11/ Crime Prevention

Through consultation with the University's Crime Reduction Advisor and Greater Manchester Police, crime prevention has been considered as an integral part of the design process. GMP has confirmed that these proposals meet 'Secured by Design' requirements, subject to details.

Access to the staff entrance on the south side of the building will be controlled via the University's proximity card system. At the main entrance on Booth Street East, access via the revolving door and adjacent pass door will be open to all during normal daytime working hours. Access beyond this point via the stair and lift will be restricted via the proximity card system. Outside of normal working hours, the revolving door will be locked shut and the pass door will switch over to proximity card control.

External doors will be specified to comply with PAS24 or LPS1175 performance requirements. All glazing which is accessible from ground floor level will be specified with a laminated outer pane to resist breakage. A CCTV security surveillance system will also be installed. Please refer to Appendix X for further details under the Crime Impact Assessment.



12/ Sustainability

As agreed with Manchester City Council during pre-application consultations, this proposal has been designed to achieve a BREEAM rating of Very Good. The University have set a target of 65% for the scheme, 10% higher than the minimum threshold for Very Good. Refer to the BREEAM Pre-Assessment under Appendix M for further details.

In terms of energy use, the operational consumption over the lifetime of the building is the principal consideration for this building type. The proposal responds to this key sustainability consideration by employing an efficient building form and organisation, a highly insulated building envelope, highly efficient mechanical and electrical systems and on-site renewable energy sources.

In order to meet the strict environmental conditions required in order to carry out scientific research at the nanoscale, the cleanrooms and laboratories need to be air conditioned. The plant areas which are required to provide this cooling and ventilation will be housed within the multi-level Central Utility Building (CUB) on the west side of the building. This stacked arrangement of plant not only reduces the impact of plant vibration on the research space, but is also an energy efficient arrangement which reduces duct and cable runs between equipment. The cleanrooms and laboratories are located adjacent to the CUB on each level, with the offices, the most lightly serviced areas of the building, arranged along the east façade, furthest away from the CUB.

The offices will be naturally ventilated with openable windows and no reliance on backup mechanical ventilation systems. Exposed concrete soffits in the offices and laboratories provide thermal mass and reduce diurnal temperature variations. Low energy underfloor heating is proposed in the offices. In the seminar room, where occupancy is too high for natural ventilation, a displacement ventilation system provides a low energy alternative to the conventional mechanical ventilation and cooling systems.

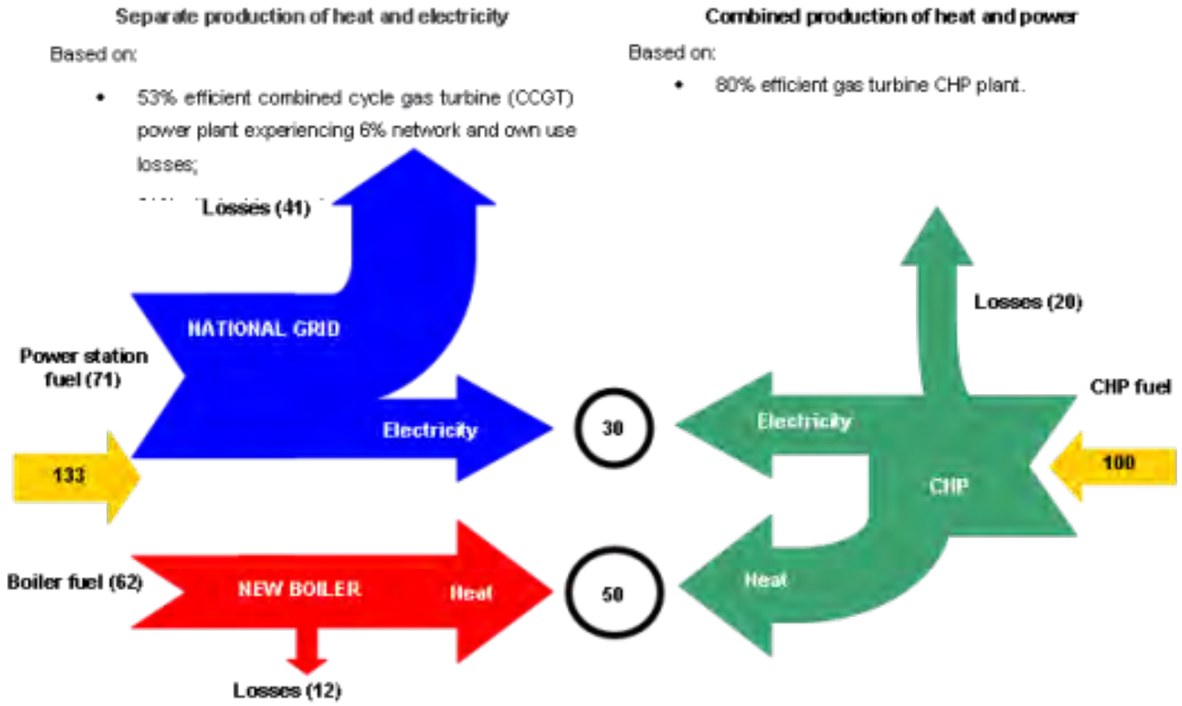
Good daylight and view is provided to all offices, with daylight or borrowed light to laboratories where appropriate in accordance with the specific research activities to be carried out in each room. Low energy lighting will be specified.

A highly insulated and airtight building envelope is proposed. U-Values of 0.15W/m2K, 0.2/m2K and 1.1W/m2K through the roof, walls/floor and windows respectively have been targeted. The perforated metal cladding provides solar shading to the south and east facing laboratories and offices, helping to prevent excessive solar gain in the offices and reducing the load on the air conditioning systems in the labs.

20% of the electrical load will be provided by on-site renewable energy sources. This includes a gas fired combined heat & power engine located in the CUB and photovoltaic panels located on the roof of the 3rd floor seminar room and laboratories. Photovoltaic panels are also proposed over the glazed roof to the double height breakout space on the east side of the building, therefore achieving the dual purposes of energy generation and solar shading. In addition, the design team are currently investigating the feasibility of plugging into the potential future campus District Heating System which is under consideration by the University.

Low water consumption has also been targeted. A rainwater harvesting tank located in the CUB will capture and re-use rainwater collected from the roof. Low water consumption sanitary appliances will also be specified. An attenuation tank located underground to the west of the site adjacent to Crawford House will delay the release of rainwater to the mains drainage system, therefore relieving pressure on this utility during stormwater conditions. Biodiverse / green roofs are proposed to the refuse store and at 3rd floor level.





Appendix A | Architectural Drawings



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KEY PLAN

NOTES

NORTH

EXTENT OF SITE FOR PROPOSAL

EXTENT OF ADJACENT LAND OWNED BY APPLICANT

REV	DATE	DESCRIPTION	DRN	CHK
P01	23.11.12	PLANNING APPLICATION	ASA	JMD

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DRAWING TITLE
SITE LOCATION PLAN

SCALE 1:1250 A3 SHEET

STATUS
PLANNING

DRAWING NO 2469–JW–100 REV P01

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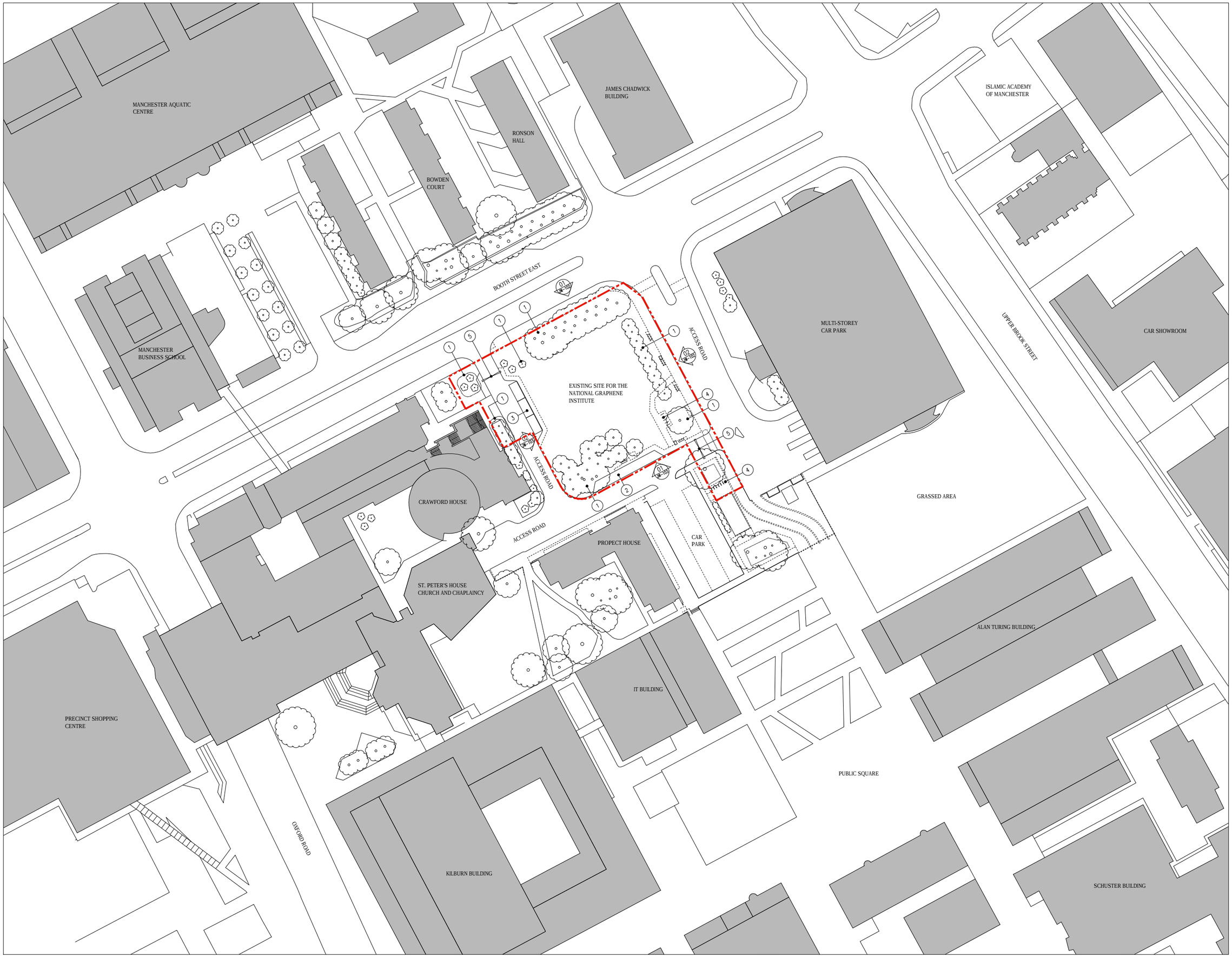

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KEY PLAN

NOTES

NORTH

1. EXISTING TREES/ PLANTING PROPOSED FOR REMOVAL
2. EXISTING LOADING BAY PROPOSED FOR REMOVAL
3. EXISTING DISABLED CAR PARKING PROPOSED FOR RELOCATION
4. EXISTING CYCLE STANDS PROPOSED FOR RELOCATION
5. EXISTING ROAD ACCESS BARRIER

REV	DATE	DESCRIPTION	DRN	CHK
P02	23.11.12	PLANNING APPLICATION	ASA	JMD
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EXISTING SITE PLAN

SCALE 1:500 A1 SHEET

STATUS
PLANNING

DRAWING NO 2469–JW–101 REV P02

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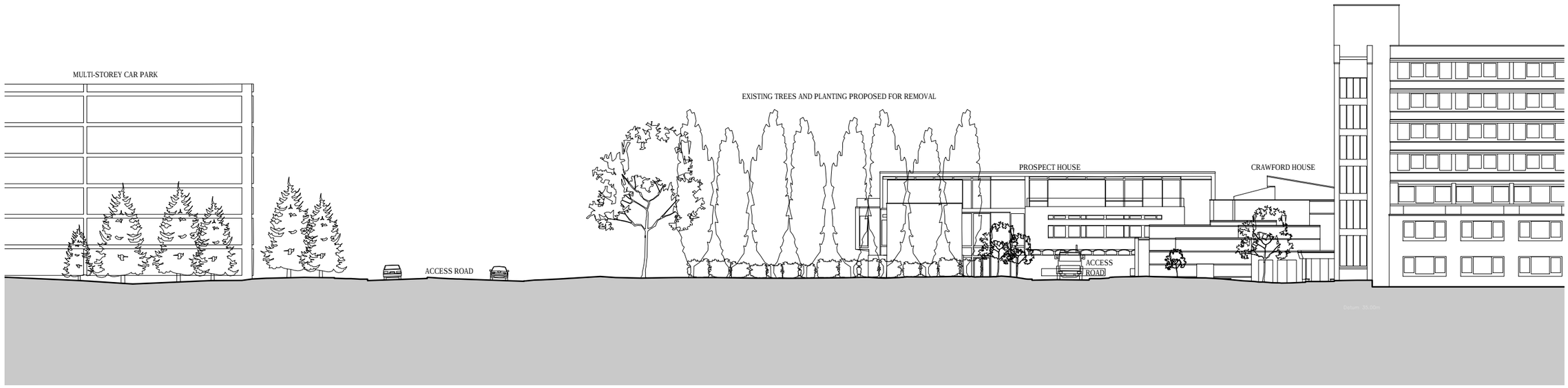
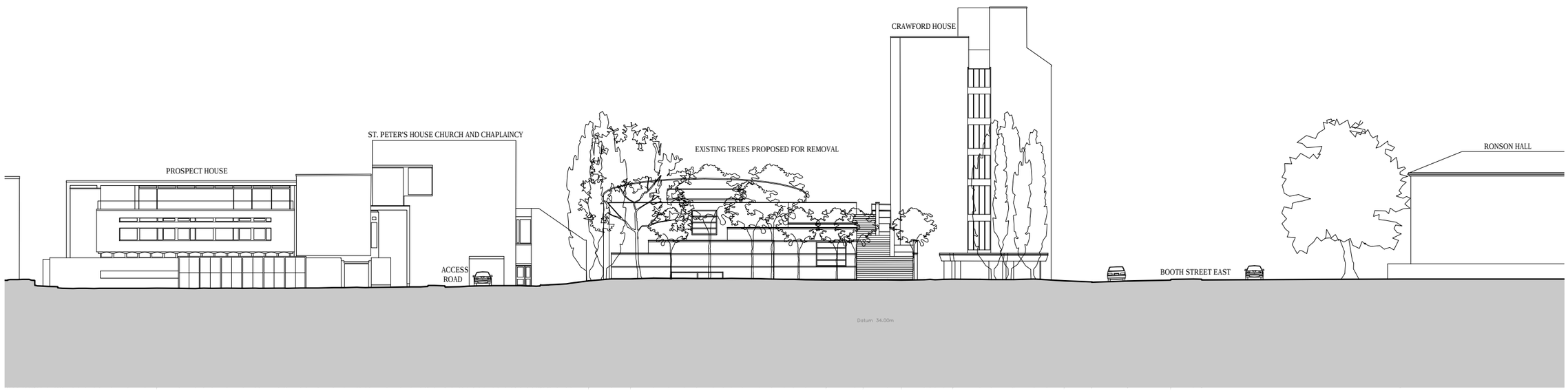


1 JW-102 EXISTING BOOTH STREET EAST ELEVATION
1:200@A1



2 JW-102 EXISTING EAST ELEVATION
1:200@A1

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KEY PLAN

NOTES

REV	DATE	DESCRIPTION	DRN	CHK
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DRAWING TITLE
EXISTING ELEVATIONS –
BOOTH STREET EAST & YORK STREET

SCALE 1:200 A1 SHEET

STATUS
PLANNING

DRAWING NO
2469–JW–102

REV
P02

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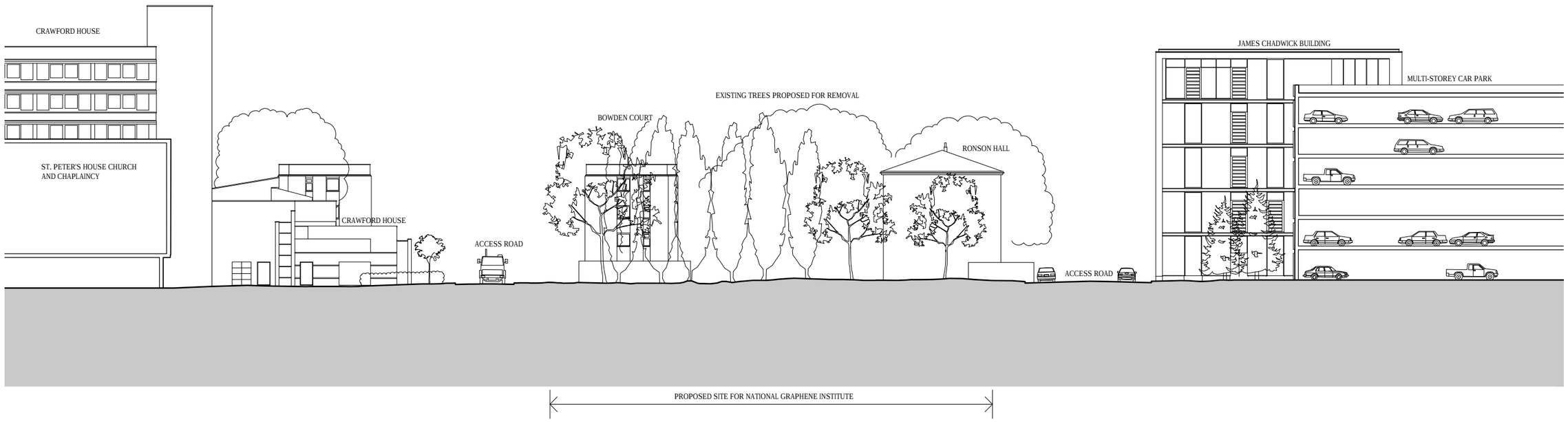
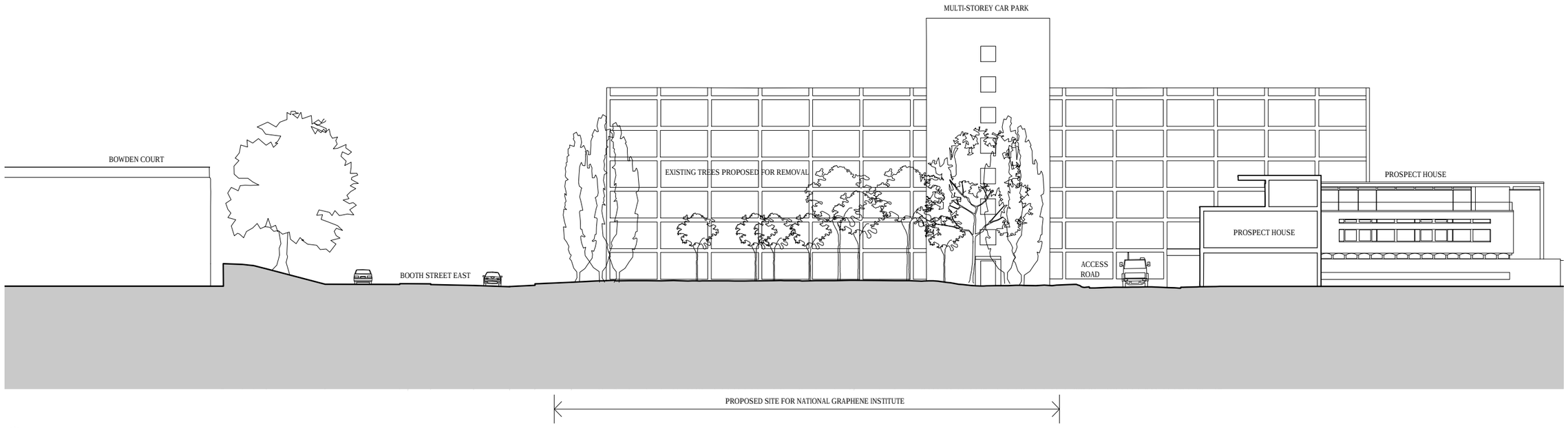
KEY PLAN

NOTES



1 EXISTING SOUTH ELEVATION
JW-103 1:200@A1



2 EXISTING WEST ELEVATION
JW-103 1:200@A1

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DRAWING TITLE
EXISTING ELEVATIONS –
SOUTH & WEST

SCALE 1:200 A1 SHEET

STATUS
PLANNING

DRAWING NO
2469–JW–103

REV
P02

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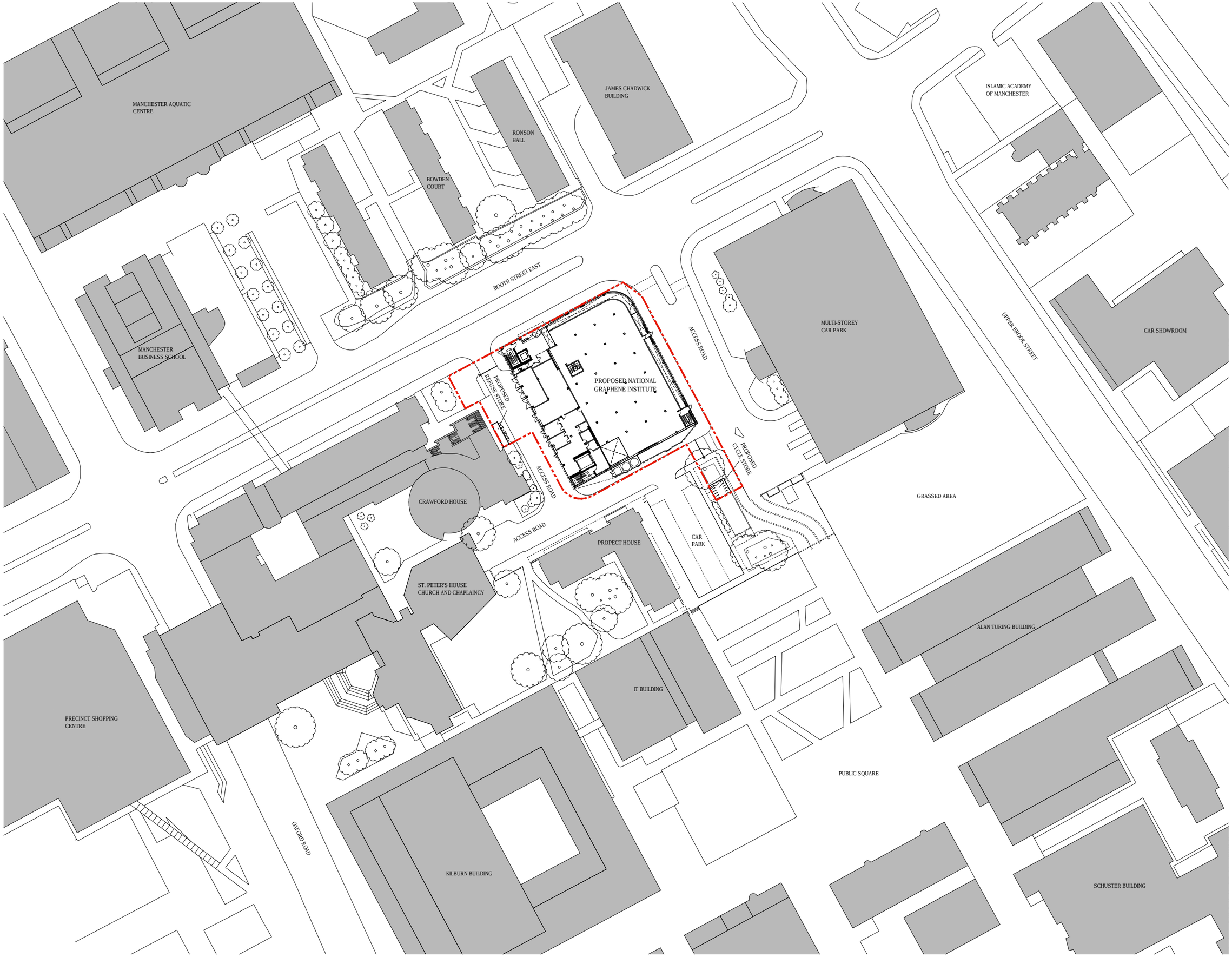

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KEY PLAN

NOTES

NORTH

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PROPOSED SITE PLAN

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STATUS
PLANNING

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2469–JW–104

REV
P02

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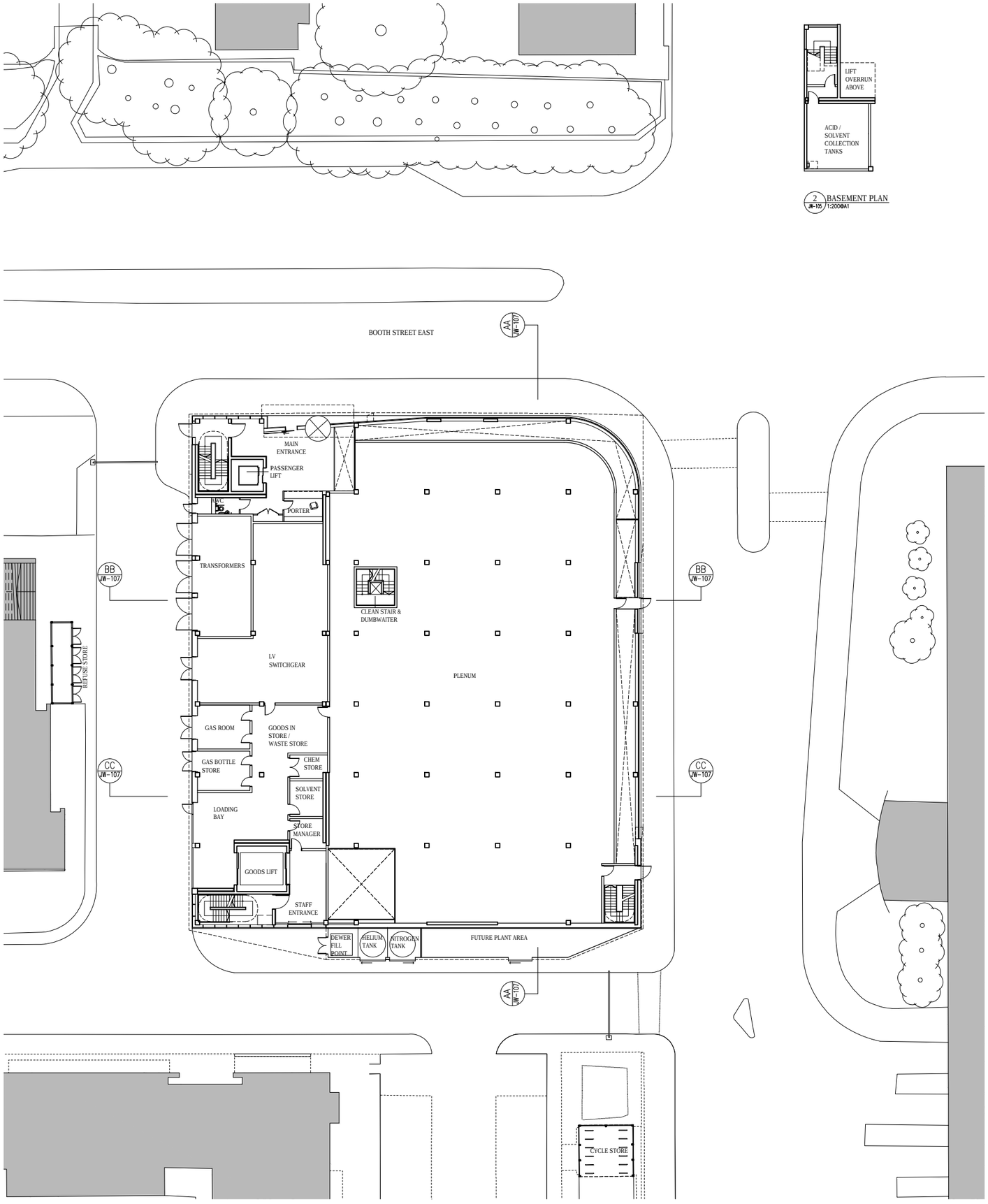
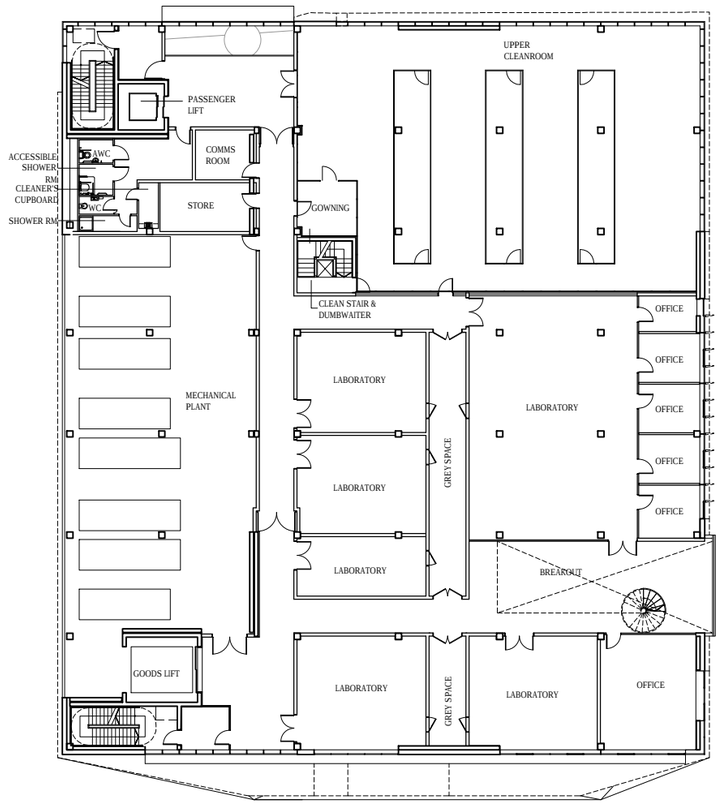
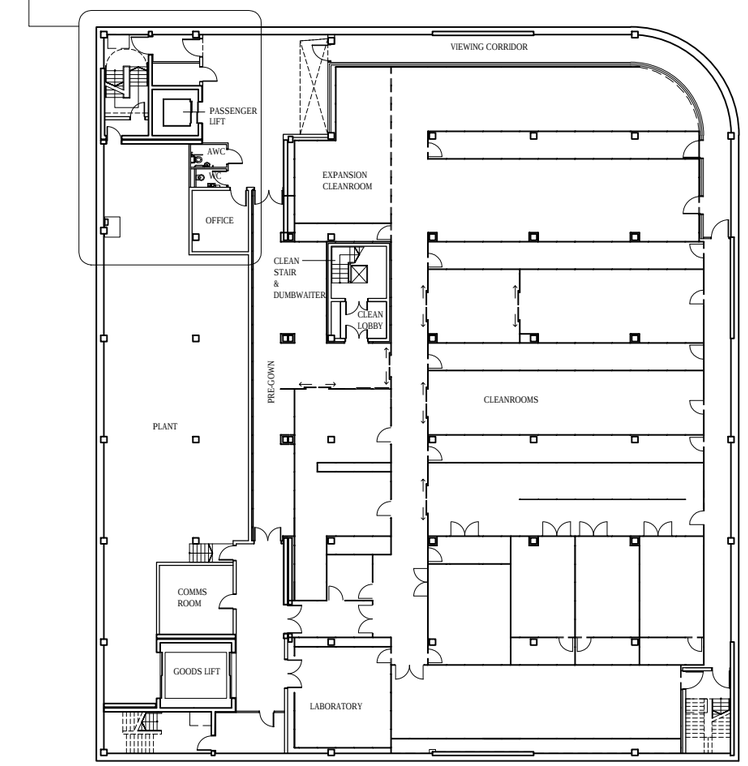


1 GROUND FLOOR PLAN
JW-105 1:200@A1

2 BASEMENT PLAN
JW-105 1:200@A1



3 FIRST FLOOR PLAN
JW-105 1:200@A1



4 LOWER GROUND FLOOR PLAN
JW-105 1:200@A1

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KEY PLAN

NOTES

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PROPOSED FLOOR PLANS
BASEMENT, LOWER GROUND, GROUND & FIRST

SCALE 1:200 A1 SHEET

STATUS
PLANNING

DRAWING NO 2469-JW-105 REV P02

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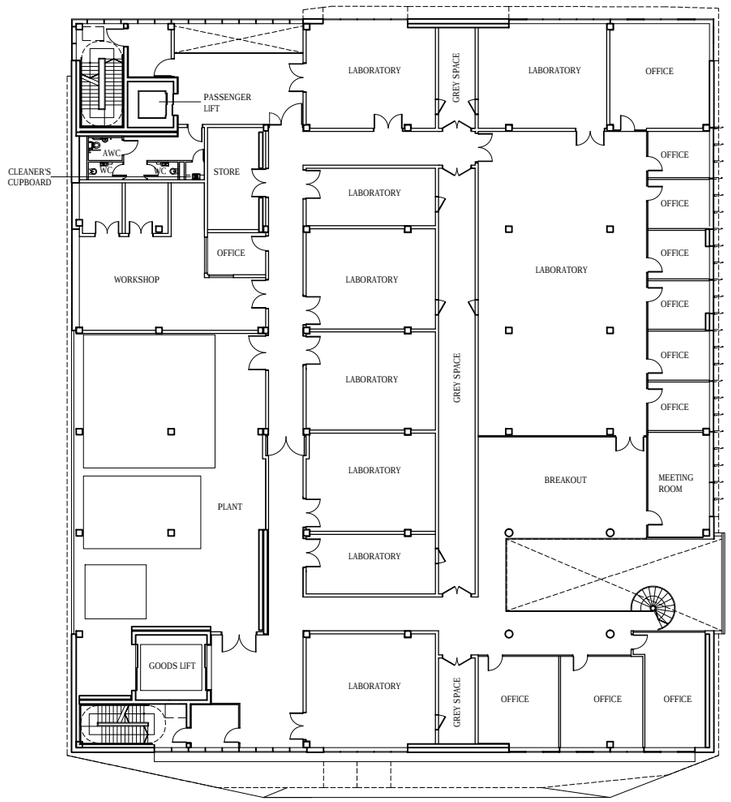
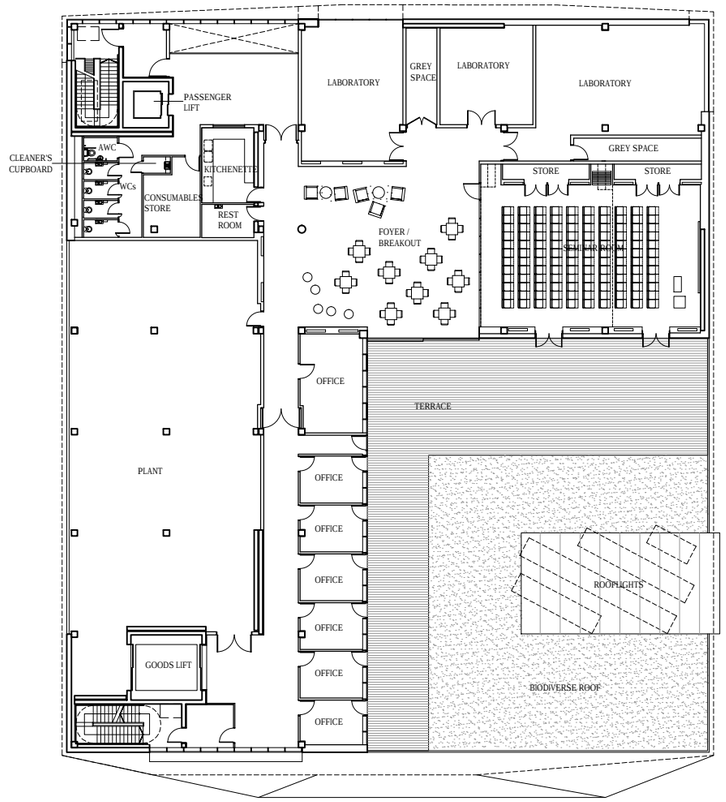
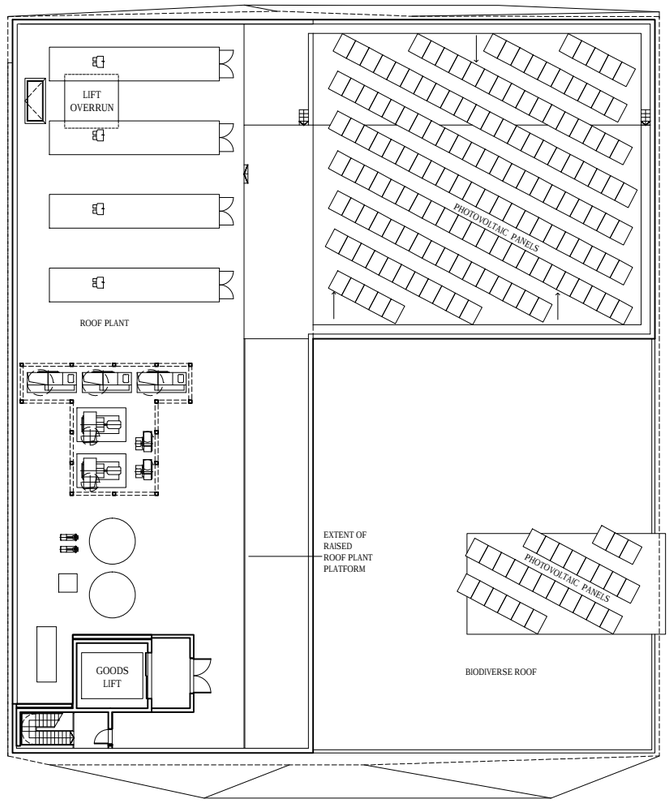


1 SECOND FLOOR PLAN
JW-106 1:200@A1



2 THIRD FLOOR PLAN
JW-106 1:200@A1



3 FOURTH FLOOR PLAN
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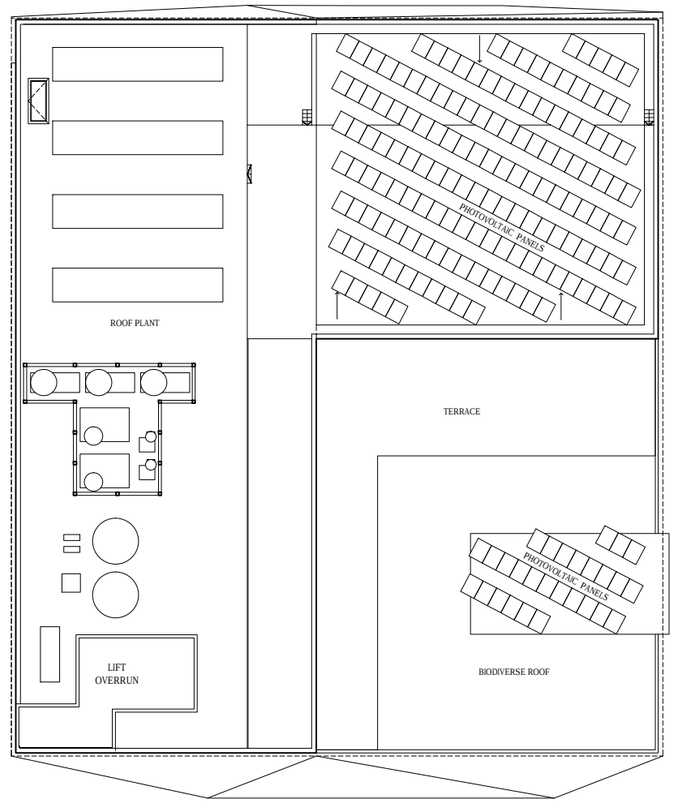

4 ROOF PLAN
JW-106 1:200@A1

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KEY PLAN

NOTES

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DRAWING TITLE
PROPOSED FLOOR PLANS
SECOND, THIRD, FOURTH & ROOF

SCALE 1:200 A1 SHEET

STATUS
PLANNING

DRAWING NO 2469-JW-106 REV P02

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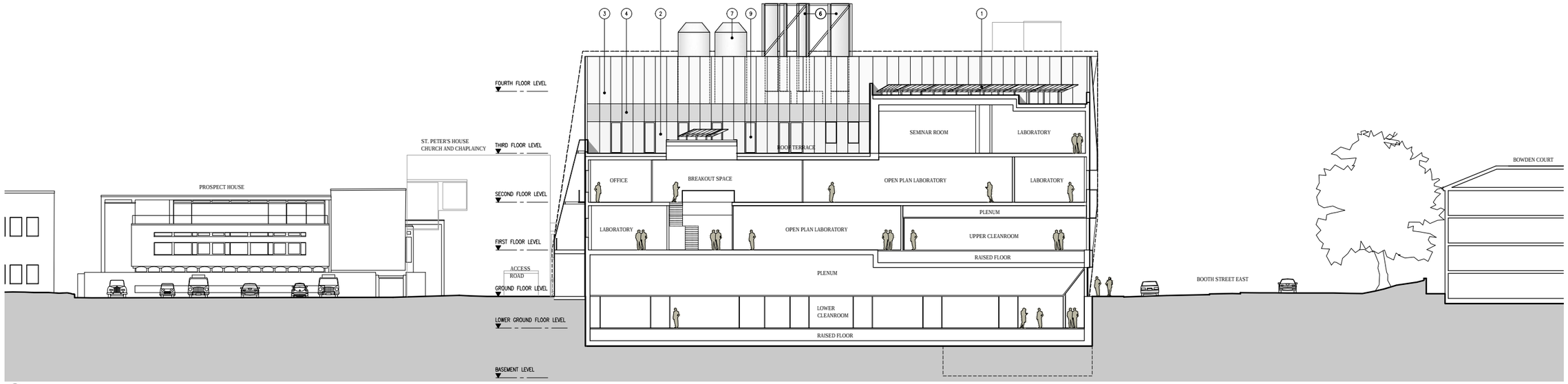

1 SECTION AA
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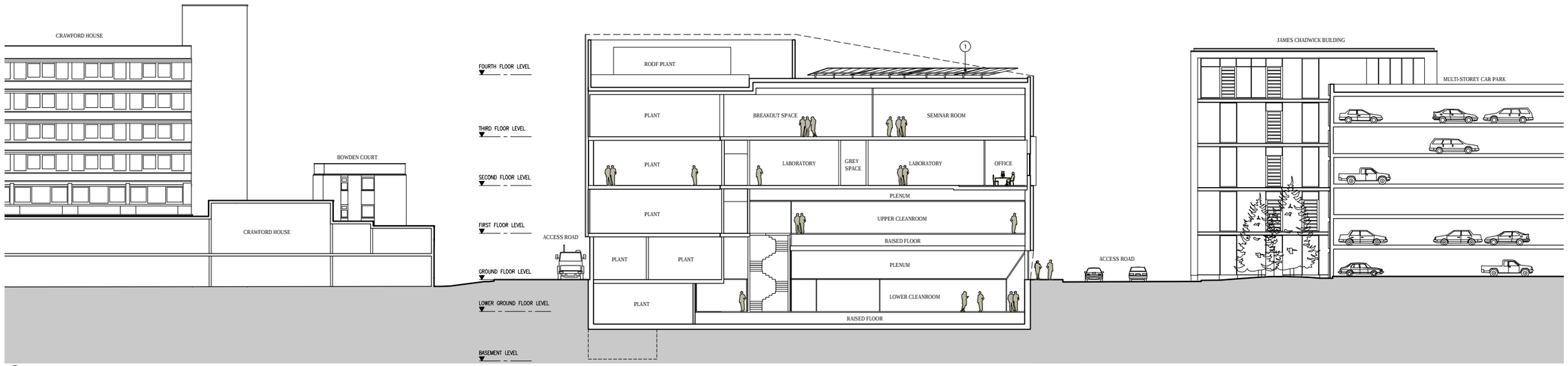

2 SECTION BB
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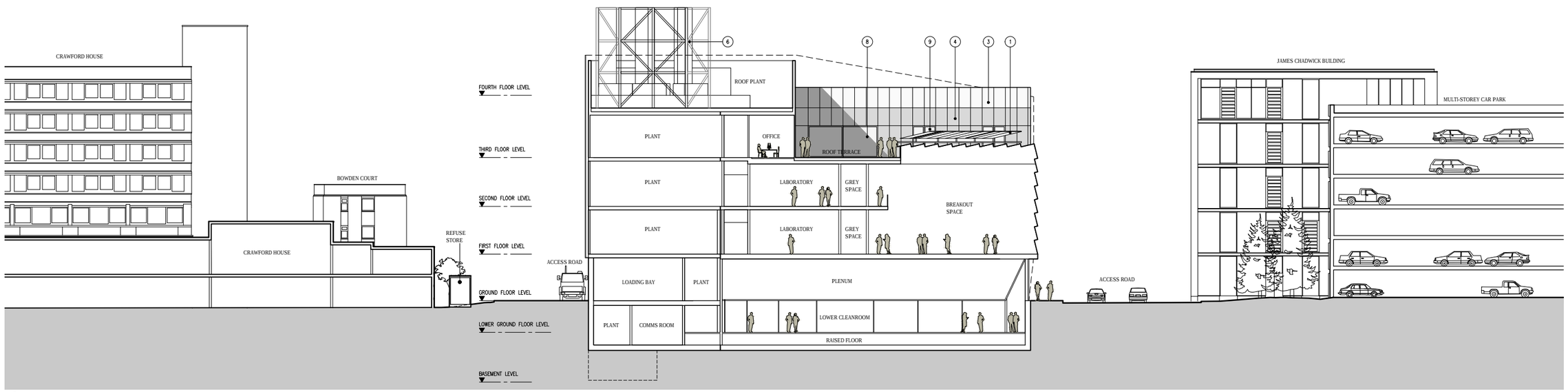

3 SECTION CC
JW-107 1:200@A1

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KEY PLAN

NOTES

1. PHOTOVOLTAIC PANELS
2. CLEAR STRUCTURALLY GLAZED CURTAIN WALLING
3. TRANSLUCENT STRUCTURALLY GLAZED CURTAIN WALLING
4. OPAQUE STRUCTURALLY GLAZED CURTAIN WALLING
5. POWDER COATED ALUMINUM FRAMED CLEAR GLAZED WINDOWS
6. EXHAUST FLUES
7. ROOF PLANT
8. GLAZED SLIDING DOOR
9. GLAZED SWING DOOR

