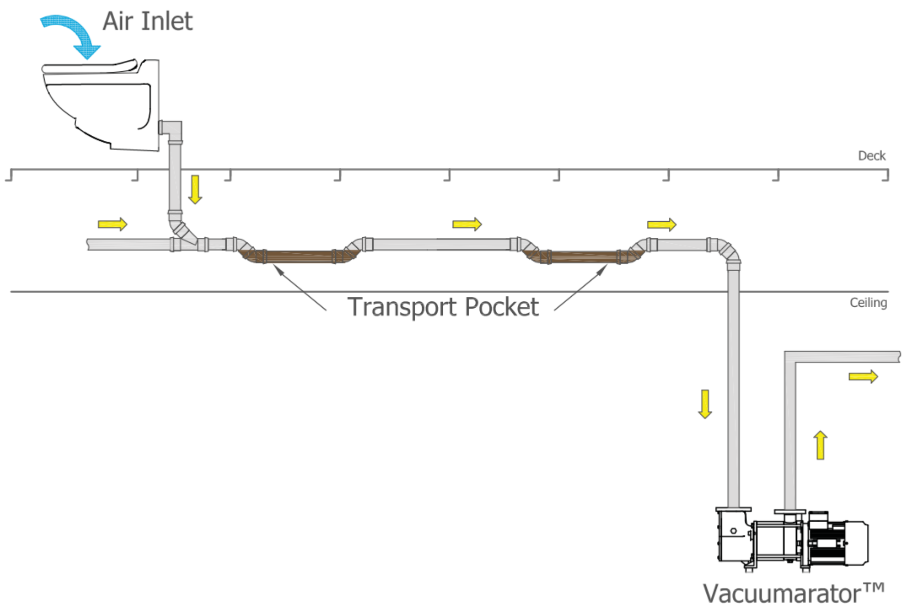


Fig. 1 General arrangement of vacuum drainage

A close up of the key design component of the system shows how this simple principle operates.

Fig. 2 Induced flushing pressures

The angular arrangement of the drainage pipework creates pressure potentials. The difference in air pressure is used to transport sewage from toilets to a vacuum unit.

In idle mode, a semi-vacuum (~0.5bar pressure) is maintained in the system. When flushed, approximately 60-80 litres of air is sucked through the toilets, in turn sucking the contents of the toilet into the system. The water and effluent forms a slug in the system, approximately 5-15m from the WC unit.

When the toilet valve closes, the movement of the slug will stop, and the sewage will flow under gravity to form pockets of slug in the angular 'transport pockets'. Subsequent flushes will move the formed slug along the network, from one 'transport pocket' to the next.

During running, the vacuum pump macerates the sewage, while at the same time generating a vacuum within the drainage pipework and transporting the sewage to appropriate treatment plant.

The system as a whole uses between 0.8 and 1 litres of water per WC flush. This is in comparison to more traditional systems that use up to 5 litres per flush.

3.2 Coordination with Other Water Savings Solutions

As noted, a number of water-saving measures have been incorporated into the design for Bloomberg London North. These include the recycling of cooling tower water, rainwater harvesting and the recycling of grey water from showers and hand wash basins.

These solutions, together with ***Vacuum Drainage*** for WC operation, will enable all WC flushing to undertaken through the use of grey water and rainwater only. There will be ***no consumption*** of potable water for operating WCs at Bloomberg London North building.

4. The Benefits

The benefits of this innovative solution are clear and various.

- Elimination of the use of potable water for WC flushing
- Use of grey water and rainwater only for WC flushing
- Cost savings related to water and drainage
- Preservation of clean water supplies
- Alleviation of pressures on existing drainage systems
- Reduced risk of local and regional flooding

The first installation of its kind in a commercial office development in the UK, this innovative solution will also act as a clear and forward looking case study for other developments seeking to encourage and support the sustainable use of clean potable water.

5. Why Innovative?

The ***Vacuum Drainage*** solution for the WCs at the North building at Bloomberg London should be considered innovative, and awarded an Applied Innovation credit under BREEAM 2011 New Construction (non-domestic) scheme.