REV	DATE	DESCRIPTION	DRN	CHK
P02	23.11.12	PLANNING APPLICATION	ASA	JMD
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PROPOSED SECTIONS

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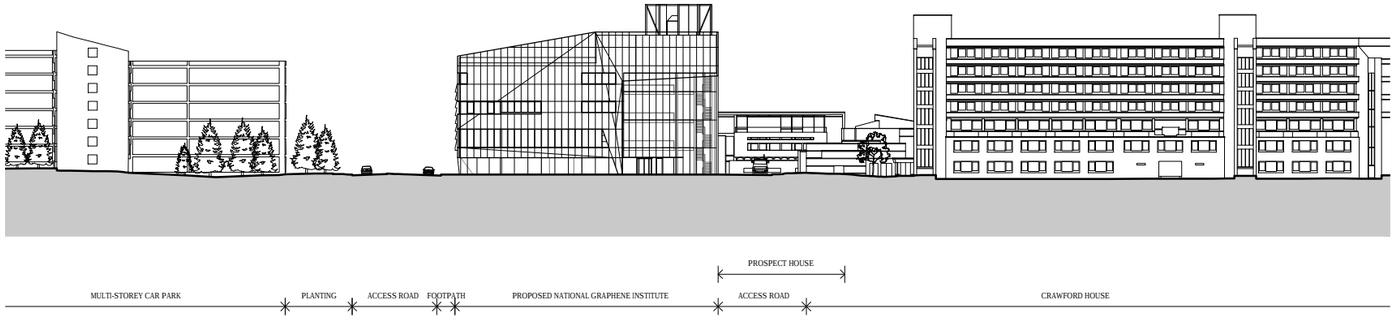
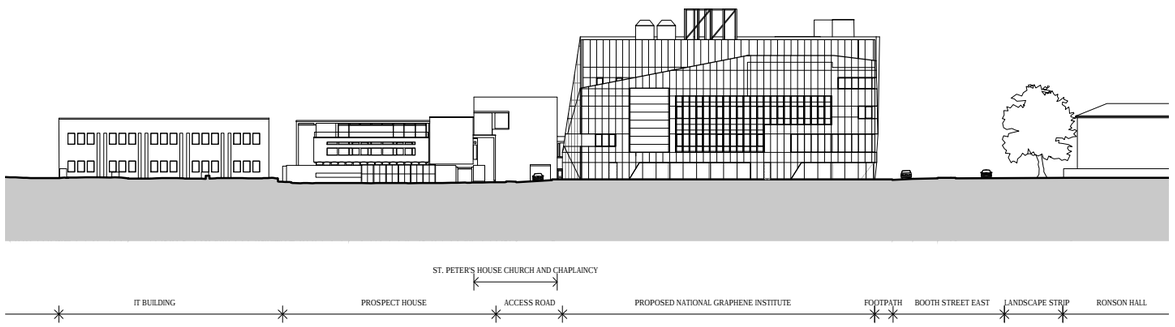
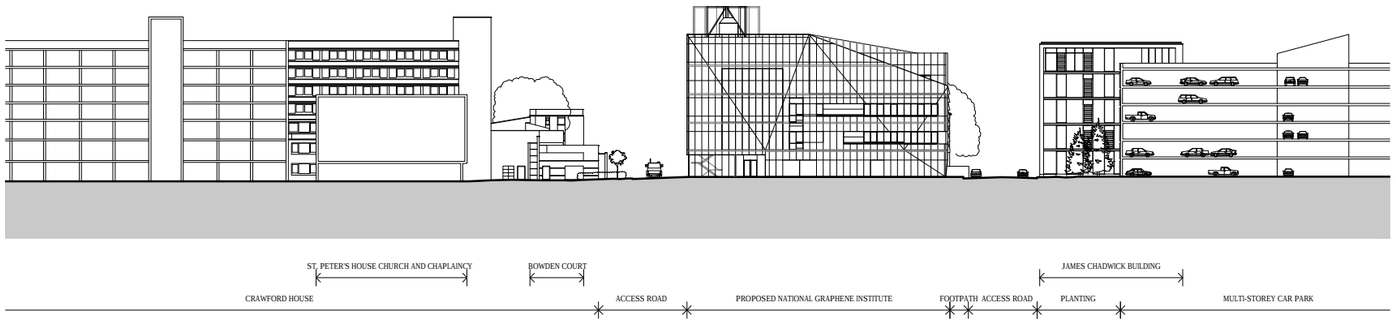


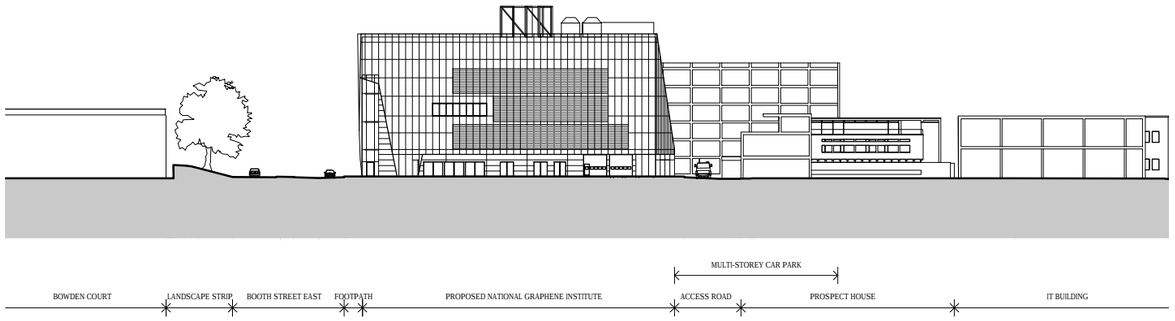
1 JW-108 PROPOSED BOOTH STREET EAST ELEVATION
1:500



2 JW-108 PROPOSED EAST ELEVATION
1:500



3 JW-108 PROPOSED SOUTH ELEVATION
1:500



4 JW-108 PROPOSED WEST ELEVATION
1:500

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KEY PLAN

NOTES

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DRAWING TITLE
PROPOSED CONTEXTUAL ELEVATIONS – BOOTH STREET EAST/EAST/SOUTH/WEST

SCALE 1:500 A1 SHEET

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PLANNING

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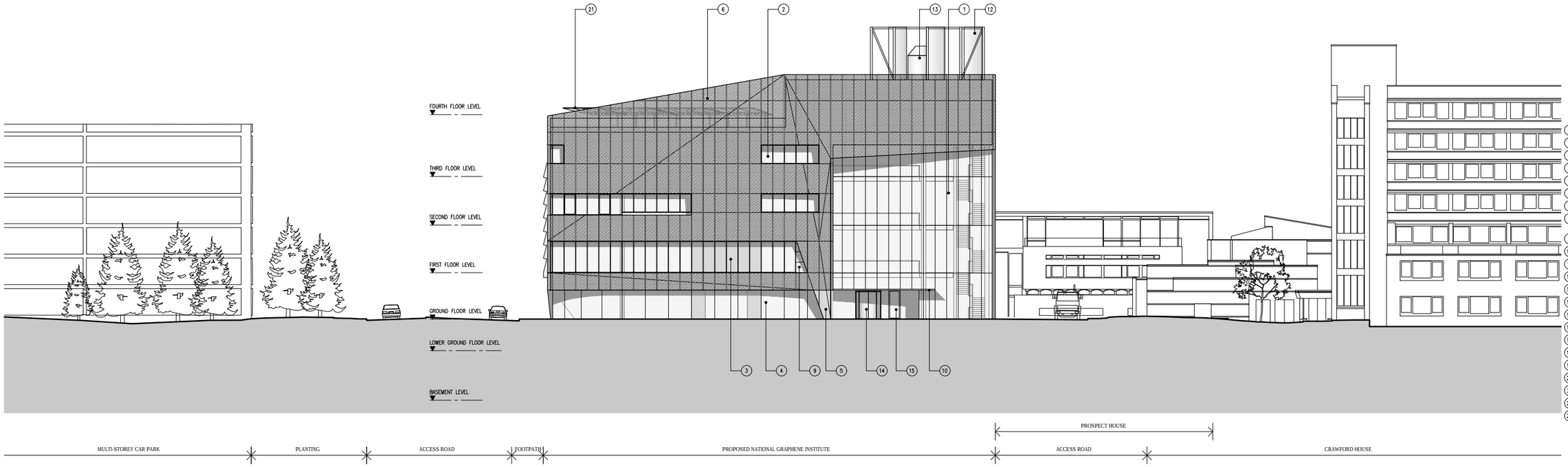
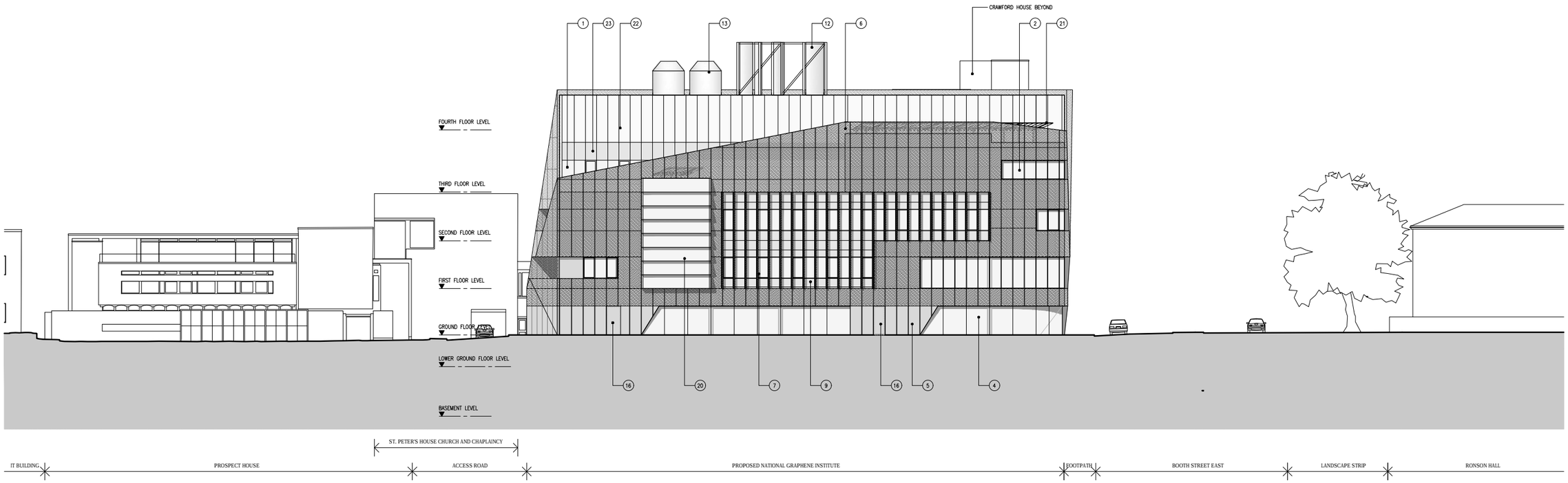


1 PROPOSED BOOTH STREET EAST ELEVATION
JW-109 1:200@A1

NOTES

1. CLEAR STRUCTURALLY GLAZED CURTAIN WALLING
2. POWDER COATED ALUMINIUM FRAMED CLEAR GLAZED WINDOWS
3. POWDER COATED ALUMINIUM FRAMED OPAQUE GLAZED WINDOWS
4. FRAMELESS CLEAR GLAZING
5. UNPERFORATED METAL CLADDING AT LOW LEVEL
6. PERFORATED METAL OUTER CLADDING
7. PERFORATED METAL SOLAR SHADING FINS
8. POWDER COATED ALUMINIUM LOUVRES BEHIND PERFORATED METAL OUTER CLADDING
9. POWDER COATED METAL INNER CLADDING PANELS
10. GLASS ENTRANCE CANOPY
11. METAL ENTRANCE CANOPY
12. EXHAUST FLUES
13. ROOF PLANT
14. GLAZED REVOLVING DOOR
15. GLAZED SLIDING DOOR
16. METAL CLAD DOOR
17. POWDER COATED ALUMINIUM LOUVRED DOORS
18. POWDER COATED OVERHEAD SECTIONAL DOORS
19. GLAZED SWING DOORS
20. ANGLED CLEAR GLAZING TO BREAKOUT SPACE
21. PHOTOVOLTAIC PANELS
22. TRANSLUCENT STRUCTURALLY GLAZED CURTAIN WALLING
23. OPAQUE STRUCTURALLY GLAZED CURTAIN WALLING



2 PROPOSED EAST ELEVATION
JW-109 1:200@A1

REV	DATE	DESCRIPTION	DRN	CHK
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DRAWING TITLE
PROPOSED BUILDING ELEVATIONS – BOOTH STREET EAST & EAST

SCALE 1:200 A1 SHEET

STATUS
PLANNING

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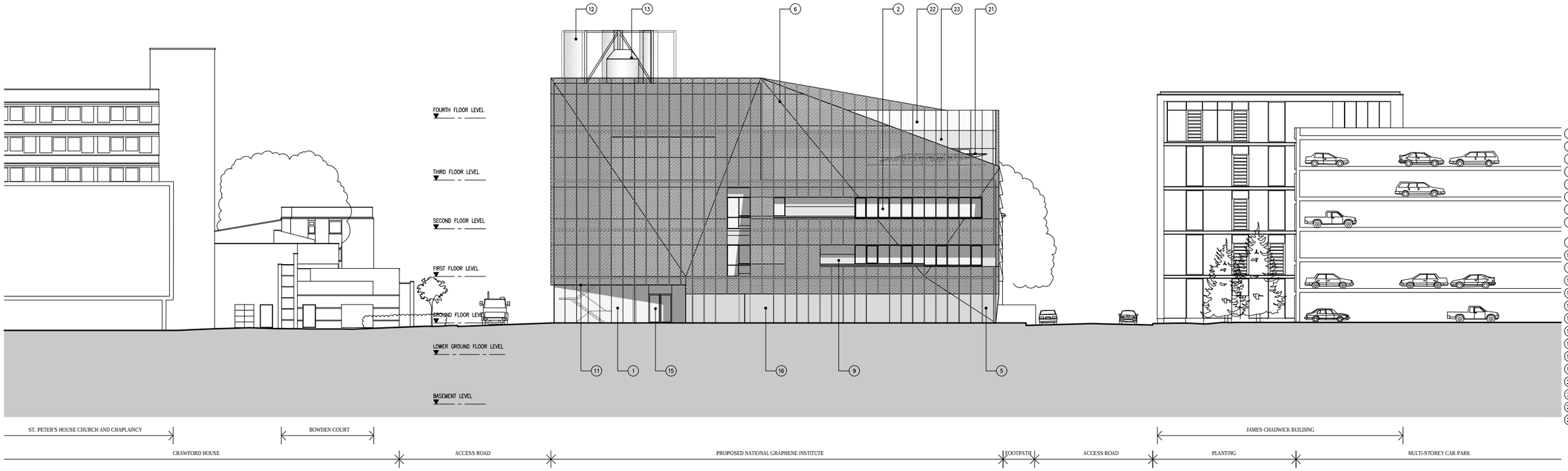
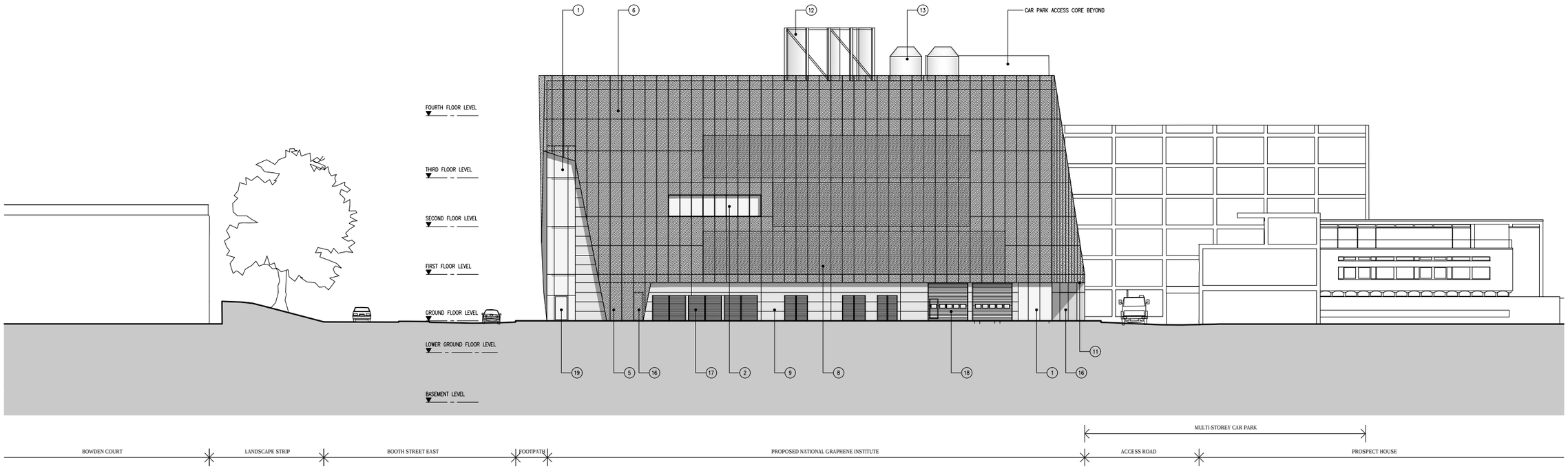
KEY PLAN



1 PROPOSED SOUTH ELEVATION
JW-110 1:200@A1

NOTES

1. CLEAR STRUCTURALLY GLAZED CURTAIN WALLING
2. POWDER COATED ALUMINIUM FRAMED CLEAR GLAZED WINDOWS
3. POWDER COATED ALUMINIUM FRAMED OPAQUE GLAZED WINDOWS
4. FRAMELESS CLEAR GLAZING
5. UNPERFORATED METAL CLADDING AT LOW LEVEL
6. PERFORATED METAL OUTER CLADDING
7. PERFORATED METAL SOLAR SHADING FINS
8. POWDER COATED ALUMINIUM LOUVRES BEHIND PERFORATED METAL OUTER CLADDING
9. POWDER COATED METAL INNER CLADDING PANELS
10. GLASS ENTRANCE CANOPY
11. METAL ENTRANCE CANOPY
12. EXHAUST FLUES
13. ROOF PLANT
14. GLAZED REVOLVING DOOR
15. GLAZED SLIDING DOOR
16. METAL CLAD DOOR
17. POWDER COATED ALUMINIUM LOUVRED DOORS
18. POWDER COATED OVERHEAD SECTIONAL DOORS
19. GLAZED SWING DOORS
20. ANGLED CLEAR GLAZING TO BREAKOUT SPACE
21. PHOTOVOLTAIC PANELS
22. TRANSLUCENT STRUCTURALLY GLAZED CURTAIN WALLING
23. OPAQUE STRUCTURALLY GLAZED CURTAIN WALLING



2 PROPOSED WEST ELEVATION
JW-110 1:200@A1

REV	DATE	DESCRIPTION	DRN	CHK
P02	23.11.12	PLANNING APPLICATION	KMK	JMD
P01	20.11.12	DRAFT PLANNING APPLICATION	KMK	JMD

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PROJECT
NATIONAL GRAPHENE INSTITUTE

DRAWING TITLE
PROPOSED BUILDING ELEVATIONS – SOUTH & WEST

SCALE 1:200 A1 SHEET

STATUS
PLANNING

DRAWING NO
2469–JW–110

REV
P02

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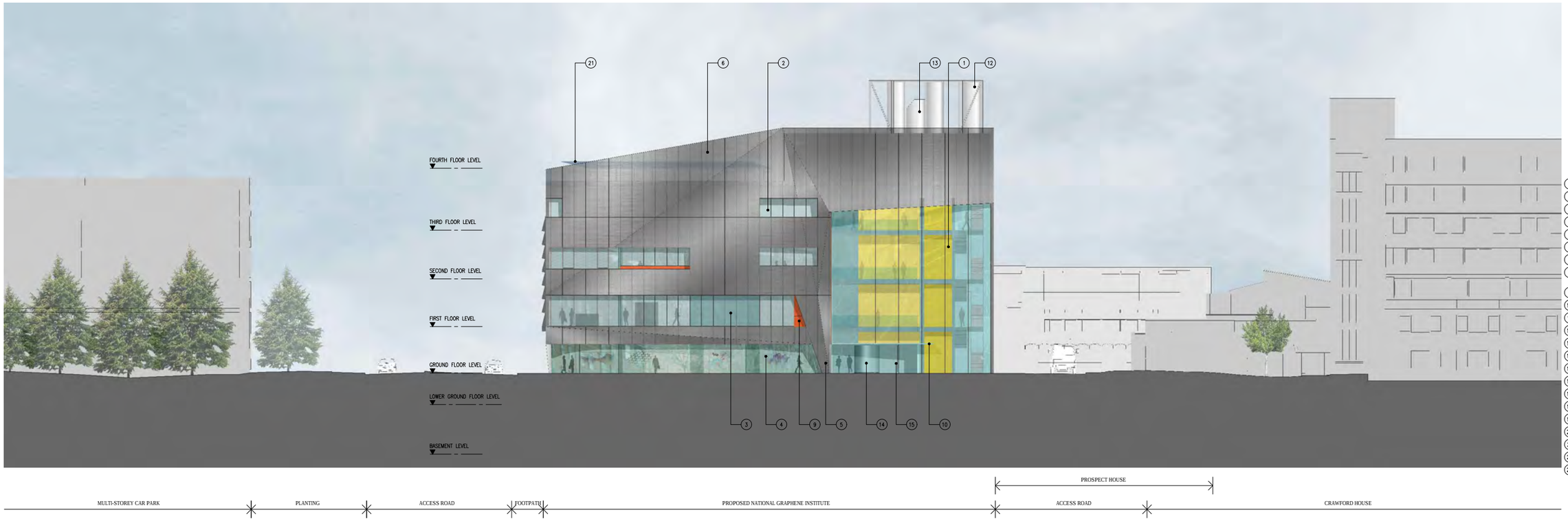
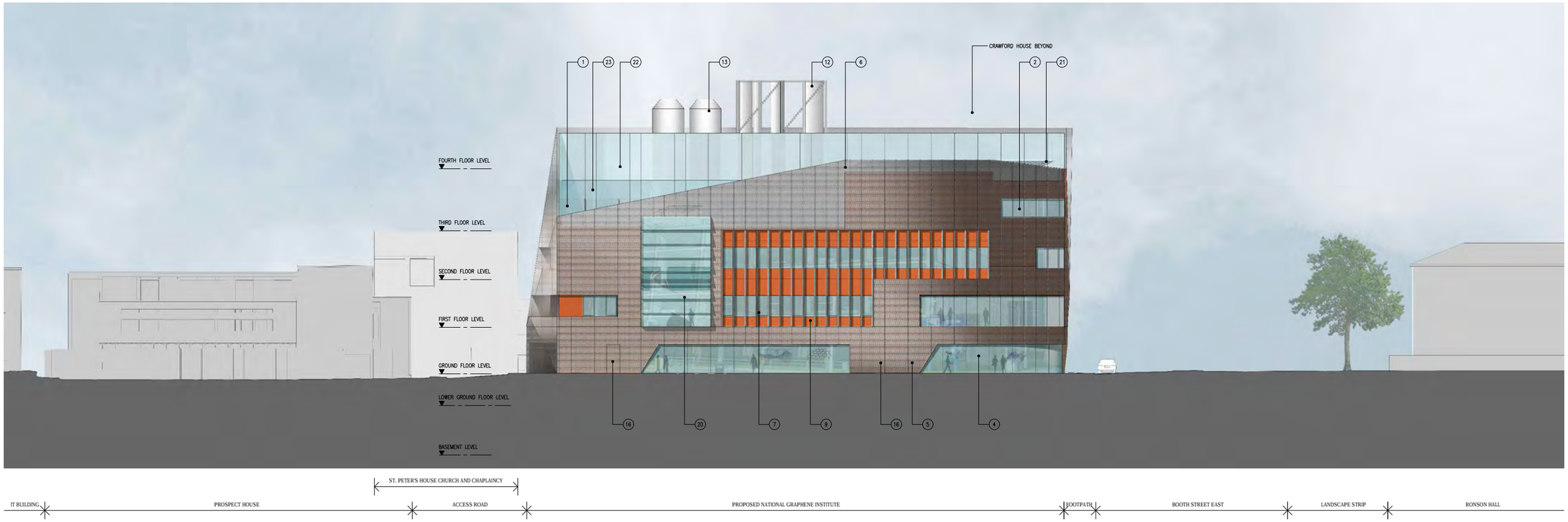


1 PROPOSED BOOTH STREET EAST ELEVATION
JW-112 1:200@A1



2 PROPOSED EAST ELEVATION
JW-112 1:200@A1

DO NOT SCALE THIS DRAWING ALL DIMENSIONS MUST BE CHECKED ON SITE INFORM THE ARCHITECT OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION

KEY PLAN

NOTES

1. CLEAR STRUCTURALLY GLAZED CURTAIN WALLING
2. POWDER COATED ALUMINIUM FRAMED CLEAR GLAZED WINDOWS
3. POWDER COATED ALUMINIUM FRAMED OPAQUE GLAZED WINDOWS
4. FRAMELESS CLEAR GLAZING
5. UNPERFORATED METAL CLADDING AT LOW LEVEL
6. PERFORATED METAL OUTER CLADDING
7. PERFORATED METAL SOLAR SHADING FINS
8. POWDER COATED ALUMINIUM LOUVRES BEHIND PERFORATED METAL OUTER CLADDING
9. POWDER COATED METAL INNER CLADDING PANELS
10. GLASS ENTRANCE CANOPY
11. METAL ENTRANCE CANOPY
12. EXHAUST FLUES
13. ROOF PLANT
14. GLAZED REVOLVING DOOR
15. GLAZED SLIDING DOOR
16. METAL CLAD DOOR
17. POWDER COATED ALUMINIUM LOUVRED DOORS
18. POWDER COATED OVERHEAD SECTIONAL DOORS
19. GLAZED SWING DOORS
20. ANGLED CLEAR GLAZING TO BREAKOUT SPACE
21. PHOTOVOLTAIC PANELS
22. TRANSLUCENT STRUCTURALLY GLAZED CURTAIN WALLING
23. OPAQUE STRUCTURALLY GLAZED CURTAIN WALLING

REV	DATE	DESCRIPTION	DRN	CHK
P01	23.11.12	PLANNING APPLICATION	KMK	JMD

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DRAWING TITLE
PROPOSED BUILDING ELEVATIONS – BOOTH STREET EAST & EAST (COLOURED)

SCALE 1:200 A1 SHEET

STATUS
PLANNING

DRAWING NO
2469–JW–112

REV
P01

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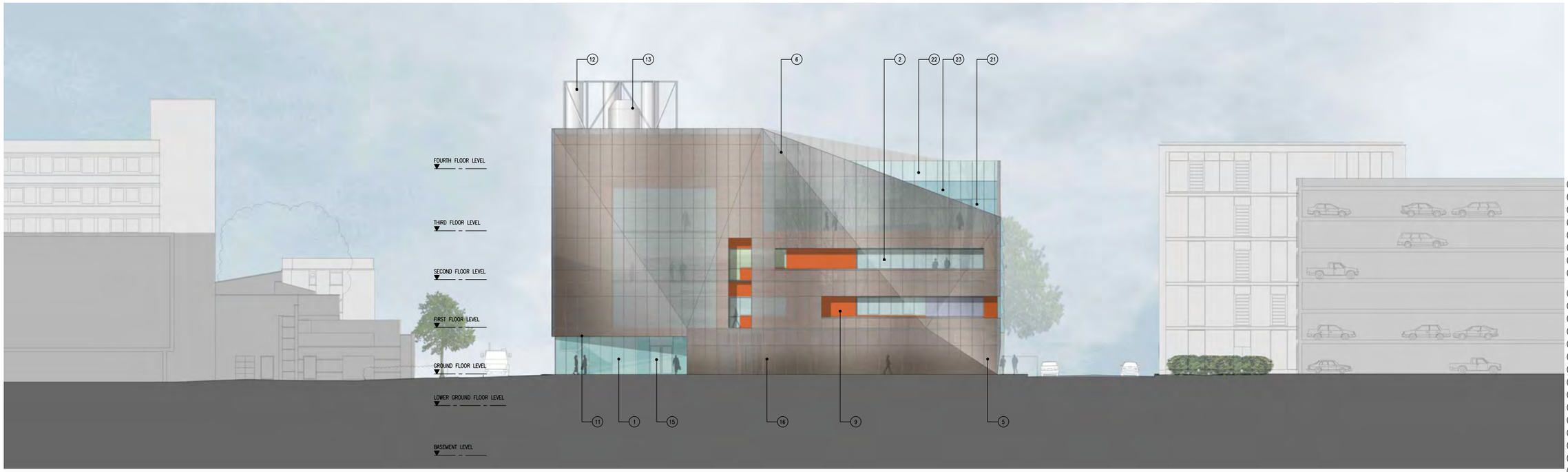
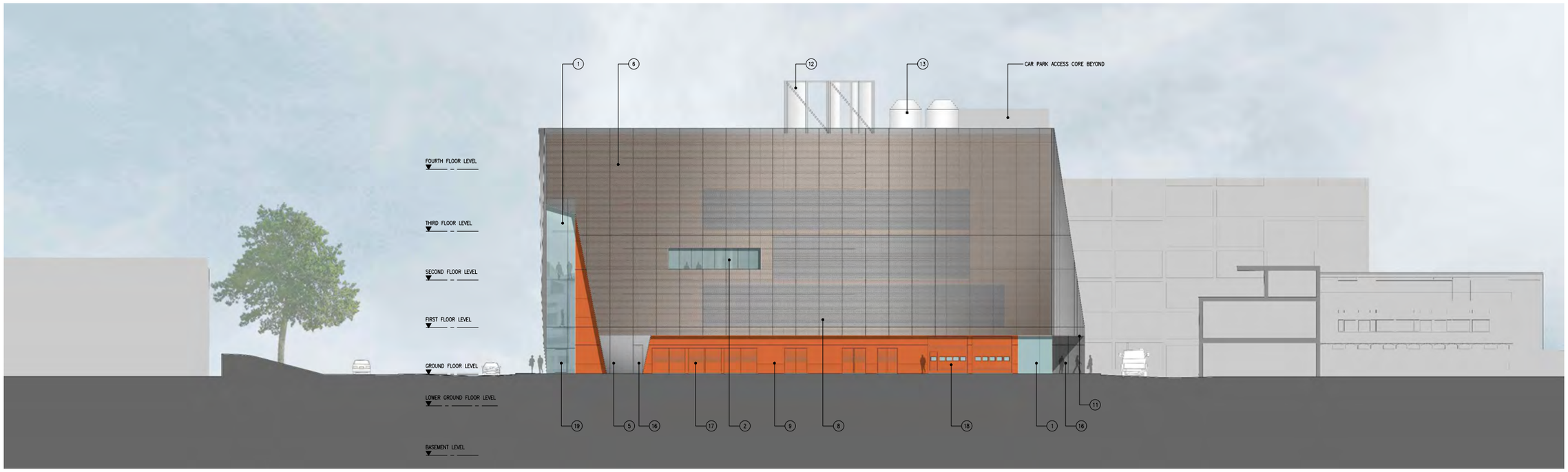


ST. PETER'S HOUSE CHURCH AND CHAPLAINCY | BOWDEN COURT | JAMES CHADWICK BUILDING

CRAWFORD HOUSE | ACCESS ROAD | PROPOSED NATIONAL GRAPHENE INSTITUTE | FOOTPATH | ACCESS ROAD | PLANTING | MULTI-STOREY CAR PARK

1 PROPOSED SOUTH ELEVATION
JW-113 1:200@A1



BOWDEN COURT | LANDSCAPE STRIP | BOOTH STREET EAST | FOOTPATH | PROPOSED NATIONAL GRAPHENE INSTITUTE | ACCESS ROAD | MULTI-STOREY CAR PARK | PROSPECT HOUSE

2 PROPOSED WEST ELEVATION
JW-113 1:200@A1

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KEY PLAN

NOTES

1. CLEAR STRUCTURALLY GLAZED CURTAIN WALLING
2. POWDER COATED ALUMINIUM FRAMED CLEAR GLAZED WINDOWS
3. POWDER COATED ALUMINIUM FRAMED OPAQUE GLAZED WINDOWS
4. FRAMELESS CLEAR GLAZING
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6. PERFORATED METAL OUTER CLADDING
7. PERFORATED METAL SOLAR SHADING FINS
8. POWDER COATED ALUMINIUM LOUVRES BEHIND PERFORATED METAL OUTER CLADDING
9. POWDER COATED METAL INNER CLADDING PANELS
10. GLASS ENTRANCE CANOPY
11. METAL ENTRANCE CANOPY
12. EXHAUST FLUES
13. ROOF PLANT
14. GLAZED REVOLVING DOOR
15. GLAZED SLIDING DOOR
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21. PHOTOVOLTAIC PANELS
22. TRANSLUCENT STRUCTURALLY GLAZED CURTAIN WALLING
23. OPAQUE STRUCTURALLY GLAZED CURTAIN WALLING

REV	DATE	DESCRIPTION	DRN	CHK
P01	23.11.12	PLANNING APPLICATION	KMK	JMD

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DRAWING TITLE
PROPOSED BUILDING ELEVATIONS – SOUTH & WEST (COLOURED)

SCALE 1:200 A1 SHEET

STATUS
PLANNING

DRAWING NO 2469–JW–113 REV P01

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BOWDEN COURT

JAMES CHADWICK BUILDING

BOOTH STREET EAST

MAIN ENTRANCE

ACCESS CONTROL BARRIER

NATIONAL GRAPHENE INSTITUTE

MULTI-STOREY CAR PARK

REFUSE STORE

LOADING

ACCESS CONTROL BARRIER

CYCLE STORE

STAFF ENTRANCE

CAR PARK

CRAWFORD HOUSE

PROSPECT HOUSE

ST. PETER'S HOUSE CHURCH AND CHAPLAINCY

PUBLIC SQUARE

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KEY PLAN

NOTES

NORTH

SITE BOUNDARY

1 PAVING TYPE 1 - IN ACCORDANCE WITH MANCHESTER CITY COUNCIL HIGHWAYS REQUIREMENTS

2 PAVING TYPE 2 - FROM UNIVERSITY OF MANCHESTER PALETTE OF MATERIALS USED ACROSS CAMPUS ON THE PUBLIC REALM WORKS.

REV	DATE	DESCRIPTION	DRN	CHK
P02	23.11.12	PLANNING APPLICATION	LK	JD
P01	20.11.12	DRAFT PLANNING APPLICATION	LK	JD

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DRAWING TITLE
PROPOSED PAVING PLAN

SCALE 1:500 A3 SHEET

STATUS
PLANNING

DRAWING NO 2469–JW–116 REV P02

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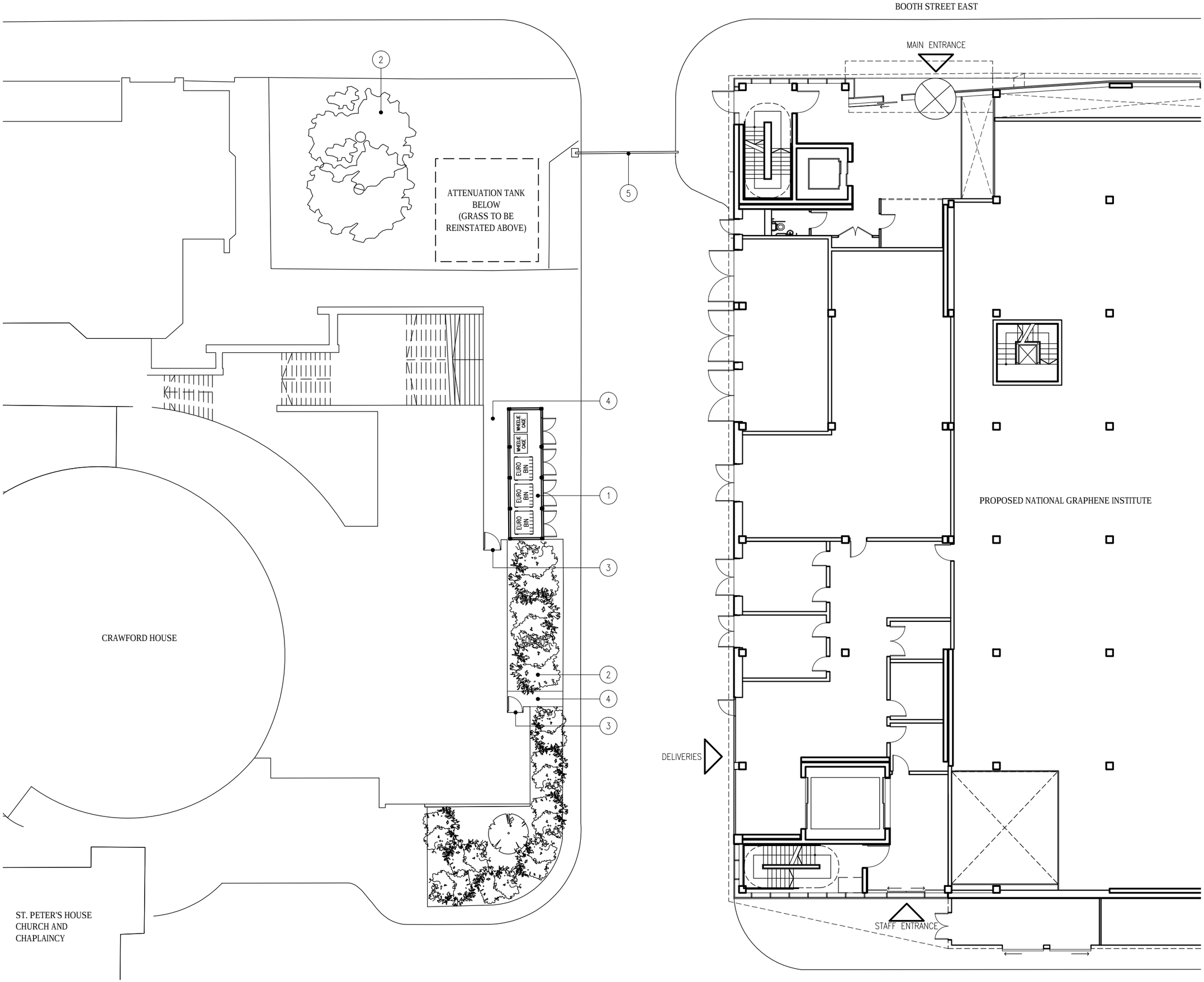

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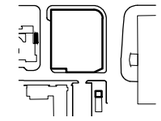
KEY PLAN



NOTES



1. PROPOSED REFUSE AND RECYCLING STORE WITH 3no. EUROBINS AND 2no. WHEELIE CAGES
2. EXISTING TREES AND PLANTING TO BE RETAINED
3. EXISTING MEANS OF ESCAPE EXIT DOOR
4. EXISTING MEANS OF ESCAPE ROUTE TO BE RETAINED
5. EXISTING ROAD ACCESS BARRIER TO BE RETAINED

REV	DATE	DESCRIPTION	DRN	CHK
P02	23.11.12	PLANNING APPLICATION	ASA	JMD
P01	20.11.12	DRAFT PLANNING APPLICATION	ASA	JMD

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DRAWING TITLE
PROPOSED PLAN OF REFUSE AND RECYCLING STORE

SCALE 1:200 A3 SHEET

STATUS
PLANNING

DRAWING NO 2469–JW–117 REV P02

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PROPOSED
NATIONAL GRAPHENE INSTITUTE

SERVICE ACCESS ROAD

ACCESS ROAD

MULTI-STOREY
CAR PARK

PROSPECT
HOUSE

CAR PARK

SECURITY
KIOSK

1
2
3
4
5
6

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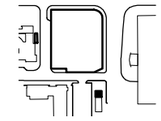
KEY PLAN



NOTES



1. EXISTING CYCLE STORE (LAYOUT IS INDICATIVE)
2. EXISTING WEEPING WILLOW TREE RETAINED
3. EXISTING 7no. EXTERNAL CYCLE STANDS RELOCATED
4. PROPOSED EXTENSION OF EXISTING CYCLE STORE TO PROVIDE TOTAL 24no. SPACES, 12no. SHEFFIELD TYPE STANDS. EXTENSION TO BE ACCESSED VIA EXISTING DOOR AT SOUTHERN END OF EXISTING CYCLE STORE.
5. EXISTING ROAD ACCESS BARRIER RETAINED
6. ARBORICULTURAL CONSULTANT HAS CONFIRMED THAT CONSTRUCTION OF THIS EXTENSION IS FEASIBLE WITHOUT CAUSING DAMAGE TO THE EXISTING WEEPING WILLOW ROOT STRUCTURE OR CANOPY.

REV	DATE	DESCRIPTION	DRN	CHK
P02	23.11.12	PLANNING APPLICATION	ASA	JMD
P01	20.11.12	DRAFT PLANNING APPLICATION	ASA	JMD

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DRAWING TITLE
PROPOSED PLAN OF CYCLE STORE

SCALE 1:200 A3 SHEET

STATUS
PLANNING

DRAWING NO 2469–JW–118
REV P02

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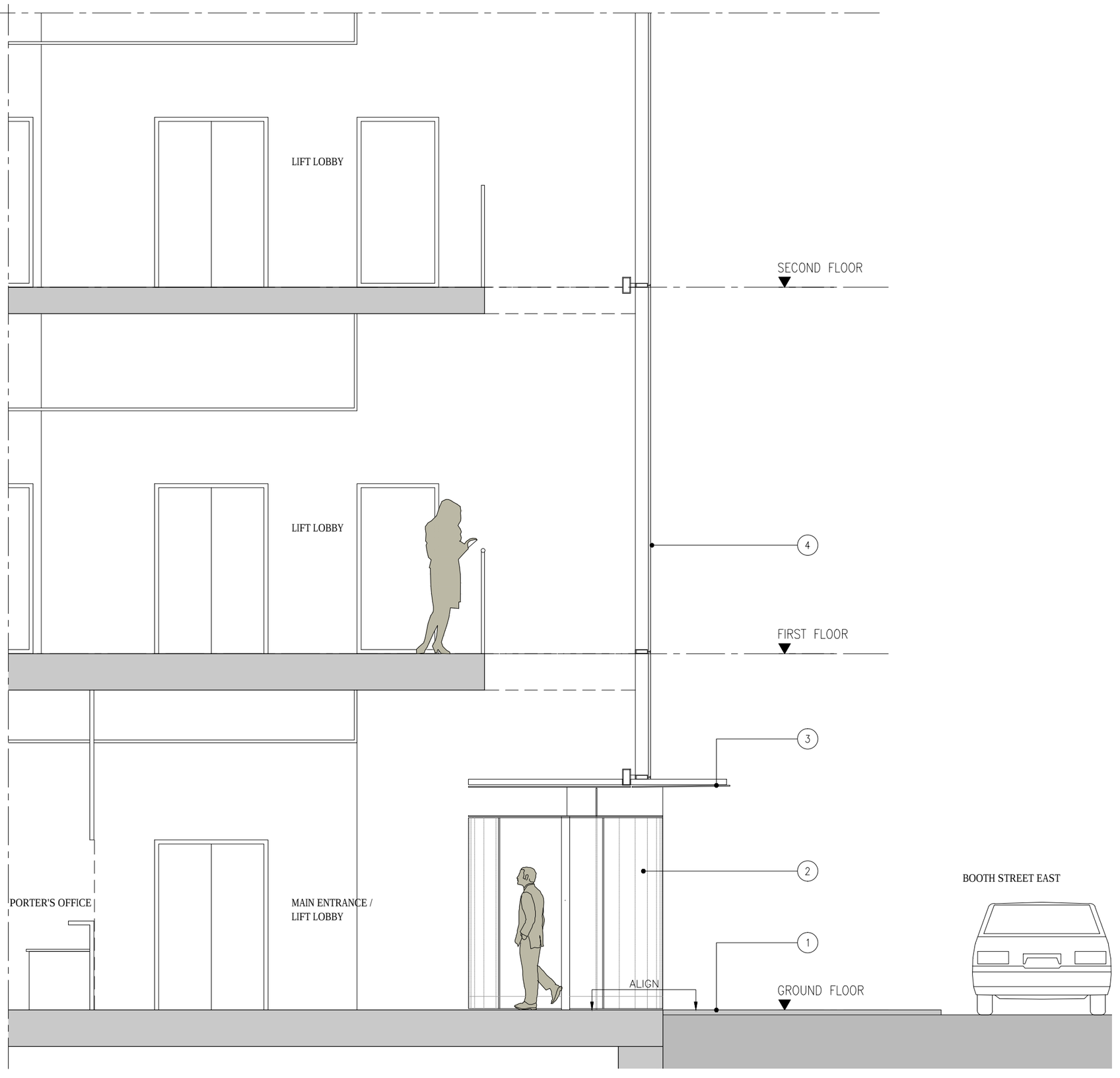

1 JW-119 MAIN ENTRANCE - SECTION

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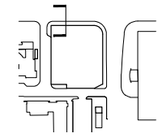
KEY PLAN



NOTES

1. EXTERNAL PAVEMENT.
2. PROPOSED REVOLVING GLASS DOOR WITH ADJACENT SLIDING GLAZED PASS DOOR (MANIFESTATION AT APPROPRIATE LEVEL) – PROPOSED ENTRANCE THRESHOLD TO BE LEVEL WITH EXTERNAL PAVEMENT.
3. PROPOSED TRANSLUCENT GLASS CANOPY.
4. CLEAR STRUCTURALLY GLAZED CURTAIN WALLING.

REV	DATE	DESCRIPTION	DRN	CHK
P02	23.11.12	PLANNING APPLICATION	LK	JMD
P01	20.11.12	DRAFT PLANNING APPLICATION	LK	JMD

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DRAWING TITLE
PROPOSED SECTION THROUGH MAIN ENTRANCE

SCALE 1:50 A3 SHEET

STATUS
PLANNING

DRAWING NO 2469–JW–119 REV P02

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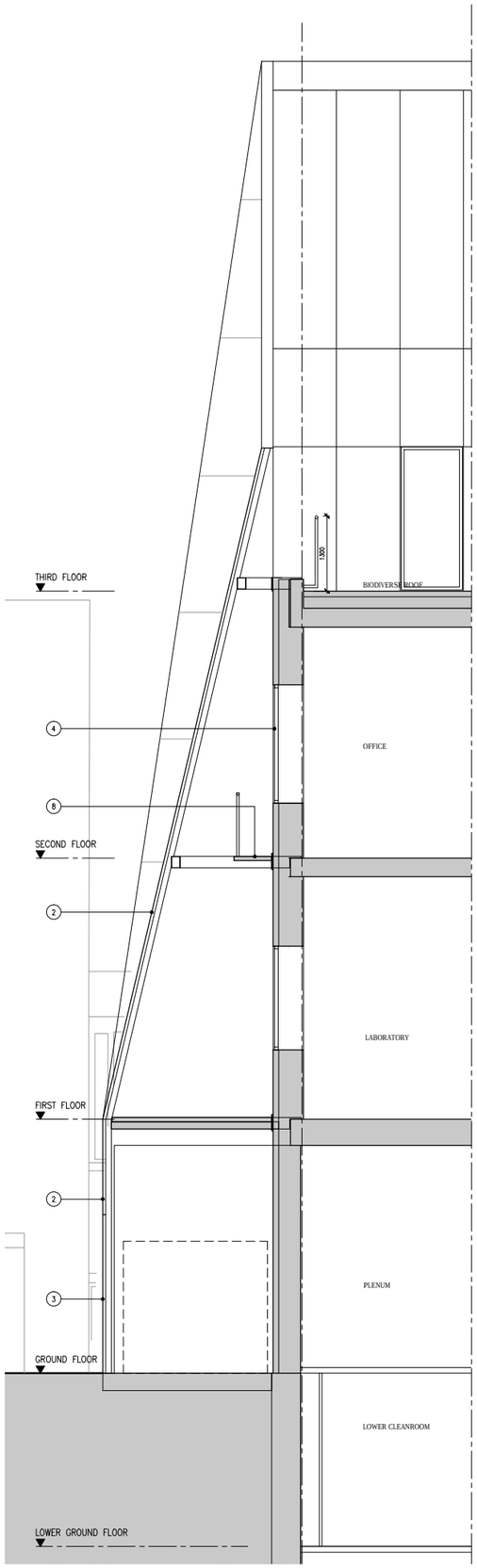
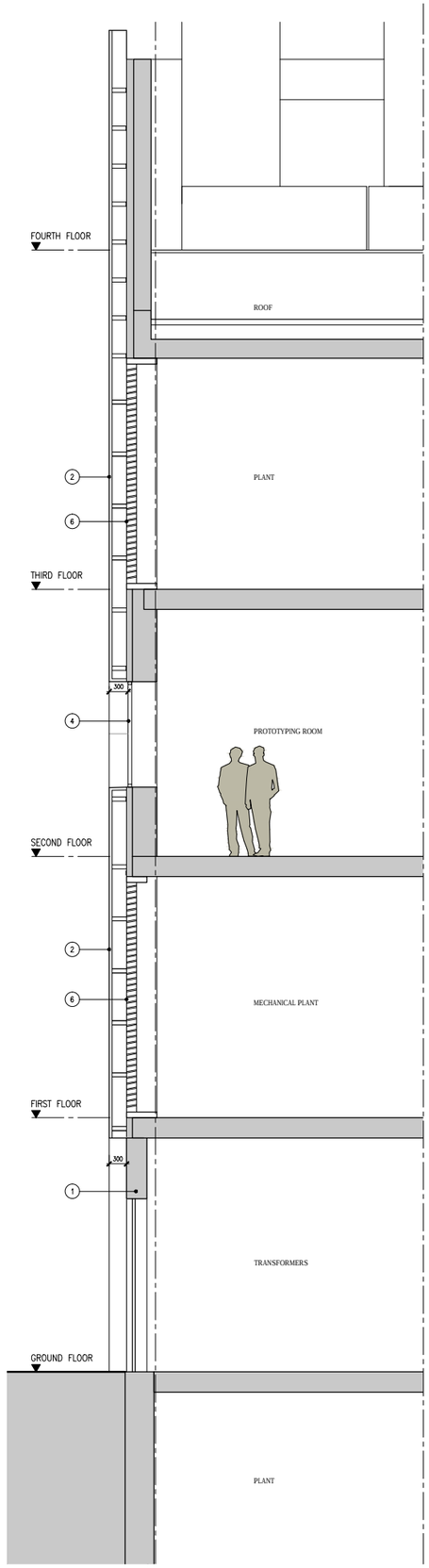
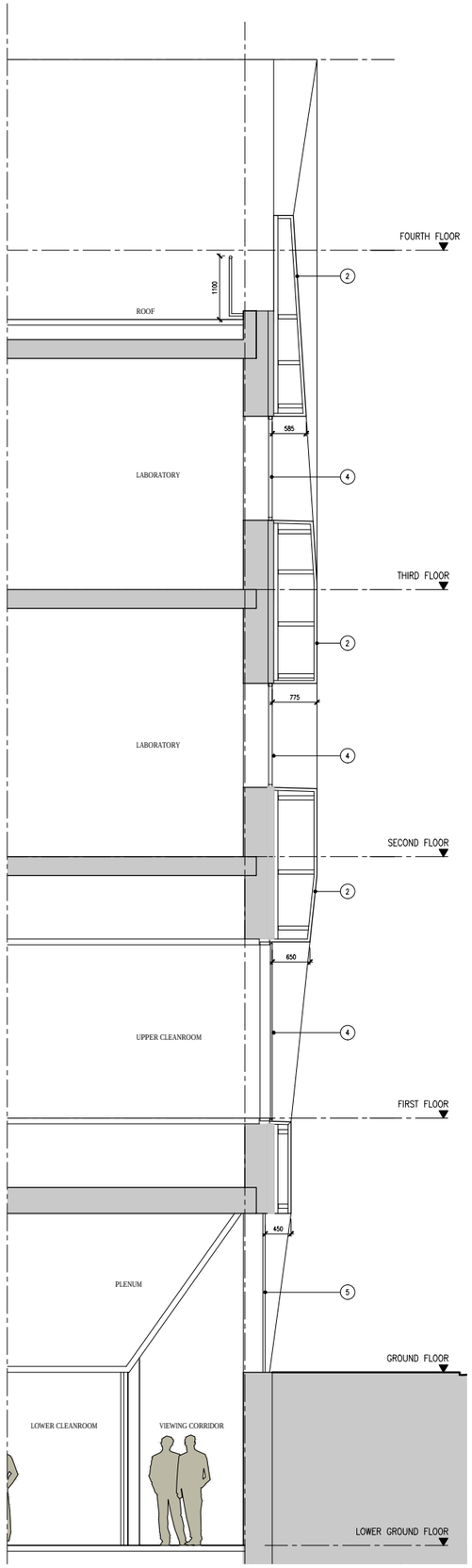


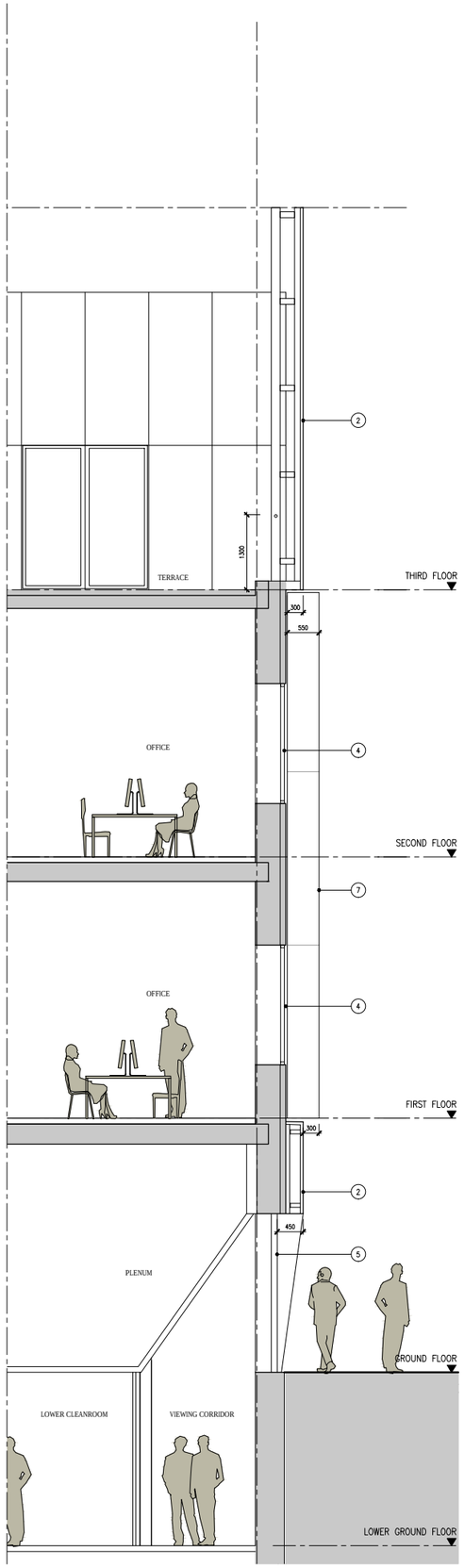
1 EXTERNAL WALL SECTION - SOUTH
JW-120 1:50@A1



2 EXTERNAL WALL SECTION - WEST
JW-120 1:50@A1



3 EXTERNAL WALL SECTION - NORTH
JW-120 1:50@A1



4 EXTERNAL WALL SECTION - EAST
JW-120 1:50@A1

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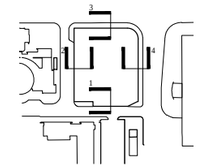
KEY PLAN



NOTES

1. POWDER COATED METAL CLADDING PANEL.
2. PERFORATED METAL CLADDING PANEL.
3. UNPERFORATED METAL CLADDING.
4. POWDER COATED ALUMINIUM FRAMED CLEAR GLAZED WINDOWS.
5. FRAMELESS CLEAR GLAZING.
6. POWDER COATED ALUMINIUM LOUVRES BEHIND PERFORATED METAL OUTER CLADDING.
7. PERFORATED METAL SOLAR SHADING FINS.
8. WINDOW CLEANING GUNTRY.

REV	DATE	DESCRIPTION	DRN	CHK
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PROJECT
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DRAWING TITLE
PROPOSED EXTERNAL WALL SECTIONS

SCALE 1:50 A1 SHEET

STATUS
PLANNING

DRAWING NO 2469–JW–120
REV P02

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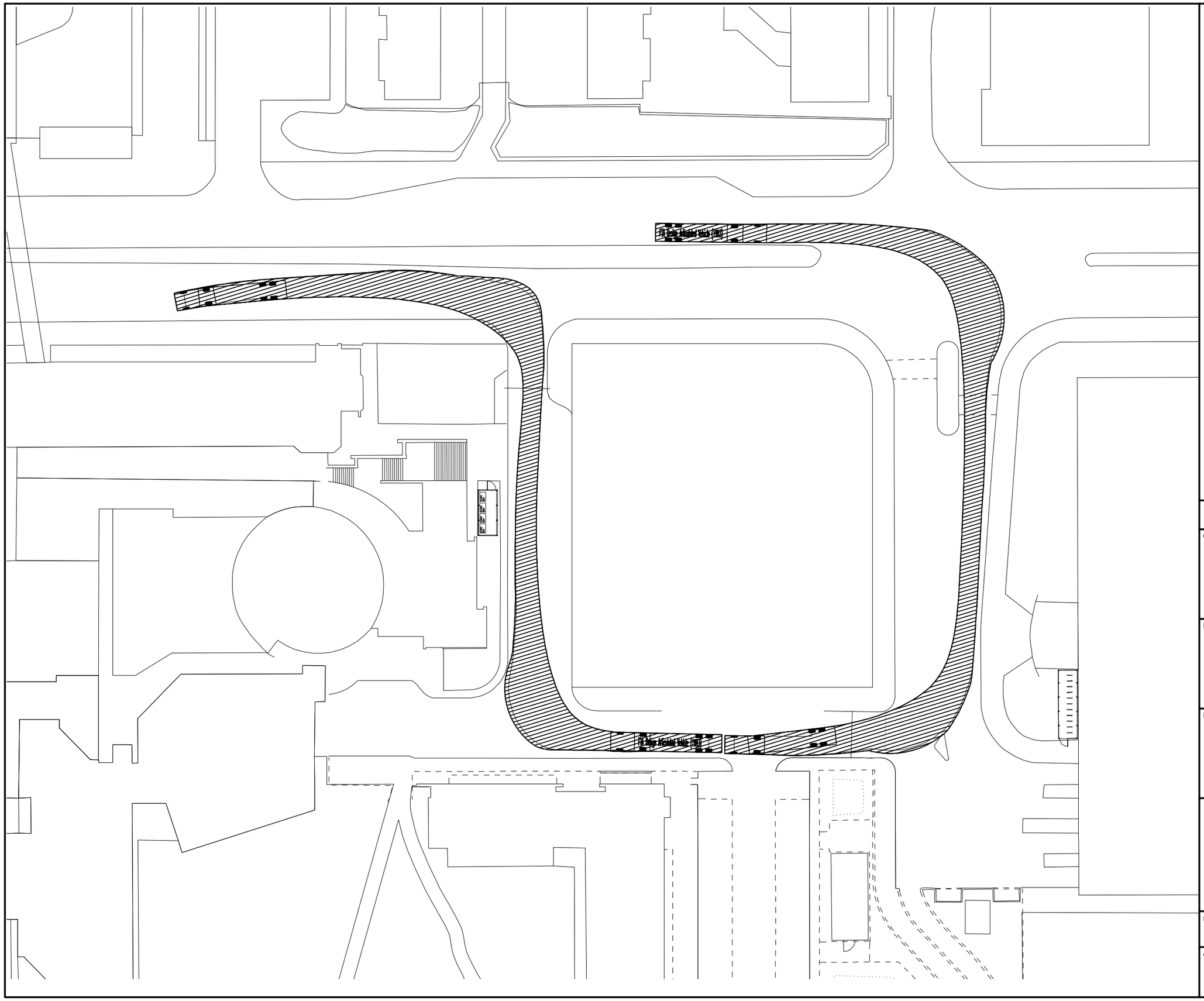
Appendix B | Vehicular Access Drawings

\\ukramsoutps4\Projects\61020221\Drawings\01_BuildingStructures\01_WIP\2aDrawing\61020221-SK-.dwg - Plot date and time = 20/11/2012 15:41:24



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Project

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Drawing Title

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RAMBOLL

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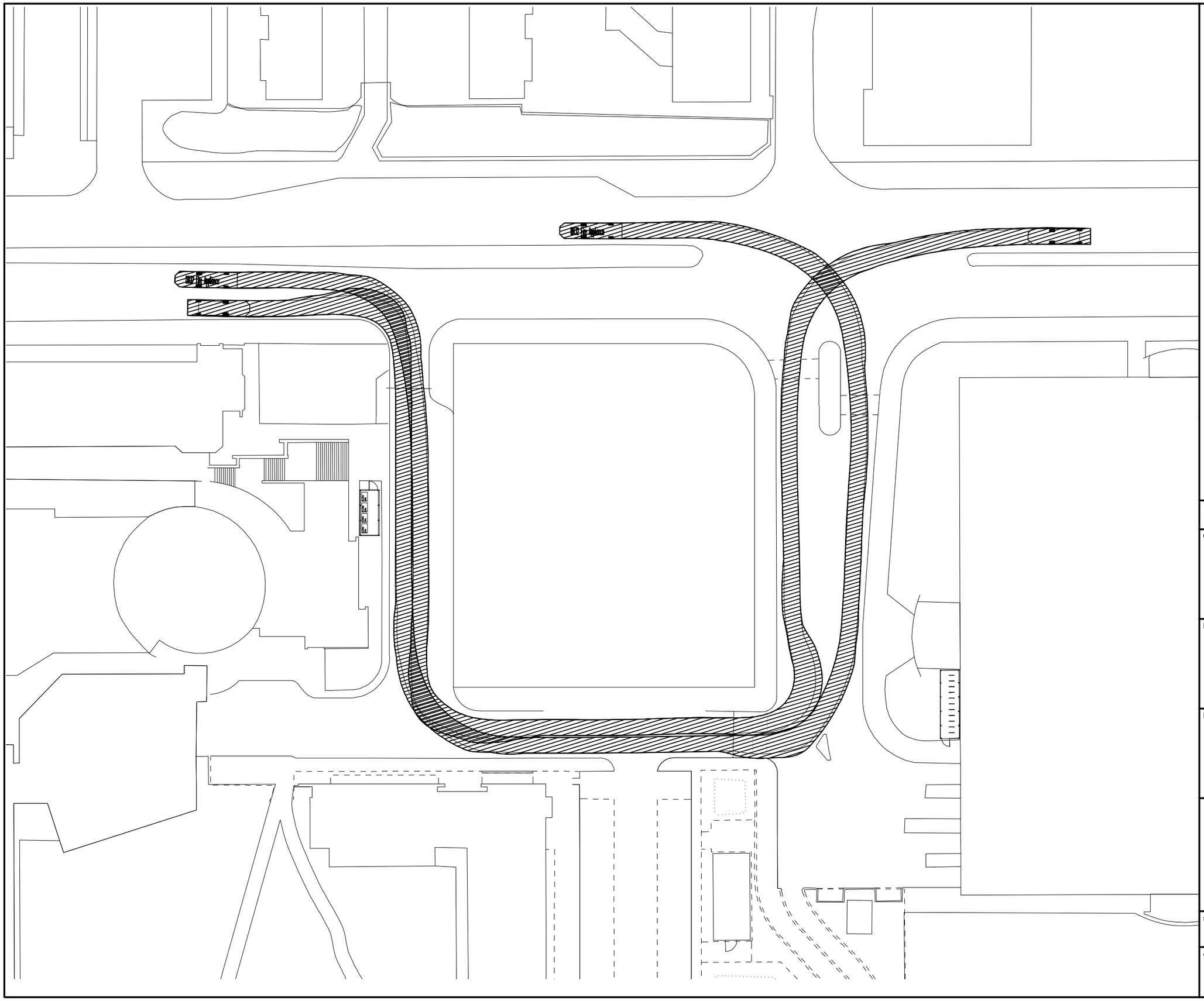
scale (at A3)	date	drawn

drg. no.	rev.
61020221-SK-	

10 0 10 20 50 100mm NATURAL SCALE

ORIGINAL DRAWING SIZE 420 x 297

\\ukramsoutps4\Projects\61020221\Drawings\01_BuildingStructures\01_WIP\2aDrawing\61020221-SK-.dwg - Plot date and time = 20/11/2012 15:39:27



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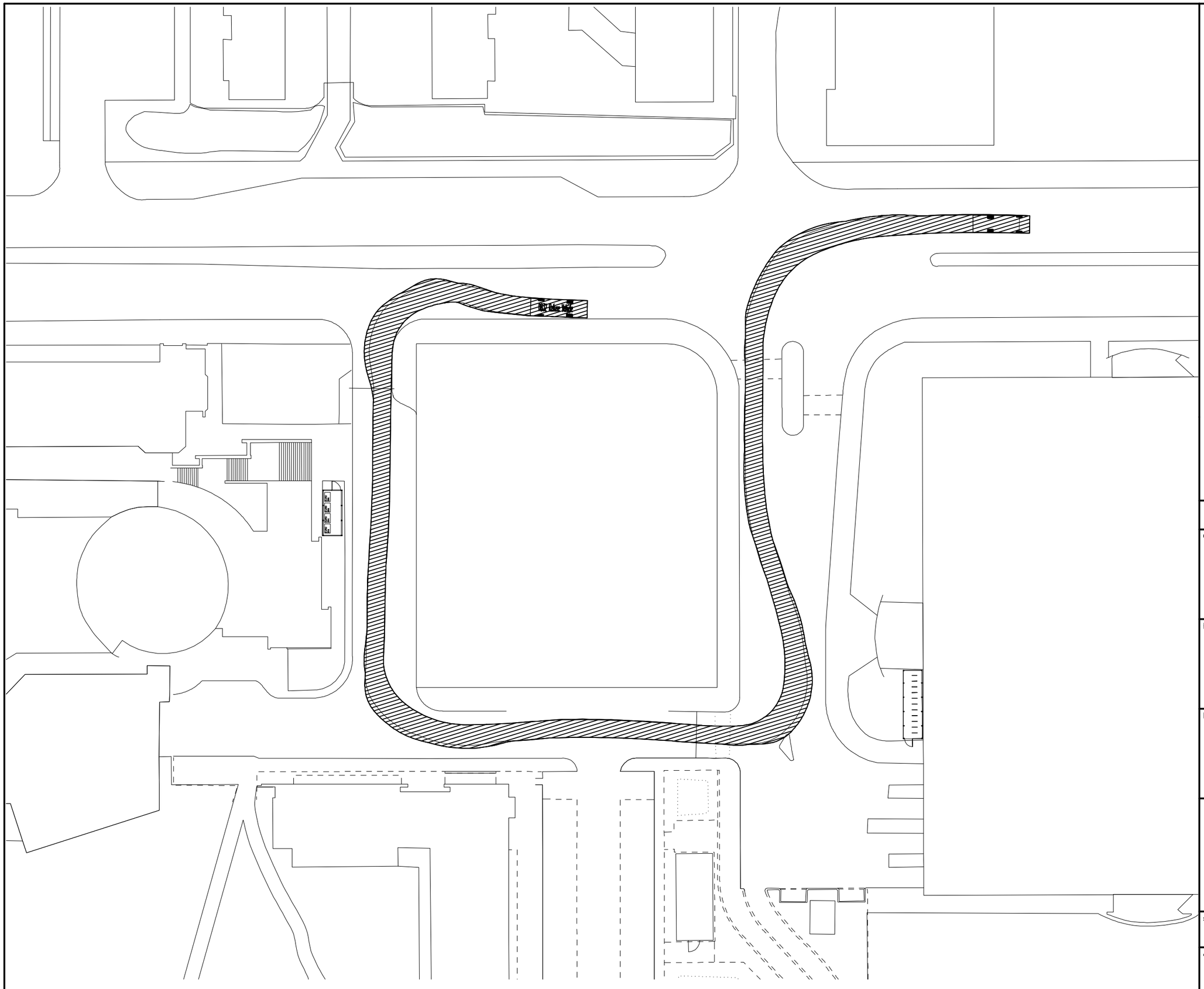
scale (at A3)	date	drawn

drg. no.	rev.
61020221-SK-	

10 0 10 20 50 100mm NATURAL SCALE

ORIGINAL DRAWING SIZE 420 x 297



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Drawing Title

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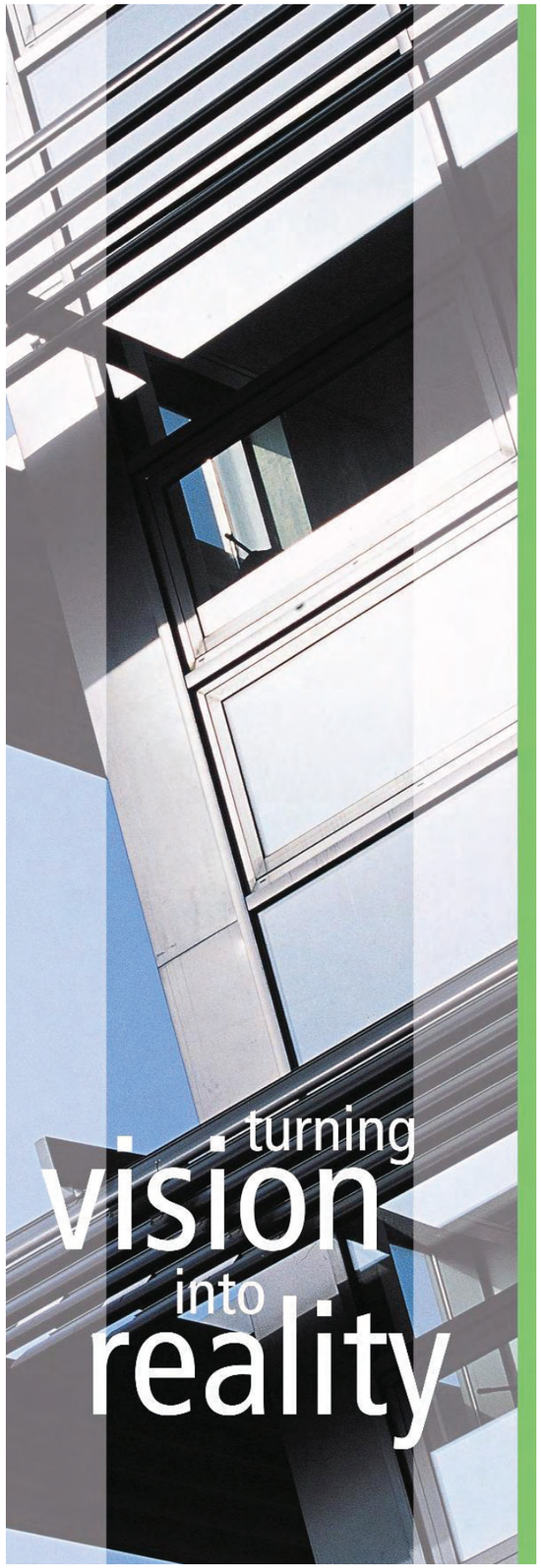
10 0 10 20 50 100mm NATURAL SCALE

ORIGINAL DRAWING SIZE 420 x 297

Appendix C | Access Statement



aa projects

University of Manchester

Access Statement

on

National Graphene Institute

November 2012

Contents

1.0 CLIENT & DESIGN TEAM MEMBERS 3

2.0 SCOPE OF INSTRUCTION 3

3.0 CONSULTATION 4

4.0 DESIGN STANDARDS 4

5.0 DESIGN PHILOSOPHY 5
5.1 Disability Definition 6
5.2 Consideration of EA / SENDA 6

6.0 THE STATEMENT AND OVERVIEW OF THE SITE 7
6.1 The Statement 7
6.2 The Site 7

7.0 MEANS OF ACCESS AND EGRESS 8
7.1 Vehicular and Transport Links / Building Approach and Access Points 8
7.2 Car Parking and Setting Down Points 9
7.3 Building Entrances 9
7.4 Porters Desk 10
7.5 Horizontal Access 10
7.6 Vertical Access 12
7.7 Sanitary Conveniences / Welfare Provisions 13
7.8 Laboratories 14
7.9 Seminar Room and Ancillary Break Out Space 14
7.10 Terraces 15
7.11 Hearing Enhancement Strategy 15
7.12 Acoustics 15
7.13 Signage / Wayfinding 15
7.14 Lighting 16
7.15 Means of Escape 16
7.16 Building Management 17

8.0 CONCLUSION 17

Appendices

Appendix A University of Manchester City Campus Map

1.0 CLIENT & DESIGN TEAM MEMBERS

In terms of accessibility, the following team members have been appointed by the Client, the University of Manchester.

1. Access Consultants - AA Projects Ltd
2. Project Managers - EC Harris LLP
3. Architect - Jestico & Whiles
4. Mechanical / Electrical Engineers - CH2M Hill
5. Structural & Civil Engineers - Ramboll
6. Fire Engineer - Ramboll
7. Acoustic consultant - Ramboll
8. Laboratory Designers - CH2M Hill
9. Building Control Approved Assessor - HCD Building Control Ltd

Property Discussed in this Report

University of Manchester
National Graphene Institute
Booth Street East
Manchester

2.0 SCOPE OF INSTRUCTION

This Access Statement has been prepared by AA Projects Ltd, Access Consultants on behalf of the University of Manchester, to support the planning application being lodged for the construction of the National Graphene Institute, on Booth Street East, Manchester City Centre.

The purpose of this Access Statement is to consider the accessibility of the proposed development with regard to Mobility Impaired Persons (MIP), wheelchair users, ambulant disabled people and people with poor dexterity, poor comprehension or sensory impairments.

The appointment of AA Projects Ltd, Access Consultants spans the entire life of the project, through to a post-completion assessment / compliance report on the completed building.

3.0 CONSULTATION

Consultation has been, and will remain, an ongoing process throughout the design of the project. AA Projects Ltd has established a project inclusion strategy devised in conjunction with the University, which provides an agreed framework outlining the process map for the flow, review and approval of design information pertaining to the accessibility of the scheme.

An integral element of the project inclusion strategy is the inclusion and integration of University stakeholders from Property Services, Student Support and Guidance, Health and Safety, Equality and Diversity, Staff Disability Forum, Student Union Disability Officer, Faculty Teaching and Learning Coordinators, and Design Team Members.

Regular consultation between the design team and stakeholders concerning matters relevant to accessible and inclusive design has taken place at each of the RIBA design stages. This process has ensured the design of the building, its facilities and provisions are tailored to meet the specific needs of the University's staff, students, visitors and research requirements.

4.0 DESIGN STANDARDS

The University of Manchester recognises that the minimum standards of the building regulations Approved Documents, do not extend far enough to cover the operational requirements of the University's needs, when operating and managing their estate.

In this context, the University of Manchester understands the importance of adopting best practice guidance where reasonable, to assist the University in meeting its statutory obligations when providing access to employment, goods, facilities and services within its estate.

For this development, consideration of best practice design standards, including those outlined below, has been considered and adopted where practical:-

1. BS8300: 2009 Code of Practice for the Design of Buildings and their Approaches to Meet the Needs of Disabled People
2. Design for Access 2 : Manchester City Council – MDPAG
3. Department for Communities and Local Government - DCLG Circular 01/2006
4. Guide to Development in Manchester – Supplementary Planning Document and Planning Guidance Adopted April 2007
5. DETR (1999) 'Guidance on Use of Tactile Surfaces'
6. ICI Paints (2002) 'A Design Guide for Use of Colour and Contrast to Improve the Built Environment for Visually Impaired People'
7. Joint Mobility Unit: Buildings and Internal Environments Technical Bulletins
8. Joint Mobility Unit: Streets and External Environments Technical Bulletins
9. Centre for Accessible Environments: Designing for Accessibility

5.0 DESIGN PHILOSOPHY

The University of Manchester is dedicated to providing inclusive environments throughout all areas of its estate. The University recognises the importance of accessible design and strives to achieve the highest possible standards of inclusivity during the design and development of capital and refurbishment schemes. As part of this process, the University engages appropriate stakeholders within the University as previously outlined above.

The National Graphene Institute will be a dedicated specialist research facility occupied by a small number of research staff and post graduate students. Post graduate students will be undertaking specific areas of research for a Ph.D. doctorate over a number of years. Consequently, the number of building users will be low, defined for long periods of time, and easily controlled. Visitor and public access will be limited and restricted to that of viewing galleries, to observe activity within the laboratories from a distance, and the seminar room on the third floor. The Seminar room will not be available for public hire, and will be restricted for use by the Graphene team to enable presentation of research development to funders and peers alike.

No undergraduate / general teaching provision will be provided from this building.

The design philosophy for the development can be split into two elements.

1. Access into, circulation around and use of facilities / ancillary provisions supporting common / circulation areas.
2. Access into and use of the research laboratories.

For item 1 above, the design philosophy is based on total accessibility for everyone to achieve the highest standards of accessible design where practical.

For item 2 above, the specialist nature and controlled number of building users, enables the University to provide accessible provision within the laboratories on a reactive basis, to accommodate the specific needs of any given individual / research project. The research laboratories will regularly be altered to suit the demands of any given research project. As a result of this, the laboratory furniture specified is flexible and adaptable to accommodate change. Circulation around the laboratories will achieve current standards of accessible design.

The term “disability” has been viewed in its broadest sense and includes Mobility Impaired Persons, wheelchair users, ambulant disabled people and people with poor dexterity, poor comprehension or sensory impairments. This approach not only ensures the design decisions taken are informed and assist the University in meeting its obligations under the Equality Act 2010, (EA), the Special Educational Needs and Disability Act 2001, (SENDA), relevant planning policies and Local Authority guidance documents, but it also ensures the building is sustainable for the long term.

The aim is therefore to provide an inclusive environment throughout the common areas and ancillary provisions of the building, with the specialist research areas easily adaptable to service the needs of any given individual / research project as demand requires. For

this reason, access issues have been, and will continue to be considered throughout the design process to ensure the design is as fully inclusive as possible.

Issues arising from the EA / SENDA (the Act’s) carry risks which need to be managed within a broad risk management and project inclusion strategy. Development of this strategy will continue throughout the design process.

5.1 Disability Definition

Under the Acts a disabled person is someone who has ‘a physical or mental impairment, which has a substantial and long term adverse effect on his or her ability to carry out normal day-to-day activities’.

In access terms, the term disability has two distinct definitions:

- People who have a mobility impairment that limits their ability to walk or flex their body.
- People with poor dexterity, poor comprehension or sensory impairments, such as impaired sight and hearing.

Provision for those with walking difficulties is not limited to people confined to wheelchairs but includes all types of impairment such as arthritis, rheumatism or partial paralysis as a result of strokes or accident, people who may not be able to bend limbs or have back problems.

When viewed in this way it becomes clear that this definition can include a substantial proportion of the population who may not consider themselves disabled.

5.2 Consideration of EA / SENDA

The intent of the EA / SENDA (the Acts) from an accessibility perspective, is to offer disabled people access to employment, goods, facilities and services in an accessible environment which does not discriminate against them, by incorporating design features which accentuate their disability.

The Acts are social documents against discrimination, and are designed to be evolutionary. The Acts do not prescribe a detailed set of requirements which, if satisfied, enable the avoidance of liability from discrimination. Furthermore, the Acts do not contain any certification procedures. Consequently, compliance with the Acts cannot be guaranteed and therefore a building cannot be certified as being “EA / SENDA compliant”. Compliance with the statutory regulations and recommendations is not proof that EA / SENDA issues have been addressed. They do, however, go a long way to achieving it.

6.0 THE STATEMENT AND OVERVIEW OF THE SITE

The arrangements for access described in this statement reflect the design at its current stage, RIBA Stage D. Access arrangements and design features will be assessed in further detail as the design develops.

The contract documents for construction will include a detailed set of Employer's Requirements outlining the accessible standards required for each of the buildings elements and features.

6.1 The Statement

An Access Statement is required by policy for the development. The statement is an evolving document, and will be updated throughout the planning process following discussions with Manchester City Council, the University of Manchester, the Architects / design team members and other relevant bodies.

This Access Statement is presented as design guide and is considered a complementary document to the fully detailed access appraisal / access action plan which has been produced at each RIBA design stage and circulated to the design team and Client for action / completion.

Both these documents are designed to be used as reference documents during the design development, and will form the basis for tracking design team and Client decisions taken during the project (relevant to access) for the University's future reference.

The documents will demonstrate the intent of the EA / SENDA and compliance with the statutory regulations, in particular Approved Document M and best practice outlined in section 4 above.

Contributors to the report include Jestico & Whiles Architects, designer of the scheme, CH2M Hill Architects, designer of the laboratories, and Ramboll, Fire Engineers.

6.2 The Site

The site is located on Booth Street East on the outskirts of Manchester City Centre, in the heart of the University's City Campus. (Refer to site reference 89 on the attached appendix A City Campus map)

The scheme includes very few landscaped areas, with the building largely occupying the curtilage of the site up to the site's boundaries. Access around the building, and to its two entrances, will have a gradient below 1:20, with level access provided into the building at each of the entrances.

The feasibility of a disabled drop-off bay close to the buildings main entrance on Booth Street East is to be discussed with the Highways Agency.

The scheme will benefit from the University's City Campus-wide cycle parking, providing exposed short stay and long stay covered parking to the South of the site.

7.0 MEANS OF ACCESS AND EGRESS

7.1 Vehicular and Transport Links / Building Approach and Access Points

The site benefits from being located within the heart of the University's City Campus and its existing well established transport.

The University has defined accessible pedestrian links throughout its City Campus, which includes Booth Street East, where the defined accessible route directly passes the proposed development site and main building entrance. Such links achieve a good accessible standard and include drop kerbs and tactile paving at required crossing points etc.

The site also benefits from excellent bus links into the City, with bus stops located on the defined accessible pedestrian routes on Oxford Road, a three minute walk away from the site over approximately 320 meters. The number 147 bus operates between Piccadilly railway station and the City Campus bus stops on Oxford Road.

The Oxford Road bus stops are approaching Quality Bus Corridor standard with seating and bus information provided. It is assumed raised kerbing will be provided as part of a Local Authority / Highways master plan.

Piccadilly railway station, which is approximately sixteen minutes walking distance, over some 1200 meters, provides high frequency rail links, providing excellent access across the Manchester urban area, nearby settlements and beyond to the national intercity rail network.

Oxford Road railway station, which is approximately twelve minutes walking distance, over some 960 meters, provides access to train lines services available via Piccadilly.

The site is therefore ideally located to benefit from good access to both bus and rail networks.

The site also benefits from a multi-storey car park directly adjacent the site, where accessible pedestrian links are provided to the proposed building's main entrance on Booth Street East. Pedestrian links to the staff entrance to the rear will be provided within the scheme and will be designed to provide safe pedestrian pavements with suitably designed drop kerbs etc. A 30 meter length of 1200mm wide pavement is provided linking the rear staff entrance with the car park provision, as this pavement has clear sight lines from each end and is below 50 meters, no passing places are required.

The City Campus affords numerous cycle lanes linking the site, along with links in close proximity of the site defined by Transport for Greater Manchester as either:-

1. On Road Route – With cycle facilities
2. Traffic Free Route – Good surface

Numerous routes are also provided a little further afield, similarly defined as those above along with a number being designated as 'On Road Route – Signed but with no facilities'

Long and short stay cycle storage is provided to the South of the site respectively.

7.2 Car Parking and Setting Down Points

Students and staff accessing the site by car will be required to use the adjacent Charles Street multi-storey car park, approximately 80 metres away from the development's Booth Street East main entrance. The car park will be closer to the development's staff entrance. The University has a contract in place with the car park to provide car parking facilities to staff and students. The University is also in negotiations to reserve dedicated accessible spaces within this car park to serve the development.

Access links from the accessible car parking bays to the building's entrances are level / accessible.

It is proposed to open negotiations with the Highways Agency to establish the feasibility of providing a disabled drop-off point to service the building, supplemented with dropped kerbs and tactile paving etc., providing access to a firm and step-free pavement leading to the building's entrances.

There are no trees, seating or other such street furniture proposed within the scheme.

7.3 Building Entrances

The building will have two entrances, namely the main entrance on Booth Street East and the staff entrance to the rear of the building.

The main entrance will consist of a large revolving door accompanied by an adjacent accessible, fully automatic sliding door in line with the recommendations of Design for Access 2. Barrier matting will be provided to each entrance. Access through the entrances will not be controlled during normal working hours and free access will be available to the building's internal porters desk, located in the main entrance lobby. (Access beyond this point internally will be controlled by access control provisions on doors). The cut-in under croft and the projecting revolving door within the Booth Street East façade offers a good visual guide of the building's entrance when approaching the building. Both the glazed revolving doors and the adjacent glazed accessible sliding pass door will be framed to provide good tonal contrast to the doors from the adjacent glazed elevation, to assist with identifying the entrance doors locations from close range. All entrances will have level thresholds and clear signage. Transitional lighting requirements will be considered by the electrical engineer. All glazing to the doors will have appropriate manifestation applied.

The staff entrance to the rear is currently designed as automatic swing doors and the feasibility of replacing these doors with sliding doors is currently being evaluated. Should swing doors remain, side swing barriers etc will be provided. This entrance will achieve the same accessible design standards as the main entrance noted above.

The staff entrance will be access controlled by way of proximity device at all times, whilst the disabled pass door to the main entrance will also be fitted with access control

provisions for use outside of normal working hours. All access control systems will be suitably located and tonally contrast in accordance with best practice and Design for Access 2. No intercoms are to be provided in line with the University's standard design standards.

7.4 Porters Desk

A porters desk will be provided within the building's main entrance lobby. This will not be a building reception in line with University policy, as reception facilities have been centralised.

The porters desk will be staffed by a porter on an irregular basis, as the porter will also be required to undertaken various other tasks within the building.

The porters desk is clearly visible when entering via the building's main entrance and will be designed with split levels for use by people standing or sitting. Hearing enhancement systems to aid people with hearing impairments will also be provided.

Appropriate lighting will be specified to assist lip reading and the desks features will offer good tonal contrast to assist the visually impaired.

The provision of seating is to be considered and procured direct by the University as part of a furniture package.

7.5 Horizontal Access

The ground floor offers little horizontal access, as this floor is almost exclusively occupied by plant to service the specialist nature of the laboratories. For security and safety reasons, access beyond the main entrance lobby will be controlled by suitably located and tonally contrasting proximity devices, preventing unauthorised access to the building's specialist areas.

All floors to the building will be step free and level. No internal ramps etc are to be provided.

Step-free access between floors will be provided by two fully compliant mobility impaired person accessible passenger lifts, with the lift serving the staff entrance also designated as goods lift.

The design for access routes, corridors and lobbies follows the recommendations set out in Approved Document Part M and BS:8300. Generally, primary corridors will be 2200mm wide, exceeding the recommendations contained in Design for Access 2, comfortably providing space for two wheelchair users to pass one another.

Balustrading to the edge of the atrium will be glazed. The design of the balustrading will be developed further during detailed design with accessible design principles considered.

The footprint and layout of the building's corridors across the floors are reasonably consistent and are considered logical and visibly obvious, which will assist with familiarity and orientation of the building's circulation routes.

Access into the clean rooms is normally denoted by a physical 'step over' barrier. The detail for this is currently being amended to ensure independent, level, obstruction-free access is available into the clean rooms.

Cross corridor doors have been kept to a minimum in order to assist with independent horizontal circulation. Where they have been fitted for fire reasons, they will be held open with hold-open devices that fail safe upon the raising of the fire alarm. Hold-open devices will be recessed into the floor to eliminate trip hazards, as per the principles of Design for Access 2.

Corridors will benefit from under floor heating, therefore, no radiator protrusions will be present. Fire extinguishers etc. will be recessed where possible.

Colour and tonal contrast will be applied to wall, floor and door junctions along with protrusions and columns along the line of travel to assist the visually impaired. This will include glazed walls along corridor routes which will benefit from manifestations in line with Design for Access 2.

Lockers provided within corridor areas will be free from the swing of doors etc. Accessible lockers will be provided by the University as and when required in a suitable location.

Lighting illumination levels along circulation routes will be designed to achieve or exceed minimum Lux level standards.

All flooring will be firm, level, slip-resistant and low-glare.

Internal doors will have a minimum clear opening of not less than 800mm, or the widths required by the building regulations. It is, however, proposed to increase the width of general access doors wherever possible to 850mm / 926mm in accordance with BS 8300 and Design for Access 2, which will also assist with the movement of laboratory equipment etc. around the building / between laboratories. All doors will accommodate an unobstructed 300mm to the side of the door adjacent to the door's leading edge, in accordance with Approved Document M and BS:8300. Where possible, this will be increase to 450mm in line with Design of Access 2. Vision panels will be fitted to all doors with the exception of cleaner's cupboards, store rooms and doors to plant rooms etc. Glazed doors will be carefully considered, framed and clearly visible. All doors will be furnished with appropriate accessible ironmongery and achieve a maximum force resistance of 30 Newton's.

Doors within the laboratories will achieve the above standards where possible, however, there are a number of sensitive areas where the activities undertaken within will not permit the installation of vision panels, the details of which are yet to be established.

A fully detailed door schedule will be prepared for the contractor, outlining door furniture and ironmongery, door resistance and vision panel details etc.

7.6 Vertical Access

The principal means of access and egress for mobility impaired persons between the different levels of the building is via two lifts designed for mobility impaired persons. Two main stair cores are also provided adjacent to the lift positions, which provide an alternative means of vertical circulation. Stairs are also provided, linking the basement and first floor clean rooms, and the first and second floor break out spaces.

The lifts are located within clear site of the main entrance and staff entrances.

The main entrance lift will be a 10 person lift, whilst the staff entrance lift will be a large MIP and goods lift, with a car size of approximately 3000mm wide x 4000mm deep, which exceeds the dimensions of 2000mm wide and 1400mm deep as recommended by Design for Access 2. The interior of the lifts will be developed at a later design stage and will take into account the guidance given in Approved Document Part M and BS:8300. The lifts will comply with BS5655 and EN81.

All lift call buttons will be distinguished by an illuminated coloured disk, which surrounds each button. The call buttons will have tactile relief indicators. It is proposed that the lift will have audible announcements at each floor, and that lift lobbies on each floor will have visual and tactile level indicators.

An emergency communication system, complete with inductive coupler, will be installed and monitored by the University's security office staffed 24 hours a day.

No fire fighting / evacuation lifts are proposed.

For those who are unable to use stairs, the feasibility of providing lift provision linking the basement and first floor clean rooms without having to exit the controlled environment is currently being accessed. Due to the strict controls required to maintain the environmental conditions in the clean rooms, it is not currently known if such a provision is possible. The feasibility of allocating space to allow for the further installation of a lift to this area is also being considered.

There are two main circulation staircases within the building, contained within dedicated cores. Each of which achieves Approved Document Part M standards as a minimum, with the exception on the number of risers in a single flight as discussed below. These stairs will be 1200mm wide.