The design should be considered ***Innovative*** *for the following reasons:*

- A nationwide ***first*** for the specification in a commercial office development of vacuum drainage for WC flushing.
- The application of this technology will ***eliminate*** the use of potable water for WC flushing purposes.
- Supporting this design will reduce the risk of regional ***flooding*** and help to alleviate the ***strains*** on local drainage infrastructure, some of which dates back to the 19th century.
- This solution will reducte by up to ***80%*** the consumption of water for operating WCs.

	Innovative	Vacuum Drainage	Bloomberg London North
Nationwide ***first*** for commercial office development	✓	✓	✓
Eliminating the use of potable water for WCs	✓	✓	✓
Reduced risk of flooding and drainage problems	✓	✓	✓
80% reduction in WC water consumption	✓	✓	✓

ATTACHMENT 3

BREEAM INNOVATION REPORT

COOLING TOWER WATER RECYCLING

Cooling Tower Water Recycling - BREEAM Innovation Report

Bloomberg London - North

103938/LA/110415
Revision 01

Report Prepared For: Building Research Establishment (BRE)

Grontmij

Grontmij

Issue	Date	Reason for Issue	Prepared		Checked		Approved	
01	Mar 2014	For information	LA	03/14	TCF	03/14	AJD	03/14

Cooling Tower Water Recycling - BREEAM Innovation Report
103938/LA/110415
Revision 01

Grontmij
1 Bath Road
Maidenhead
Berkshire
SL6 4AQ

+44 (0)1628 623 423
building.services@grontmij.co.uk
grontmij.co.uk/buildingservices

value beyond engineering

Contents

1. Executive Summary 4
2. Introduction 5
2.1 Overview 5
2.2 The Problem 5
2.3 The Benefits 6
2.4 The Solution 6
3. The Design 7
3.1 Recycling Strategy 7
4. The Benefits 9
5. Why Innovative? 10

1. Executive Summary

This report provides a summary of the ***Cooling Tower Water Recycling*** solution, in support of an application for a BREEAM Innovation credit for the North Building of the Bloomberg London development. The development provides a mix of office and retail space in the City of London.

The application of cooling tower technologies result in a significant uplift in chiller efficiencies, through the process of rejecting heat to atmosphere via water. This process enables this heat rejection to occur at or near wet-bulb temperatures, instead of at the higher dry-bulb temperature in the case of air-cooled chillers, thus increasing overall chiller efficiency.

Despite this obvious benefit, the cooling towers' Achilles heel is that large quantities of water are required for them to operate as designed. Inevitably, this water is traditionally sourced from potable water sources, thereby increasing the demand for, and use of, potable water.

The ***Cooling Tower Water Recycling*** solution developed for Bloomberg London North employs innovative techniques that ensure ***all*** bleed off back-wash water that would be expelled to drainage in conventional cooling tower designs, is instead recycled. This is equivalent to over ***two*** Olympic-size swimming pools of potable water for each year of operation.

This innovative solution is considered to be unique for commercial office buildings in the UK, and should provide the industry with a strong case study that can help drive future development of these techniques. For these reasons, the ***Cooling Tower Water Recycling*** solution developed for Bloomberg London North is considered to be an innovation in sustainability and the environmental design of buildings.

2. Introduction

Bloomberg London is a new development in the City of London comprising two high-grade specification buildings (namely the North and South Buildings), with retail units at ground floor level. When completed, it will provide approximately 1,000,000 ft^2 of office and retail space and includes a new entrance to the London Underground at Bank station.

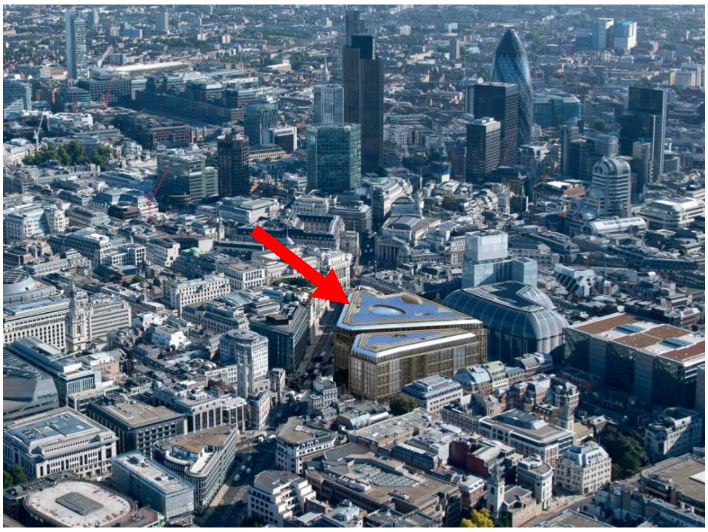


Fig. 1 Location of the Bloomberg London Development

This report is prepared in support of a BREEAM Innovation application for the North building for ***Cooling Tower Water Recycling***. The diagrams and figures used for explanatory purposes in this report have been developed for the project named above only and not any other.