The stair linking the basement and first floor clean rooms will also achieve Approved Document Part M standards with the exception of the number of risers as discussed above. This stair will be 1200mm wide.

The dedicated escape stair to the South East corner of the building is not a circulation stair and is designed to Approved Document Part K. This stair will be 1200mm wide.

A feature spiral stair linking the first and second floor break out spaces will be provided. This will be designed in accordance with BS5395 as recommended by BS8300. This stair

will also incorporate as many features of an Approved Document Part M stair as is practical. This stair will be 1200mm wide. As this stair is located within the general circulation space, the stairs will tonally contrast from the corridor flooring.

Due to the high floor-to-ceiling heights within the building, necessary to accommodate the volumes of plant serving the laboratories, each stair has flights of 13 continuous risers. Given the specialist nature of the building this is considered reasonable. All risers will be uniform.

7.7 Sanitary Conveniences / Welfare Provisions

The location of the WC core towards the West corner of the building has been dictated by the necessity to locate vast amounts of plant needed to service the specialist laboratories along the building's South West side. The siting of the plant in this location is necessary to ensure connections between plant are efficient and vibration control originating from the plant can be contained, in order that the functional performance of the specialist laboratories and equipment contained within is not compromised.

All sanitary provisions are uni-sex provisions.

WC's will be provided on each floor for both the able bodied and the disabled which will be designed in accordance with Approved Document Part M and BS:8300.

The able bodied provisions generally include no more than 2 no. cubicles in each WC. The WC serving the seminar provision on the third floor includes 4 no. cubicles, one of which will be designed as accessible for the ambulant disabled. The ambulant provisions will be signed.

One accessible WC will be provided on each floor. The maximum travel distances will exceed the recommended 45-50 meters. When measuring from the extremities of the building's provisions, travel distances are a little in excess of 70 meters. Given the strict limitations that need to be observed to ensure the plant serving the specialist laboratories is not compromised, along with the defined and controlled nature of the buildings occupants, it is considered reasonable in this case that the travel distances from the extremities of the building are longer than that recommended in Approved Document Part M. Travel distances to accessible WC's from visitor's provisions, such as the seminar facilities, are within the recommended travel distances. If found necessary to accommodate a specific individual's needs at a future date, the University will assess the possibility of containing the provisions to which the individual requires access, as close to the accessible WC provisions as possible. Cross corridor doors being hold open will go some way to reducing the impact of the travel distances.

The handing of the accessible WC's will vary between floors to provide alternative lateral transfer positions.

Visual fire alarms will be installed to all WC's.

All WC's will have thermostatically controlled mixer taps.

Each accessible WC will contain a panic alarm system providing a local alarm. There will be no lone working, however, all alarms will also report to a panel in the main entrance lobby by the porters desk.

The ground floor accessible WC will include masonry walls to allow for the future installation of a wall mounted overhead tracking hoist if required.

Shower provisions for the able bodied and an Approved Document Part M shower facility will be located on the first floor.

Given the specialist nature of this building and defined / controlled nature of the buildings occupants, provision for a changing place is not considered reasonable. A rest room will however be provided for those who require, for example, a place of rest following an epileptic fit or require privacy for self-administered medical injections. The details of this provision are yet to be agreed, it is however likely to contain the following:-

1. A rest bed / chair.
2. Masonry walls to allow for the future installation of a wall mounted overhead tracking hoist if required.
3. A sink.
4. A visual fire alarm.
5. A panic alarm system connected to the University's security lodge or other suitable location to be agreed with the University.
6. A fridge.

7.8 Laboratories

Due to the specialist nature of the laboratories, their continual adaption to accommodate the progressive and evolving demands of any given research project and the defined / controlled nature of the building's occupants, the laboratory furniture will not be designed as fully accessible. The University will provide reactive alterations as necessary to accommodate an individual user's needs.

As a result of this, the laboratory furniture specified is flexible and adaptable to accommodate change.

All laboratory furniture will however include accessible provision where economical to do so, for example, colour contrast, appropriate cupboard handles etc.
Circulation around the laboratories will achieve current standards of accessible design.

7.9 Seminar Room and Ancillary Break Out Space

This provision will be flexible with bi-folding walls, being able to be laid out for:-

1. One large break out / exhibition space
2. One small seminar room and separate break out / exhibition space
3. One large seminar room and separate break out / exhibition space

Seating within the space will be loose and fully flexible. The University will procure a height adjustable desk for the seminar room as part of the furniture package.

The accessibility of the door handles within the bi-folding walls is currently being reviewed. The doors contained within the bi-folding walls will tonally contrast from walls.

The seminar room will benefit from an audio visual system in accordance the University's standard specification.

Subject to confirmation that hearing enhancement systems are available that will not produce electromagnetic interference with the specialist laboratory equipment, the audio visual system will be directly linked / integrated into a hearing enhancement system covering the maximum footprint of the seminar space. Appropriate signage will be displayed.

The space will be level with no podium provided.

7.10 Terraces

Access to the terraces will be available for users of the seminar room etc. Access to the terrace will be provided via a level threshold and external flooring will be smooth, solid and slip resistant, with any gaps required for drainage less than 12mm.

Access doors leading onto the terrace will be accessible with manifestations applied to the bi-folding glazed walling.

This provision will be flexible with bi-folding walls, being able to be laid out for:-

Visual and audible fire alarms will be provided externally.

7.11 Hearing Enhancement Strategy

Hearing enhancement will be limited to the porters desk and seminar room. The hearing enhancement specification and strategy is currently being developed.

7.12 Acoustics

An acoustic specialist is employed as part of the design team and will specify acoustic performance.

7.13 Signage / Wayfinding

The specific details of the building's wayfinding strategy and specification will be developed in detail and agreed at a later design stage.

The University's corporate signage standard will be followed which has been in used successfully in other buildings for some time.

7.14 Lighting

All lighting will be even to reduce possible dark spots. The building's lighting scheme has been designed by the Mechanical and Electrical Engineer and will achieve current design standards as a minimum.

Further discussions are taking place with the University to establish if higher illumination levels are required in specialist areas.

7.15 Means of Escape

Ramboll Fire Engineers have undertaken consultation with HCD Building Control Ltd, Greater Manchester Fire Authority and the University's Fire Officers. A detailed fire strategy has been developed by Ramboll and the building's design fire engineered to achieve the necessary standards. The University's Fire Officers and Health and Safety departments have been consulted on the emergency escape provisions and design strategy. The following points are worthy to note from an access perspective.

The building has two escape stair cores extending the full height of the building and an escape core to the West corner extending a from basement to ground level. Each escape core has a fire and smoke protected lobby located directly off the stairs with disabled refuges to each floor level within the protected lobbies, except to the ground floor. Each of the escape stair cores exit directly to the outside at ground floor level.

Refuge communication systems will be installed to each of the refuges, with a master communication station positioned at a location agreed with HCD Building Control Ltd, Greater Manchester Fire Authority and the University's Fire Officers. It is considered the master station will be adjacent the main fire alarm panel in the entrance lobby.

Only visual fire beacons will be provided in each of the disabled refuge positions, to ensure an audible fire alarm siren does not impact upon clear and legible communications through the refuge communication system.

Refuge communication systems will be in line the University's standard specification. The units will be located a minimum 500mm away from any internal corner and 1200mm above finish floor level.

All refuges will be clearly signed.

As part of a robust campus wide fire evacuation strategy, the University has a policy of attending fire alarm activations with an evacuation team, consisting of trained security staff. As part of the University's procedure, an evacuation sling is routinely brought to each activation to enable the evacuation of disabled persons from disabled refuges. Consequently, no evacuation chairs are provided within University buildings.

It has been identified that evacuation from the basement is not possible via use of an evacuation sling, and a suitable alternative strategy is currently been developed. This may include an evacuation chair capable of travelling up stairs, complete with a battery charging station / secure store.

No fire fighting / evacuation lift is necessary by way of regulation for this building, and one will not be provided.

Dual visual and siren fire alarms will be installed throughout, with the exception of sensitive laboratory areas where lighting needs to be carefully controlled, such locations are yet to be determined. The beacons will be programmed to flash at intervals less likely to induce an epileptic seizure or similar.

All final fire exits will have a flush threshold, maximum 12mm.

7.16 Building Management

The University are committed to ensuring it maintains the high standards of accessibility built into the design with robust policies, procedures and staff training. The University is currently reviewing elements of its working practices and will continue to improve.

8.0 CONCLUSION

The University of Manchester's National Graphene Institute is a specialist research facility. Whilst the design has been developed with disabled access and accessible design standards as a key driver throughout the building, it has been necessary to balance the accessible design standards against the functional performance and controlled occupation of the specialist laboratory provisions. The general circulation and access standards throughout all areas of the building achieve high levels of accessible design and the specialist laboratory areas have been designed to be as flexible and adaptable as possible, enabling these spaces to be modified to accommodate specific user needs as required.

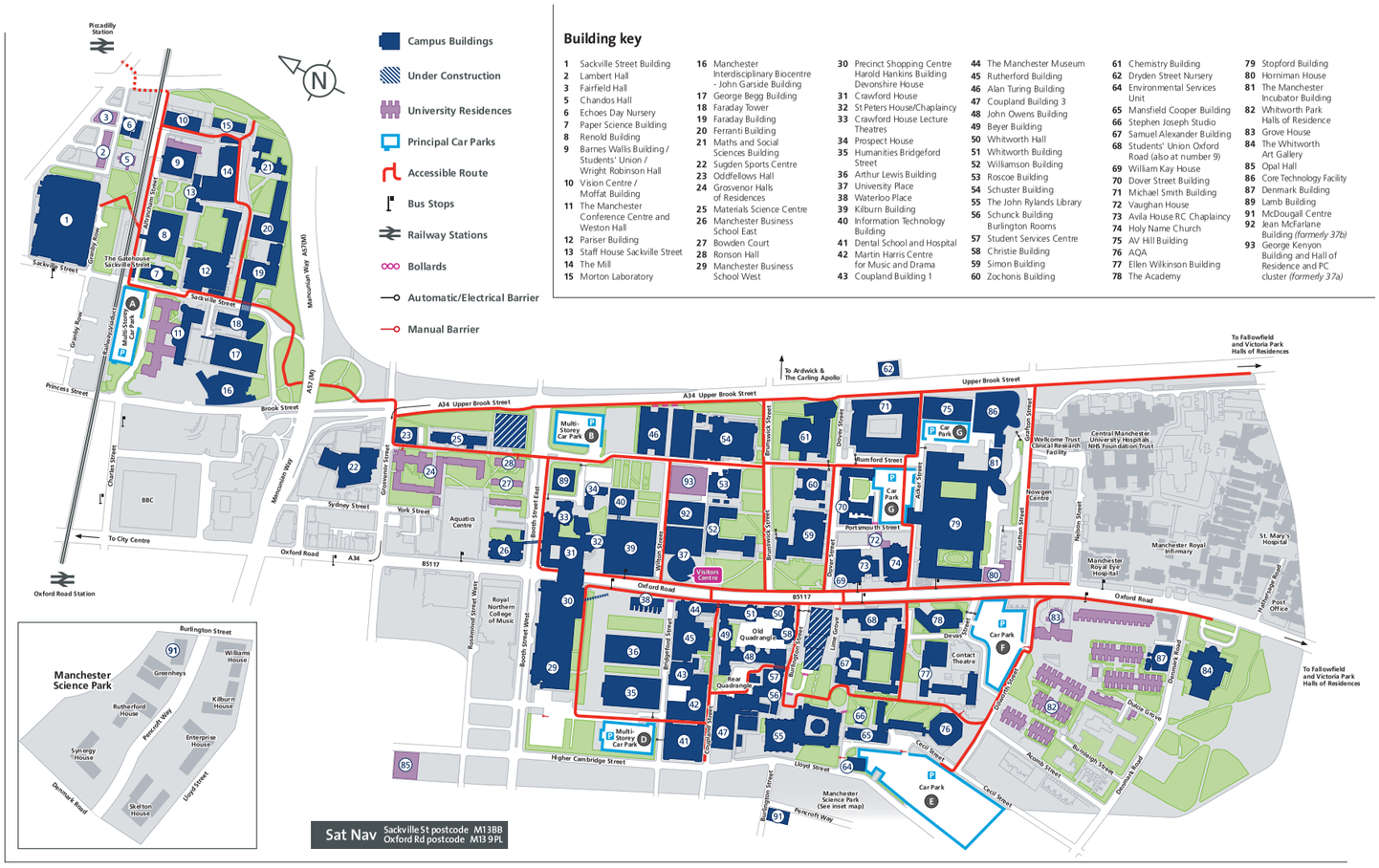
The design decisions have been, and will continue to be, influenced by accessible design standards, policy, best practice and the collective experience of the design team and University stakeholders.

Options are at present being considered to ensure the building's features / facilities yet to be fully designed and detailed are, where practical, fully accessible to a wide range of disabled users. The ongoing design development of features such as the porters desks, staircases, interior design / colours, lighting, surface finishes, signage etc will be focused on improving the accessibility of the building and the site.

This access statement has explored access and egress issues, to and around the site, as well as within the building itself. Further access assessments and consultations will be undertaken throughout the design progression and at each of the RIBA design stages, with the final as-built building assessed on completion to ensure the design standards and criteria detailed have been adhered to.

University of Manchester
Access Statement – National Graphene Institute

Appendix A
University of Manchester City Campus Map



Building key

1 Sackville Street Building
2 Lambert Hall
3 Fairfield Hall
5 Chandos Hall
6 Echoes Day Nursery
7 Paper Science Building
8 Renold Building
9 Barnes Wallis Building / Students' Union / Wright Robinson Hall
10 Vision Centre / Moffat Building
11 The Manchester Conference Centre and Weston Hall
12 Pariser Building
13 Staff House Sackville Street
14 The Mill
15 Morton Laboratory
16 Manchester Interdisciplinary Biocentre - John Garside Building
17 George Begg Building
18 Faraday Tower
19 Faraday Building
20 Ferranti Building
21 Maths and Social Sciences Building
22 Sugden Sports Centre
23 Oddfellows Hall
24 Grosvenor Halls of Residences
25 Materials Science Centre
26 Manchester Business School East
27 Bowden Court
28 Ronson Hall
29 Manchester Business School West
30 Precinct Shopping Centre Harold Hankins Building Devonshire House
31 Crawford House
32 St Peters House/Chaplaincy
33 Crawford House Lecture Theatres
34 Prospect House
35 Humanities Bridgeford Street
36 Arthur Lewis Building
37 University Place
38 Waterloo Place
39 Kilburn Building
40 Information Technology Building
41 Dental School and Hospital
42 Martin Harris Centre for Music and Drama
43 Coupland Building 1
44 The Manchester Museum
45 Rutherford Building
46 Alan Turing Building
47 Coupland Building 3
48 John Owens Building
49 Beyer Building
50 Whitworth Hall
51 Whitworth Building
52 Williamson Building
53 Roscoe Building
54 Schuster Building
55 The John Rylands Library
56 Schunck Building Burlington Rooms
57 Student Services Centre
58 Christie Building
59 Simon Building
60 Zochonis Building
61 Chemistry Building
62 Dryden Street Nursery
64 Environmental Services Unit
65 Mansfield Cooper Building
66 Stephen Joseph Studio
67 Samuel Alexander Building
68 Students' Union Oxford Road (also at number 9)
69 William Kay House
70 Dover Street Building
71 Michael Smith Building
72 Vaughan House
73 Avila House RC Chaplaincy
74 Holy Name Church
75 AV Hill Building
76 AQA
77 Ellen Wilkinson Building
78 The Academy
79 Stopford Building
80 Horniman House
81 The Manchester Incubator Building
82 Whitworth Park Halls of Residence
83 Grove House
84 The Whitworth Art Gallery
85 Opal Hall
86 Core Technology Facility
87 Denmark Building
89 Lamb Building
91 McDougall Centre
92 Jean McFarlane Building *(formerly 37b)*
93 George Kenyon Building and Hall of Residence and PC cluster *(formerly 37a)*

Sat Nav Sackville St postcode M13BB
Oxford Rd postcode M139PL

A
78 Academy
32 Access Summit Disability Resource Centre
37 Accommodation Office
31 Accounting and Finance
1 Aerospace Research Centre (UMARI)
60 Age and Cognitive Performance Research Centre
30 Ahmed Iqbal Ullah Race Relations Resource Centre
46 Alan Turing Building
36 Applied Social Sciences
76 AQA (formerly NEAB)
79 ARC Epidemiology Unit
65 Archaeology
35 Architecture and Planning
65 Art History and Visual Studies
36 Arthur Lewis Building
48 Association of University Administrators (AUA)
46 Astrophysics
69 Athletic Union
75 AV Hill Building
73 Avila House (RC Chaplaincy)

B
9 Barnes Wallis Building
49 Beyer Building
1 Bindery (Joule Library)
14 Biomolecular Sciences
54 Blackett Lecture Theatre
27 Bowden Court
54 Braddick Library
54 Bragg Lecture Theatre
35 Brookes World Poverty Institute
56 Burlington Rooms
56 Burlington Society

C
D Car Park Permit Office (Booth St West)
31 Careers and Employability Division (via Booth St East)
8 Careers Metro
35 Cathie Marsh Centre for Census and Survey Research (CCSR)
37 Central Academic Advisory Service
34 Central Services Unit
77 Centre for Continuing Education
77 Centre for Educational Leadership
77 Centre for English Language Studies in Education (CELSE)
77 Centre for Occupational and Environmental Health
79 Centre for Integrated Genomic Medical Research (CIGMR)
59 Centre for the History of Science, Technology and Medicine (CHSTM)
65 Centre for New Writing
1 Centre for Manufacture
1 Centre for Process and Integration
5 Chandos Hall
14 Chemical Engineering and Analytical Sciences
61 Chemistry Building
67 Chinese Studies
58 Christie Building/Bistro
12 Civil and Construction Engineering
67 Classics and Ancient History
67 Combined Studies
49 Communications, Media and Public Relations
39 Computer Science
63 Concourse Cafe
13 Conference Office
67 Confucius Institute
75 CONTACT (Manchester Science Park)
35 Cordingley Lecture Theatre
86 Core Technology Facility
42 Cosmo Rodewald Concert Hall
1 Council Chamber (Sackville Street)
51 Council Chamber (Whitworth Building)
68 Council Chamber (Students' Union)
31 Counselling Service
43 Coupland Building 1
47 Coupland Building 3
31 Crawford House
33 Crawford House Lecture Theatres
30 CRIC (ESRC Centre for Research and Innovation and Competition)
48 Curriculum Innovation

D
12 Dalton Institute
87 Denmark Road Building
41 Dental School and Hospital
47 Dental School Annexe
58 Development and Alumni Relations
30 Devonshire House
79 Diagnostic Radiology
37 Disability Support Office
70 Dover Street Building
42 Drama
62 Dryden Street Day Nursery

E
52 Earth Sciences
67 East Asian Studies
6 Echoes Day Nursery
1 Electrical and Electronic Engineering
20 EEE Engineering
36 Economics
29 Eddie Davies Library
77 Education
77 Ellen Wilkinson Building
1 Engineering and Physical Sciences Faculty Office
1 Engineering Doctorate Centre
67 English and American Studies
23 English Language Courses
36 Environment and Development
64 Environmental Services Unit
1 EPS Foundation Studies
1 Equality and Diversity Office
49 Estates Directorate
67 European Studies

F
3 Fairfield Hall
19 Faraday Building
18 Faraday Tower
20 Ferranti Building
48 Finance Office
67 French Studies

G
36 Geography
52 Geology
17 George Begg Building
93 George Kenyon Building and Hall of Residence *(formerly 37a)*
67 German Studies
67 Goethe Institute
36 Government
35 Graduate Development Scheme
36 Granada Centre for Visual Anthropology
35 Graphics Support Workshop
65 GM Archaeological Unit
52 GM Geological Unit
83 Grove House
24 Grosvenor Halls of Residences

H
30 Harold Hankins Building
38 Health and Safety Services
34 Higher Education Careers Service Unit
67 History
74 Holy Name RC Church
80 Horniman House
77 Human Communication and Deafness
48 Human Resources
35 Humanities Bridgeford Street
30 Humanities Faculty Office

I
48 Income Office
40 Information Technology Building
36 Institute for Development Policy and Management (IDPM)
35 Institute for Political and Economic Governance (IPEG)
52 Institute of Health Sciences
53 International Centre for Labour Studies
45 International Development
69 International Society
67 Italian Studies

J
38 Japan Centre
67 Japanese Studies
92 Jean McFarlane Building *(formerly 37b)*
16 John Garside Building
48 John Owens Building
55 John Rylands University Library
42 John Thaw Studio
12 Joule Centre
1 Joule Library

K
44 Kanaris Lecture Theatre
35 Kantorowich Library
51 Keepers Room
48 Ken Kitchen Committee Room
39 Kilburn Building
50 Knowles Committee Room

L
89 Lamb Building
2 Lambert Hall
23 Language Centre (Oddfellows Hall)
67 Language Centre (Samuel Alexander Building)
52 Law
67 Learnington Rooms
30 Legal Advice Centre
42 Lenagan Library
71 Life Sciences
79 Life Sciences
79 Life Sciences Faculty Office
67 Linguistics

M
77 Management and Leisure
26 Manchester Business School East
29 Manchester Business School West
30 Manchester Centre for Healthcare Management
39 Manchester Computing
11 Manchester Conference Centre
41 Manchester Dental Education Centre (MANDEC)
81 The Manchester Incubator Building/UMIC
30 Manchester Institute of Innovation Research
31 Manchester Institute for the Deaf
16 Manchester Interdisciplinary Biocentre - John Garside Building
44 Manchester Museum
1 Manchester Science and Enterprise Centre
110 Manchester Student Homes
47 Manchester University Press
39 Manchester Visualisation Centre
65 Mansfield Cooper Building
42 Martin Harris Centre for Music and Drama, and Electro Acoustic Studio
25 Materials Science Centre
46 Mathematics
21 Maths and Social Science Building
91 McDougall Centre
17 Mechanical, Aerospace and Civil Engineering (MACE)
35 Media Centre
59 Medical and Human Sciences Faculty Office
79 Medicine
79 Medical School
71 Michael Smith Building
67 Middle Eastern Studies
67 Modern Languages
10 Moffat Building
15 Morton Laboratory
54 Moseley Lecture Theatre
42 Music
1 Muslim Prayer Hall North
91 Muslim Prayer Hall South

N
36 National Centre for e-Social Science (NCeSS)
52 National Primary Care Research and Development Centre (NPCRDC)
42 Novars Research Centre
92 Nursing, Midwifery and Social Work

O
38 Occupational Health
14 Occupational Health (Sackville Street)
23 Oddfellows Hall
85 Opal Hall
10 Optometry and Neuroscience
48 Owens Committee Room

P
7 Paper Science
12 Pariser Building
93 PC Cluster
43 Pear Lecture Theatre
79 Pharmacy and Pharmaceutical Sciences
36 Philosophy
46 Photon Science Research Institute
54 Physics and Astronomy
36 Planning and Landscape
70 Police Office
36 Politics
56 Postgraduate Society
31 Precinct Library
30 Precinct Shopping Centre
48 President and Vice Chancellor's Office
30 PREST
40 Prospects House
59 Psychiatry
43 Psychology

R
38 Regional and Economic Affairs
48 Registrar and Secretary
67 Religions and Theology
8 Renold Building
58 Research Office
28 Ronson Hall
53 Roscoe Building
67 Russian Studies
45 Rutherford Building
54 Rutherford Lecture Theatre

S
32 St Peter's Chaplaincy
1 Sackville Street Building
67 Samuel Alexander Building
56 Schunck Building
54 Schuster Building
59 Simon Building
36 Social Anthropology
37 Social Work
36 Sociology
67 Spanish and Portuguese Studies
77 Speech Pathology
13 Sport, Trading and Residential Services (STARS)
69 Sports Directorate
13 Staff House Sackville Street
35 Staff Training and Development Unit
66 Stephen Joseph Studio
79 Stopford Building
37 Student Experience
38 Student Health Centre
48 Student Records
45 Student Recruitment, Admissions and International Development
13 Student Services Centre Satellite
57 Student Services Centre
37 Student Experience
9 Students' Union Sackville St
68 Students' Union Oxford Rd
22 Sugden Sports Centre

T
48 Teaching, Learning and Assessment Office
1 Textiles
14 The Mill

U
1 UMARI
81 UMIC
86 UMIP
52 University College Union
37 University Place

V
72 Vaughan House
37 Visitors Centre
10 Vision Centre

W
38 Waterloo Place
70 Wellbeing Room
11 Weston Hall
84 Whitworth Art Gallery
51 Whitworth Building
50 Whitworth Corridor
50 Whitworth Hall
82 Whitworth Park Halls of Residence
69 William Kay House
52 Williamson Building
31 Workers' Educational Association North West Region
9 Wright Robinson Hall

Z
60 Zochonis Building

Appendix D | Crime Prevention Statement

Greater Manchester Police

designforsecurity

Crime Impact Statement

Site of the Lamb Building, Booth Street East, Manchester

National Graphene Institute

For Jestico + Whiles

Version A: 21.11.12

www.designforsecurity.org
info@designforsecurity.org
0161 856 5912

Not Protectively Marked

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Crime Impact Statement

Site of the Lamb Building, Booth Street East, Manchester

National Graphene Institute

2012/0684/CIS/01

For Jestico + Whiles

Version A: 21.11.12

Executive Summary

☐ **Significant material changes are advised**

☐ **Proposal is satisfactory in principle but minor changes are advised**

☒ **Proposal is generally acceptable subject to the advice in this report**

The principal volume crimes in the locality, which may affect this development, are theft, whilst belongings are left unattended in accessible buildings, and cycle theft. Consequently, particular attention should be paid to the provision of access controls into, and within, the building, and the provision of secure cycle shelters in visible locations.

This development has been assessed against, and is consistent with, the principles of 'Crime Prevention through Environmental Design' (CPTED). It will add interest to the streetscene and includes features which will promote a secure environment internally, through appropriate access controls and the adoption of risk commensurate security standards, and externally, through the increase in activity and surveillance associated with the building.

I am happy to support the development and recommend adoption of the security measures set out in sections 6 and 7 of this report, as well as due consideration of the matters set out in section 5.3.

Adrian Murphy *MRTPI*
Consultant
e: adrian.murphy@designforsecurity.org

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Contents

1 Visual Audit 4

2 Crime Statistics & Analysis 6

- 2.1 Crime Count
- 2.2 Misc Theft (Proposed Use Only): Risk Analysis
- 2.3 Burglary Other (Proposed Use Only): Risk Analysis
- 2.4 Vehicle Crime: Risk Analysis
- 2.5 Wounding: Risk Analysis
- 2.6 Criminal Damage and Robbery: Breakdown
- 2.7 Common Use-Specific M.O.s (Modus Operandi)

3 Risk Factors 9

4 Design Considerations 10

Safer Places (2004) ODPM, London

Secured by Design (SBD)

5 Design & Layout Appraisal 10

- 5.1 The Proposal
- 5.2 Positive Aspects of the Proposal
- 5.3 Changes and Amendments Needed

6 Physical Security 11

- 6.1 Doors
- 6.2 Windows and Shutters
- 6.3 Glazing
- 6.4 Intruder Alarm
- 6.5 Access Control

7 External Features 12

- 7.1 Lighting
- 7.2 CCTV
- 7.3 Other

8 Management & Maintenance 13

9 Construction 13

Appendix

A Contact register 14

B Associated Documents 14

C CIS Version History 14

D Glossary 15

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1 Visual Audit

1.1.1 The plan and images below illustrate: the site edged in red; the surrounding University Campus buildings to the south, west and northeast; multi storey car park to the east; halls of residence to the north; pockets of open space and public realm; security features; and, the surrounding highway network.





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1.1.2 The site lies with the Manchester University Campus, facing Booth Street East. Formerly the site of the Lamb Building, the land has now been cleared of buildings and is secured with temporary welded mesh fencing. The perimeter of the site is lined with mature trees. The site is surrounded by public and private roads; the private roads provide access to University buildings and are controlled by means of arm barriers. Booth Street East is the principal trafficked road whilst the road to the east of the site provides access and egress from the nearby multi-storey car park.

1.1.3 A security lodge lies to the south of the site, in the centre of the access controlled service road.

1.1.4 There are a number of private parking spaces within the confines of the access controlled roads, including a small formal car park immediately south of the site. A small number of roadside parking bays will be lost as a result of this development.

1.1.5 There is some surveillance of the site from passing motorists and pedestrians, particularly during the academic day as students and staff move between buildings. The presence of the security lodge and the prevalence of CCTV cameras provide formal and electronic surveillance of the site and campus as a whole. The overall impression is that the campus, certainly in this locality, is well managed from a security perspective.

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2 Crime Statistics & Analysis

All data below is based on crimes recorded between 1st November 2011 and 2012.

2.1 Crime Count

Figure 1: Recorded Crime in Km² Centred on Site

Burglary Dwelling	Burglary Other	Criminal Damage	Less Serious Wounding	Misc. Thefts	Robbery	Serious Wounding	Theft from Motor Vehicle	Theft of Motor Vehicle	Theft of Pedal Cycle
21	62	62	119	194	65	<20	86	<20	143

2.1.1 During the previous 12 months the volume of crime locally has been very high, especially the number of incidents of theft and violence. The site is located close to the city centre and this explains the high volume of incidents of violence and miscellaneous theft, the risk of pedal cycle theft is greater in the University Campus than most places in Greater Manchester.

2.2 Misc Theft (Proposed Use Only): Risk Analysis

The data below relates to miscellaneous thefts within/against university premises and research institutes, recorded in the Manchester area.

Figure 2: Misc Theft – Day Range

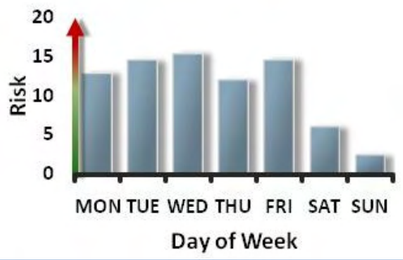

Figure 3: Misc Theft – Time Range



2.2.1 Day Range: The risk of theft is greatest between Monday and Friday, peaking on Thursday. The majority of university buildings are only open between Monday and Friday and this explains why the risk is far greater than at the weekend.

2.2.2 Time Range: The risk of theft is concentrated between 10am and 5pm, the time when most university buildings will be open and/or busy and there are more opportunities for offenders to commit theft.

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2.3 Burglary Other (Proposed Use Only): Risk Analysis

The data below relates to burglary other offences within/against university premises and research institutes, recorded in the Manchester area.

Figure 4: Burglary Other – Day Range

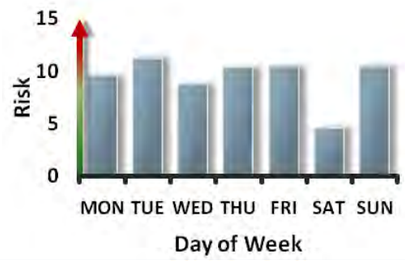
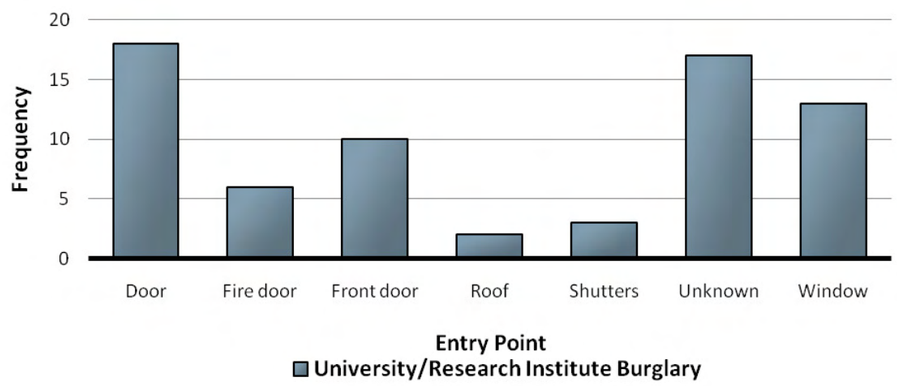


Figure 5: Burglary Other – Time Range



Figure 6: Burglary Other – Point of Entry



2.3.1 Day Range: The risk of burglary does not vary greatly during the week; the risk of burglary is greatest on Tuesday and lowest on Saturday.

2.3.2 Time Range: The majority of burglaries at university premises are committed through the night. Offenders typically target premises at night when they are closed, it is dark, the local area is quiet and they perceive the risk of being caught or identified as low.

2.3.3 Point of Entry: There have been a high number of burglaries at universities where the point of entry has been unknown, and this is likely due to the open nature of universities which allow offenders to gain access as members of the public before targeting restricted areas. When entry has been forced doors (particularly those to the rear) and windows have been targeted. Doors have been forced open with tools and windows have been prised open by offenders to gain entry.

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2.4 Vehicle Crime: Risk Analysis

The data below relates to vehicle crime committed within a Km² centred on the site.

Figure 7: Vehicle Crime – Day Range

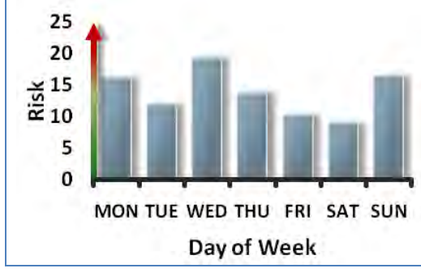

Figure 8: Vehicle Crime – Time Range



2.4.1 Day Range: The risk of vehicle crime during the week is greatest on Monday and Sunday, the risk on other days is lower but not significantly.

2.4.2 Time Range: The risk of vehicle crime is concentrated in the afternoon and in the evening. Vehicles belonging to staff at the university and hospital, and students, are frequently parked on streets and on informal car parks in the local area where they are vulnerable – particularly after dark.

2.5 Wounding: Risk Analysis

The data below relates to instances of wounding committed within a Km² centred on the site.

Figure 9: Wounding – Day Range

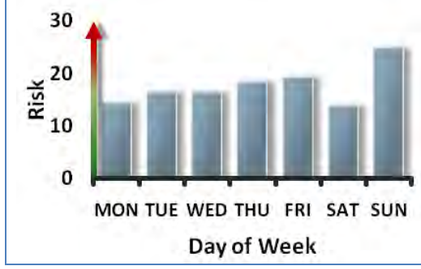

Figure 10: Wounding – Time Range



2.5.1 Day Range: During the week the risk of violence is greatest on Friday and Sunday. The risk of violence often increases at the weekend when more people attend license premises, often for longer and consuming more alcohol leading to conflict.

2.5.2 Time Range: During the day the risk of violence is greatest late in the afternoon and in the evening. The risk of violence often increases at these times when alcohol has been consumed in homes and licensed premises leading to violence.

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2.6 Criminal Damage and Robbery: Breakdown

The data below relates to criminal damage and robbery offences committed within a Km² centred on the site.

Figure 11: Criminal Damage Targets

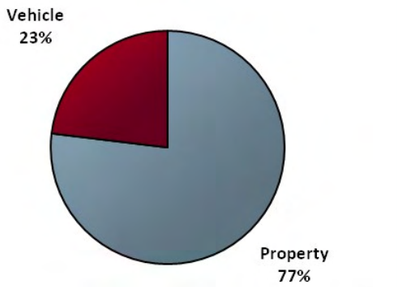
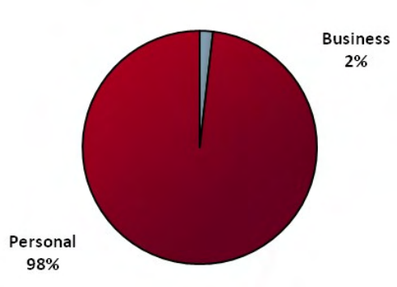


Figure 12: Robbery Targets



2.6.1 Criminal Damage Targets: The majority of criminal damage in the local area has been against property rather than vehicles. Glazing has been smashed in a high number of offences.

2.6.2 Robbery Targets: There have been a high number of burglaries in the local area and the majority of robberies in this area have targeted individuals rather than businesses. Individuals walking alone through the area at night have been targeted most frequently.

2.7 Common Use-Specific M.O.s (Modus Operandi)

2.7.1 Offenders targeting restricted areas of buildings after gaining access as members of the public

Solution *Access control systems help to ensure only authorised people can gain access to designated spaces. Doors may be controlled by fob/swipe systems, and turnstiles or speed gates can be used at the building entrance. All security strategies should be complimented by signage to clearly identify restricted areas and procedures to ensure staff/students carry and display authentic identification and eliminate/minimise tail-gating into secure areas.*

2.7.2 Rear doors and windows have been forced open with bodily pressure and tools

Solution *Doors should firstly be positioned where they can be monitored by staff, passers-by and by CCTV to minimise risk. Door products should also be certified to PAS 24 or LPS 1175 to provide resistance to typical modus operandi used in breaking and entering. Access to concealed rear areas should be prevented by suitable boundary treatments. Specifying windows certified to BS 7950 with laminate glazing will ensure a known level of resistance to forced opening.*

3 Risk Factors

The typical security risks for a development of this nature are:

- Burglary
- Criminal damage to property
- Unauthorised access to buildings and private space
- Antisocial behaviour
- Loitering groups (particularly out of hours)
- Internal theft

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- Theft of staff/pupil belongings
- Bullying
- Staff, pupil and parent safety
- Acts of criminal damage during the construction period.

4 Design Considerations

Design for Security does recommend that designers and developers refer to:

Safer Places (2004) ODPM, London

- Seven attributes of sustainable communities that are particularly relevant to crime prevention are detailed within Chapter 2 of this ODPM publication. Annex 3 also contains many useful references. You can download 'Safer Places' at www.designforsecurity.org

Secured by Design (SBD)

- Secured by Design focuses on crime prevention at the design, layout and construction stages of homes and commercial premises and promotes the use of security standards for a wide range of applications and products. To apply for Secured by Design certification for your development, visit our online application form at: http://www.designforsecurity.org/secured-by-design/sbd-accreditation/

5 Design & Layout Appraisal

5.1 The Proposal

5.1.1 A part four/ five storey building is proposed, housing 3263m^2 research laboratories, 475m^2 offices and 4419m^2 plant and ancillary space. The main entrance is situated on Booth Street East in the North West corner of the site. Central Utility Building (plant room) will be on all levels of the building.

5.1.2 The lower ground floor accommodates the main 'clean' room, and has a corridor around the external wall to provide means of escape, viewing, damp protection, temperature regulation and access to the chases.

5.1.3 The ground floor accommodates the main entrance, porter's office, loading bay and bulk gases, and the plenum to the lower clean-room.

5.1.4 First floor accommodates upper 'clean' room, an open plan laboratory, other laboratories and offices.

5.1.5 Second floor accommodates laboratories and offices

5.1.6 Third floor accommodates offices, further laboratories, a seminar room, and welfare facilities, with external access to roof area.

5.1.7 Roof Level provides space for air cooled plant and chillers.

5.1.8 Two lifts are provided - one passenger (front of the building) and one goods lift (rear of the building).

5.1.9 The service area is located on the western elevation utilising the existing, access controlled, service road.

5.1.10 Car parking is not included in the scheme though cycle parking is.

5.2 Positive Aspects of the Proposal

5.2.1 The development is well located within the University campus, on a currently vacant site.

5.2.2 The building presents an active frontage to most of the public elevations around the site, which will help to enliven the street scene and help to provide useful natural surveillance of the area. Windows from routinely occupied rooms will face the street and create an interesting feature on a currently feature free street.

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5.2.3 There are no recesses in the building footprint that could provide potential hiding places or loitering places where an offender could commit crime without fear of detection.

5.2.4 The porter rooms are positioned to face the entrance doors, so that people entering/leaving the building can be monitored.

5.2.5 The cycle store is welcomed but should have self-closing and locking gates/doors and fob-activated access controls with entry restricted to permit holders only..

5.3 Changes and Amendments Needed

5.3.1 The proposed staff entrance is somewhat secluded and requires CCTV coverage and appropriate lighting.

5.3.2 All facades of the building should have low intensity, dawn to dusk lighting, operated by daylight sensor, particularly around doorways.

5.3.3 Cycle parking provision appears in two different locations – adjacent to the multi-storey car park entrance, on the site plan, and across the service road on the west side of the building, on the ground floor plan. As cycle crime is an issue in this locality, I would encourage as much secure, cycle parking as possible in and around the scheme, but if there is only to be one additional shelter then the multi-storey location would be most suitable due to its greater visibility and activity support. Lockable enclosures are preferred.

5.3.4 Bin stores should be fireproof, lockable enclosures.

6 Physical Security

The following standards and features will be required for this development to demonstrate a level of physical security acceptable to Design for Security.

6.1 Doors

6.1.1 External doors must be compliant with and certified to either BS PAS 24, WCL2, or LPS 1175 SR2. The front and rear entry doors must include a lock capable of being operated via an electronic access control system. These must be accessible by fob or swipe card; keypads should not be used.

6.1.2 An intercom with both audio and video should be provided at the main entrance, to allow staff or security staff to vet visitors prior to allow entry remotely if necessary.

6.1.3 Revolving doors should be tested and certified to ENV 1627-30 (WK2+). If circumstances could prevent this, please consult with Design for Security.

6.1.4 External escape-only doors (as with external doors in general) should be certified to BS PAS 24, or LPS 1175 SR2. It is crucial that the door ironmongery is permitted for use on these doors under the security certification of the product. Fire doors should be alarmed in order to reduce the likelihood of misuse, which would then compromise the security of the building.

6.1.5 Internal doors to sensitive areas should be tested to the same standard as external doors.

6.2 Windows and Shutters

6.2.1 Windows must be compliant with and certified to BS 7950.

6.2.2 Any ground floor and easily accessible lights which are opening (escape requirements permitting) must be key-lockable, and have fixed/lockable opening restrictors (not releasable from the outside) limited to 100mm.

6.2.3 Loading bay shutters should meet LPS1175 security rating 2 or higher. Should internal or external shutters be considered elsewhere within the development, they must be tested and certified to LPS 1175 SR2 (or SR1 if perforated laths are required), and installed in accordance with manufacturer's instructions.

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6.3 Glazing

6.3.1 Glazing to a height of 2400mm (or if otherwise accessible) must incorporate at least one pane of glass with a 1.5mm PVB interlayer (e.g. 7.5mm laminated glass), or a glass rated as P4A under EN 356. The remaining pane in a double glazed unit may be toughened glass.

6.4 Intruder Alarm

6.4.1 Should the building need to be secured for any length of time, an intruder alarm should be installed, with contacts on all external doors, and monitored by the University security service.

6.5 Access Control

6.5.1 Access control systems should be operable by swipe card or fob, and not numeric key pads. The following doors should operate on access control:

- Main and staff entrances.
- Service shutters
- Doors connecting lobbies to lab or office areas.

7 External Features

7.1 Lighting

7.1.1 The building would benefit from low intensity, dusk to dawn lighting to illuminate the building elevations and support the CCTV system. In addition, dusk 'til dawn lights, operated by photoelectric cell/daylight sensor, should be installed to all external doors.

7.1.2 Light fittings should produce 'white' light, as opposed to yellow/orange light. Metal halide (or bulbs with a comparable output) should be used, as these offer superior colour rendition over alternatives such as high and low pressure sodium bulbs.

7.2 CCTV

7.2.1 CCTV systems that are used within this proposal will require certain specifications and intelligent placement of cameras to compliment the design of the development. Designers should consider the following points when planning a CCTV strategy:

- With regards to the retention of footage, the police prefer quality over quantity. The overall retention period should be dictated by what the system is designed to achieve, though it would be better to have good quality images over a 14-day period than poor ones over a 30-day period.
- Procedures for the recovery of recordings should be established and an appropriate number of staff properly trained to perform this function staff. This is to ensure that the images produced will be of an acceptable standard that will allow for identification of an individual, which will stand up to scrutiny should recorded material be used as admissible evidence in any court proceedings
  - **Acceptable Standard** - this generally requires a resolution of 720x576 pixels at a real time frame rate of 25 frames per second. (N.B. Both the camera and DVR must be capable of this – if the camera will only send low resolution images then it does not matter how high the resolution of the recording unit is).
  - **Identification** – To identify an individual, the image must capture no less than 120% of the field of view (at least from the top of the individuals head to their knees). 'Overview' and 'Recognition', which whilst effective for observational purposes, are less likely to result in the identification of a person/offender.
- CCTV systems (and lighting that support them) require regular cleaning and maintenance to remain effective.

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- Where necessary cameras that are vulnerable to damage should be protected from attack either by relocation to a higher level and using a bigger lens to achieve the view required or through the fitting of a vandal resistant housing.

7.2.2 The intelligent placement of cameras helps to provide clear facial identification of individuals. Suitable locations should be selected to monitor: all elevations of the building, the main and staff entrances, the reception area/lobbies.

7.2.3 The locations of CCTV cameras in the vicinity of the proposed development should be re-evaluated for their continued effectiveness.

7.3 Other

7.3.1 The cycle store(s) should be secure, lockable enclosures. For further information refer to our cycle storage guidance document: http://www.designforsecurity.org/uploads/files/DFS_Cycles.pdf

7.3.2 Any bin or external material stores should be secure, lockable, and fire resistant enclosures.

8 Management & Maintenance

8.1.1 The upkeep of a development over its lifetime can be crucial to the level of security and safety within. Aspects of a development, which are left to deteriorate, have the potential to attract further crime. The building and its immediate environs should be included in the University plans for security and maintenance to ensure that the development is managed to the highest of standards.

9 Construction

9.1.1 Untidy sites and their surroundings can be littered with debris accessible to vandals who often use loose materials as missiles to commit crime. The client should take measures appropriate to secure their site during construction, and control pedestrian and vehicular access in to and out of the site curtilage. It is also recommended that the contractor on this scheme is a member of the 'Considerate Constructors Scheme', who has committed to be a considerate and good neighbour, as well as clean, respectful, safe, environmentally conscious, responsible and accountable.

9.1.2 Site security contractors should be SIA (Security Industry Authority) approved to ensure professional standards are adhered to (please see http://www.sia.homeoffice.gov.uk/pages/acs-intro.aspx for more details).

9.1.3 For further information regarding site security, please contact your local Crime Reduction Advisor, **Nicola Oldham**, on **0161 856 5912**.

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A Contact register

Date	Contact With	Summary of Contact
11.09.12	DESIGN TEAM	Pre- planning meeting
13.11.12	STUART LOCKWOOD/JULIAN DICKENS	Request for Crime Impact Statement
19.11.12	UNACCOMPANIED	Site visit
22.11.12	STUART LOCKWOOD	Report issued

B Associated Documents

This report is based on the following drawings and supplementary information submitted by the applicant.

DWG No.	DWG Title	Date	Rev
2469-OV-000	LOCATION PLAN	27.09.12	PO4
2469-GA-000	SITE PLAN	26.10.12	PO5
2469-GA-100	LOWER GROUND FLOOR PLAN	31.08.12	PO7
2469-GA-101	GROUND FLOOR PLAN	31.08.12	PO7
2469-GA-102	FIRST FLOOR PLAN	31.08.12	PO6
2469-GA-103	SECOND FLOOR PLAN	31.08.12	PO6
2469-GA-104	THIRD FLOOR PLAN	31.08.12	PO7
2469-GA-105	FOURTH FLOOR PLAN	31.08.12	PO7
2469-SC-100	PROPOSED SECTION AA	27.09.12	PO4
2469-SC-101	PROPOSED SECTION BB	27.09.12	PO4
2469-SC-102	PROPOSED SECTION CC	27.09.12	PO4
2469-OV-100	SITE SECTION AA AND BB	27.09.12	PO3
2469-SK-075	PROPOSED NORTH-WEST VIEW	31.08.12	PO3
2469-SK-076	PROPOSED SOUTH-EAST VIEW	31.08.12	PO3
2469	SECURITY MEETING MINUTES	11.09.12	

PLEASE NOTE - In the event of any subsequent material changes to the scheme, it will be necessary for Design for Security to reassess the comments made within this report.

C CIS Version History

Version	Status			Revisions Made
A	☐	☐	☒	

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D Glossary

Burglary Resistance Standards

BS 3621, 2007

Thief resistant locks. Key Egress.

The minimum standard for locks on external or entrance doors to be acceptable to the Association of British Insurers (ABI) and the police service. The effectiveness of the lock also depends on the quality of the door, frame and other hardware which is not tested by this standard and which may fail before the lock.

BS 8621, 2007

Thief resistant locks. Keyless Egress.

Same as above, but egress is possible without a key (by use of thumb turn or latch lever.

BS 7950, 1997

Specification for enhanced security performance of casement and tilt/turn windows.

BS 4873, 2005: Specification for aluminium windows.

BS 7412, 2007: Specification for plastic windows made from PVC-U extruded hollow profiles.

BS 644-1, 2003: Wood windows. Specification for factory assembled windows - various types.

BWF:TWAS: Timber window accreditation scheme.

BS 6510, 2005: Specification for steel windows, sills, window boards & doors.

BS PAS 23-1, 1999

General performance requirements for door assemblies.

A performance standard for door sets, which certifies that a particular door set is fit for purpose. Door products must also have BS PAS 24 certification.

BS PAS 24-1, 2007

General security performance requirements for door assemblies.

An attack test standard for door sets, which certifies that a particular door, frame, lock and hardware set has withstood a series of physical tests. This is the minimum police requirement for Secured by Design dwellings, and is also applicable to French/double doors, and sliding doors.

ENV 1627-30 (Security Ratings WK1 to WK6)

Windows, doors, shutters - Burglar resistance Requirements and classification

The classification system used in ENV 1627-30 is aimed at the commercial market and is based on five elements:

a) Resistance of glazing

b) Performance of hardware

c) Resistance to static loading

d) Resistance to dynamic loading

e) Burglary resistance by manual intervention

LPS 1175 (Security Ratings 1 to 6)

Specification for testing and classifying the burglary resistance of building components

This includes doors, shutters, garage doors and grilles typically for commercial premises and higher risk domestic premises and is acceptable to the ABI and the Police. The standard has 6 levels, 6 being the highest, with levels 1 and 2 equivalent in many respects to BS PAS 24 and BS 7950.

EN 356, 2000 (Ratings P1A to P8A)

Glass in building. Security glazing. Testing and classification of resistance against manual attack.

A performance standard for manual attacks on glazing. P2A is comparable to the performance of a 6.8mm laminated glass, and P4A to that of a 9.5mm laminated glass.

Commonly Used Acronyms

CIT

Cash in transit (refers to vehicles, personnel and routines).

CPTED

Crime Prevention Through Environmental Design
(Learn more at ***www.designforsecurity.org/about/cpted***)

CRA

Crime Reduction Advisor. Sometimes known as CPO (Crime Prevention Officer)

NPT

Neighbourhood Policing Team.

PVB/PolyVinyl Butyral (Glazing interlayer)

A commonly used interlayer used in the production of laminated glass.

LPCB (Loss Prevention Certification Board)

A brand of the BRE Global (Building Research Establishment) family. The LPCB work with insurers, Government, police, designers, manufacturers, contractors and end users to develop methods of assessing performance and reliability of security products to ensure their fitness for purpose.

UKAS (United Kingdom Accreditation Service)

The sole national accreditation body recognised by government to assess, against internationally agreed standards, organisations that provide certification, testing, inspections and calibration services.

Useful Websites

Secured by Design
www.securedbydesign.com

RIBA Product Selector
www.ribaproductselector.com

LPCB – Red Book Live
www.redbooklive.com

Crime Reduction (Home Office)
www.crimereduction.homeoffice.gov.uk

DAC (Design Against Crime) Solution Centre
www.designagainstcrime.org

Building for Life
www.buildingforlife.org

CLG (Communities and Local Government)
www.communities.gov.uk

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Appendix E | Ground Investigation Report

University of Manchester

Graphene Innovation Hub

Ground Investigation Report

DRAFT

July 2012

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Contents

		Page
1.0	EXECUTIVE SUMMARY	1
2.0	INTRODUCTION	3
3.0	SITE DESCRIPTION	5
4.0	DESK STUDY SUMMARY	6
5.0	WYG INVESTIGATIONS	7
6.0	ENCOUNTERED GROUND CONDITIONS	11
7.0	GROUND GAS	15
8.0	GROUND CONTAMINATION ASSESSMENT	17
9.0	CONTAMINATION RISK ASSESSMENT	23
10.0	GEOTECHNICAL ASSESSMENT	29
11.0	CONCLUSIONS & RECOMMENDATIONS	31

Figures

Figure 1 – Site Location Plan

Figure 2 – Site Plan

Figure 3 – Exploratory Hole Location Plan

Figure 4 – Conceptual Site Model (CSM)

Appendix Contents

Appendix A – Report Conditions

Appendix B – Manchester City Council Letter

Appendix C – Exploratory Hole Logs

WYG Environment
part of the WYG group

Appendix D – Chemical Laboratory Results

Appendix E – Geotechnical Laboratory Results

Appendix F – Monitoring Results

Appendix G – Tier 1 Screening Assessment and Statistical Analysis

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1.0 EXECUTIVE SUMMARY

Site Status	The proposed Graphene Innovation Hub comprises a rectangular parcel of grassed land, approximately 0.3ha in area, located off Booth Street East within the University of Manchester campus. The site is to be developed as a multi-storey research building.
Environmental Setting	A desk study has been completed for the site (WYG, May 2012) which determined that: • The site has previously been occupied by terraced housing, a hospital and a university building. • The site is underlain by possible Made Ground, Glacial-fluvial Sand and Gravel (Secondary A Aquifer), possible Glacial Till clay with lithologies of the Sherwood Sandstone (Principal Aquifer) at depth. • The site is located in a Source Protection Zone for a potable water supply. • The nearest watercourse is the River Medlock, approximately 500m from the site. • Preliminary risk associated with potential contamination has been identified as low to moderate.
Site Investigation	An intrusive investigation of the site was undertaken in June 2012, comprising: • 3 No. rotary boreholes drilled to 15m depth. • 2 no. cable percussive holes to 5m depth. • 8 No. window sample holes to between 4m and 5m depth. • 5 No. tracked machine excavated trial pits to approximately 3m depth. • Hand dug pit to 0.3m bgl. • Full-time supervision by WYG consultant, to record the ground conditions, obtain soil samples and undertake a photographic record of the works. • In-situ Geotechnical testing. • Semi-quantitative analysis of Volatile Organic Compounds (VOCs) using a Photo-Ionisation Detector (PID) of environmental soil samples taken. • Taking of soil samples for geotechnical and geo-chemical laboratory testing. • Topographic survey of exploratory hole locations. • Return visits, to monitor for ground gas and groundwater levels, including taking groundwater samples on one occasion (further 4 no. monitoring visits still to be undertaken).
Ground Conditions	Ground conditions encountered comprised topsoil over Made Ground (including in-filled basements or cellars) up to 2.8m thick underlain by superficial Sand and Gravels and below these, weathered sandstone. Groundwater was encountered within the superficial deposits and in the sandstone during the investigation with groundwater levels during the monitoring works at 3.6m depth in the superficials.
Laboratory Testing and Land Gas Monitoring Results	The following has been identified through the investigation and monitoring works: • Elevated benzo(a)pyrene concentrations in the Made Ground of TP1 and WS6. • Elevated potentially leachable arsenic and lead in the Made Ground of TP1 and TP3. • Elevated petroleum hydrocarbon concentrations which may affect potable water supply pipes in the Made Ground. • Elevated ground gases (concentrations of carbon dioxide and VOCs) associated with Made Ground and Natural Ground.
Tier 1 Contaminated Land Risk Assessment	The contamination risk posed to future site users, construction workers, controlled waters and flora and fauna is considered to be **low**. The risk to future potable water supplies and from ground gases is considered to be **low to moderate**.
Geotechnical Assessment	The building can be supported on spread foundations established below the basement floor level to bear on dense or very dense sand. The sides of the basement excavation will need to be supported to maintain stability and control groundwater ingress. The basement floor slab can be ground bearing subject to compatibility with ground gas protection measures. The site is classified as DS1 and AC1 for the purposes of specifying sub-structure concrete.
Conclusions and Recommendations	Overall, the site poses a **low to moderate** risk and may require suitable mitigation to refine the risk posed associated with any new potable water supply and for ground gases, dependant on building design and subject to Local Authority Development Control approval.
	This sheet is intended as a summary of the assessment of the site. It does not provide a definitive analysis.

Ground Investigation Report
Graphene Innovation Hub, Manchester

2.0 INTRODUCTION

2.1 Instruction

WYG Environment Planning Transport Limited (WYG) was commissioned by the University of Manchester to undertake a ground investigation for the proposed Graphene Innovation Hub, located off Booth Street East within the University of Manchester Campus (see Figures 1 and 2).

2.2 Aims and Objectives

The principal aim of the commissioned work is to provide a land contamination and geotechnical assessment of the site in support of the proposed construction of a new multi-storey university building.

The scope of services to achieve the aims and objectives was determined by Ramboll on behalf of The University of Manchester, as set out in the invitation to tender, dated 11th April 2012 and comprised:

- Desk Top Study (undertaken by WYG and reported under separate cover, ref: A076252_DTS_V1_May 2012).
- Ground investigation.
- All necessary sampling, testing and monitoring (solid, water and gas).
- Report.

2.3 Proposed Development

The site is currently vacant but is to be developed for the University of Manchester Graphene Innovation Hub, a multi-storey building providing research, clean room and laboratory facilities. It is understood that the building may also include an approximately 4m deep basement.

2.4 Report Conditions

Attention is drawn to the report conditions included in Appendix A and our proposal ref: 4716/Graphene/KE/V1/Submission, April 2012.

This report has been prepared as an interim draft report, based on information to date. It will be updated on completion of the ground gas monitoring regime and outstanding chemical test data (SVOCs and VOCs).

3.0 SITE DESCRIPTION

The proposed Graphene Innovation Hub facility is located off Booth Street East, Manchester within The University of Manchester campus situated to the south of Manchester city centre. A site location plan is provided as Figure 1.

The site is an area of open grassed land with some trees and shrubs. It is bounded by roads to three sides and university buildings to the other. A site boundary plan is enclosed as Figure 2.

Table 3.1 – Summary of Site Details

Site Address	Land at University of Manchester, Booth Street East, Manchester.
Site Access	Pedestrian, off Booth Street East. Vehicle access via barriers off side road from Booth Street East.
Surrounding Land Uses	Manchester University Campus. • Booth Street East and SCEAS and Management School to north. • Side road and multi-storey car park to east. • Side road and Prospect House to south. • Crawford House to west.
Grid Reference	384602, 396909.
Area	0.3 hectares (ha)
Elevation	Approximately 40m above Ordnance Datum (AOD).

4.0 DESK STUDY SUMMARY

A Desk Study report was produced by WYG in May 2012. A summary of the pertinent findings of the desk study is given below.

Table 4.1 – Summary of Desk Study Information

Environmental Setting	• No landfill or significant industrial uses within 250m.
History	• 1880s - Terraced housing, part of a club house and a hospital. • 1940's to 1970's – Demolition of structures. • 1990's to 2000's - University building.
Geology	• Made Ground, Glacio-fluvial Deposits, possible Glacial Till (clay), Sherwood Sandstone Group. The western part of the site may be underlain by Manchester Marl. The West Manchester Fault potentially runs northwest to southeast across the centre of the Graphene site.
Hydrogeology	• Secondary A Aquifer (the Superficial Sands and Gravels). • Unproductive Strata (Glacial Till - clay). • Principal Aquifer (Sherwood Sandstone). • Secondary B Aquifer (Manchester Marl). • The site is located within a SPZ3 Source Protection Zone for potable water supply.
Hydrology	• River Medlock, located approximately 500m north of the site.
Flood Risk	• Considered to be at risk from extreme flooding.
Preliminary Risk Assessment	• Based on guidance given in CIRIA C552, the contamination risk posed to future site users, construction workers, controlled waters, future buildings & services, flora and fauna is considered to be **low to moderate.** • The risk to the site from ground gas is considered to be **moderate**.

5.0 WYG INVESTIGATIONS

5.1 Fieldworks Undertaken

The intrusive investigation works were undertaken between 18th to 21st June 2012, with follow-up monitoring of borehole installations between 29th June and 12th July 2012 (four further gas monitoring visits are to be undertaken).

The works were undertaken in general accordance with the SISG specification, BS 10175: Code of Practice for Site Investigations of Potentially Contaminative Sites, BS5930 (+A2), BS EN 1997-2, BS EN ISO 14688 and 14689 and CDM Regulations 2007.

The scope of the investigation was agreed with Manchester City Council's Contaminated Land Officer, via letter on 7th June 2012. A copy of the letter is included in Appendix B.

After the works were commissioned, some amendments to exploratory hole layout and scope of works were made by Ramboll (the Client's Engineer), as follows:

- Relocation of proposed rotary and cable percussive boreholes to the perimeter of the site (apart from borehole CP2).
- Removal of requirement to undertake soakaway testing in accordance with BRE365.
- Addition of two days' window sampling with SPTs (maximum of 8 no. holes) around the perimeter of the site.

Therefore, the works comprised the following:

- 3 No. rotary boreholes (RBH1 to RBH3) drilled to 15m depth.
- 2 no. cable percussive holes (CP1 & CP2) to 5m depth.
- 8 No. window sample holes (WS1 to WS8) to between 4.2m to 5.2m depth.
- 5 No. tracked machine excavated trial pits (TP1 to TP5) to depths between 2.9 and 3.2m bgl.
- Hand dug pit (WS1A) to 0.3m bgl (undertaken on 05/07/12) to obtain soil sample.

- Full-time supervision by WYG consultant, to record the ground conditions, obtain soil samples and undertake a photographic record of the works.
- In-situ geotechnical testing.
- Semi-quantitative analysis of environmental soil samples for Volatile Organic Compounds (VOCs) using a Photo-Ionisation Detector (PID).
- Taking of soil samples for geotechnical and geo-chemical laboratory testing.
- Topographic survey of exploratory hole locations to Ordnance Datum and National Grid on 4th July 2012.
- 2 No. return visits over 1 month, to monitor for ground gas and groundwater levels (29/06/12 to 12/07/12), including taking groundwater samples on one occasion (28/06/12) – a further 4 no. visits over 1 month are to be undertaken.

An Exploratory Hole Location Plan is presented as Figure 3.

Detailed engineering logs are presented as Appendix C and a summary of the encountered ground conditions is provided in Section 6.

5.2 Laboratory Analysis

5.2.1 Soils and Soil Leachate Chemical Testing

Soil samples underwent the following testing at Jones Environmental Laboratory, an MCERTS/UKAS accredited laboratory in Deeside, Flintshire. The chemical analysis was based on potential contaminants associated with historical use of the site:

- 12 no. samples for main suite: arsenic, water soluble boron, cadmium, chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium, zinc, sulphate (water soluble), cyanide (free), pH, phenols, speciated USEPA 16 PAHs, and TPH C6-C40 (with splits).
- 4 no. samples for beryllium, vanadium
- 5 no. samples for TPH Criteria Working Group (CWG).
- 4 no. samples for Fraction Organic Carbon (FOC).
- 9 no. samples for asbestos screen.
- 4 no. samples for Semi-Volatile Organic Compounds (SVOCs).

- 4 no. samples for Volatile Organic Compounds (VOCs).
- 3 no. samples for Waste Acceptance Criteria (WAC) full waste suite.
- 4 no. samples for leachability suite: pH, ammoniacal nitrogen, arsenic, boron, cadmium, cyanide, chromium, copper, mercury, nickel, lead, selenium, zinc and sulphate.

Soil samples from both the Made Ground and natural strata were selected for testing, taking into account the possibility that a basement is to be provided in the development. Visual and olfactory field observations and recorded PID readings were also taken into account when selecting samples for testing.

4 No. samples of Made Ground (WS1, TP1, TP4 and TP5 between 0.3 and 1.4m depth) were scheduled for a suite of analysis required by the United Utilities Pipe Selection Risk Assessment Summary (PSRAS) which includes pH, TPH, SVOCs and VOCs.

Results for SVOCs and VOCs are still awaited from the laboratory. This report will be updated on receipt of these results.

Full copies of the chemical laboratory testing results and the accreditation details for each determinand analysed are included in Appendix D.

5.2.2 Water Chemical Testing

Sufficient groundwater for analysis was only present in RBH3 during the monitoring regime. One groundwater sample underwent the following testing at Jones Environmental Laboratory:

- pH, sulphate, cyanide, ammonia, ammonium, nitrate, nitrite, chloride, alkalinity as CaCO3, arsenic, boron, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, total phenol, speciated USEPA 16 PAHs, TPH CWG, SVOCs and VOCs.

Results for SVOCs and VOCs are still awaited from the laboratory. This report will be updated on receipt of these results.

Full copies of the chemical laboratory testing results and the accreditation details for each determinand analysed are included in Appendix D.

5.2.3 Geotechnical Laboratory Testing

Geotechnical samples underwent the following testing at Professional Soils Laboratory (PSL), a UKAS accredited laboratory in Doncaster:

- 3 No. moisture content.
- 3 No. Atterberg Limits.
- 7 No. particle size distribution tests.
- 2 no. organic content.
- 6 No. water soluble sulphate (2:1 water:soil extract) and pH.
- 1 No. Uniaxial Compressive Strength (UCS) test.
- 8 No. point load tests.

Further pH and soluble sulphate testing was undertaken as part of the soil contamination suite given above.

Full copies of the geotechnical laboratory testing results are included in Appendix E.

6.0 ENCOUNTERED GROUND CONDITIONS

A summary of the encountered geological conditions is presented below, with detailed information presented on the exploratory hole logs included in Appendix C and details of each stratum presented in subsequent sections.

Trial pit photo plates are also included in Appendix C.

Ground conditions comprised turf and topsoil over Made Ground, underlain by Superficial Sand and Gravels. Bedrock (weathered to competent Sandstone) was encountered at the base of the exploratory holes with the exception of the trial pits.

A summary of the ground conditions encountered is provided in Table 6.1 below.

Table 6.1 Summary of Encountered Ground Conditions

Stratum	Depth Encountered (m bgl)	Depth to Base (m bgl)	Thickness (m)	SPT Range (N)
Topsoil (all exploratory holes)	Ground level	0.15-0.45	0.15-0.45	N/A
Made Ground (all exploratory holes)	0.15 – 0.45	1.2-2.8	1.05-2.60	7-34
Superficial Deposits (all exploratory holes)	1.2-2.8	3.6-5.5	>0.2->3.3	9-42
Sandstone	3.6-5.5	>15*	Not proven	>50

Note: *Not fully penetrated. N/A – Not Applicable.

Topsoil

Beneath the turf, topsoil (dark brown slightly clayey slightly gravelly sand with frequent rootlets) was encountered in all exploratory hole locations.

Made Ground

Beneath the turf or topsoil, Made Ground generally comprising brown to dark brown slightly clayey, gravelly Sand with brick, concrete, mudstone, plastic, limestone, glass, metal (TP3), wood (TP3) and coal (WS5) was encountered in most exploratory hole locations. Low to medium cobble content of brick and concrete was encountered in the exploratory hole locations within the former building footprint.

Possible asbestos cement sheeting was encountered in the shallow Made Ground at WS1.

Possible reworked natural deposits were encountered in some locations as a gravelly Sand with gravel of mixed lithologies (WS3 - 6).

Several exploratory holes encountered Made Ground to depths in excess of 2m and up to 2.8m. Some holes encountered evidence for former cellar or basement floors, most likely associated with former terraced housing.

Superficial Deposits

Natural soil deposits encountered in the majority of exploratory locations generally comprised loose to dense orange brown gravelly Sand and Sand.

Silty Sand was encountered in WS8, where the soil comprised a very dense red silty Sand (4.5-5.0m bgl).

Rock

Rock was encountered as extremely weak to medium strong red brown sandstone. Rock core photographs can be found in Appendix C.

6.1 Groundwater

Groundwater was not encountered at every exploratory location, but was observed in the following exploratory holes:

- RBH1 at 4.5m bgl in Sand and Gravels.
- RBH2 at 10.9m bgl in weathered Sandstone.
- RBH3 at 13.5m bgl in weathered Sandstone.
- WS1 at 3.6m bgl in gravelly Sand.

Standpipes were installed in 6 No. exploratory holes, for the purposes stated below, as follows:

- Ground gas monitoring of the Made Ground: WS1, WS6 & CP1.

- Groundwater level within the Superficial associated with potential basement to 4m bgl: CP2 & RBH3 and,
- Groundwater level within the Sandstone associated with potential basement to 4m bgl: RBH2 & RBH3.

To date, groundwater water levels have been monitored on 4 no. occasions (28/06/12 to 17/07/12) and further monitoring visits are to be undertaken.

Table 6.2 below summarises the groundwater encountered and the range of levels monitored. Full results are included in Appendix F.

Table 6.2 - Groundwater Levels Monitored.

Location	Water strike during drilling (m bgl) in Stratum	Response Zone (m bgl) in Stratum	Monitored Water Level Range (m bgl)	Monitored Water Level Range (m AOD)
WS1	3.6 Sand	0.5-1.5m bgl Made Ground	Dry-WAB (1.5)	Dry - WAB (36.67)
WS6	3.2 Sand	0.5-1.5m bgl Made Ground	Dry	Dry
CP1	None	0.5-1.5m bgl Made Ground	Dry	Dry
CP2	None	2-4m bgl Superficial Sand	3.61-3.65	34.55-34.59
RBH2	10.9 Sandstone	4-7m bgl Sandstone	WAB (6.92)	WAB (31.29)
RBH3	13.5 Sandstone	4-8m bgl Superficial Sand/Sandstone	7.12-7.55	31.19-30.76

Note: WAB – Wet at base. MG – Made Ground. N/A – Not Applicable.

6.2 Observed Contamination

Made Ground was encountered in all exploratory locations; however, significant visual and olfactory observations of contamination were not noted during the investigation works with the exception of WS1 in which suspected asbestos containing material (cement sheet) was observed.

Screening of soil samples using a PID reported readings between 0.9ppm and 264ppm. The majority of the elevated PID readings were associated with organic matter observed (topsoil) or Made Ground. Significant other olfactory evidence of VOCs was not noted.

6.3 Observed Obstructions

The investigation has shown that the site is occupied by former cellars or basements associated with historical terraced housing or other structures. As well as Made Ground back-fill to the former voids, evidence was found for remnant sub-structures such as foundation walls and cellar floors.

7.0 GROUND GAS

7.1 Ground Gas Results

Two ground gas and groundwater level monitoring visits were undertaken on 4th July and 12th July 2012. One visit was conducted during falling barometric pressure. Four monitoring visits are still to be undertaken. Table 7.1 below summarises the ground gas results and the results are presented in Appendix F.

The maximum recorded methane concentration was <0.1% in all exploratory holes and the maximum carbon dioxide concentration was 9.0% in WS1. Low oxygen levels were recorded associated with the elevated carbon dioxide readings. A minimum of 7.2% oxygen was recorded in WS1. No elevated hydrogen sulphide or carbon monoxide was reported above 1ppm.

Flow rates were generally low during the monitoring period, the maximum positive flow rate being 0.3l/h in the Made Ground (CP1) and 0.7l/h in Sand (RBH2).

Semi-quantitative analysis of concentrations of VOCs was obtained using a PID on one occasion. Concentrations were reported between 3.2 and 16.4ppm. There was no visual or other olfactory evidence of VOCs.

Table 7.1: Summary of Ground Gas Results

Location	Response Zone (m bgl) & Strata	Max. Methane Conc. %	Max. Carbon Dioxide Conc. %	Min. Oxygen conc. %	Max. Flow Rate (l/hr)	Water Level Range (m bgl)
WS1	0.5-1.5m bgl Made Ground	<0.1*	9.0*	7.2	0.1*	Dry-WAB (1.5)
WS6	0.5-1.5m bgl Made Ground	<0.1*	3.0*	16.0	0.1*	Dry
CP1	0.5-1.5m bgl Made Ground	<0.1*	2.5*	16.0	0.3*	Dry
CP2	2-4m bgl Superficial Sand	<0.1*	7.4*	8.9	0.2*	3.61-3.65
RBH2	4-7m bgl Sst	<0.1*	4.8*	14.6	0.7*	WAB (6.92)
RBH3	4-8m bgl Superficial Sand/Sst	<0.1*	2.3*	12.9	0.1*	7.12-7.55

Note: WAB = Wet at Base. Brackets indicates steady state. * - Peak and steady the same. Sst = Sandstone.

7.2 Ground Gas Assessment

Ground gas results have been assessed using the methodology described in CIRIA C665. The methodology uses volume flow rates to assess the risk from ground gas.

In accordance with the CIRIA methodology, a conservative Gas Screening Value (GSV) is calculated using a worst case scenario (i.e. highest gas concentration combined with highest flow rate). Where readings are not recorded above the instrument detection limit, the value of the instrument detection limit is used to calculate the GSV. The calculation of the GSV is as follows:

$0.1\%\ CH_4 \times 0.7\ l/hr = 0.00071\ l/hr\ CH_4$
$9.0\%\ CO_2 \times 0.7\ l/hr = 0.063\ l/hr\ CO_2$

Based on the worse case peak and steady gas concentrations and flow rates, the site is classified as Characteristic Situation (CS) 1, but elevated to CS2 due to the measured maximum carbon dioxide concentration being greater than 5%, in accordance with CIRIA C665. This is typical of natural soil with a high peat/organic content and 'typical' Made Ground. Based on these worst case values, gas mitigation measures achieving 2 points as prescribed in BS 8485:2007 (Table 2 for commercial use) are required.

Although the majority of the Made Ground will be removed during the construction of the basement, elevated carbon dioxide concentrations were recorded from Made Ground around the perimeter of the site (WS1, max. 9%) and also from the natural ground around basement level (CP2, max. 7.4% & RBH2, max 4.8%); therefore, it is recommended that gas mitigation measures be incorporated into the proposed building design.

Ultimately, the proposals for gas protection measures will be subject to Local Authority Development Control (Planning and Building Control) approval. It is likely that the installation of gas protection measures will need to be formally validated.

This assessment will be reviewed and updated, as required, once the full set of gas readings has been collected.

8.0 GROUND CONTAMINATION ASSESSMENT

8.1 Soils Contamination Assessment Methodology

In order to assess the Tier 1 environmental risk posed by potential contaminants within the underlying soils WYG undertook an initial screen of the laboratory results using Tier 1 Screening Values (TSVs) for a commercial end use, as a representation of the proposed university end-use. The TSVs are based on the following sources of preference:

- Environment Agency published screening values (April, May and July 2009) based on 6% Soil Organic Matter (SOM).
- The LQM/CIEH Generic Assessment Criteria (GAC) for Human Health Risk Assessment (2nd Edition), 2009 published screening values based on 1% SOM as a conservative estimate (using site data).
- The EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment, January 2010 published values based on 1% SOM as a conservative estimate (using site data).
- WYG derived TSV for lead using CLEA Model V1.04, based on pH 7 and 1% SOM as a conservative estimate (using site data).
- A published acute effect for an infant from one dose (ingestion) of 3g soil, for freely available cyanide.

At present, although lead is on the priority list of contaminants for the development of national technical guidance by the Environment Agency, there is currently no published SGV. A previous SGV published for lead has been withdrawn by the EA as it was derived using a version of the CLEA model that has now been superseded and withdrawn from use. Interim guidance given on the EA CLEA website has indicated that the EA will consider setting the Health Criteria Value (HCV) as an intake dose, and not a blood lead level as it was for the previously published SGV. WYG has derived a SGV/HCV for lead for the site based on use of the current CLEA model and input criteria provided by the CLEA team.

The screening value used and its source are colour coded for the above TSV sources on the soil screening sheet provided in Appendix G.

Contaminant concentrations below the TSVs are considered not to warrant further risk assessment. Concentrations of potential contaminants above the TSVs require further consideration of the potential pollutant linkages. It should be noted that exceedance of the TSVs does not necessarily mean that the site requires remediation.

It is considered that at depths greater than 1m, the probability of human exposure via the direct contact pathways is significantly reduced, leaving inhalation of volatile compounds as the dominant pathway with regard to human health risks. Typically, volatile compounds only significantly affect the indoor inhalation pathway.

8.2 Statistical Analysis

Should exceedances of the TSV occur, for the proposed planning scenario, the CL:AIRE guidelines state that for each contaminant, the upper 95th percentile of the mean measured concentration (95%UCL) should be calculated and this value should be compared to the TSV.

Maximum value tests are also performed in accordance with the method outlined in Annex 1 of CLR7. The objective of these tests is to decide whether the maximum concentration observed should be treated as an outlier or whether it can reasonably be considered to come from the same underlying population as the other samples.

Constituent non-detects are assigned a value equal to the reported analytical laboratory limit of detection, considered reasonably conservative in accordance with CLR principles or where a significant number of non-detects are reported CL:AIRE guidelines are utilised to limit over conservatism. Any identified outliers are excluded from the datasets used in calculation of the 95%UCL value.

For Total Petroleum Hydrocarbon concentrations, assessment has been made with reference to the UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils (Science Report P5-080/TR5), Environment Agency, 2005. This calculates the combined toxicological affects of

the TPH fractions by calculation of a Hazard Index, which if greater than 1 may indicate a potential risk to human health.

8.3 Controlled Waters Contamination Assessment Methodology

The site considered to be located in a sensitive area with respect to groundwater (principal aquifer and SPZ) but not in relation to surface water due to the distance to the nearest watercourse.

The results of the soil leachate and groundwater analysis have been assessed by direct comparison against The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010. The receptors that have been assessed are groundwater quality. The following threshold values have been selected for use based on the above:

Groundwater Aquifer

- Groundwater Drinking Water Protected Areas.
- General Quality of Groundwater Body (in the absence of above).
- UK Drinking Water Standards (in the absence of above).
- Groundwater Impacts to Surface Water (in the absence of above).

The water Tier 1 assessment TSVs are provided in Appendix G.

8.4 Site Contamination Assessment

8.4.1 Initial Tier 1 Soils Screening

An assessment of the chemical results has been undertaken in accordance with the methodology described above. Of the determinands analysed, none exceeded published commercial values apart from some elevated benzo(a)pyrene in the Made Ground in two exploratory locations. A summary of the exceedances is provided in Table 8.1 below.

No asbestos fibres were detected in samples analysed. However, potentially asbestos containing material (ACM) was observed in the Made Ground in WS1 and WS1A.

Elevated TPH was also reported in the Made Ground in WS6, but none of the individual TPH fractions exceeded the published TSVs; therefore, TPH is not considered to pose a significant risk to human health. Analysis of TPH Results (TPH CWG) using EA Report P5-080/TR5 did not identify any significant risk to human health. The Hazard Index confirms that it does not pose a significant risk to human health.

Table 8.1 Summary of Tier 1 Soil Screening Exceedances.

Determinand	TSV (mg/kg)	Total no. of tests	Conc. Range (mg/kg)	No. elevated above TSV	Location of exceedance
Benzo(a)pyrene	14	12	<0.04-78.02	2	TP1 at 0.7m (16.24mg/kg) WS1A at 0.3m bgl (78.02mg/kg) WS6 at 0.6m (41.46mg/kg)

The original chemical analysis results are included in Appendix D and Tier 1 Screening Values and assessment are included in Appendix G.

Statistical analysis of results for Benzo(a)pyrene from Made Ground representative of the top 1m of ground across the site was undertaken (total of 10 no. samples). This identified that overall, the elevated soil concentrations do not pose a significant risk to human health as the derived Upper Confidence Limit (UCL) (7mg/kg) was less than the TSV (14mg/kg) with no significant outliers identified. The statistical analysis sheets are provided in Appendix G.

8.4.2 Controlled Waters Assessment

An assessment of the soil leachate and groundwater chemical results has been undertaken in accordance with the methodology described above.

The concentrations of the leachable determinands analysed did not exceed the applicable screening values for groundwater quality, apart from elevated leachable arsenic, lead and mercury; however, elevated concentrations of these were not reported from the groundwater sample. A summary of the leachate screening assessment is given in Table 8.2.

The concentrations of groundwater determinands did not exceed the applicable screening values for groundwater quality.

Table 8.2 Summary of Tier 1 Soil Leachate Screening Exceedances.

Determinand	TSV (ug/l)	Total no. of tests	Conc. Range (ug/l)	No. elevated above TSV	Location of exceedance
Arsenic	7.5	4	4.6-11.3	1	TP3 at 0.3m bgl (11.3ug/l)
Lead	18.8	4	4-30.5	1	TP1 at 0.7m bgl (30.5ug/l)
Mercury	0.75	4	0.15-3.23	1	WA1A at 0.3m bgl (3.23ug/l)

The original chemical analysis results are included in Appendix D and Tier 1 Screening Values and assessment are included in Appendix G.

8.4.3 Waste Classification

The following samples were analysed for a full waste suite:

- TP1 at 0.1m bgl – Topsoil.
- TP2 at 1.6m bgl – Made Ground.
- TP4 at 0.4m bgl – Made Ground

Analysis shows that the soils are likely to be classified as inert, although slightly elevated concentrations of some contaminants were reported, as listed below. This may lead to the soil being classed as non hazardous which may affect potential disposal options and the associated cost.

- TP1 – Slightly elevated TOC & potentially leachable fluoride.
- TP2 – Elevated potentially leachable phenol
- TP4 – Slightly elevated TOC and potentially leachable chromium and fluoride.

Elevated TPH was also reported in the Made Ground in WS6; this may also lead to the soil not being classed as inert and may affect potential disposal options and the associated cost.

The original chemical analysis results are included in Appendix D.

Ground Investigation Report
Graphene Innovation Hub, Manchester

8.4.4 United Utilities Risk Assessment

Chemical results have been compared to United Utilities Water Supplementary Guidance for the Selection of Water Pipes in Land Potentially Affected by Contamination, Table 1 – Pipe Selection Risk Assessment Summary (PSRAS).

Elevated EC10-16 Aliphatic and Aromatic Hydrocarbons were identified in the Made Ground in WS1A, WS3 & WS6 and elevated EC16-40 Aliphatic and Aromatic Hydrocarbons were identified in the Made Ground in TP3, WS1A, WS3 & WS6.

It should be noted that no free phase hydrocarbons, visual or olfactory evidence for the presence of hydrocarbons were observed during the site investigation works.

Based on the above, mitigation measures may be required for new potable water supplies including 'clean' filled channels and suitable pipe materials.

A copy of the results which can be used in the UU application for potable water supply is included in Appendix G.

9.0 CONTAMINATION RISK ASSESSMENT

The site has been considered in line with the current UK guidelines, namely the Contaminated Land (England) Regulations 2000 and Part II A of the Environmental Protection Act 1990, in accordance with current guidance.

For a risk of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

- A source, i.e. a substance that is capable of causing pollution or harm;
- A receptor (or target), i.e. something which could be adversely affected by the contaminant; and
- A pathway, i.e. a route by which the contaminant can reach the receptor.

If one of these elements is absent there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

Potential sources, pathways and receptors have been identified and the risks associated with possible pollutant linkages outlined. At this stage and in accordance with current guidance the following significant sources, pathways and receptors have been defined for the proposed future commercial end-use:

9.1.1 On-site Sources

Based on the historical and present use of the site, it is considered there are a number of potential on-site contamination sources. Those identified are:

- Elevated benzo(a)pyrene in Made Ground.
- Elevated potentially leachable arsenic, lead and mercury in the Made Ground.
- Elevated petroleum hydrocarbon concentrations which may affect potable water supply pipes.

- Elevated ground gases (concentrations of carbon dioxide and VOCs).

9.1.2 Off-Site Sources

Based on the previous Desk Study and the results of the ground investigations, it is not considered that there are any significant off-site potential hazard sources.

9.1.3 Contamination Pathways

Potential contamination pathways, listed below, are proposed considering the future university end-use of the site:

- Dermal contact;
- Inhalation of vapours or dusts;
- Ingestion of dusts;
- Leaching to surface run-off/drainage;
- Leaching to groundwater;
- Lateral and vertical migration of groundwater;
- Migration along/into service conduits and pipe work; and,
- Ground gas migration and accumulation.

9.1.4 Contamination Receptors

Receptors that may be affected by potential contamination are:

- Future site users (students, staff and visitors);
- Development workers;
- Underlying groundwater (Superficial Secondary A Aquifer and Principal Sandstone Aquifer);
- Surface waters (River Medlock);
- Adjacent properties and land users (predominantly University);
- Future buildings and installations; and,
- Flora (landscaping).

By considering the sources, pathways and receptors, a preliminary assessment of the environmental risk is made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the source contamination can reach a receptor and hence whether it is of major or minor significance.

The risk assessment has been carried out by assessing the severity of the potential consequence, the sensitivity of the target and the likelihood of occurrence, based on the categories given below (Tables 9.1 to 9.3).

Table 9.1: Potential Hazard Severity Definition

Category	Definition
Severe	Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters
Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species.
Mild	Pollution of non sensitive waters, significant damage to buildings or structures
Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non sensitive ecosystems or species, minor damage to buildings or structures

The likelihood of an event (probability) takes into account both the presence of the hazard and target and the integrity of the pathway and has been assessed based on the categories given below.

Table 9.2: Probability of Risk Definition

Category	Definition
High likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Low likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard.

Table 9.3: Level of Risk for Potential Hazard Definition

		Potential Severity			
		Severe	Medium	Mild	Minor
Probability of Risk	High Likelihood	High	High	Moderate	Low/ Moderate
	Likely	High	Moderate	Low/Moderate	Low
	Low Likelihood	Moderate	Low/Moderate	Low	Low
	Unlikely	Low/Moderate	Low	Low	Low

9.2 Revised Risk Assessment

The preliminary risk assessment has been revised based on the ground investigation data obtained.

The contamination risk posed to future site users, construction workers, controlled waters and flora and fauna is considered to be **low**.

The risk to future potable water supplies is considered to be **low to moderate** and may require suitable mitigation when specifying materials and construction details for water supply pipes.

The risk to the site from ground gas is also considered to be **low to moderate**. Ground gas mitigation measures are likely to be required, dependant on building design and subject to Local Authority Development Control approval.

Table 9.4 Revised Contamination Risk Assessment (post site investigation)

On Site						
Source	**Pathway**	**Receptor**	**Severity**	**Probability**	**Risk**	**Justification**
Made Ground in TP1 & WS6 – Elevated benzo(a)pyrene	Dermal contact, Ingestion and/or inhalation of vapours or dusts	Human Health – Future site users	Medium	Unlikely	Low	Statistical analysis does not indicate localised elevated beno(a)pyrene. Exposure to future site users is unlikely based on the proposed end-use and also the predominance of hardstanding and the presence of topsoil at the site.
		Human Health – Construction Workers	Minor	Low	Low	The risk rating is based on the use of Personal Protective Equipment (PPE) and appropriate working procedures.
	Direct contact/plant root uptake	Flora and fauna (gardens & landscaping)	Minor	Low	Low	There may be a requirement to import a suitable growing medium for landscaping in this area.
Made Ground in TP1, TP3 7 WS1A – Elevated potentially leachable arsenic, lead, mercury	Leaching, and lateral and vertical migration of groundwater	Controlled Waters –Secondary A Aquifer	Mild	Low	Low	The majority of Made Ground is likely to be removed from site during construction of the basement or be covered by future hardstanding.
		Controlled Waters –Principal Aquifer	Medium	Unlikely	Low	Elevated concentrations were not reported in groundwater sampled from site.
		Controlled Waters – Surface Waters	Medium	Unlikely	Low	The risk is based on the distance of the nearest surface water.
		Adjacent Properties and Land Uses	Minor	Unlikely	Low	The risk is based upon the sensitivity of the receptors and the potential existence for mobile contaminants.

On Site						
Source	**Pathway**	**Receptor**	**Severity**	**Probability**	**Risk**	**Justification**
Elevated Petroleum hydrocarbons in Made Ground	Migration along service conduits, pipework	Human Health	Medium	Low	Low to Moderate	Free product was not encountered. Risk based on exceedance of UU New Pipe Risk Assessment. Suitable pipe materials and construction required to lower the risk.
Ground gas generation and accumulation / migration.	Generation and migration / accumulation of ground gases	Human Health – Future site users	Medium (asphyxiation)	Low	Low to Moderate	Ground gas monitoring has led to the site being classed as Characteristic Situation 2, which would require suitable mitigation measures incorporated into building designed to lower the risk, subject to Local Authority Regulatory control.
		Future Buildings, Installations and Adjacent Properties	Severe (explosion)	Unlikely	Low to Moderate	
		Human Health – Construction workers	Minor (asphyxiation & explosion)	Low	Low	The risk rating is based on the use of Personal Protective Equipment (PPE) and appropriate working procedures.

10.0 GEOTECHNICAL ASSESSMENT

The following preliminary geotechnical assessment is based on the current proposal for a multi-storey research, cleanroom and laboratory development.

In summary, the ground conditions comprise (with increasing depth):

- A superficial layer of Made Ground of varying thickness, but proved to extend up to approximately 3m below existing ground level.
- An underlying layer of typically medium dense gravelly Sand.
- Extremely weak to medium strong red Sandstone (Sherwood Sandstone) weathered to dense and very dense Sand in the upper horizons.

10.1 Foundations

Based on the most recent development plan available a basement is to be provided at approximately 4.2m bgl across the building footprint.

Based on the ground investigation results, pads up to 5.0m deep (measured from existing ground level) will be required due to the basement level set at approximately 4.2m bgl. At this depth, foundations for the basement should be established within the dense or very dense Sand.

For a pad of size 1.5m x 1.5m founded at approximately 5.0m bgl on the very dense sand, the safe bearing pressure is expected to be 700kPa. Foundations loaded to this intensity are not expected to settle more than 25mm.

10.2 Ground Floor Slabs

Subject to compatibility with any ground gas protection measures, a ground bearing floor slab can be adopted for the basement floor.

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Graphene Innovation Hub, Manchester

10.3 Groundwater & Excavations

Based on monitoring to date, groundwater may be encountered at relatively shallow depths (3.5m bgl in CP2) i.e. above basement formation level. Provision should be made for managing groundwater ingress into excavations and for disposal of water in line with environmental legislation and regulators' requirements.

The basement is to be excavated to an approximate depth of 4.2m bgl. The granular material to be excavated was found to be unstable within the trial pits undertaken during the site investigation. Temporary support will be required for excavation of the basement. Depending on the structural design, a secant (or possibly contiguous) bored pile wall could be utilised for excavation support, groundwater control and (if required) to carry loads from the superstructure.

Alternatively a sheet pile wall could be used for temporary stability.

10.4 Sub-surface Concrete

In accordance with BRE Special Digest 1:2005 *Concrete in aggressive ground*, based on chemical analysis of soils, the site is classified as Design Sulphate Class DS1 and ACEC Class AC1.

11.0 CONCLUSIONS & RECOMMENDATIONS

11.1 Conclusions

Ground conditions encountered comprised topsoil over Made Ground with evidence of infilled former basements, underlain by superficial Sand and Gravels with Sherwood Sandstone at depth (approximately 3.6 to 5.5m bgl). Groundwater is present within both the superficial and bedrock strata.

The site investigation indicated potentially elevated concentrations of benzo(a)pyrene, TPH and leachable metals in the Made Ground in the soils in addition to elevated carbon dioxide concentrations recorded during monitoring.

Overall, the site poses a **low to moderate** risk. The contamination risk posed to future site users, construction workers, controlled waters and flora and fauna is considered to be low. The risk to future potable water supplies and from ground gases is considered to be low to moderate and may require suitable mitigation to refine the risk posed, dependant on building design and subject to Local Authority Development Control approval.