2.1 Overview

Bloomberg London North building utilises cooling towers, located at roof level, to reject waste heat from the main chiller and combined cooling heating and power (CCHP) plant to atmosphere. The standard application of cooling towers makes use of mains water to reject this waste heat, with the bleed off back-wash from this process typically expelled through conventional drainage.

In order to lead the sustainable principles of the project, the design team for Bloomberg London North building recognised the need for achieving better and more efficient water usage systems, in order to reduce the consumption of potable water. To this end, a number of innovative solutions were developed and specified, including ***Cooling Tower Water Recycling***.

2.2 The Problem

Tackling excessive water consumption is a priority for sustainable development. Potable water is used typically for all sorts of processes beyond the obvious and necessary requirement for those connected to human consumption. Processes at work in typical building designs that require the use of water include those connected to sanitary (e.g. WC flushing), as well as servicing HVAC systems.

Although cooling towers can result in a significant uplift in chiller efficiencies, the disadvantage remains that they require large quantities of water in order for them to operate as designed. Inevitably, this water is traditionally sourced from potable water sources, thereby increasing the demand for, and use of, potable water. For a building such as Bloomberg London North, the quantities of potable water that would be needed to operate the cooling towers would be significant.

Other risk elements to using large amounts of potable water for mechanical systems include the exacerbation of the challenges associated with drainage, and the contribution to flooding risks.

In light of these concerns, the design team felt it necessary to develop solutions which, through their innovative approach, would significantly reduce the consumption of water.

2.3 The Benefits

Despite the challenges related to reducing water usage, the design team recognised at an early stage the potential benefits such solutions could bring. In summary, these benefits are:

- Significant reduction in the consumption of potable water for HVAC services
- Reduction in potable water costs
- Reduction in drainage costs
- Alleviation of pressures placed on ageing drainage systems
- The preservation of finite potable water supplies
- Significant contribution to reducing the risks associated with flooding

The potential benefits identified by the design team were assessed to be considerable. This acknowledgement led the team to explore how best these benefits could be realised. One of the solutions developed to this end was the ***Recycling of Cooling Tower Water***.

2.4 The Solution

The solution developed addresses the significant water consumption associated with operating cooling towers. The innovative technique recycles all the bleed off back-wash waste water from the cooling towers, to be used again in either the cooling towers themselves, or in other processes such as WC flushing.

This solution is in addition to other significant water saving measures that will reuse grey water sourced from systems such as hand-wash basins and cycle showers.

This innovative solution is believed to be the first of its kind in a commercial application in the UK. It is therefore considered appropriate for consideration for the award of a BREEAM Applied Innovation credit.

3. The Design

The Bloomberg London North building utilises cooling towers for heat rejection purposes from the main chiller and CCHP plant.

Cooling towers operate by utilising the effects of evaporative cooling.

Whilst this results in significant increases in associated chiller efficiencies, the towers themselves consume large quantities of water.

A lot of this water is expelled to atmosphere, through its evaporation, and is often observable as a plume of water vapour.

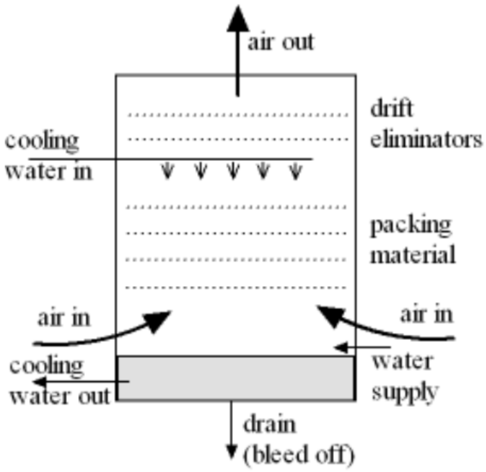


Fig. 1 Cooling tower operation

There is however a significant quantity of water that is washed-back, to be expelled to drainage in conventional designs. This bleed off is typically around 20% of the total water consumption of cooling towers. These significantly amounts of water were identified as being valuable by-products that could be recycled.