Overall, the soils excavated for the basement are likely to be classified as inert but some Made Ground could be classified as non-hazardous and may attract a premium for disposal, particularly relating to TPH concentrations for the Made Ground in WS6.

It is expected that the building can be supported on spread foundations established on the dense or very dense sand at approximately 5m bgl. The sides of the excavation for the basement are likely to need supporting to control stability and groundwater ingress. Consideration can be given to the use of a secant/contiguous bored pile wall (possibly carrying permanent loads from the superstructure) or a sheet pile wall. The basement floor slab can be ground bearing subject to compatibility with ground gas protection measures.

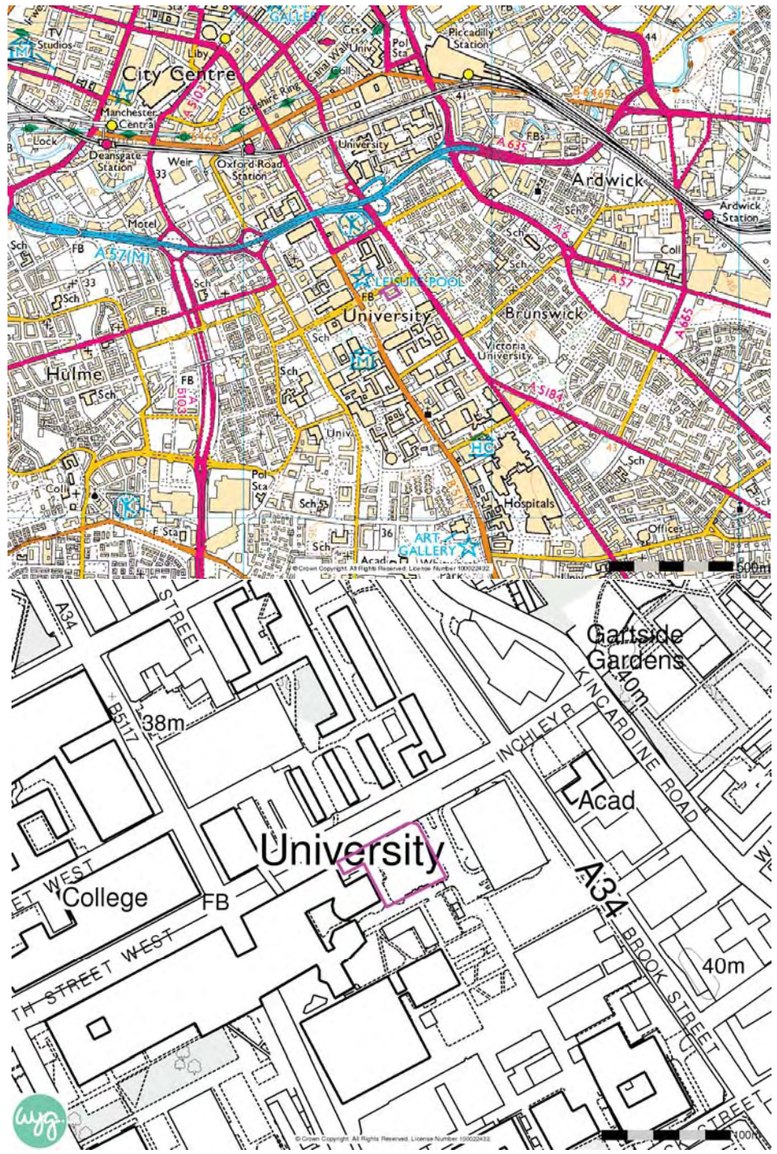
11.2 Recommendations

The following mitigation measures are considered to be required to enable development of the site and discharge anticipated associated planning conditions:

Ground Investigation Report
Graphene Innovation Hub, Manchester

- Ground gas mitigation measures suitable for CS2 in accordance with BS8485 (2 points for a commercial building).
- Liaison with Statutory Undertakers is undertaken in relation to any new potable water supply relating to the ground conditions.
- Liaison with the Environment Agency.
- Liaison with the Local Authority Contaminated Land Officer and production of a Remediation Statement in relation to the above.
- Validation of imported soils, gas measures and production of a Validation Report.

Figures



APPROXIMATE SKETCH ONLY – DO NOT SCALE

Quay West at MediaCityUK
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Fax: 0161 872 3192
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Environmental Consultancy
Ground Technologies & Investigation

Project : Proposed Graphene Innovation Hub, Manchester

Client: The University of Manchester

Figure 1: Site Location Plan

Project No.: A76252

Date: June 2012

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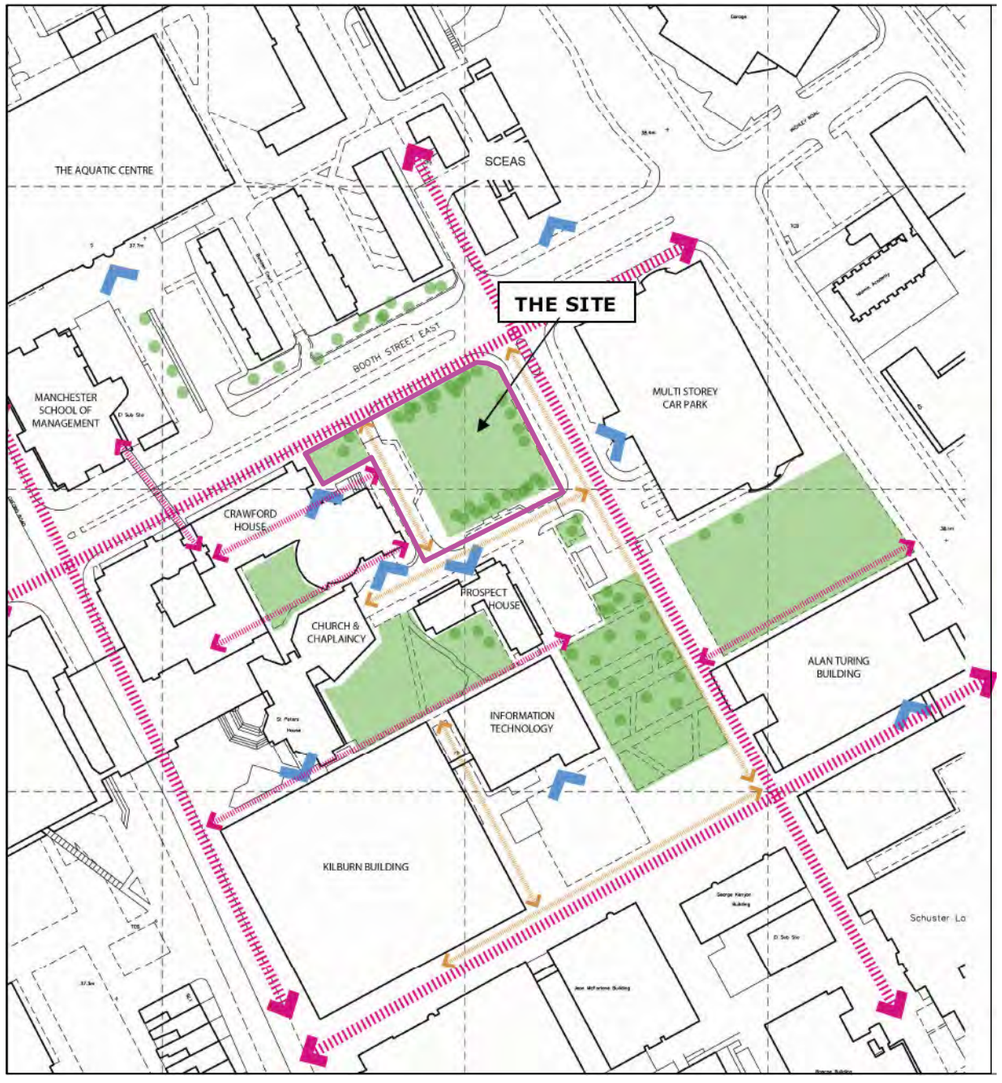

Site Boundary

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Ground Technologies & Investigation

Project : Proposed Graphene Innovation Hub, Manchester

Client: The University of Manchester

Figure 2: Site Plan

Project No.: A76252

Date: June 2012

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KEY

- Site Boundary
- Approximate Location of Former Lamb Building
- Rotary Borehole (RBH)
- Cable Percussion Borehole (RBH)
- Trial Pit (TP)
- Window Sample Hole (WS)
- Monitoring Well Installed

Note: Exploratory hole locations restricted due to underground services and trees.

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Environmental Consultancy
Ground Technologies & Investigation

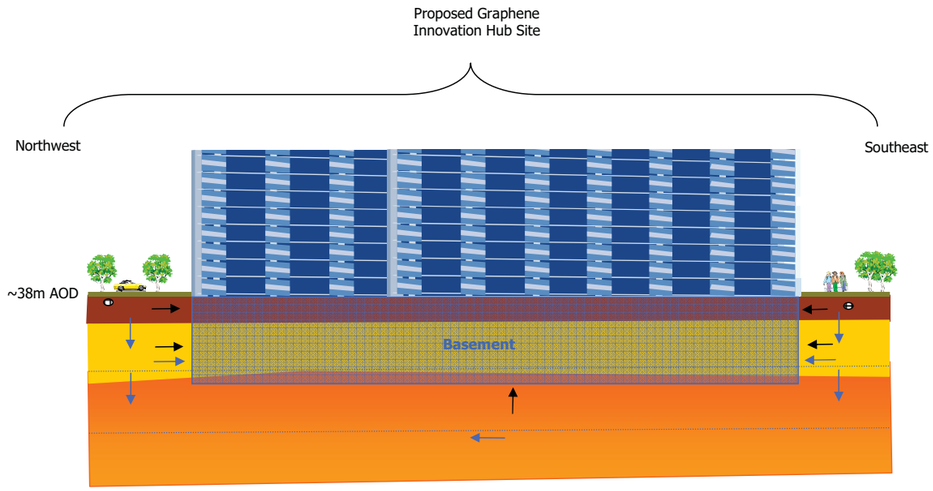
Project : Proposed Graphene Innovation Hub

Client: University of Manchester

Figure 3: Exploratory Hole Plan

Project No.: A076252

Date: June 2012



Key:

- Turf/Topsoil
- Made Ground
- Superficial (Sand & Gravel)
- Bedrock – (Sherwood Sandstone)
- Groundwater (Receptor)
- Groundwater Migration (Pathway)
- Potential Future Utilities (Receptor & Migration Pathway)
- Potential Ground Gases (Migration Pathway)

n.b. Receptors illustrated – Pathways include inhalation, ingestion and direct contact.

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Environmental Consultancy
Ground Technologies & Investigation

Project : Proposed Graphene Innovation Hub

Client: The University of Manchester

Figure 4: Conceptual Site Model (Proposed End-Use)

Project No.: A76252

Date: July 2012

Appendices

Appendix A – Report Conditions

Ground Investigation Report
Graphene Innovation Hub, Manchester

APPENDIX A - REPORT CONDITIONS

GROUND INVESTIGATION

This report is produced solely for the benefit of the University of Manchester and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

This report is based on a visual site inspection, reference to accessible referenced historical records, information supplied by those parties referenced in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented as the best that can be obtained without further extensive research. Where ground contamination is suspected but no physical site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to activities related to the site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, perhaps in higher concentrations, elsewhere on the site cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categoric assurances that they will be accepted by Authorities or Funds etc. without question as such bodies often have unpublished, more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to WYGE. In time improved practices or amended legislation may necessitate a re-assessment.

The assessment of ground conditions within this report is based upon the findings of the study undertaken. We have interpreted the ground conditions in between locations on the assumption that conditions do not vary significantly. However, no investigation can inspect each and every part of the site and therefore changes or variances in the physical and chemical site conditions as described in this report cannot be discounted.

The report is limited to those aspects of land contamination specifically reported on and is necessarily restricted and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents. The opinions expressed cannot be absolute due to the limitations of time and resources imposed by the agreed brief and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report and provides an opinion on surrounding sites. If migrating pollution or contamination (past or present) exists further extensive research will be required before the effects can be better determined.

Graphene Innovation Hub
A076252

Appendix B – Manchester City Council Letter

MANCHESTER CITY COUNCIL

Neighbourhood Services
Environment On Call
PO Box 204, Manchester, M12 5QN

FAO: Kathryn Ellis
White Young Green
Quay West Business Centre
Trafford Wharf Road
Old Trafford
M17 1HH

To reply please contact:
Simon Rogers
Our Reference No. 443152

Tel: 0161 234 1364
Fax: 0161 274 7245
e-mail: s.rogers@manchester.gov.uk

Date: 7th June 2012

Dear Kathryn,

Re: Graphene Innovation Hub, Clifford Street, Manchester

I write in response to information received regarding potential contaminated land condition for the above planning development. The Contaminated Land Section has received a copy of the following information:

- Desk Top Study, The Graphene Innovation Hub, Booth Street East, WYG, Reference: A076252, Dated: May 2012.

The Contaminated Land Section has reviewed the above information in order to assess the following points:

1. The adequacy of the desk study information available for this site.
2. The adequacy of the site investigation.
3. The adequacy of the final risk assessment.
4. The acceptability of the proposed remediation strategy.
5. Whether the information submitted is sufficient to discharge the relevant contamination and/or gas condition from the planning approval.

1. The adequacy of the desk study information available for this site

The report includes a description of the site including its past historical uses. An appraisal of the site environmental setting is presented including its geology, hydrogeology and hydrological regime, mining activities, waste management issues, and identification of additional environmental sources, pathways and receptors. This information has been used to compile a clear site conceptual model, which identifies potential sources, pathways and receptors and likely pollution linkages.

The desk study information was found to be **adequate**.

2. The adequacy of the site investigation

The following recommendations have been proposed for an intrusive site investigation:

- 3 no. rotary open boreholes to 15m depth, with a minimum of 3m of coring at the top of bedrock.
- 2 no. cable percussive boreholes to 5m depth, if rockhead is deeper than expected based on the rotary drilling.
- Installation of ground gas and/or ground water monitoring wells in the above boreholes.
- 5 no. trial pits to approximately 3m depth.
- In-situ semi-quantitative analysis for SVOCs using a PID during investigation and monitoring works.
- Ground gas sampling and analysis on 1 no. occasion.
- Laboratory analysis of soils and groundwater.
- 6 no. ground gas and groundwater level monitoring visits over a 2 month period (based on low gas potential and development of low sensitivity in accordance with CIRIA C665).
- Combined factual and interpretative report regarding the above.

It is proposed that soil samples would be subject to site specific chemical testing suites, as described below.

- 10 no. samples for main suite (based on historical use): arsenic, water soluble boron, cadmium, chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium, zinc, sulphate (water soluble), cyanide (free), pH, phenols, speciated USEPA 16 PAHs, and TPH C6-C40 (with splits).
- 4 no. samples for beryllium, vanadium
- 4 no. samples for TPH Criteria Working Group (CWG).
- 4 no. samples for Fraction Organic Matter (FOC).
- 6 no. samples for asbestos screen.
- 4 no. samples for Semi-Volatile Organic Compounds (SVOCs).
- 4 no. samples for Volatile Organic Compounds (VOCs).
- 3 no. samples for Waste Acceptance Criteria (WAC) full waste suite.
- 3 no. samples for leachability suite: pH, ammoniacal nitrogen, arsenic, boron, cadmium, cyanide, chromium, copper, mercury, nickel, lead, selenium, zinc and sulphate.

The following groundwater analysis suite is proposed for 3 no. samples from 1 no. visit: pH, sulphate, cyanide, ammonia, ammonium, nitrate, nitrite, chloride, alkalinity as CaCO3, arsenic, boron, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, total phenol, speciated USEPA 16 PAHs, TPH CWG, SVOCs and VOCs.

The above proposals appear reasonable to this Section. It should be noted that if any unusual potential contamination is identified then we would expect the proposals to be flexible and be able to assess the potential contamination with analysis and subsequent risk assessments

3. The adequacy of the final risk assessment

No final risk assessment has been submitted to date.

4. The acceptability of the proposed remediation strategy

No remediation strategy has been submitted to date.

5. Whether the information submitted is sufficient to discharge the relevant site investigation and/or gas condition of the planning approval

Before this Section can recommend the discharge of any contaminated land conditions that may be attached to this development in the future. the following information needs to be submitted to the Council for approval:

I. Provision of the results of the site investigation.
II. Provision of a final risk assessment.
III. Provision of a remediation strategy.
IV. After completion of site works, a verification report is required to validate that the work undertaken conforms to the remediation proposals received and agreed by this Section.

Please do not hesitate to contact me if you require any clarification of the above.

Yours sincerely

Simon Rogers
Neighbourhood Officer (Environmental Protection Group)

The Council has taken all reasonable precautions to ensure that the information contained in this letter is accurate, but neither the Council, its officers, its servants or agents can assume any legal responsibility for any loss or damage caused to any person relying on this information.

Appendix C – Exploratory Hole Logs

WYG ENVIRONMENT
Quay West at MediaCityUK, Salford Quays, M17 1HH
Tel. 0161 872 3223 Fax. 0161 872 3193

Exploratory Hole Number **TP1**
Preliminary

Project : **Graphene Innovation Hub, University of Manchester**
Project Number : **A076252**
Client : **University of Manchester**
Method : **Machine Excavated Trial Pit**
Co-ordinates : **384587.87E - 396919.16N**
Level : **38.19mAOD**

Scale 1:50 **Sheet 1 of 1**
Logged By : **DB**
Checked By : **RAJ**
Start Date : **19/06/12**
Finish Date : **19/06/12**

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Water Strike (m)	Installation/ Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
TOPSOIL: Brown slightly sandy Clay with many rootlets. Gravel is angular to subrounded fine and medium Limestone.		38.03	**0.16**			0.10	ES1	PID=187ppm
		37.99	**0.20**			0.10	WAC2	
MADE GROUND: Grey sandy Gravel. Gravel is angular fine to coarse Limestone.		37.64	**0.55**			0.70	ES3	PID=47.9ppm
MADE GROUND: Brown slightly clayey gravelly Sand with low cobble content of brick and concrete. Gravel is angular to subrounded fine to coarse brick, concrete, mudstone, sandstone, glass and quartz.								
MADE GROUND: Dark brown gravelly Sand with medium cobble content of brick and concrete. Sand is ash. Gravel is angular to subangular fine to coarse brick, concrete, glass and Mudstone. Boulder of concrete at 1.7m bgl.		35.49	**2.70**					
Red SAND and GRAVEL. Sand is fine and medium. Gravel is medium sandstone.		35.29	**2.90**			2.80	ES4	PID=24.2ppm
						2.80	B5	
End of Trial Pit at 2.90 m bgl.								

Observations / Remarks
1. Groundwater not observed.
2. Trial pit terminated at 2.9m bgl due to collapse.
3. Wall encountered on east face of pit.
4. Trial pit backfilled with arisings on completion.

Excavation Information

Length : 3.00m
Width : 0.50m
Orientation : 90º
Shoring : None
Stability : Unstable

Groundwater

Struck	Rising to	Time (mins)	Remarks

WYG ENVIRONMENT
Quay West at MediaCityUK, Salford Quays, M17 1HH
Tel. 0161 872 3223 Fax. 0161 872 3193

Exploratory Hole Number
TP2
Preliminary

Project : **Graphene Innovation Hub, University of Manchester**
Project Number : **A076252**
Client : **University of Manchester**
Method : **Machine Excavated Trial Pit**
Co-ordinates : **384602.10E - 396925.16N**
Level : **38.16mAOD**

Scale 1:50 **Sheet 1 of 1**
Logged By : **DB**
Checked By: **RAJ**
Start Date : **19/06/12**
Finish Date : **19/06/12**

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Water Strike (m)	Installation/ Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
TOPSOIL: Brown slightly gravelly sandy Clay with many rootlets. Gravel is angular and subangular fine to medium Limestone		38.01	**0.15**			0.40	ES1	PID=2.4ppm
		37.96	**0.20**					
MADE GROUND: Grey sandy Gravel of angular and subangular fine to coarse Limestone.						0.90	ES2	PID=2.3ppm
MADE GROUND: Brown slightly clayey gravelly Sand with high cobble content of brick and concrete and occasional pockets of sandy Clay. Gravel is angular and subangular fine to coarse sandstone, brick, concrete, glass, mudstone and textile.						1.60	WAC3	
		35.86	**2.30**					
MADE GROUND: Bricks (basement floor)		35.66	**2.50**	▽ 2.50				
Orange SAND and GRAVEL. Sand is coarse. Gravel is medium Sandstone.						2.70 2.70	ES4 B5	PID=2.4ppm
		35.06	**3.10**					
End of Trial Pit at 3.10 m bgl.								

Observations / Remarks
1. Damp strata observed at 2.5m bgl.
2. Trial pit terminated at 3.1m bgl due to collapse.
3. Concrete wall observed on north face of pit.
4. Trial pit backfilled with arisings on completion.

Excavation Information

Length : 3.00m
Width : 0.50m
Orientation : 90º
Shoring : None
Stability : Unstable

Groundwater

Struck	Rising to	Time (mins)	Remarks
2.50	-	-mins	Damp Strata

WYG ENVIRONMENT
Quay West at MediaCityUK, Salford Quays, M17 1HH
Tel. 0161 872 3223 Fax. 0161 872 3193

Exploratory Hole Number
TP3
Preliminary

Project : **Graphene Innovation Hub, University of Manchester**
Project Number : **A076252**
Client : **University of Manchester**
Method : **Machine Excavated Trial Pit**
Co-ordinates : **384591.23E - 396905.12N**
Level : **38.24mAOD**

Scale 1:50 **Sheet 1 of 1**
Logged By : **DB**
Checked By: **RAJ**
Start Date : **19/06/12**
Finish Date : **19/06/12**

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Water Strike (m)	Installation/ Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
Grass over MADE GROUND: Dark brown slightly clayey slightly gravelly Sand with rootlets. Gravel is angular to subrounded fine and medium mudstone, brick, concrete and glass.		38.08	**0.16**			0.30	ES1	PID=51.6ppm
		37.84	**0.40**					
MADE GROUND: Brown grey slightly clayey gravelly Sand with low cobble content of concrete and brick. Gravel is angular and subangular fine to coarse brick, concrete, wood, mudstone, sandstone and plastic.		37.54	**0.70**			0.80	ES2	PID=6.6ppm
MADE GROUND: Firm brown grey slightly gravelly slightly sandy Clay with medium cobble content of brick, sandstone and concrete and occasional pockets of clayey Sand. Gravel is angular and subangular fine to coarse brick and sandstone.		36.34	**1.90**					
		36.24	**2.00**					
MADE GROUND: Dark brown gravelly Sand with high cobble content of brick, concrete and metal. Sand is medium to coarse. Gravel is angular and subangular fine to coarse brick, ash, concrete, metal, glass and ceramic. Concrete slab at 1.3m bgl on face of pit. Timber beam running east to west across pit at 1.7m bgl.		35.54	**2.70**			3.00	B3	
MADE GROUND: Concrete Slab.		35.04	**3.20**					
MADE GROUND: Red Sand and Gravel of brick with high cobble content of whole brick.								
Red orange gravelly SAND. Sand is medium and coarse. Gravel is subrounded to rounded fine to coarse of mixed lithologies.								
End of Trial Pit at 3.20 m bgl.								

Observations / Remarks
1. Groundwater not observed.
2. Trial pit terminated at 3.2m bgl due to collaspe.
3. Trial pit backfilled with arisings on completion.

Excavation Information

Length : 3.00m
Width : 0.50m
Orientation : 90º
Shoring : None
Stability : Unstable

Groundwater

Struck	Rising to	Time (mins)	Remarks

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel. 0161 872 3223 Fax. 0161 872 3193

Exploratory Hole Number **TP4**

Preliminary

Project : Graphene Innovation Hub, University of Manchester
Project Number : A076252
Client : University of Manchester
Method : Machine Excavated Trial Pit
Co-ordinates : 384611.98E - 396908.94N
Level : 38.32mAOD

Scale 1:50 Sheet 1 of 1
Logged By : DB
Checked By: RAJ
Start Date : 19/06/12
Finish Date : 19/06/12

Strata Description	Reduced Level (mOD)	Depth (m)	Water Strike (m)	Sample Depth	Sample Type	Notes / Remarks
Grass over MADE GROUND: Dark brown slightly clayey slightly gravelly Sand with rootlets. Gravel is angular and subangular fine to coarse concrete, brick, limestone and glass.	38.12	**0.20**		0.40	ES1	PID=1.7ppm
	37.82	**0.50**		0.40	WAC2	
	37.72	**0.60**				
MADE GROUND: Brown grey slighly clayey gravelly Sand with low cobble content of concrete and brick. Gravel is angular and subangular fine to coarse brick, concrete, wood, mudstone, sandstone and plastic.				0.80	ES3	PID=0.9ppm
MADE GROUND: Sandstone slabs.				1.40	ES4	PID=1.9ppm
MADE GROUND: Brown slightly gravelly clayey Sand. Gravel is subrounded and rounded fine to coarse mudstone with occasional brick (reworked natural)	36.62	**1.70**				
	36.52	**1.80**				
	36.32	**2.00**	▽ 2.00			
MADE GROUND: Bricks (Basement floor)				2.30	B5	
Red fine and medium SAND.						
Red damp slightly gravelly SAND and GRAVEL. Sand is coarse. Gravel is medium Sandstone.	35.22	**3.10**				
End of Trial Pit at 3.10 m bgl.						

Observations / Remarks
1. Damp strata observed at 2m bgl.
2. Trial pit terminated at 3.1m bgl due to collapse.
3. Trial pit backfilled with arisings on completion.

Excavation Information

Length : 3.00m
Width : 0.50m
Orientation : 0º
Shoring : None
Stability : Unstable

Groundwater

Struck	Rising to	Time (mins)	Remarks
2.00	-	-mins	Damp Strata

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel. 0161 872 3223 Fax. 0161 872 3193

Exploratory Hole Number **TP5**

Preliminary

Project : Graphene Innovation Hub, University of Manchester
Project Number : A076252
Client : University of Manchester
Method : Machine Excavated Trial Pit
Co-ordinates : 384597.98E - 396897.89N
Level : 38.07mAOD

Scale 1:50 Sheet 1 of 1
Logged By : DB
Checked By: RAJ
Start Date : 19/06/12
Finish Date : 19/06/12

Strata Description	Reduced Level (mOD)	Depth (m)	Water Strike (m)	Sample Depth	Sample Type	Notes / Remarks
Grass over MADE GROUND: Dark brown slightly clayey slightly gravelly Sand with rootlets. Sand is fine and medium. Gravel is subrounded and subangular fine to coarse Limestone, Mudstone and brick. Tree root at 0.2m bgl.	37.62	**0.45**		0.25	ES1	PID=43.0ppm
	37.32	**0.75**				
MADE GROUND: Brown Sand and Gravel . Sand is fine to coarse. Gravel is subrounded and rounded fine to coarse mixed lithologies (Reworked Natural).				1.00	ES2	PID=264ppm
MADE GROUND: Light brown gravelly Sand with low cobble content of brick and concrete. Gravel is subangular and subrounded medium concrete, Limestone, Mudstone, Sandstone and brick.	36.57	**1.50**		1.80	ES3	PID=24.2ppm
	36.07	**2.00**		1.80	B4	
MADE GROUND: Brown clayey slightly gravelly Sand. Gravel is fine to coarse mixed lithologies and occasional angular fine brick (Reworked Natural).						
Brown slightly clayey slightly gravelly SAND with occasional pockets of sandy Clay. Gravel is fine to coarse mixed lithologies.	35.07	**3.00**		2.80	B5	
End of Trial Pit at 3.00 m bgl.						

Observations / Remarks
1. Groundwater not observed.
2. Trial pit terminated at 3m bgl due to collapse.
3. Trial pit backfilled with arisings on completion.

Excavation Information

Length : 3.00m
Width : 0.50m
Orientation : 90º
Shoring : None
Stability : Unstable

Groundwater

Struck	Rising to	Time (mins)	Remarks

WYG ENVIRONMENT
Quay West at MediaCityUK, Salford Quays, M17 1HH
Tel. 0161 872 3223 Fax. 0161 872 3193

Borehole Number CP1
Preliminary

Project : Graphene Innovation Hub, University of Manchester
Project Number: A076252
Client : University of Manchester
Method : Dando 2000
Co-ordinates : 384613.52E - 396916.78N Level: 38.17m AOD

Hole Information

From	To	Method	Diameter
0.00m	5.00m	Percussion boring	150mm

Scale 1:50 Sheet 1 of 1
Logged By : DB
Checked By :
Start Date : 19/06/12
Finish Date : 19/06/12

Strata Description	Legend	Reduced Level (mOAD)	Depth (m)	Casing (m)	Water Level (m)	Installation /Backfill	Sampling & In Situ Testing: Depth	Type Number	
MADE GROUND: Grass over dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and limestone.		(38.02)	**0.15**				0.15-0.50 0.20	B3 ES1	
		(37.57)	**0.60**				0.50 0.50-1.00	D4 B5	
MADE GROUND: Dark brown slightly clayey gravelly sand with medium cobble content of concrete and brick. Sand is medium. Gravel is angular to subangular fine to coarse of sandstone, mudstone, concrete and brick.							1.00 1.20 1.20-1.65 1.20-1.70 1.40	D6 S SPTLS2 B8 ES2	N=19 (3,2/5,5,4,5)
MADE GROUND: Medium dense brown slightly clayey gravelly sand with occasional band of slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is angular to subangular fine to medium of sandstone, ceramic and brick.		(36.47)	**1.70**				1.70 2.00 2.00-2.45 2.00-2.50	D9 S SPTLS10 B11	N=27 (6,6/5,6,8,8)
Medium dense brown slightly clayey slightly gravelly SAND. Sand is fine to coarse. Gravel is subrounded to rounded fine to coarse of mixed lithologies.		(35.67)	**2.50**				2.50 3.00 3.00-3.45 3.00-3.50	D12 S SPTLS13 B14	N=21 (3,6/5,5,6,5)
Medium dense red slightly gravelly SAND with low cobble content of sandstone. Gravel is subrounded to rounded fine to coarse of mixed lithologies.		(34.57)	**3.60**				3.60 4.00 4.00-4.45 4.00-4.50	D15 S SPTLS16 B17	50 for 190mm 50 (6,10/15,19,16 for 40mm)
Very dense red SAND. (Possibly weathered Sandstone).		(33.17)	**5.00**				4.50 5.00 5.00	D18 S SPTLS19	50 for 103mm 50 (18,7 for 33mm/38,12 for 28mm)
Borehole complete at 5.00m bgl.									

Observations / Remarks.
1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was not observed during drilling.
3. Upon completion 50mm diameter gas/groundwater monitoring standpipe was installed with response zone between 0.5m and 1.5m bgl.

Chiselling

From	To	Time
4.60m	5.00m	60 mins

Groundwater

Struck	Rising to	Time (mins)	Remarks

WYG ENVIRONMENT
Quay West at MediaCityUK, Salford Quays, M17 1HH
Tel. 0161 872 3223 Fax. 0161 872 3193

Borehole Number CP2
Preliminary

Project : Graphene Innovation Hub, University of Manchester
Project Number: A076252
Client : University of Manchester
Method : Dando 2000
Co-ordinates : 384596.05E - 396914.27N Level: 38.20m AOD

Hole Information

From	To	Method	Diameter
0.00m	5.00m	Percussion boring	150mm

Scale 1:50 Sheet 1 of 1
Logged By : DB
Checked By :
Start Date : 19/06/12
Finish Date : 19/06/12

Strata Description	Legend	Reduced Level (mOAD)	Depth (m)	Casing (m)	Water Level (m)	Installation /Backfill	Sampling & In Situ Testing: Depth	Type Number	
MADE GROUND: Grass over dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of sandstone and mudstone.		(38.00)	**0.20**				0.20-0.50	B4	
		(37.70)	**0.50**				0.50 0.50-1.00 0.70	D5 B6 ES1	
MADE GROUND: Dark brown slightly clayey gravelly sand with medium cobble content of concrete and brick. Sand is fine to medium. Gravel is angular to subangular fine to coarse of sandstone, mudstone, concrete and brick.							1.00 1.20 1.20-1.65 1.20-1.70	D7 S SPTLS8 B9	N=8 (1,1/2,2,2,2)
MADE GROUND: Loose dark brown slightly gravelly clayey sand with occasional pocket of slightly gravelly sandy clay. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, concrete and brick.		(36.50)	**1.70**				1.50 1.70 2.00 2.00-2.45 2.00-2.50	ES2 D10 S SPTLS11 B12	N=13 (2,3/3,3,3,4)
Medium dense brown slightly gravelly SAND. Sand is medium to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies.							2.20 2.50 3.00 3.00-3.45 3.00-3.50	ES3 D13 S SPTLS14 B15	N=28 (3,3/4,4,8,12)
Medium dense becoming very dense red SAND. (Possibly weathered sandstone).		(34.30)	**3.90**				3.50 3.90 4.00 4.00-4.45 4.00-4.50	D16 D17 S SPTLS18 B19	N=26 (3,3/3,4,8,11)
		(33.20)	**5.00**				4.50 5.00 5.00	D20 S SPTLS21	50 for 72mm 50 (16,9 for 20mm/50 for 72mm)
Borehole complete at 5.00m bgl.									

Observations / Remarks.
1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was not observed during drilling.
3. Upon completion 50mm diameter gas/groundwater monitoring standpipe was installed with response zone between 2.0m and 4.0m bgl.

Chiselling

From	To	Time

Groundwater

Struck	Rising to	Time (mins)	Remarks

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel. 0161 872 3223 Fax. 0161 872 3193

Exploratory Hole Number **RBH1**

Preliminary

Project : **Graphene Innovation Hub, University of Manchester**
Project Number : **A076252**
Client : **University of Manchester**
Method : **MI6 rotary rig**
Co-ordinates : **384583.21E - 396918.54N Level:38.11 m AOD**

Hole Information

From	To	Method	Diameter
0.00m	6.00m	Rotary open hole	92mm
6.00m	13.50m	Rotary cored	75mm
13.50m	15.00m	Rotary open hole	75mm

Scale 1:50 **Sheet 1 of 2**
Logged By : **DB**
Checked By :
Start Date : **18/06/2012**
Finish Date : **19/06/2012**
Inclination : **90°**

Strata Description	Legend	Depth(m) (AOD)	Samples & In Situ Testing: Depth (m)	Type	Results/Remarks	Casing Diameter	Water Strikes	Backfill / Installation
MADE GROUND: Grass over dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of sandstone and limestone.		**0.20** (37.91)						
MADE GROUND: Brown slightly clayey gravelly sand with low cobble content of brick and concrete. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of brick, concrete, mudstone, sandstone, glass and quartz.		**1.20** (36.91)						
MADE GROUND: Brick, wood, ash, steel bars and soil backfill (drillers description).								
Red brown fine to medium SAND and GRAVEL (drillers description).		**2.80** (35.31)	4.00	S	N=14 (2,2/2,2,4,6)		4.50	
Red brown weathered SANDSTONE (drillers description).		**5.50** (32.61)	6.00	S	50 for 65mm 50 (7,18/50 for 65mm)	6.00 92mm		
Extremely weak SANDSTONE recovered as stiff slightly laminated red clayey SAND.		**7.50** (30.61)	7.50					
Very weak red medium to coarse grained SANDSTONE. Discontinuities are closely spaced sub horizontal (10 degrees from horizontal), planar, rough, breccia.		**7.68** (30.43)	7.80-7.90	C1	TCR 100 SCR 93 RQD 53 FI 12	7.68		
Very weak red grey SANDSTONE recovered as angular gravel.		**8.20** (29.91)				8.75		
Very weak red fine to coarse grained SANDSTONE. Discontinuities are closely spaced, sub horizontal (30 degrees from horizontal), planar, rough, breccia.		**8.30** (29.81)						
Very weak to weak red medium to coarse grained SANDSTONE. Discontinuities are closely spaced sub horizontal (10 degrees from horizontal), planar, rough, stained black.		**8.75** (29.36)	9.00		NI	9.00		
			10.10-10.20	C2	TCR 93 SCR 73 RQD 57 FI 13			

Remarks / Observations: Continued next sheet

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was observed at 4.50m bgl during drilling.
3. Upon completion borehole was backfilled with bentonite.
4. Air mist flush used. No loss of flush was noted.

Groundwater

			Depth Struck	Rising To	Time (mins)	Remarks
			4.50m	4.50m	20	

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel. 0161 872 3223 Fax. 0161 872 3193

Exploratory Hole Number **RBH1**

Preliminary

Project : **Graphene Innovation Hub, University of Manchester**
Project Number : **A076252**
Client : **University of Manchester**
Method : **MI6 rotary rig**
Co-ordinates : **384583.21E - 396918.54N Level:38.11 m AOD**

Hole Information

From	To	Method	Diameter
0.00m	6.00m	Rotary open hole	92mm
6.00m	13.50m	Rotary cored	75mm
13.50m	15.00m	Rotary open hole	75mm

Scale 1:50 **Sheet 2 of 2**
Logged By : **DB**
Checked By :
Start Date : **18/06/2012**
Finish Date : **19/06/2012**
Inclination : **90°**

Strata Description	Legend	Depth(m) (AOD)	Rotary Coring: Depth (m)	TCR	SCR	RQD	FI	Casing Diameter	Water Strikes	Backfill / Installation
Very weak to weak red medium to coarse grained SANDSTONE. Discontinuities are closely spaced sub horizontal (10 degrees from horizontal), planar, rough, stained black. Recovered as angular gravel between 10.25m and 10.50m bgl.		**10.50** (27.61)	10.50				NI	10.25 10.50		
Very weak red medium grained SANDSTONE. Discontinuity set 1 are closely spaced sub horizontal (10 degrees from horizontal), angular, rough, breccia. Discontinuity set 2 are sub vertical (45 degrees) angular, rough, breccia.			12.00	60	60	30	9	12.00		
Extremely weak, recovered as gravelly sand between 12.85m and 13.30m bgl.			12.40-12.60	C3			8			
Weak to medium strong red medium grained SANDSTONE. Discontinuities are closely spaced sub horizontal (10 degress from horizontal), angular, rough, breccia.		**13.30** (24.81)		100	83	60	NI	12.85 13.30		
Red brown weathered SANDSTONE (drillers description).		**13.50** (24.61)								
End of Borehole at 15.00 m		**15.00** (23.11)								

Remarks / Observations:

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was observed at 4.50m bgl during drilling.
3. Upon completion borehole was backfilled with bentonite.
4. Air mist flush used. No loss of flush was noted.

Groundwater

			Depth Struck	Rising To	Time (mins)	Remarks
			4.50m	4.50m	20	

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel. 0161 872 3223 Fax. 0161 872 3193

Exploratory Hole Number **RBH2**

Preliminary

Project : **Graphene Innovation Hub, University of Manchester**
Project Number : **A076252**
Client : **University of Manchester**
Method : **MI6 rotary rig**
Co-ordinates : **384600.51E - 396930.85N Level:38.21 m AOD**

Hole Information

From	To	Method	Diameter
0.00m	5.50m	Rotary open hole	92mm
5.50m	13.00m	Rotary cored	75mm
13.00m	15.00m	Rotary open hole	75mm

Scale 1:50 **Sheet 1 of 2**
Logged By : **DB**
Checked By :
Start Date : **19/06/2012**
Finish Date : **19/06/2012**
Inclination : **90°**

Strata Description	Legend	Depth(m) (AOD)	Samples & In Situ Testing: Depth (m)	Type	Results/Remarks	Casing Diameter	Water Strikes	Backfill / Installation
MADE GROUND: Grass over slightly gravelly sandy clay with frequent rootlets. Sand is fine to medium. Gravel is angular to subangular fine to medium of limestone and concrete.		**0.15** (38.06)						
MADE GROUND: Brown slightly clayey gravelly sand with medium cobble content of brick. Sand is medium. Gravel is angular to subangular fine to coarse of sandstone, brick, concrete, glass, mudstone and textiles.		**1.20** (37.01)						
Brown sandy soil with gravels (drillers description).		**2.80** (35.41)						
Brown SAND and GRAVEL (drillers description)		**3.90** (34.31)						
Red brown sandy CLAY with gravels (drillers description).		**4.50** (33.71)						
Red brown weathered SANDSTONE (drillers description).		**5.50** (32.71)	5.50		0 0 0			
No recovery.		**7.00** (31.21)	7.00 7.00	S	50 for 40mm 50 (13,12 for 35mm/50 for 40mm)	7.00 92mm		
Very weak to weak red medium grained SANDSTONE. Discontinuity set 1 are closely spaced sub horizontal (0 - 10 degrees from horizontal), planar, rough, breccia. Discontinuity set 2 are widely spaced, sub vertical, undulating, rough, breccia.			7.50-7.70	C2	100 100 44 9			
			8.50			8.50		
					100 100 79 7			
			10.00		TCR SCR RQD FI	10.00		

Remarks / Observations: Continued next sheet

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was observed at 10.90m bgl during drilling.
3. Upon completion 50mm diameter gas/groundwater monitoring standpipe was installed with response zone between 4.0m and 7.0m bgl.
4. Air mist flush used. No loss of flush noted.

Groundwater

Depth Struck	Rising To	Time (mins)	Remarks
10.90m	-	-	

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Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel. 0161 872 3223 Fax. 0161 872 3193

Exploratory Hole Number **RBH2**

Preliminary

Project : **Graphene Innovation Hub, University of Manchester**
Project Number : **A076252**
Client : **University of Manchester**
Method : **MI6 rotary rig**
Co-ordinates : **384600.51E - 396930.85N Level:38.21 m AOD**

Hole Information

From	To	Method	Diameter
0.00m	5.50m	Rotary open hole	92mm
5.50m	13.00m	Rotary cored	75mm
13.00m	15.00m	Rotary open hole	75mm

Scale 1:50 **Sheet 2 of 2**
Logged By : **DB**
Checked By :
Start Date : **19/06/2012**
Finish Date : **19/06/2012**
Inclination : **90°**

Strata Description	Legend	Depth(m) (AOD)	Rotary Coring: Depth (m)	TCR	SCR	RQD	FI	Casing Diameter	Water Strikes	Backfill / Installation
Very weak to weak red medium grained SANDSTONE. Discontinuity set 1 are closely spaced sub horizontal (0 - 10 degrees from horizontal), planar, rough, breccia. Discontinuity set 2 are widely spaced, sub vertical, undulating, rough, breccia.			10.35-10.58	C3 87	83	75	9		▽ 10.90	
Discontinuity set 1 are very closely spaced between 11.50m and 11.90m bgl. recovered as sand and gravel between 11.90m and 12.15m bgl.			11.50 12.18-12.42	C5 100	73	53	NI NI 9	11.50 11.90 12.15		
Red brown weathered SANDSTONE (drillers description).		**13.00** (25.21)						13.00		
End of Borehole at 15.00 m		**15.00** (23.21)								
				TCR	SCR	RQD	FI			

Remarks / Observations:

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was observed at 10.90m bgl during drilling.
3. Upon completion 50mm diameter gas/groundwater monitoring standpipe was installed with response zone between 4.0m and 7.0m bgl.
4. Air mist flush used. No loss of flush noted.

Groundwater

Depth Struck	Rising To	Time (mins)	Remarks
10.90m	-	-	

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel. 0161 872 3223 Fax. 0161 872 3193

Exploratory Hole Number **RBH3**

Preliminary

Project : **Graphene Innovation Hub, University of Manchester**
Project Number : **A076252**
Client : **University of Manchester**
Method : **MI6 rotary rig**
Co-ordinates : **384605.00E - 396901.97N Level:38.31 m AOD**

Hole Information

From	To	Method	Diameter
0.00m	5.50m	Rotary open hole	92mm
5.50m	13.00m	Rotary cored	75mm
13.00m	15.00m	Rotary open hole	75mm

Scale 1:50 **Sheet 1 of 2**
Logged By : **DB**
Checked By :
Start Date : **19/06/2012**
Finish Date : **20/06/2012**
Inclination : **90°**

Strata Description	Legend	Depth(m) (AOD)	Samples & In Situ Testing: Depth (m)	Type	Results/Remarks	Casing Diameter	Water Strikes	Backfill / Installation
MADE GROUND: Grass over dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is subangular to rounded fine to coarse of limestone, sandstone and brick.		**0.20** (38.11)						
MADE GROUND: Reworked brown sand and gravel. Sand is fine to coarse. Gravel is subrounded to rounded fine to coarse of mixed lithologies.		**1.20** (37.11)						
MADE GROUND: Brown sandy soil with gravels and brick fill (drillers description).		**2.80** (35.51)						
Red brown SAND and GRAVEL (drillers description).		**5.30** (33.01)						
Red brown weathered SANDSTONE (drillers description).		**5.50** (32.81)	5.50					
Extremely weak red SANDSTONE recovered as SAND.		**5.80** (32.51)			NI	5.80		
Very weak red medium grained SANDSTONE. Discontinuity set 1 is closely spaced sub vertical (45 degrees), planar, smooth, clean. Discontinuity set 2 is closely spaced, horizontal, undulating, rough, clay infill. recovered as SAND and GRAVEL between 6.40m and 6.75m bgl.				100 TCR	60 SCR 17 RQD			
					10 FI	6.40		
					NI	6.75		
		7.00 (31.31)			12	7.00		
Extremely weak orange brown coarse grained SANDSTONE. Discontinuities are very closely to closely spaced, sub horizontal, undulating, rough, breccia.			7.00	23 TCR	23 SCR 0 RQD	7.50 92mm		
					NI FI	8.50		
			8.50	7 TCR	4 SCR 0 RQD			
					NI FI	10.00		
			10.00	S TCR	50 for 60mm SCR 50 for 60mm RQD	10.00		

Remarks / Observations: Continued next sheet

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was observed at 13.50m bgl during drilling.
3. Upon completion 50mm diameter gas/groundwater monitoring standpipe was installed with response zone between 4.0m and 8.0m bgl.
4. Air mist flush used. No loss of flush noted.

Groundwater

			Depth Struck	Rising To	Time (mins)	Remarks
			13.50m	-	-	

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Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel. 0161 872 3223 Fax. 0161 872 3193

Exploratory Hole Number **RBH3**

Preliminary

Project : **Graphene Innovation Hub, University of Manchester**
Project Number : **A076252**
Client : **University of Manchester**
Method : **MI6 rotary rig**
Co-ordinates : **384605.00E - 396901.97N Level:38.31 m AOD**

Hole Information

From	To	Method	Diameter
0.00m	5.50m	Rotary open hole	92mm
5.50m	13.00m	Rotary cored	75mm
13.00m	15.00m	Rotary open hole	75mm

Scale 1:50 **Sheet 2 of 2**
Logged By : **DB**
Checked By :
Start Date : **19/06/2012**
Finish Date : **20/06/2012**
Inclination : **90°**

Strata Description	Legend	Depth(m) (AOD)	Rotary Coring: Depth (m)	TCR	SCR	RQD	FI	Casing Diameter	Water Strikes	Backfill / Installation
Extremely weak orange brown coarse grained SANDSTONE. Discontinuities are very closely to closely spaced, sub horizontal, undulating, rough, breccia.			10.60-10.70 C1	60	40	17	12	10.70		
							NI			
		11.50 (26.81)	11.50					11.50		
Very weak orange brown coarse grained SANDSTONE. Discontinuities are closely spaced, sub horizontal, undulating, rough, breccia.			11.90-12.05 C5	80	73	42	11			
Red brown weathered SANDSTONE (drillers description).		**13.00** (25.31)						13.00	▽ 13.50	
End of Borehole at 15.00 m		**15.00** (23.31)								

Remarks / Observations:

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was observed at 13.50m bgl during drilling.
3. Upon completion 50mm diameter gas/groundwater monitoring standpipe was installed with response zone between 4.0m and 8.0m bgl.
4. Air mist flush used. No loss of flush noted.

Groundwater

			Depth Struck	Rising To	Time (mins)	Remarks
			13.50m	-	-	

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel: 0161 872 3223 Fax: 0161 872 3193

Exploratory Hole Number: WS1

Preliminary

Project : Graphene Innovation Hub, University of Manchester
Project Number : A076252
Client : University of Manchester
Method : Tracked window sample rig
Co-ordinates : 384560.24E - 396911.80N
Level : 38.18 mAOD

Scale 1:50 Sheet 1 of 1
Logged By : DB
Checked By: RAJ
Start Date : 21/06/12
Finish Date : 21/06/12

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Casing (m)	Water Strike (m)	Installation Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
MADE GROUND: Dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is angular to subrounded fine to medium of sandstone, limestone and mudstone.		37.98	0.20				0.30	ES1	
MADE GROUND: Dark brown slightly clayey gravelly sand. Sand is fine to medium. Gravel is angular to subangular fine to coarse of brick, asbestos sheeting, concrete, plastic, ceramics, sandstone, fabric and tarmacadam.		37.28	0.90				1.00 1.20	ES2 S	N=7 (1,1/2,1,2,2)
MADE GROUND: Loose brown slightly clayey slightly gravelly sand. Sand is fine to medium. Gravel is angular to subangular fine to coarse of brick and sandstone.		36.68	1.50						
MADE GROUND: Reworked brown slightly gravelly sand. Sand is medium to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies.		36.28	1.90				2.00	S	N=20 (3,3/5,4,5,6)
Medium dense light brown slightly gravelly SAND. Sand is medium to coarse. Gravel is angular to rounded fine to coarse of mixed lithologies.							3.00	S	N=23 (4,4/5,5,6,7)
wet between 3.60m and 3.80m bgl		34.38	3.80		3.60				
Loose becoming very dense damp red SAND. Sand is medium.							4.00 4.00-5.00	S B3	N=9 (1,1/1,3,2,3)
End of Window Sample at 5.08 m		33.10	5.08				4.90	S	50 for 80mm 50 (15,10 for 30mm/44,6 for 5mm)

Observations / Remarks

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was observed at 3.60m bgl buring drilling.
3. Upon completion 50mm diameter gas/groundwater monitoring standpipe was installed with response zone between 0.5m and 1.5m bgl.

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Tel: 0161 872 3223 Fax: 0161 872 3193

Exploratory Hole Number: WS1A

Preliminary

Project : Graphene Innovation Hub, University of Manchester
Project Number : A076252
Client : University of Manchester
Method : Hand Dug Inspection Pit
Co-ordinates : 384559.69E - 396911.47N
Level : 38.14 mAOD

Scale 1:50 Sheet 1 of 1
Logged By : JL
Checked By: RAJ
Start Date : 05/07/12
Finish Date : 05/07/12

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Casing (m)	Water Strike (m)	Installation Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
Grass over MADE GROUND: Brown gravelly fine to coarse Sand. Gravel is fine to coarse subrounded to angular glass, brick, slate, sandstone, mudstone, concrete and rootlets.		37.99	0.15				0.30	ES1	
MADE GROUND: Light brown Sand and Gravel with occasional cobbles of angular concrete. Sand is fine to coarse. Gravel is subangular and angular fine to coarse brick and concrete with occasional glass and charcoal.		37.92	0.22						
MADE GROUND: Brown slightly clayey gravelly fine to coarse Sand. Gravel is fine to coarse subangular brick, glass, concrete, Mudstone with pockets of red sand. Cobble of angular concrete at 0.23m bgl. Sheet of metal encountered at 0.27m bgl. Possible asbestos containing material (cement sheet fragment) encountered at 0.28m bgl.		37.83	0.31						
End of Window Sample at 0.31 m									

Observations / Remarks

1. Hand dug inspection pit undertaken adjacent to WS1 to obtain soil sample.
2. Groundwater not encountered.
3. Hole backfilled with arisings on completion.

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel: 0161 872 3223 Fax: 0161 872 3193

Exploratory Hole Number **WS2**

Preliminary

Project : Graphene Innovation Hub, University of Manchester
Project Number : A076252
Client : University of Manchester
Method : Tracked window sample rig
Co-ordinates : 384580.26E - 396924.14N
Level : 38.12 mAOD

Scale 1:50 Sheet 1 of 1
Logged By : DB
Checked By: RAJ
Start Date : 20/06/12
Finish Date : 20/06/12

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Casing (m)	Water Strike (m)	Installation Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
MADE GROUND: Dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of sandstone and limestone.		37.97	0.15						
MADE GROUND: Dark brown gravelly sand with medium cobble content of angular brick. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick, mudstone, concrete, plastic, limestone and glass.		36.82	1.30				1.20	S	N=16 (2,3/5,4,4,3)
MADE GROUND: Medium dense reworked light brown slightly gravelly clayey sand. Sand is medium to coarse. Gravel is subangular to rounded of mixed lithologies with occasional fragment of brick.		36.22	1.90				2.00	S	N=16 (2,3/3,4,4,5)
Medium dense orange brown slightly gravelly SAND. Sand is medium to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies.							3.00	S	N=17 (4,4/4,4,4,5)
Damp between 3.30m and 3.60m bgl.		34.52	3.60						
Medium dense red SAND.							4.00	S	N=17 (4,4/5,4,3,5)
		33.62	4.50				4.50-5.00	B1	
Very dense red Silty SAND recovered as angular gravel. (possible weathered sandstone).							5.00	S	50 for 125mm 50 (10,15 for 60mm/24,26 for 50mm)
		32.95	5.17						
End of Window Sample at 5.17 m									

Observations / Remarks

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was not observed during drilling but damp ground conditions were encountered at 3.3m bgl.
3. Upon completion borehole was backfilled with arisings.

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel: 0161 872 3223 Fax: 0161 872 3193

Exploratory Hole Number **WS3**

Preliminary

Project : Graphene Innovation Hub, University of Manchester
Project Number : A076252
Client : University of Manchester
Method : Tracked window sample rig
Co-ordinates : 384589.23E - 396928.80N
Level : 38.08 mAOD

Scale 1:50 Sheet 1 of 1
Logged By : DB
Checked By: RAJ
Start Date : 20/06/12
Finish Date : 20/06/12

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Casing (m)	Water Strike (m)	Installation Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
MADE GROUND: Dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of sandstone and mudstone.		37.83	0.25				0.40	ES1	
MADE GROUND: Dark brown slightly gravelly sand with medium cobble content of angular brick. Sand is fine to medium. Gravel is angular to subangular fine to coarse of brick, concrete, ceramic, plastic and limestone.		36.98	1.10				1.20	S	N=20 (5,5/5,5,5,5)
Possible reworked medium dense brown slightly gravelly sand. Sand is medium. Gravel is subangular to subrounded fine to coarse of mixed lithologies.							2.00	S	N=16 (2,2/2,4,5,5)
From 2.20m bgl gravelly and sand is coarse.							3.00	S	N=42 (6,7/8,9,11,14)
		34.88	3.20				3.20-4.00	B2	
Dense becoming very dense red SAND. Sand is medium to coarse.							4.00	S	50 for 125mm 50 (10,15 for 60mm/24,26 for 50mm)
		34.08	4.00						
Very dense SAND. Sand is medium to coarse. (possible weathered sandstone).		33.82	4.26						
End of Window Sample at 4.26 m									

Observations / Remarks

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was not observed during drilling.
3. Upon completion borehole was backfilled with arisings.

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel: 0161 872 3223 Fax: 0161 872 3193

Exploratory Hole Number **WS4**

Preliminary

Project : Graphene Innovation Hub, University of Manchester
Project Number : A076252
Client : University of Manchester
Method : Tracked window sample rig
Co-ordinates : 384602.14E - 396934.89N
Level : 38.03 mAOD

Scale 1:50 Sheet 1 of 1
Logged By : DB
Checked By: RAJ
Start Date : 20/06/12
Finish Date : 20/06/12

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Casing (m)	Water Strike (m)	Installation Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
MADE GROUND: Dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is aubangular to subrounded fine to medium of sandstone and limestone.		37.88	0.15						
MADE GROUND: Brown gravelly sand. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, concrete, brick, plastic and glass.		36.83	1.20				1.20	S	N=8 (3,2/1,2,2,3)
MADE GROUND: Loose red slightly clayey slightly gravelly sand. Sand is medium to coarse. Gravel is subrounded to rounded fine to coarse of sandstone.		36.13	1.90						
MADE GROUND: Brick cobble.		36.03	2.00				2.00 2.00-3.00	S B1	N=17 (4,3/5,4,4,4)
Possible reworked medium dense light brown gravelly SAND. Sand is coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies.							3.00	S	N=19 (5,3/4,4,5,6)
Very dense red SAND. Sand is medium. (possible weathered sandstone)		34.43	3.60				4.00	S	50 for 260mm 50 (4,10/12,12,15,11 for 35mm)
End of Window Sample at 4.41 m		33.62	4.41						

Observations / Remarks

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was not observed during drilling but damp ground conditions were encountered at 3.6m bgl.
3. Upon completion borehole was backfilled with arisings.

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel: 0161 872 3223 Fax: 0161 872 3193

Exploratory Hole Number **WS5**

Preliminary

Project : Graphene Innovation Hub, University of Manchester
Project Number : A076252
Client : University of Manchester
Method : Tracked window sample rig
Co-ordinates : 384612.86E - 396931.78N
Level : 38.20 mAOD

Scale 1:50 Sheet 1 of 1
Logged By : DB
Checked By: RAJ
Start Date : 20/06/12
Finish Date : 20/06/12

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Casing (m)	Water Strike (m)	Installation Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
MADE GROUND: Dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of sandstone and mudstone.		38.00	0.20						
MADE GROUND: Loose brown slightly clayey slightly gravelly sand with low cobble content of angular brick. Sand is medium to coarse. Gravel is angular to subrounded of sandstone, limestone, brick, concrete, glass and plastic. Clayey between 1.20m and 1.80m bgl. Fragments of coal at 1.50m bgl.		36.40	1.80				1.20	S	N=9 (2,2/2,2,3,2)
MADE GROUND: Brick cobble.		36.30	1.90				2.00	S	N=15 (2,3/3,4,4,4)
Possible reworked medium dense light brown slightly gravelly sand. Sand is medium to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies.							3.00	S	N=18 (5,4/4,4,4,6)
Very dense red slightly clayey SAND. Sand is medium. (possible weathered sandstone).		34.60	3.60				4.00	S	50 for 225mm 50 (6,9/12,17,21)
End of Window Sample at 4.37 m		33.83	4.37						

Observations / Remarks

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was not observed during drilling but damp ground conditions were encountered at 3.6m bgl.
3. Upon completion borehole was backfilled with arisings.

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel: 0161 872 3223 Fax: 0161 872 3193

Exploratory Hole Number **WS6**

Preliminary

Project : **Graphene Innovation Hub, University of Manchester**
Project Number : **A076252**
Client : **University of Manchester**
Method : **Tracked window sample rig**
Co-ordinates : **384615.36E - 396923.32N**
Level : **38.24 mAOD**

Scale 1:50 **Sheet 1 of 1**
Logged By : **DB**
Checked By: **RAJ**
Start Date : **20/06/12**
Finish Date : **20/06/12**

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Casing (m)	Water Strike (m)	Installation Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
MADE GROUND: Dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of sandstone and mudstone.		38.09	0.15						
		37.84	0.40						
		37.74	0.50				0.60	ES1	
MADE GROUND: Brown slightly clayey slightly gravelly sand with low cobble content of angular brick. Sand is medium to coarse. Gravel is angular to subrounded of sandstone, limestone, brick, concrete, glass and plastic.							1.20	S	N=12 (2,2/3,2,4,3)
MADE GROUND: Concrete cobbles.		36.59	1.65						
MADE GROUND: Medium dense brown slightly clayey slightly gravelly sand with low cobble content of angular brick. Sand is medium to coarse. Gravel is angular to subrounded of sandstone, limestone, brick, concrete, glass and plastic.							2.00 2.00-3.00	S B2	N=22 (4,3/4,5,6,7)
Possible reworked medium dense brown orange slightly gravelly sand. Sand is coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies.		35.04	3.20				3.00	S	N=16 (3,4/3,4,4,5)
Medium dense slightly damp red SAND.		34.24	4.00				4.00	S	50 for 265mm 50 (7,7/7,11,16,16 for 40mm)
Very dense red SAND. (possible weathered sandstone)		33.82	4.42						
End of Window Sample at 4.42 m									

Observations / Remarks

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was not observed during drilling but damp ground conditions were encountered at 3.2m bgl.
3. Upon completion 50mm diameter gas/groundwater monitoring standpipe was installed with response zone between 0.5m and 1.5m bgl.

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel: 0161 872 3223 Fax: 0161 872 3193

Exploratory Hole Number **WS7**

Preliminary

Project : **Graphene Innovation Hub, University of Manchester**
Project Number : **A076252**
Client : **University of Manchester**
Method : **Tracked window sample rig**
Co-ordinates : **384621.71E - 396910.05N**
Level : **38.08 mAOD**

Scale 1:50 **Sheet 1 of 1**
Logged By : **DB**
Checked By: **RAJ**
Start Date : **21/06/12**
Finish Date : **21/06/12**

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Casing (m)	Water Strike (m)	Installation Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
MADE GROUND: Dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of sandstone and mudstone.		37.88	0.20						
MADE GROUND: Medium dense red gravelly sand with high cobble content of brick. Sand is fine to medium. Gravel is angular fine to coarse of brick, sandstone and concrete.							1.20	S	N=34 (8,7/10,8,9,7)
		36.58	1.50						
MADE GROUND: Medium dense grey brown gravelly sand. Sand is coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies.		35.88	2.20				2.00	S	N=14 (3,4/2,4,4,4)
Medium dense light brown slightly gravelly SAND. Sand is coarse. Gravel is subangular to rounded of mixed lithologies.		34.98	3.10				3.00 3.10-4.00	S B1	N=17 (5,5/4,4,4,5)
Medium dense red SAND. Sand is fine to medium.		34.08	4.00				4.00	S	50 for 105mm 50 (20,5 for 10mm/30,20 for 30mm)
Very dense red SAND. Sand is fine to medium. (possible weathered sandstone).		33.89	4.19						
End of Window Sample at 4.19 m									

Observations / Remarks

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was not observed during drilling.
3. Upon completion borehole was backfilled with arisings.

WYG ENVIRONMENT

Quay West at MediaCityUK, Salford Quays, M17 1HH

Tel: 0161 872 3223 Fax: 0161 872 3193

Exploratory Hole Number
WS8

Preliminary

Project : Graphene Innovation Hub, University of Manchester
Project Number : A076252
Client : University of Manchester
Method : Tracked window sample rig
Co-ordinates : 384608.24E - 396899.84N
Level : 38.30 mAOD

Scale 1:50 Sheet 1 of 1
Logged By : DB
Checked By: RAJ
Start Date : 21/06/12
Finish Date : 21/06/12

Strata Description	Legend	Reduced Level (mOD)	Depth (m)	Casing (m)	Water Strike (m)	Installation Backfill	Sample Test Depth	Sample Test Type	Notes / Remarks
MADE GROUND: Dark brown slightly clayey slightly gravelly sand with frequent rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of sandstone, limestone and mudstone.		38.10	0.20						
MADE GROUND: Dark brown gravelly sand with low cobble content of brick. Gravel is angular to subangular of brick, concrete, sandstone and plastic.		37.30	1.00						
MADE GROUND: Loose light brown gravelly sand. Sand is fine to medium. Gravel is angular to subangular fine to coarse of sandstone, brick, and concrete.							1.20	S	N=8 (2,1/2,3,1,2)
							2.00	S	N=8 (2,2/1,1,2,4)
		36.10	2.20						
Loose becoming medium dense brown gravelly SAND. Sand is medium to coarse. Gravel is subrounded to rounded fine to coarse of mixed lithologies.							3.00	S	N=19 (4,3/5,5,4,5)
Slightly gravelly from 3.60m bgl.		34.40	3.90						
Medium dense red brown damp slightly silty SAND. Sand is fine.							4.00	S	N=23 (5,5/5,7,6,5)
		33.80	4.50						
Very dense red silty SAND. Sand is fine.							4.60	D1	
		33.30	5.00				5.00	S	~~50 for 55mm~~ 50 (5,20 for 60mm/50 for 55mm)
End of Window Sample at 5.00 m									

Observations / Remarks

1. Inspection pit hand excavated to 1.20m bgl prior to drilling.
2. Groundwater was not observed during drilling but damp ground conditions were encountered at 3.9m bgl.
3. Upon completion borehole was backfilled with arisings.





Photo Plate No. 01: TP1 (18/06/12)





Photo Plate No. 02: TP2 (18/06/12)

Quay West at MediaCityUK
Trafford Wharf Road
Trafford Park
Manchester M17 1HH

Tel: 0161 872 3223
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E-mail enquiries @wyg.com

Environmental Consultancy
Ground Technologies & Investigation

Project : Proposed Graphene Innovation Hub

Client: The University of Manchester

Trial Pit Photo Plates

Project No.: A756252

Date: June 2012





Photo Plate No. 03: TP3 (18/06/12)





Photo Plate No. 04: TP4 (18/06/12)

Quay West at MediaCityUK
Trafford Wharf Road
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Tel: 0161 872 3223
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Environmental Consultancy
Ground Technologies & Investigation

Project : Proposed Graphene Innovation Hub

Client: The University of Manchester

Trial Pit Photo Plates

Project No.: A756252 | Date: June 2012





Photo Plate No. 05: TP5 (18/06/12)





Photo Plate No. 06: WS1A (05/07/12)

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Environmental Consultancy
Ground Technologies & Investigation

Project : Proposed Graphene Innovation Hub

Client: The University of Manchester

Trial Pit Photo Plates

Project No.: A756252 | Date: June/July 2012



Photo Plate No. 01: RBH1 – Core Box 1 of 2: 7.5m – 10.5m bgl (18/06/12)



Photo Plate No. 02: RBH1 – Core Box 2 of 2: 10.5m – 13.5m bgl (18/06/12)

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E-mail enquiries @wyg.com

Environmental Consultancy
Ground Technologies & Investigation

Project : Proposed Graphene Innovation Hub

Client: The University of Manchester

Rock Core Photo Plates

Project No.: A756252 | Date: June 2012



Photo Plate No. 01: RBH2 – Core Box 1 of 2: 7.0m – 10.0m bgl (19/06/12)



Photo Plate No. 02: RBH2 – Core Box 2 of 2: 10.0m – 13.0m bgl (19/06/12)

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E-mail enquiries @wyg.com

Environmental Consultancy
Ground Technologies & Investigation

Project : Proposed Graphene Innovation Hub

Client: The University of Manchester

Rock Core Photo Plates

Project No.: A756252 | Date: June 2012



Photo Plate No. 01: RBH3 – Core Box 1 of 2: 5.5m – 11.5m bgl (19/06/12)



Photo Plate No. 02: RBH3 – Core Box 2 of 2: 11.5m – 13.0m bgl (19/06/12)

Quay West at MediaCityUK
Trafford Wharf Road
Trafford Park
Manchester M17 1HH

Tel: 0161 872 3223
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E-mail enquiries @wyg.com

Environmental Consultancy
Ground Technologies & Investigation

Project : Proposed Graphene Innovation Hub

Client: The University of Manchester

Rock Core Photo Plates

Project No.: A756252 | Date: June 2012

Appendix D – Chemical Laboratory Results

Jones Environmental Laboratory

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

WYG
Quay West at MediaCityUK
Trafford Wharf Road
Trafford Park
Manchester
M17 1HH

No.4225

Attention :	Kathryn Ellis
Date :	4th July, 2012
Your reference :	A076252
Our reference :	Test Report 12/4921 Batch 2
Location :	GRAPHENE
Date samples received :	26th June, 2012
Status :	Final report
Issue :	1

Three samples were received for analysis on 26th June, 2012. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton B.Sc
Project Manager

Bob Millward B.Sc
Principal Chemist

Client Name: WYG
Reference: A076252
Location: GRAPHENE
Contact: Kathryn Ellis
JE Job No.: 12/4921

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	39-40	43-44									LOD	Units	Method No.
Sample ID	CP2	CP2											
Depth	0.7	2.2											
COC No / misc													
Containers	V J	V J											
Sample Date	19/06/2012	19/06/2012											
Sample Type	Soil	Soil											
Batch Number	2	2											
Date of Receipt	26/06/2012	26/06/2012											
Arsenic #M	10.2	4.5									<0.5	mg/kg	TM30/PM15
Cadmium #M	<0.1	<0.1									<0.1	mg/kg	TM30/PM15
Chromium #M	26.6	13.5									<0.5	mg/kg	TM30/PM15
Copper #M	36	14									<1	mg/kg	TM30/PM15
Lead #M	79	7									<5	mg/kg	TM30/PM15
Mercury #M	0.2	<0.1									<0.1	mg/kg	TM30/PM15
Nickel #M	26.1	13.9									<0.7	mg/kg	TM30/PM15
Selenium #M	<1	<1									<1	mg/kg	TM30/PM15
Water Soluble Boron #M	0.9	0.3									<0.1	mg/kg	TM74/PM32
Zinc #M	79	39									<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #M	0.07	<0.04									<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.06	<0.03									<0.03	mg/kg	TM4/PM8
Acenaphthene #M	0.12	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene #M	0.07	<0.04									<0.04	mg/kg	TM4/PM8
Phenanthrene #M	0.92	<0.03									<0.03	mg/kg	TM4/PM8
Anthracene #	0.23	<0.04									<0.04	mg/kg	TM4/PM8
Fluoranthene #M	1.92	<0.03									<0.03	mg/kg	TM4/PM8
Pyrene #	1.67	<0.03									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.85	<0.06									<0.06	mg/kg	TM4/PM8
Chrysene #M	0.88	<0.02									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #M	1.30	<0.07									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.84	<0.04									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #M	0.43	<0.04									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	0.08	<0.04									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.43	<0.04									<0.04	mg/kg	TM4/PM8
PAH 16 Total	9.9	<0.6									<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.94	<0.05									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.36	<0.02									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	88	114									<0	%	TM4/PM8
EPH >C10-C12 #M	<10	<10									<10	mg/kg	TM5/PM8
EPH >C12-C16 #M	<10	<10									<10	mg/kg	TM5/PM8
EPH >C16-C21 #M	22	<10									<10	mg/kg	TM5/PM8
EPH >C21-C40	150	<10									<10	mg/kg	TM5/PM8
EPH >C10-C40	172	<30									<30	mg/kg	TM5/PM8
GRO (>C4-C8) #M^	<100	<100									<100	ug/kg	TM36/PM12
GRO (>C8-C12) #M^	<100	<100									<100	ug/kg	TM36/PM12
GRO (>C4-12) #M^	<100	<100									<100	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15									<0.15	mg/kg	TM26/PM21

Jones Environmental Laboratory

Client Name: WYG

Reference: A076252

Location: GRAPHENE

Contact: Kathryn Ellis

JE Job No.: 12/4921

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	39-40	43-44									LOD	Units	Method No.
Sample ID	CP2	CP2											
Depth	0.7	2.2											
COC No / misc													
Containers	V J	V J											
Sample Date	19/06/2012	19/06/2012											
Sample Type	Soil	Soil											
Batch Number	2	2											
Date of Receipt	26/06/2012	26/06/2012											
Hexavalent Chromium^	<0.3	<0.3									<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext)	0.0232	0.0153									<0.0015	g/l	TM38/PM20
Free Cyanide^	<0.5	<0.5									<0.5	mg/kg	TM89/PM45
Fibre Screen*	NFD	-										None	Subcontracted
pH# #M	8.64	8.44									<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 12/4921

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:

$	Sample temperature on receipt considered inappropriate for analysis requested.
^	Samples exceeding recommended holding times.
&	Samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials).
1	The pH was not tested within 6 hours of sampling and therefore the sample is considered deviating.
~	No sampling date given, unable to confirm if samples are with acceptable holding times.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

NOTE

Data is only accredited when all the requirements of our Quality System have been met. In certain circumstances where the requirements have not been met, the laboratory may issue the data in an interim report but will remove the accreditation, in this instance results should be considered indicative only. Where possible samples will be re-extracted and a final report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance.
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
NFD	No Fibres Detected

Jones Environmental Laboratory

Method Code Appendix

JE Job No 12/4921

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Air Dried (AD)	Solid Results expressed on Dry/Wet basis
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction			AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction	Yes		AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction	Yes	Yes	AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction			AR	
TM5	EPH by GC-FID, modified USEPA 8015	PM8	End Over End extraction			AR	DRY
TM5	EPH by GC-FID, modified USEPA 8015	PM8	End Over End extraction	Yes	Yes	AR	DRY
TM26	Phenols by HPLC	PM21	Methanol : Water extraction			AR	DRY
TM30	Metals by ICP-OES	PM15	Aqua Regia extraction (Soils)	Yes	Yes	AD	DRY
TM36	GRO by Headspace GC-FID	PM12	GRO GC-FID	Yes	Yes	AR	DRY
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM20	1:2 soil to water extraction			AD	DRY
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM20	1:2 soil to water extraction			AR	DRY
TM73	pH in by Metrohm	PM11	1:2.5 soil/water extraction	Yes	Yes	AR	WET
TM74	Water Soluble Boron by ICP-OES	PM32	Preparation of soils for WSB	Yes	Yes	AD	DRY
TM89	Cyanide by FIA	PM45	Cyanide & Thiocyanate prep for soils			AR	DRY
Subcontracted	Subcontracted					AR	

Jones Environmental Laboratory

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Deeside
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Fax: +44 (0) 1244 833781

WYG
Quay West at MediaCityUK
Trafford Wharf Road
Trafford Park
Manchester
M17 1HH

No.4225

Attention :	Kathryn Ellis
Date :	16th July, 2012
Your reference :	A076252
Our reference :	Test Report 12/4921 Batch 4 Schedule B
Location :	GRAPHENE
Date samples received :	29th June, 2012
Status :	Final report
Issue :	1

Two samples were received for analysis on 29th June, 2012. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton B.Sc
Project Manager

Bob Millward B.Sc
Principal Chemist

Client Name: WYG
Reference: A076252
Location: GRAPHENE
Contact: Kathryn Ellis
JE Job No.: 12/4921

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	51-52	LOD	Units	Method No.
Sample ID	WS6			
Depth	0.6			
COC No / misc				
Containers	V J			
Sample Date	20/06/2012			
Sample Type	Soil			
Batch Number	4			
Date of Receipt	29/06/2012			
TPH CWG				
Aliphatics				
>C5-C6 #M^	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 #M^	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10^	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 #M	0.9	<0.2	mg/kg	TM5/PM16
>C12-C16 #M	10	<4	mg/kg	TM5/PM16
>C16-C21 #M	9	<7	mg/kg	TM5/PM16
>C21-C35 #M	17	<7	mg/kg	TM5/PM16
Total aliphatics C5-35	37	<19	mg/kg	TM5/TM36/PM12/PM16
Aromatics				
>C5-EC7^	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8^	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #M^	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 #M	3.1	<0.2	mg/kg	TM5/PM16
>EC12-EC16 #M	128	<4	mg/kg	TM5/PM16
>EC16-EC21 #M	800	<7	mg/kg	TM5/PM16
>EC21-EC35 #M	1260	<7	mg/kg	TM5/PM16
Total aromatics C5-35	2191	<19	mg/kg	TM5/TM36/PM12/PM16
Total aliphatics and aromatics(C5-35)	2228	<38	mg/kg	TM5/TM36/PM12/PM16
MTBE #^	<5	<5	ug/kg	TM31/PM12
Benzene #^	<5	<5	ug/kg	TM31/PM12
Toluene #^	<5	<5	ug/kg	TM31/PM12
Ethylbenzene #^	<5	<5	ug/kg	TM31/PM12
m/p-Xylene #^	<5	<5	ug/kg	TM31/PM12
o-Xylene #^	<5	<5	ug/kg	TM31/PM12

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 12/4921

SOILS

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NOTE

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NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance.
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
NFD	No Fibres Detected

Jones Environmental Laboratory

Method Code Appendix

JE Job No 12/4921

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Air Dried (AD)	Solid Results expressed on Dry/Wet basis
TM5	EPH by GC-FID, modified USEPA 8015	PM16	Aliphatic/Aromatic fractionation	Yes	Yes	AR	DRY
TM5/TM36	TPH CWG by GC-FID	PM12/PM16	CWG GC-FID			AR	DRY
TM31	BTEX/MTBE by GC-FID, modified USEPA 8015	PM12	GRO GC-FID			AR	DRY
TM31	BTEX/MTBE by GC-FID, modified USEPA 8015	PM12	GRO GC-FID	Yes		AR	DRY
TM36	GRO by Headspace GC-FID	PM12	GRO GC-FID			AR	DRY
TM36	GRO by Headspace GC-FID	PM12	GRO GC-FID	Yes	Yes	AR	DRY

Jones Environmental Laboratory

Report: **Solid**

JE Job No:	12/4921	**Sample ID**	WS3	WS6
Client:	WYG	**Depth**	0.4	0.6
Client ref:	A076252	**Sample Type**	Soil	Soil
Location:	GRAPHENE	**Sampled Date**	20/06/2012	20/06/2012
Contact	Kathryn Ellis	**Sample Received Date**	29/06/2012	29/06/2012
		J E Sample No	49-50	51-52
		Batch Number	4	4

Test	Method	Units	LOD		
Arsenic #M	TM30/PM15	mg/kg	<0.5	50.6	17.7
Cadmium #M	TM30/PM15	mg/kg	<0.1	0.4	0.7
Chromium #M	TM30/PM15	mg/kg	<0.5	28.2	19.3
Copper #M	TM30/PM15	mg/kg	<1	97	170
Lead #M	TM30/PM15	mg/kg	<5	875	324
Mercury #M	TM30/PM15	mg/kg	<0.1	1.3	0.9
Nickel #M	TM30/PM15	mg/kg	<0.7	36.6	22
Selenium #M	TM30/PM15	mg/kg	<1	<1	<1
Water Soluble Boron #M	TM74/PM32	mg/kg	<0.1	1.3	0.7
Zinc #M	TM30/PM15	mg/kg	<5	277	219
PAH MS					
Naphthalene #M	TM4/PM8	mg/kg	<0.04	0.61	7.22
Acenaphthylene	TM4/PM8	mg/kg	<0.03	<0.15	5.92
Acenaphthene #M	TM4/PM8	mg/kg	<0.05	0.51	13.27
Fluorene #M	TM4/PM8	mg/kg	<0.04	<0.20	11.34
Phenanthrene #M	TM4/PM8	mg/kg	<0.03	4.19	117.68
Anthracene #	TM4/PM8	mg/kg	<0.04	0.57	21.95
Fluoranthene #M	TM4/PM8	mg/kg	<0.03	9.01	135.45
Pyrene #	TM4/PM8	mg/kg	<0.03	9.48	111.93
Benzo(a)anthracene #	TM4/PM8	mg/kg	<0.06	4.31	54.01
Chrysene #M	TM4/PM8	mg/kg	<0.02	7.38	64.92
Benzo(bk)fluoranthene #M	TM4/PM8	mg/kg	<0.07	5.54	68.58
Benzo(a)pyrene #	TM4/PM8	mg/kg	<0.04	2.52	41.46
Indeno(123cd)pyrene #M	TM4/PM8	mg/kg	<0.04	1.63	32.8
Dibenzo(ah)anthracene #	TM4/PM8	mg/kg	<0.04	0.47	5.93
Benzo(ghi)perylene #	TM4/PM8	mg/kg	<0.04	2.23	28.97
PAH 16 Total	TM4/PM8	mg/kg	<0.6	48.5	721.4
Benzo(b)fluoranthene	TM4/PM8	mg/kg	<0.05	3.99	49.38
Benzo(k)fluoranthene	TM4/PM8	mg/kg	<0.02	1.55	19.2
PAH Surrogate % Recovery	TM4/PM8	%	<0	95	87
EPH >C10-C12 #M	TM5/PM8	mg/kg	<10	<10	49
EPH >C12-C16 #M	TM5/PM8	mg/kg	<10	12	257
EPH >C16-C21 #M	TM5/PM8	mg/kg	<10	124	1261
EPH >C21-C40	TM5/PM8	mg/kg	<10	492	3074
EPH >C10-C40	TM5/PM8	mg/kg	<30	628	4641
GRO (>C4-C8) #M	TM36/PM12	ug/kg	<100	<100	<100
GRO (>C8-C12) #M	TM36/PM12	ug/kg	<100	<100	<100
GRO (>C4-12) #M	TM36/PM12	ug/kg	<100	<100	<100
Total Phenols HPLC	TM26/PM21	mg/kg	<0.15	<0.15	<0.15
Hexavalent Chromium	TM38/PM20	mg/kg	<0.3	<0.3	<0.3
Sulphate as SO4 (2:1 Ext)	TM38/PM20	g/l	<0.0015	0.02	0.013
Free Cyanide	TM89/PM45	mg/kg	<0.5	<0.5	<0.5
Fibre Screen*	Subcontracted	None		NFD	NFD
pH↑ #M	TM73/PM11	pH units	<0.01	8.16	8.41

Jones Environmental Laboratory

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WYG
Quay West at MediaCityUK
Trafford Wharf Road
Trafford Park
Manchester
M17 1HH

No.4225

Attention :	Kathryn Ellis
Date :	9th July, 2012
Your reference :	A076252
Our reference :	Test Report 12/4921 Batch 1 Schedule B
Location :	GRAPHENE
Date samples received :	20th June, 2012
Status :	Final report
Issue :	1

Seventeen samples were received for analysis on 20th June, 2012. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton B.Sc
Project Manager

Bob Millward B.Sc
Principal Chemist

Client Name: WYG
Reference: A076252
Location: GRAPHENE
Contact: Kathryn Ellis
JE Job No.: 12/4921

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	37-38	LOD	Units	Method No.
Sample ID	CP1			
Depth	1.4			
COC No / misc				
Containers	V J			
Sample Date	18/06/2012			
Sample Type	Soil			
Batch Number	1			
Date of Receipt	20/06/2012			
Arsenic #M	5.8	<0.5	mg/kg	TM30/PM15
Cadmium #M	<0.1	<0.1	mg/kg	TM30/PM15
Chromium #M	16.5	<0.5	mg/kg	TM30/PM15
Copper #M	15	<1	mg/kg	TM30/PM15
Lead #M	36	<5	mg/kg	TM30/PM15
Mercury #M	<0.1	<0.1	mg/kg	TM30/PM15
Nickel #M	16.0	<0.7	mg/kg	TM30/PM15
Selenium #M	<1	<1	mg/kg	TM30/PM15
Water Soluble Boron #M	0.4	<0.1	mg/kg	TM74/PM32
Zinc #M	50	<5	mg/kg	TM30/PM15
PAH MS				
Naphthalene #M	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #M	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #M	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #M	0.03	<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene #M	<0.03	<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06	mg/kg	TM4/PM8
Chrysene #M	<0.02	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #M	<0.07	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #M	<0.04	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	103	<0	%	TM4/PM8
EPH >C10-C12 #M	<10	<10	mg/kg	TM5/PM8
EPH >C12-C16 #M	<10	<10	mg/kg	TM5/PM8
EPH >C16-C21 #M	<10	<10	mg/kg	TM5/PM8
EPH >C21-C40	<10	<10	mg/kg	TM5/PM8
EPH >C10-C40	<30	<30	mg/kg	TM5/PM8
GRO (>C4-C8) #M	<100	<100	ug/kg	TM36/PM12
GRO (>C8-C12) #M	<100	<100	ug/kg	TM36/PM12
GRO (>C4-12) #M	<100	<100	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15	mg/kg	TM26/PM21

Jones Environmental Laboratory

Client Name: WYG

Reference: A076252

Location: GRAPHENE

Contact: Kathryn Ellis

JE Job No.: 12/4921

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	37-38													
Sample ID	CP1													
Depth	1.4													
COC No / misc														
Containers	V J													
Sample Date	18/06/2012													
Sample Type	Soil													
Batch Number	1													
Date of Receipt	20/06/2012													
												LOD	Units	Method No.
Hexavalent Chromium	<0.3											<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext)	0.0152											<0.0015	g/l	TM38/PM20
Free Cyanide	<0.5											<0.5	mg/kg	TM89/PM45
pH[1] #M	8.46											<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 12/4921

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:

$	Sample temperature on receipt considered inappropriate for analysis requested.
^	Samples exceeding recommended holding times.
&	Samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials).
1	The pH was not tested within 6 hours of sampling and therefore the sample is considered deviating.
~	No sampling date given, unable to confirm if samples are with acceptable holding times.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

NOTE

Data is only accredited when all the requirements of our Quality System have been met. In certain circumstances where the requirements have not been met, the laboratory may issue the data in an interim report but will remove the accreditation, in this instance results should be considered indicative only. Where possible samples will be re-extracted and a final report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance.
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
NFD	No Fibres Detected

Jones Environmental Laboratory

Method Code Appendix

JE Job No 12/4921

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Air Dried (AD)	Solid Results expressed on Dry/Wet basis
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction			AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction	Yes		AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction	Yes	Yes	AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction			AR	
TM5	EPH by GC-FID, modified USEPA 8015	PM8	End Over End extraction			AR	DRY
TM5	EPH by GC-FID, modified USEPA 8015	PM8	End Over End extraction	Yes	Yes	AR	DRY
TM26	Phenols by HPLC	PM21	Methanol : Water extraction			AR	DRY
TM30	Metals by ICP-OES	PM15	Aqua Regia extraction (Soils)	Yes	Yes	AD	DRY
TM36	GRO by Headspace GC-FID	PM12	GRO GC-FID	Yes	Yes	AR	DRY
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM20	1:2 soil to water extraction			AD	DRY
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM20	1:2 soil to water extraction			AR	DRY
TM73	pH in by Metrohm	PM11	1:2.5 soil/water extraction	Yes	Yes	AR	WET
TM74	Water Soluble Boron by ICP-OES	PM32	Preparation of soils for WSB	Yes	Yes	AD	DRY
TM89	Cyanide by FIA	PM45	Cyanide & Thiocyanate prep for soils			AR	DRY

Jones Environmental Laboratory

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No.4225

Attention :	Kathryn Ellis
Date :	29th June, 2012
Your reference :	A076252
Our reference :	Test Report 12/4921 Batch 1 Schedule A
Location :	GRAPHENE
Date samples received :	20th June, 2012
Status :	Final report
Issue :	1

Seventeen samples were received for analysis on 20th June, 2012. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Jamie Williams B.Sc
Project Co-ordinator

Bob Millward B.Sc
Principal Chemist

Client Name: WYG
Reference: A076252
Location: GRAPHENE
Contact: Kathryn Ellis
JE Job No.: 12/4921

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	3-4	7-8	11-12	15-16	17-20	21-22	23-24	29-30	33-34		LOD	Units	Method No.
Sample ID	TP5	TP3	TP4	TP4	TP1	TP1	TP1	TP2	TP2				
Depth	1.0	0.3	0.4	1.4	0.1	0.7	2.8	0.9	1.6				
COC No / misc													
Containers	V J	V J	V J	V J	V J T	V J	V J	V J	T				
Sample Date	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012				
Arsenic #M	10.4	12.8	-	8.3	-	15.4	7.6	16.2	-		<0.5	mg/kg	TM30/PM15
Beryllium	1.0	-	-	1.0	-	1.3	-	-	-		<0.5	mg/kg	TM30/PM15
Cadmium #M	<0.1	0.4	-	<0.1	-	0.8	<0.1	0.9	-		<0.1	mg/kg	TM30/PM15
Chromium #M	19.2	19.6	-	21.5	-	32.0	16.3	23.4	-		<0.5	mg/kg	TM30/PM15
Copper #M	20	40	-	20	-	126	12	71	-		<1	mg/kg	TM30/PM15
Lead #M	39	121	-	152	-	525	10	379	-		<5	mg/kg	TM30/PM15
Mercury #M	<0.1	0.3	-	<0.1	-	0.6	<0.1	0.3	-		<0.1	mg/kg	TM30/PM15
Nickel #M	17.3	24.0	-	19.9	-	28.3	18.1	25.8	-		<0.7	mg/kg	TM30/PM15
Selenium #M	<1	<1	-	1	-	<1	<1	<1	-		<1	mg/kg	TM30/PM15
Vanadium	29	-	-	29	-	33	-	-	-		<1	mg/kg	TM30/PM15
Water Soluble Boron #M	1.1	0.6	-	0.7	-	0.5	0.3	0.8	-		<0.1	mg/kg	TM74/PM32
Zinc #M	48	153	-	67	-	404	54	261	-		<5	mg/kg	TM30/PM15
PAH MS					x20 dilution				x10 dilution				
Naphthalene #M	<0.04	0.32	0.18	<0.04	<0.80	1.74	<0.04	0.07	<0.40		<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	0.24	0.20	<0.03	<0.60	0.42	<0.03	0.06	0.87		<0.03	mg/kg	TM4/PM8
Acenaphthene #M	<0.05	0.38	0.09	<0.05	<1.00	8.15	<0.05	0.14	<0.50		<0.05	mg/kg	TM4/PM8
Fluorene #M	<0.04	0.39	0.08	<0.04	<0.80	5.72	<0.04	0.09	<0.40		<0.04	mg/kg	TM4/PM8
Phenanthrene #M	<0.03	3.85	1.37	<0.03	3.33	51.04	<0.03	1.19	2.72		<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	0.95	0.34	<0.04	0.93	8.63	<0.04	0.32	1.93		<0.04	mg/kg	TM4/PM8
Fluoranthene #M	<0.03	5.34	2.98	<0.03	5.63	42.12	<0.03	2.52	6.07		<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	4.55	2.71	<0.03	4.69	40.27	<0.03	1.87	5.18		<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	2.98	1.92	<0.06	4.27	21.32	<0.06	1.09	5.35		<0.06	mg/kg	TM4/PM8
Chrysene #M	<0.02	2.31	1.50	<0.02	2.88	19.47	<0.02	1.06	5.69		<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #M	<0.07	4.25	2.67	<0.07	4.48	24.36	<0.07	1.92	12.11		<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	2.72	1.60	<0.04	2.53	16.24	<0.04	1.10	6.03		<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #M	<0.04	1.86	1.18	<0.04	1.97	10.14	<0.04	0.77	5.22		<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	0.32	0.29	<0.04	<0.80	1.64	<0.04	0.14	1.55		<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	1.45	1.01	<0.04	1.60	9.92	<0.04	0.60	5.39		<0.04	mg/kg	TM4/PM8
Coronene	-	-	0.20	-	<0.80	-	-	-	1.64		<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	31.9	-	<0.6	-	261.2	<0.6	12.9	-		<0.6	mg/kg	TM4/PM8
PAH 17 Total	-	-	18.32	-	32.31	-	-	-	59.75		<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	3.06	1.92	<0.05	3.23	17.54	<0.05	1.38	8.72		<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	1.19	0.75	<0.02	1.25	6.82	<0.02	0.54	3.39		<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	106	104	111	88	83	110	108	108	110		<0	%	TM4/PM8
EPH >C10-C12 #M	-	<10	-	-	-	-	<10	<10	-		<10	mg/kg	TM5/PM8
EPH >C12-C16 #M	-	<10	-	-	-	-	<10	<10	-		<10	mg/kg	TM5/PM8
EPH >C16-C21 #M	-	58	-	-	-	-	<10	<10	-		<10	mg/kg	TM5/PM8
EPH >C21-C40	-	466	-	-	-	-	<10	95	-		<10	mg/kg	TM5/PM8
EPH >C10-C40	-	524	-	-	-	-	<30	95	-		<30	mg/kg	TM5/PM8
Mineral Oil (C8-C40)	-	-	<30	-	<30	-	-	-	56		<30	mg/kg	TM5/PM16