3.1 Recycling Strategy

The back-wash water from the cooling towers will be recycled for use in both the cooling towers themselves, as well as for storage alongside other grey water (which will be harnessed from sources such as hand wash basins and cyclists' showers).

The anticipated approximate proportions of recycled cooling tower water will be as below.

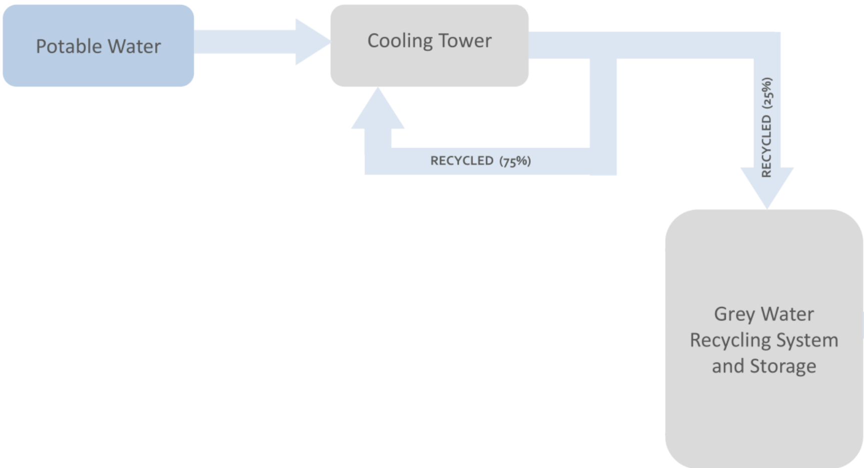


Fig. 2 Recycling of cooling tower waste water

Grey water storage is located centrally in basement level B3 and will serve other water consuming processes that do not require the use of potable water, such as WC flushing.

It is anticipated that the savings in potable water will amount to:

- Over 5,700m^3 per year in total potable water, equivalent to over ***two*** Olympic-size swimming pools
- Over 4,200m^3 per year in potable water consumption for the cooling towers
- Over 1,400m^3 per year in potable water consumption for the flushing of WCs

These significant reductions in the consumption of potable water will ensure Bloomberg London North building delivers sustainability benefits throughout its operational life.

4. The Benefits

The innovative nature of the ***Cooling Tower Water Recycling*** system developed for Bloomberg London North will generate significant benefits across a range of measures. In summary, these benefits are:

- Significant reduction in the consumption of potable water for HVAC services
- Significant reduction in the consumption of potable water for WC services
- Reduction in potable water costs
- Reduction in drainage costs
- Significant contribution to reducing the risks associated with flooding
- Providing a case study for the industry as a whole to enable further developments in this field, as well as demonstrate the applicability and benefits that can be accrued through this design

The variety of benefits is considerable in nature and will contribute to the delivery, both for current operation as well as in the future, of tangible sustainability benefits throughout the building's lifespan.

5. Why Innovative?

The ***Cooling Tower Water Recycling*** solution for the North building at Bloomberg London should be considered innovative, and awarded an Applied Innovation credit under BREEAM 2011 New Construction (non-domestic) scheme.

The design should be considered ***Innovative*** *for the following reasons:*

- A technique that is believed to be the ***first*** of its kind anywhere in the UK in a commercial application.
- The innovative solution will reduce the water consumption of Bloomberg London North building by over ***two Olympic***-sized swimming pools, each and ***every year***.
- The application of this technology will act as a ***case study*** for the wider industry, helping to drive innovations in the sustainable use of water.
- A significant contribution will be made to ***reducing*** the ***risks*** associated with drainage capacity and ***flooding.***

	Innovative	Cooling Tower Water Recycling	Bloomberg London North
Technique that is ***first*** of its kind in the UK	✓	✓	✓
Reducing water consumption by over ***two Olympic***-sized swimming pools, ***every year***	✓	✓	✓
Case study for the industry	✓	✓	✓
Reducing the ***risks*** associated with drainage and ***flooding***	✓	✓	✓