Jones Environmental Laboratory

Client Name: WYG

Reference: A076252

Location: GRAPHENE

Contact: Kathryn Ellis

JE Job No.: 12/4921

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	3-4	7-8	11-12	15-16	17-20	21-22	23-24	29-30	33-34		LOD	Units	Method No.
Sample ID	TP5	TP3	TP4	TP4	TP1	TP1	TP1	TP2	TP2				
Depth	1.0	0.3	0.4	1.4	0.1	0.7	2.8	0.9	1.6				
COC No / misc													
Containers	V J	V J	V J	V J	V J T	V J	V J	V J	T				
Sample Date	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012				
TPH CWG													
Aliphatics													
>C5-C6 #M	<0.1	-	-	<0.1	-	<0.1	-	-	-		<0.1	mg/kg	TM36/PM12
>C6-C8 #M	<0.1	-	-	<0.1	-	<0.1	-	-	-		<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1	-	-	<0.1	-	<0.1	-	-	-		<0.1	mg/kg	TM36/PM12
>C10-C12 #M	<0.2	-	-	<0.2	-	<0.2	-	-	-		<0.2	mg/kg	TM5/PM16
>C12-C16 #M	<4	-	-	<4	-	<4	-	-	-		<4	mg/kg	TM5/PM16
>C16-C21 #M	<7	-	-	<7	-	<7	-	-	-		<7	mg/kg	TM5/PM16
>C21-C35 #M	<7	-	-	<7	-	23	-	-	-		<7	mg/kg	TM5/PM16
>C35-C44	<7	-	-	<7	-	<7	-	-	-		<7	mg/kg	TM5/PM16
Total aliphatics C5-44	<26	-	-	<26	-	<26	-	-	-		<26	mg/kg	TM5/TM36/PM16
Aromatics													
>C5-EC7	<0.1	-	-	<0.1	-	<0.1	-	-	-		<0.1	mg/kg	TM36/PM12
>EC7-EC8	<0.1	-	-	<0.1	-	<0.1	-	-	-		<0.1	mg/kg	TM36/PM12
>EC8-EC10 #M	<0.1	-	-	<0.1	-	<0.1	-	-	-		<0.1	mg/kg	TM36/PM12
>EC10-EC12 #M	<0.2	-	-	<0.2	-	<0.2	-	-	-		<0.2	mg/kg	TM5/PM16
>EC12-EC16 #M	<4	-	-	<4	-	5	-	-	-		<4	mg/kg	TM5/PM16
>EC16-EC21 #M	<7	-	-	<7	-	49	-	-	-		<7	mg/kg	TM5/PM16
>EC21-EC35 #M	<7	-	-	<7	-	159	-	-	-		<7	mg/kg	TM5/PM16
>EC35-EC44	<7	-	-	<7	-	<7	-	-	-		<7	mg/kg	TM5/PM16
Total aromatics C5-44	<26	-	-	<26	-	213	-	-	-		<26	mg/kg	TM5/TM36/PM16
Total aliphatics and aromatics(C5-44)	<52	-	-	<52	-	213	-	-	-		<52	mg/kg	TM5/TM36/PM16
GRO (>C4-C8) #M	-	<100	-	-	-	-	<100	<100	-		<100	ug/kg	TM36/PM12
GRO (>C8-C12) #M	-	<100	-	-	-	-	<100	<100	-		<100	ug/kg	TM36/PM12
GRO (>C4-12) #M	-	<100	-	-	-	-	<100	<100	-		<100	ug/kg	TM36/PM12
MTBE #	<5	-	<5	<5	<5	<5	-	-	<5 &		<5	ug/kg	TM31/PM12
Benzene #	<5	-	<5	<5	<5	<5	-	-	<5 &		<5	ug/kg	TM31/PM12
Toluene #	<5	-	<5	<5	<5	<5	-	-	<5 &		<5	ug/kg	TM31/PM12
Ethylbenzene #	<5	-	<5	<5	<5	<5	-	-	<5 &		<5	ug/kg	TM31/PM12
m/p-Xylene #	<5	-	<5	<5	<5	<5	-	-	<5 &		<5	ug/kg	TM31/PM12
o-Xylene #	<5	-	<5	<5	<5	<5	-	-	<5 &		<5	ug/kg	TM31/PM12
Total Phenols HPLC	-	<0.15	-	-	-	-	<0.15	<0.15	-		<0.15	mg/kg	TM26/PM21
Phenol	<0.01	-	-	<0.01	-	<0.01	-	-	-		<0.01	mg/kg	TM26/PM21
Hexavalent Chromium	<0.3	<0.3	-	<0.3	-	<0.3	<0.3	<0.3	-		<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext)	0.0106	0.1676	-	0.0368	-	0.0181	0.0099	0.0269	-		<0.0015	g/l	TM38/PM20
Free Cyanide	<0.5	<0.5	-	<0.5	-	<0.5	<0.5	<0.5	-		<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	-	-	3.6	-	7.1	-	-	-	2.9		<0.2	%	TM21/PM24
Fraction Organic Carbon	0.010	-	-	0.006	-	0.040	-	-	-		<0.001	None	TM21/PM24

Jones Environmental Laboratory

Client Name: WYG

Reference: A076252

Location: GRAPHENE

Contact: Kathryn Ellis

JE Job No.: 12/4921

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	3-4	7-8	11-12	15-16	17-20	21-22	23-24	29-30	33-34		LOD	Units	Method No.
Sample ID	TP5	TP3	TP4	TP4	TP1	TP1	TP1	TP2	TP2				
Depth	1.0	0.3	0.4	1.4	0.1	0.7	2.8	0.9	1.6				
COC No / misc													
Containers	V J	V J	V J	V J	V J T	V J	V J	V J	T				
Sample Date	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012				
PCB 28 #	-	-	<5	-	<5	-	-	-	<5		<5	ug/kg	TM86/PM8
PCB 52 #	-	-	<5	-	<5	-	-	-	<5		<5	ug/kg	TM86/PM8
PCB 101 #	-	-	<5	-	<5	-	-	-	<5		<5	ug/kg	TM86/PM8
PCB 118 #	-	-	<5	-	<5	-	-	-	<5		<5	ug/kg	TM86/PM8
PCB 138 #	-	-	<5	-	<5	-	-	-	<5		<5	ug/kg	TM86/PM8
PCB 153 #	-	-	<5	-	<5	-	-	-	<5		<5	ug/kg	TM86/PM8
PCB 180 #	-	-	<5	-	<5	-	-	-	<5		<5	ug/kg	TM86/PM8
Total 7 PCBs #	-	-	<35	-	<35	-	-	-	<35		<35	ug/kg	TM86/PM8
ANC at pH4	-	-	0.36	-	0.39	-	-	-	0.37		<0.03	mol/kg	TM77/PM0
ANC at pH7	-	-	0.04	-	0.29	-	-	-	0.28		<0.03	mol/kg	TM77/PM0
Fibre Screen*	NFD	NFD	-	NFD	-	NFD	-	NFD	-			None	Subcontracted
Loss on Ignition #	-	-	6.9	-	8.0	-	-	-	5.2		<1.0	%	TM22/PM0
pH: #M	8.59	8.39	8.35	8.24	8.38	8.51	8.13	8.59	8.23		<0.01	pH units	TM73/PM11
Sample Type	Sand	Clay	Sand	Clayey Sand	Loamy Sand	Sand	Sand	Sand	Sand			None	PM13/PM0
Sample Colour	Light Brown	Medium Brown	Black	Medium Brown	Black	Dark Brown	Light Brown	Light Grey	Dark Brown			None	PM13/PM0
Other Items	stones/ minor brick fragments	sand/ stones/tar	stones/oil	stones/ minor brick fragments	stones	stones	tones	stones/ minor brick fragments	stones/ minor brick fragments			None	PM13/PM0

Jones Environmental Laboratory

Client Name: WYG

Reference: A076252

Location: GRAPHENE

Contact: Kathryn Ellis

JE Job No.: 12/4921

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	7-8	21-22	23-24	LOD	Units	Method No.
Sample ID	TP3	TP1	TP1			
Depth	0.3	0.7	2.8			
COC No / misc						
Containers	V J	V J	V J			
Sample Date	18/06/2012	18/06/2012	18/06/2012			
Sample Type	Soil	Soil	Soil			
Batch Number	1	1	1			
Date of Receipt	20/06/2012	20/06/2012	20/06/2012			
Dissolved Arsenic #	11.3	7.3	4.6	<0.9	ug/l	TM30/PM14
Dissolved Boron #	43	<12	<12	<12	ug/l	TM30/PM14
Dissolved Cadmium #	0.07	0.08	0.49	<0.03	ug/l	TM30/PM14
Dissolved Chromium #	3.5	9.9	4.2	<0.2	ug/l	TM30/PM14
Dissolved Copper #	9	9	4	<3	ug/l	TM30/PM14
Dissolved Lead #	8.6	30.5	4.0	<0.4	ug/l	TM30/PM14
Dissolved Nickel #	0.9	<0.2	0.7	<0.2	ug/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2	ug/l	TM30/PM14
Dissolved Zinc #	<3	6	5	<3	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	0.19	0.53	0.18	<0.01	ug/l	TM61/PM38
Sulphate #	32.18	5.10	4.09	<0.05	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	0.06	0.05	<0.03	<0.03	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01	<0.01	<0.01	mg/l	TM89/PM0
Mass of raw test portion	0.1081	0.1053	0.0956		kg	NONE/PM17
Leachant Volume	0.882	0.884	0.894		l	NONE/PM17
pH	8.34	8.15	7.56	<0.01	pH units	TM73/PM0

Jones Environmental Laboratory

CEN 2 BATCH LEACHATE RESULTS

Mass of sample taken (kg) =	0.213	Moisture Content Ratio (%) =	21.2
Mass of dry sample (kg) =	0.175	Dry Matter Content Ratio (%) =	82.5
Particle Size <4mm =	>95%		

JEFL Job No	12/4921	Landfill Waste Acceptance Criteria Limits		
Sample No	12			
Client Sample No	TP4			
Depth/Other	0.4	Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Sample Date	18/06/2012			
Batch No	1			
Solid Waste Analysis				
Total Organic Carbon (%)	3.6	3	5	6
Loss on Ignition (%)	6.9	-	-	10
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<30	500	-	-
PAH Sum of 17(mg/kg)	18.32	100	-	-
pH (pH Units)	8.35	-	>6	-
ANC to pH 7 (mol/kg)	0.04	-	to be evaluated	to be evaluated
ANC to pH 4 (mol/kg)	0.36	-	to be evaluated	to be evaluated

Eluate Analysis	Conc^{n} in 2:1 eluate	Conc^{n} in 8:1 eluate	2:1 conc^{n} leached	Cumulative 10:1 conc^{n} leached	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	C_2	C_8	A_2	A_{2-10}			
	mg/l		mg/kg		mg/kg		
Arsenic	0.0054	0.0105	0.011	0.098	0.5	2	25
Barium	0.024	0.010	0.048	0.12	20	100	300
Cadmium	<0.0005	<0.0005	<0.001	<0.005	0.04	1	5
Chromium	0.0079	0.0595	0.016	0.524	0.5	10	70
Copper	0.012	0.014	0.024	0.14	2	50	100
Mercury	<0.0006	<0.0006	<0.0012	<0.006	0.01	0.2	2
Molybdenum	0.015	0.004	0.030	0.06	0.5	10	30
Nickel	<0.002	0.005	<0.004	0.04	0.4	10	40
Lead	0.012	0.023	0.02	0.21	0.5	10	50
Antimony	0.013	0.009	0.026	0.10	0.06	0.7	5
Selenium	<0.003	<0.003	<0.006	<0.03	0.1	0.5	7
Zinc	0.012	0.101	0.024	0.89	4	50	200
Chloride	1.4	<0.3	2.8	<3	800	15000	25000
Fluoride	1.7	1.1	3.4	12	10	150	500
Sulphate as SO4	54.87	5.94	109.8	126.5	1000	20000	50000
Total Dissolved Solids	214	110	428	1243	4000	60000	100000
Phenol	0.07	<0.05	0.1	<0.5	1	-	-
Dissolved Organic Carbon	13	8	26	87	500	800	1000

Leachate Information		
Date Prepared	26/06/2012	26/06/2012
pH (pH Units)	8.12	8.29
Conductivity (µS/cm)	273	112
Temperature (°C)	21	22.8
Volume Leachant (Litres)	0.313	1.4
Volume of Eluate VE1 (Litres)	0.240	

Jones Environmental Laboratory

CEN 2 BATCH LEACHATE RESULTS

Mass of sample taken (kg) =	0.200	Moisture Content Ratio (%) =	14.6
Mass of dry sample (kg) =	0.175	Dry Matter Content Ratio (%) =	87.2
Particle Size <4mm =	>95%		

JEFL Job No	**12/4921**			**Landfill Waste Acceptance Criteria Limits**		
Sample No	**19**					
Client Sample No	**TP1**			**Inert Waste Landfill**	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Depth/Other	**0.1**					
Sample Date	**18/06/2012**					
Batch No	**1**					
Solid Waste Analysis						
Total Organic Carbon (%)	7.1			3	5	6
Loss on Ignition (%)	8.0			-	-	10
Sum of BTEX (mg/kg)	<0.025			6	-	-
Sum of 7 PCBs (mg/kg)	<0.035			1	-	-
Mineral Oil (mg/kg)	<30			500	-	-
PAH Sum of 17(mg/kg)	32.31			100	-	-
pH (pH Units)	8.38			-	>6	-
ANC to pH 7 (mol/kg)	0.29			-	to be evaluated	to be evaluated
ANC to pH 4 (mol/kg)	0.39			-	to be evaluated	to be evaluated

Eluate Analysis	**Conc^{n} in 2:1 eluate**	**Conc^{n} in 8:1 eluate**	**2:1 conc^{n} leached**	**Cumulative 10:1 conc^{n} leached**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	C_2	**C_8**	**A_2**	**A_{2-10}**			
	mg/l		**mg/kg**		**mg/kg**		
Arsenic	0.0058	0.0084	0.012	0.080	0.5	2	25
Barium	0.043	0.035	0.086	0.36	20	100	300
Cadmium	<0.0005	<0.0005	<0.001	<0.005	0.04	1	5
Chromium	0.0030	0.0118	0.006	0.105	0.5	10	70
Copper	0.010	0.007	0.020	0.07	2	50	100
Mercury	<0.0006	<0.0006	<0.0012	<0.006	0.01	0.2	2
Molybdenum	0.011	0.005	0.022	0.06	0.5	10	30
Nickel	<0.002	<0.002	<0.004	<0.02	0.4	10	40
Lead	0.005	<0.005	<0.01	<0.05	0.5	10	50
Antimony	0.003	0.003	0.006	0.03	0.06	0.7	5
Selenium	<0.003	<0.003	<0.006	<0.03	0.1	0.5	7
Zinc	0.011	0.027	0.022	0.25	4	50	200
Chloride	1.1	<0.3	2.2	<3	800	15000	25000
Fluoride	2.0	1.0	4.0	11	10	150	500
Sulphate as SO4	15.26	11.27	30.5	118.4	1000	20000	50000
Total Dissolved Solids	180	132	360	1388	4000	60000	100000
Phenol	0.11	0.05	0.2	0.6	1	-	-
Dissolved Organic Carbon	12	7	24	77	500	800	1000

Leachate Information		
Date Prepared	26/06/2012	26/06/2012
pH (pH Units)	8.18	8.52
Conductivity (µS/cm)	217	125
Temperature (°C)	20.9	22.1
Volume Leachant (Litres)	0.324	1.4
Volume of Eluate VE1 (Litres)	0.250	

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Jones Environmental Laboratory

CEN 2 BATCH LEACHATE RESULTS

Mass of sample taken (kg) =	0.207	Moisture Content Ratio (%) =	18.4
Mass of dry sample (kg) =	0.175	Dry Matter Content Ratio (%) =	84.5
Particle Size <4mm =	>95%		

JEFL Job No	**12/4921**			**Landfill Waste Acceptance Criteria Limits**		
Sample No	**33**					
Client Sample No	**TP2**			**Inert Waste Landfill**	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Depth/Other	**1.6**					
Sample Date	**18/06/2012**					
Batch No	**1**					
Solid Waste Analysis						
Total Organic Carbon (%)	2.9			3	5	6
Loss on Ignition (%)	5.2			-	-	10
Sum of BTEX (mg/kg)	<0.025			6	-	-
Sum of 7 PCBs (mg/kg)	<0.035			1	-	-
Mineral Oil (mg/kg)	56			500	-	-
PAH Sum of 17(mg/kg)	59.75			100	-	-
pH (pH Units)	8.23			-	>6	-
ANC to pH 7 (mol/kg)	0.28			-	to be evaluated	to be evaluated
ANC to pH 4 (mol/kg)	0.37			-	to be evaluated	to be evaluated

Eluate Analysis	**Conc^{n} in 2:1 eluate**	**Conc^{n} in 8:1 eluate**	**2:1 conc^{n} leached**	**Cumulative 10:1 conc^{n} leached**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	C_2	**C_8**	**A_2**	**A_{2-10}**			
	mg/l		**mg/kg**		**mg/kg**		
Arsenic	0.0048	0.0083	0.010	0.078	0.5	2	25
Barium	0.055	0.039	0.110	0.41	20	100	300
Cadmium	<0.0005	<0.0005	<0.001	<0.005	0.04	1	5
Chromium	0.0117	0.0224	0.023	0.209	0.5	10	70
Copper	0.007	0.008	0.014	0.08	2	50	100
Mercury	<0.0006	<0.0006	<0.0012	<0.006	0.01	0.2	2
Molybdenum	0.012	0.006	0.024	0.07	0.5	10	30
Nickel	<0.002	<0.002	<0.004	<0.02	0.4	10	40
Lead	<0.005	0.008	<0.01	0.07	0.5	10	50
Antimony	0.007	0.005	0.014	0.05	0.06	0.7	5
Selenium	<0.003	<0.003	<0.006	<0.03	0.1	0.5	7
Zinc	0.011	0.029	0.022	0.27	4	50	200
Chloride	1.7	0.5	3.4	7	800	15000	25000
Fluoride	0.7	0.6	1.4	6	10	150	500
Sulphate as SO4	330.22	59.47	660.8	966.1	1000	20000	50000
Total Dissolved Solids	652	148	1305	2171	4000	60000	100000
Phenol	1.53	0.13	3.1	3.2	1	-	-
Dissolved Organic Carbon	12	10	24	103	500	800	1000

Leachate Information		
Date Prepared	26/06/2012	26/06/2012
pH (pH Units)	8.10	8.46
Conductivity (µS/cm)	785	295
Temperature (°C)	20.9	22.8
Volume Leachant (Litres)	0.318	1.4
Volume of Eluate VE1 (Litres)	0.240	

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All solid results are expressed on a dry weight basis unless stated otherwise.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 12/4921

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:

$	Sample temperature on receipt considered inappropriate for analysis requested.
^	Samples exceeding recommended holding times.
&	Samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials).
1	The pH was not tested within 6 hours of sampling and therefore the sample is considered deviating.
~	No sampling date given, unable to confirm if samples are with acceptable holding times.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

NOTE

Data is only accredited when all the requirements of our Quality System have been met. In certain circumstances where the requirements have not been met, the laboratory may issue the data in an interim report but will remove the accreditation, in this instance results should be considered indicative only. Where possible samples will be re-extracted and a final report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance.
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
NFD	No Fibres Detected

JE Job No 12/4921

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Air Dried (AD)	Solid Results expressed on Dry/Wet basis
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction			AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction	Yes		AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction	Yes	Yes	AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction			AR	
TM5	EPH by GC-FID, modified USEPA 8015	PM16	Aliphatic/Aromatic fractionation			AR	DRY
TM5	EPH by GC-FID, modified USEPA 8015	PM16	Aliphatic/Aromatic fractionation	Yes	Yes	AR	DRY
TM5	EPH by GC-FID, modified USEPA 8015	PM8	End Over End extraction			AR	DRY
TM5	EPH by GC-FID, modified USEPA 8015	PM8	End Over End extraction	Yes	Yes	AR	DRY
TM5/TM36	TPH CWG by GC-FID	PM16	Aliphatic/Aromatic fractionation			AR	DRY
PM13	Soil Typing for MCERTS	PM0	No Preparation			AR	
TM20	TDS, TSS and TS - gravimetric	PM0	No Preparation			AR	DRY
TM21	TOC and TC by Combustion	PM24	Eltra preparation			AD	DRY
TM21	TOC and TC by Combustion	PM24	Eltra preparation	Yes		AD	DRY
TM22	Loss on Ignition (LOI) - gravimetric	PM0	No Preparation	Yes		AD	DRY
TM26	Phenols by HPLC	PM21	Methanol : Water extraction			AR	DRY
TM27	SO4,Cl,NO3,NO2,F,PO4 by Dionex	PM0	No Preparation			AR	DRY
TM30	Metals by ICP-OES	PM14	Metals by ICP (Waters)			AR	DRY
TM30	Metals by ICP-OES	PM14	Metals by ICP (Waters)	Yes		AR	DRY
TM30	Metals by ICP-OES	PM15	Aqua Regia extraction (Soils)			AD	DRY
TM30	Metals by ICP-OES	PM15	Aqua Regia extraction (Soils)	Yes	Yes	AD	DRY
TM31	BTEX/MTBE by GC-FID, modified USEPA 8015	PM12	GRO GC-FID			AR	DRY
TM31	BTEX/MTBE by GC-FID, modified USEPA 8015	PM12	GRO GC-FID	Yes		AR	DRY
TM36	GRO by Headspace GC-FID	PM12	GRO GC-FID			AR	DRY
TM36	GRO by Headspace GC-FID	PM12	GRO GC-FID	Yes	Yes	AR	DRY
TM36	GRO by Headspace GC-FID	PM12	GRO GC-FID			AR	DRY
TM36	GRO by Headspace GC-FID	PM12	GRO GC-FID	Yes	Yes	AR	DRY
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM0	No Preparation			AR	DRY
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM0	No Preparation	Yes		AR	DRY
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM20	1:2 soil to water extraction			AD	DRY
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM20	1:2 soil to water extraction			AR	DRY
TM60	TOC/DOC by NDIR	PM0	No Preparation			AR	DRY
TM61	Mercury - low level CVAF	PM38	Mercury CVAF	Yes		AR	DRY
TM73	pH in by Metrohm	PM0	No Preparation			AR	DRY
TM73	pH in by Metrohm	PM11	1:2.5 soil/water extraction	Yes	Yes	AR	WET
TM74	Water Soluble Boron by ICP-OES	PM32	Preparation of soils for WSB	Yes	Yes	AD	DRY
TM77	ANC at pH4 and pH7 by Metrohm	PM0	No Preparation			AR	WET
TM86	PCB 7 congeners by ECD	PM8	End Over End extraction	Yes		AR	DRY
TM89	Cyanide by FIA	PM0	No Preparation	Yes		AR	DRY
TM89	Cyanide by FIA	PM45	Cyanide & Thiocyanate prep for soils			AR	DRY
TM101	Phenol Index 4-aminoantipyrine spectrophotometric	PM0	No Preparation			AR	DRY
NONE	No Method Code	PM17	CEN PR12457-2 10:1 1 batch leach				
NONE	No Method Code	PM18	CEN PR12457-3 10:1 2 batch leach			AR	DRY
NONE	No Method Code	PM4	Moisture Content			AR	
Subcontracted	Subcontracted					AR	

Jones Environmental Laboratory

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Quay West at MediaCityUK
Trafford Wharf Road
Trafford Park
Manchester
M17 1HH

No.4225

Attention :	Kathryn Ellis
Date :	18th July, 2012
Your reference :	A076252
Our reference :	Test Report 12/4921 Batch 5
Location :	GRAPHENE
Date samples received :	6th July, 2012
Status :	Final report
Issue :	1

One sample was received for analysis on 6th July, 2012. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton B.Sc
Project Manager

Bob Millward B.Sc
Principal Chemist

Jones Environmental Laboratory

Client Name: WYG

Reference: A076252

Location: GRAPHENE

Contact: Kathryn Ellis

JE Job No.: 12/4921

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	53-55	LOD	Units	Method No.
Sample ID	WS1A			
Depth	0.3			
COC No / misc				
Containers	V J T			
Sample Date	05/07/2012			
Sample Type	Soil			
Batch Number	5			
Date of Receipt	06/07/2012			
Arsenic #M	39.1	<0.5	mg/kg	TM30/PM15
Beryllium	1.6	<0.5	mg/kg	TM30/PM15
Cadmium #M	6.4	<0.1	mg/kg	TM30/PM15
Chromium #M	38.5	<0.5	mg/kg	TM30/PM15
Copper #M	348	<1	mg/kg	TM30/PM15
Lead #M	911	<5	mg/kg	TM30/PM15
Mercury #M	2.3	<0.1	mg/kg	TM30/PM15
Nickel #M	67.1	<0.7	mg/kg	TM30/PM15
Selenium #M	3	<1	mg/kg	TM30/PM15
Vanadium	32	<1	mg/kg	TM30/PM15
Water Soluble Boron #M	0.7	<0.1	mg/kg	TM74/PM32
Zinc #M	1156	<5	mg/kg	TM30/PM15
PAH MS				
Naphthalene #M	99.01	<0.04	mg/kg	TM4/PM8
Acenaphthylene	16.08	<0.03	mg/kg	TM4/PM8
Acenaphthene #M	21.59	<0.05	mg/kg	TM4/PM8
Fluorene #M	32.29	<0.04	mg/kg	TM4/PM8
Phenanthrene #M	218.47	<0.03	mg/kg	TM4/PM8
Anthracene #	50.99	<0.04	mg/kg	TM4/PM8
Fluoranthene #M	192.90	<0.03	mg/kg	TM4/PM8
Pyrene #	165.04	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	89.49	<0.06	mg/kg	TM4/PM8
Chrysene #M	69.47	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #M	125.30	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	78.02	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #M	50.90	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	7.74	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	43.40	<0.04	mg/kg	TM4/PM8
PAH 16 Total	1260.7	<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	90.22	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	35.08	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	86	<0	%	TM4/PM8

Jones Environmental Laboratory

Client Name: WYG

Reference: A076252

Location: GRAPHENE

Contact: Kathryn Ellis

JE Job No.: 12/4921

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	53-55	LOD	Units	Method No.
Sample ID	WS1A			
Depth	0.3			
COC No / misc				
Containers	V J T			
Sample Date	05/07/2012			
Sample Type	Soil			
Batch Number	5			
Date of Receipt	06/07/2012			
TPH CWG				
Aliphatics				
>C5-C6 #M	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 #M	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 #M	<0.2	<0.2	mg/kg	TM5/PM16
>C12-C16 #M	<4	<4	mg/kg	TM5/PM16
>C16-C21 #M	27	<7	mg/kg	TM5/PM16
>C21-C35 #M	241	<7	mg/kg	TM5/PM16
>C35-C44	36	<7	mg/kg	TM5/PM16
Total aliphatics C5-44	304	<26	mg/kg	TM5/TM36/PM16
Aromatics				
>C5-EC7	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #M	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 #M	<0.2	<0.2	mg/kg	TM5/PM16
>EC12-EC16 #M	15	<4	mg/kg	TM5/PM16
>EC16-EC21 #M	101	<7	mg/kg	TM5/PM16
>EC21-EC35 #M	445	<7	mg/kg	TM5/PM16
>EC35-EC44	22	<7	mg/kg	TM5/PM16
Total aromatics C5-44	583	<26	mg/kg	TM5/TM36/PM16
Total aliphatics and aromatics(C5-44)	887	<52	mg/kg	TM5/TM36/PM16
MTBE #	<5	<5	ug/kg	TM31/PM12
Benzene #	<5	<5	ug/kg	TM31/PM12
Toluene #	<5	<5	ug/kg	TM31/PM12
Ethylbenzene #	<5	<5	ug/kg	TM31/PM12
m/p-Xylene #	<5	<5	ug/kg	TM31/PM12
o-Xylene #	<5	<5	ug/kg	TM31/PM12
Phenol	<0.01	<0.01	mg/kg	TM26/PM21
Hexavalent Chromium	1.3	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext)	0.0198	<0.0015	g/l	TM38/PM20
Free Cyanide	<0.5	<0.5	mg/kg	TM89/PM45
Fraction Organic Carbon	0.057	<0.001	None	TM21/PM24
Fibre Screen*	NFD		None	Subcontracted
pH1 #M	8.37	<0.01	pH units	TM73/PM11

Jones Environmental Laboratory

Client Name: WYG

Reference: A076252

Location: GRAPHENE

Contact: Kathryn Ellis

JE Job No.: 12/4921

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	53-55													
Sample ID	WS1A													
Depth	0.3													
COC No / misc														
Containers	V J T													
Sample Date	05/07/2012													
Sample Type	Soil													
Batch Number	5													
Date of Receipt	06/07/2012													
												LOD	Units	Method No.
Dissolved Arsenic #	5.2											<0.9	ug/l	TM30/PM14
Dissolved Boron #	<12											<12	ug/l	TM30/PM14
Dissolved Cadmium #	0.04											<0.03	ug/l	TM30/PM14
Dissolved Chromium #	4.0											<0.2	ug/l	TM30/PM14
Dissolved Copper #	14											<3	ug/l	TM30/PM14
Dissolved Lead #	5.8											<0.4	ug/l	TM30/PM14
Dissolved Nickel #	1.2											<0.2	ug/l	TM30/PM14
Dissolved Selenium #	2.1											<1.2	ug/l	TM30/PM14
Dissolved Zinc #	8											<3	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	3.23											<0.01	ug/l	TM61/PM38
Sulphate #	7.18											<0.05	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	0.17											<0.03	mg/l	TM38/PM0
Total Cyanide #	0.02											<0.01	mg/l	TM89/PM0
Mass of raw test portion	0.1095												kg	NONE/PM17
Leachant Volume	0.881												l	NONE/PM17
pH	8.14											<0.01	pH units	TM73/PM0

Jones Environmental Laboratory

Client Name: WYG

Reference: A076252

Location: GRAPHENE

Contact: Kathryn Ellis

JE Job No.: 12/4921

SVOC Report : Solid

Please see attached notes for all abbreviations and acronyms

J E Sample No.	53-55													
Sample ID	WS1A													
Depth	0.3													
COC No / misc														
Containers	V J T													
Sample Date	05/07/2012													
Sample Type	Soil													
Batch Number	5													
Date of Receipt	06/07/2012													
												LOD	Units	Method No.
SVOC MS														
Phenols	x10 Dilution													
2-Chlorophenol	<100											<10	ug/kg	TM16/PM8
2-Methylphenol	542											<10	ug/kg	TM16/PM8
2-Nitrophenol	<100											<10	ug/kg	TM16/PM8
2,4-Dichlorophenol	<100											<10	ug/kg	TM16/PM8
2,4-Dimethylphenol	410											<10	ug/kg	TM16/PM8
2,4,5-Trichlorophenol	<100											<10	ug/kg	TM16/PM8
2,4,6-Trichlorophenol	<100											<10	ug/kg	TM16/PM8
4-Chloro-3-methylphenol	<100											<10	ug/kg	TM16/PM8
4-Methylphenol	916											<10	ug/kg	TM16/PM8
4-Nitrophenol	<100											<10	ug/kg	TM16/PM8
Pentachlorophenol	<100											<10	ug/kg	TM16/PM8
Phenol	722											<10	ug/kg	TM16/PM8
PAHs														
2-Chloronaphthalene	<100											<10	ug/kg	TM16/PM8
2-Methylnaphthalene	29080											<10	ug/kg	TM16/PM8
Phthalates														
Bis(2-ethylhexyl) phthalate	<100											<10	ug/kg	TM16/PM8
Butylbenzyl phthalate	<100											<10	ug/kg	TM16/PM8
Di-n-butyl phthalate	<100											<10	ug/kg	TM16/PM8
Di-n-Octyl phthalate	<100											<10	ug/kg	TM16/PM8
Diethyl phthalate	<100											<10	ug/kg	TM16/PM8
Dimethyl phthalate	<100											<10	ug/kg	TM16/PM8
Other SVOCs														
1,2-Dichlorobenzene	<100											<10	ug/kg	TM16/PM8
1,2,4-Trichlorobenzene	<100											<10	ug/kg	TM16/PM8
1,3-Dichlorobenzene	<100											<10	ug/kg	TM16/PM8
1,4-Dichlorobenzene	<100											<10	ug/kg	TM16/PM8
2-Nitroaniline	<100											<10	ug/kg	TM16/PM8
2,4-Dinitrotoluene	<100											<10	ug/kg	TM16/PM8
2,6-Dinitrotoluene	<100											<10	ug/kg	TM16/PM8
3-Nitroaniline	<100											<10	ug/kg	TM16/PM8
4-Bromophenylphenylether	<100											<10	ug/kg	TM16/PM8
4-Chloroaniline	<100											<10	ug/kg	TM16/PM8
4-Chlorophenylphenylether	<100											<10	ug/kg	TM16/PM8
4-Nitroaniline	<100											<10	ug/kg	TM16/PM8
Azobenzene	<100											<10	ug/kg	TM16/PM8
Bis(2-chloroethoxy)methane	<100											<10	ug/kg	TM16/PM8
Bis(2-chloroethyl)ether	<100											<10	ug/kg	TM16/PM8
Carbazole	20549											<10	ug/kg	TM16/PM8
Dibenzofuran	21614											<10	ug/kg	TM16/PM8
Hexachlorobenzene	<100											<10	ug/kg	TM16/PM8
Hexachlorobutadiene	<100											<10	ug/kg	TM16/PM8
Hexachlorocyclopentadiene	<100											<10	ug/kg	TM16/PM8
Hexachloroethane	<100											<10	ug/kg	TM16/PM8
Isophorone	<100											<10	ug/kg	TM16/PM8
N-nitrosodi-n-propylamine	<100											<10	ug/kg	TM16/PM8
Nitrobenzene	<100											<10	ug/kg	TM16/PM8

Jones Environmental Laboratory

Client Name: WYG **VOC Report : Solid**

Reference: A076252

Location: GRAPHENE

Contact: Kathryn Ellis

JE Job No.: 12/4921

J E Sample No.	53-55										
Sample ID	WS1A										
Depth	0.3										
COC No / misc											
Containers	V J T										
Sample Date	05/07/2012										
Sample Type	Soil										
Batch Number	5										
Date of Receipt	06/07/2012										

Please see attached notes for all abbreviations and acronyms

		LOD	Units	Method No.
VOC MS				
Dichlorodifluoromethane	<2	<2	ug/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<2	<2	ug/kg	TM15/PM10
Chloromethane #	<3	<3	ug/kg	TM15/PM10
Vinyl Chloride	<2	<2	ug/kg	TM15/PM10
Bromomethane	<1	<1	ug/kg	TM15/PM10
Chloroethane #	<2	<2	ug/kg	TM15/PM10
Trichlorofluoromethane #	<2	<2	ug/kg	TM15/PM10
1,1-Dichloroethene #	<6	<6	ug/kg	TM15/PM10
Dichloromethane #	<7	<7	ug/kg	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	ug/kg	TM15/PM10
1,1-Dichloroethane #	<3	<3	ug/kg	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	ug/kg	TM15/PM10
2,2-Dichloropropane	<4	<4	ug/kg	TM15/PM10
Bromochloromethane #	<3	<3	ug/kg	TM15/PM10
Chloroform #	<3	<3	ug/kg	TM15/PM10
1,1,1-Trichloroethane #	<3	<3	ug/kg	TM15/PM10
1,1-Dichloropropene #	<3	<3	ug/kg	TM15/PM10
Carbon tetrachloride #	<4	<4	ug/kg	TM15/PM10
1,2-Dichloroethane #	<4	<4	ug/kg	TM15/PM10
Benzene #	<3	<3	ug/kg	TM15/PM10
Trichloroethene #	<3	<3	ug/kg	TM15/PM10
1,2-Dichloropropane #	<6	<6	ug/kg	TM15/PM10
Dibromomethane #	<3	<3	ug/kg	TM15/PM10
Bromodichloromethane #	<3	<3	ug/kg	TM15/PM10
cis-1-3-Dichloropropene	<4	<4	ug/kg	TM15/PM10
Toluene #	14	<3	ug/kg	TM15/PM10
trans-1-3-Dichloropropene	<3	<3	ug/kg	TM15/PM10
1,1,2-Trichloroethane #	<3	<3	ug/kg	TM15/PM10
Tetrachloroethene #	<3	<3	ug/kg	TM15/PM10
1,3-Dichloropropane #	<3	<3	ug/kg	TM15/PM10
Dibromochloromethane #	<3	<3	ug/kg	TM15/PM10
1,2-Dibromoethane #	<3	<3	ug/kg	TM15/PM10
Chlorobenzene #	<3	<3	ug/kg	TM15/PM10
1,1,1,2-Tetrachloroethane	<3	<3	ug/kg	TM15/PM10
Ethylbenzene #	<3	<3	ug/kg	TM15/PM10
p/m-Xylene #	8	<6	ug/kg	TM15/PM10
o-Xylene #	3	<3	ug/kg	TM15/PM10
Styrene #	<3	<3	ug/kg	TM15/PM10
Bromoform #	<3	<3	ug/kg	TM15/PM10
Isopropylbenzene #	<3	<3	ug/kg	TM15/PM10
1,1,2,2-Tetrachloroethane #	<3	<3	ug/kg	TM15/PM10
Bromobenzene	<2	<2	ug/kg	TM15/PM10
1,2,3-Trichloropropane #	<4	<4	ug/kg	TM15/PM10
Propylbenzene #	<4	<4	ug/kg	TM15/PM10
2-Chlorotoluene	<3	<3	ug/kg	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	ug/kg	TM15/PM10
4-Chlorotoluene	<3	<3	ug/kg	TM15/PM10
tert-Butylbenzene #	<5	<5	ug/kg	TM15/PM10
1,2,4-Trimethylbenzene #	<6	<6	ug/kg	TM15/PM10
sec-Butylbenzene #	<4	<4	ug/kg	TM15/PM10
4-Isopropyltoluene #	<4	<4	ug/kg	TM15/PM10
1,3-Dichlorobenzene #	<4	<4	ug/kg	TM15/PM10
1,4-Dichlorobenzene #	<4	<4	ug/kg	TM15/PM10
n-Butylbenzene #	<4	<4	ug/kg	TM15/PM10
1,2-Dichlorobenzene #	<4	<4	ug/kg	TM15/PM10
1,2-Dibromo-3-chloropropane #	<4	<4	ug/kg	TM15/PM10
1,2,4-Trichlorobenzene #	<7	<7	ug/kg	TM15/PM10
Hexachlorobutadiene	<4	<4	ug/kg	TM15/PM10
Naphthalene	372	<27	ug/kg	TM15/PM10
1,2,3-Trichlorobenzene #	<7	<7	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	100	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	71	<0	%	TM15/PM10

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 12/4921

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:

$	Sample temperature on receipt considered inappropriate for analysis requested.
^	Samples exceeding recommended holding times.
&	Samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials).
1	The pH was not tested within 6 hours of sampling and therefore the sample is considered deviating.
~	No sampling date given, unable to confirm if samples are with acceptable holding times.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

NOTE

Data is only accredited when all the requirements of our Quality System have been met. In certain circumstances where the requirements have not been met, the laboratory may issue the data in an interim report but will remove the accreditation, in this instance results should be considered indicative only. Where possible samples will be re-extracted and a final report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance.
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
NFD	No Fibres Detected

Jones Environmental Laboratory

Method Code Appendix

JE Job No 12/4921

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Air Dried (AD)	Solid Results expressed on Dry/Wet basis
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction			AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction	Yes		AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction	Yes	Yes	AR	DRY
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	End Over End extraction			AR	
TM5	EPH by GC-FID, modified USEPA 8015	PM16	Aliphatic/Aromatic fractionation			AR	DRY
TM5	EPH by GC-FID, modified USEPA 8015	PM16	Aliphatic/Aromatic fractionation	Yes	Yes	AR	DRY
TM5/TM36	TPH CWG by GC-FID	PM16	Aliphatic/Aromatic fractionation			AR	DRY
TM15	VOC - Target by GC-MS, modified USEPA 8260	PM10	VOC GC-MS			AR	DRY
TM15	VOC - Target by GC-MS, modified USEPA 8260	PM10	VOC GC-MS	Yes		AR	DRY
TM15	VOC - Target by GC-MS, modified USEPA 8260	PM10	VOC GC-MS			AR	
TM16	SVOC - Target by GC-MS, modified USEPA 8270	PM8	End Over End extraction			AR	DRY
TM21	TOC and TC by Combustion	PM24	Eltra preparation			AD	DRY
TM26	Phenols by HPLC	PM21	Methanol : Water extraction			AR	DRY
TM30	Metals by ICP-OES	PM14	Metals by ICP (Waters)	Yes		AR	DRY
TM30	Metals by ICP-OES	PM15	Aqua Regia extraction (Soils)			AD	DRY
TM30	Metals by ICP-OES	PM15	Aqua Regia extraction (Soils)	Yes	Yes	AD	DRY
TM31	BTEX/MTBE by GC-FID, modified USEPA 8015	PM12	GRO GC-FID			AR	DRY
TM31	BTEX/MTBE by GC-FID, modified USEPA 8015	PM12	GRO GC-FID	Yes		AR	DRY
TM36	GRO by Headspace GC-FID	PM12	GRO GC-FID			AR	DRY
TM36	GRO by Headspace GC-FID	PM12	GRO GC-FID	Yes	Yes	AR	DRY
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM0	No Preparation	Yes		AR	DRY
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM20	1:2 soil to water extraction			AD	DRY
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM20	1:2 soil to water extraction			AR	DRY
TM61	Mercury - low level CVAF	PM38	Mercury CVAF	Yes		AR	DRY
TM73	pH in by Metrohm	PM0	No Preparation			AR	DRY
TM73	pH in by Metrohm	PM11	1:2.5 soil/water extraction	Yes	Yes	AR	WET
TM74	Water Soluble Boron by ICP-OES	PM32	Preparation of soils for WSB	Yes	Yes	AD	DRY
TM89	Cyanide by FIA	PM0	No Preparation	Yes		AR	DRY
TM89	Cyanide by FIA	PM45	Cyanide & Thiocyanate prep for soils			AR	DRY
NONE	No Method Code	PM17	CEN PR12457-2 10:1 1 batch leach				
NONE	No Method Code	PM4	Moisture Content			AR	
Subcontracted	Subcontracted					AR	

Jones Environmental Laboratory

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

WYG
Quay West at MediaCityUK
Trafford Wharf Road
Trafford Park
Manchester
M17 1HH

No.4225

Attention :	Kathryn Ellis
Date :	12th July, 2012
Your reference :	A076252
Our reference :	Test Report 12/4921 Batch 3
Location :	GRAPHENE
Date samples received :	29th June, 2012
Status :	Final report
Issue :	1

One sample was received for analysis on 29th June, 2012. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton B.Sc
Project Manager

Bob Millward B.Sc
Principal Chemist

Client Name: WYG
Reference: A076252
Location: GRAPHENE
Contact: Kathryn Ellis
JE Job No.: 12/4921

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	45-48	LOD	Units	Method No.
Sample ID	RBH3			
Depth				
COC No / misc				
Containers	V P G			
Sample Date	28/06/2012			
Sample Type	Ground Water			
Batch Number	3			
Date of Receipt	29/06/2012			
Dissolved Antimony #	<2	<2	ug/l	TM30/PM14
Dissolved Arsenic #	0.9	<0.9	ug/l	TM30/PM14
Dissolved Barium #	34.8	<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Boron	109	<2	ug/l	TM30/PM14
Dissolved Cadmium #	0.06	<0.03	ug/l	TM30/PM14
Total Dissolved Chromium #	0.3	<0.2	ug/l	TM30/PM14
Dissolved Copper #	<3	<3	ug/l	TM30/PM14
Dissolved Lead #	1.4	<0.4	ug/l	TM30/PM14
Dissolved Molybdenum #	0.5	<0.2	ug/l	TM30/PM14
Dissolved Nickel #	0.9	<0.2	ug/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	ug/l	TM30/PM14
Dissolved Zinc #	5.2	<1.5	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	<0.01	<0.01	ug/l	TM61/PM38
PAH MS				
Naphthalene	<0.01	<0.01	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01	ug/l	TM4/PM30
Acenaphthene	0.01	<0.01	ug/l	TM4/PM30
Fluorene	0.01	<0.01	ug/l	TM4/PM30
Phenanthrene	0.02	<0.01	ug/l	TM4/PM30
Anthracene	<0.01	<0.01	ug/l	TM4/PM30
Fluoranthene	0.01	<0.01	ug/l	TM4/PM30
Pyrene	0.02	<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	0.01	<0.01	ug/l	TM4/PM30
Chrysene	<0.01	<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	0.01	<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1	<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	120	<0	%	TM4/PM30
Methyl Tertiary Butyl Ether #	<1	<1	ug/l	TM15/PM10
Benzene #	<1	<1	ug/l	TM15/PM10
Toluene #	<2	<2	ug/l	TM15/PM10
Ethylbenzene #	<2	<2	ug/l	TM15/PM10
p/m-Xylene #	<3	<3	ug/l	TM15/PM10
o-Xylene #	<2	<2	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	111	<0	%	TM15/PM10

Jones Environmental Laboratory

Client Name: WYG

Reference: A076252

Location: GRAPHENE

Contact: Kathryn Ellis

JE Job No.: 12/4921

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	45-48												
Sample ID	RBH3												
Depth													
COC No / misc													
Containers	V P G												
Sample Date	28/06/2012												
Sample Type	Ground Water												
Batch Number	3												
Date of Receipt	29/06/2012												
												LOD	**Units**	**Method No.**
Surrogate Recovery 4-Bromofluorobenzene	111											<0	%	TM15/PM10
TPH CWG														
Aliphatics														
>C5-C6 #	<5											<5	ug/l	TM36/PM12
>C6-C8 #	<5											<5	ug/l	TM36/PM12
>C8-C10 #	<5											<5	ug/l	TM36/PM12
>C10-C12 #	<5											<5	ug/l	TM5/PM30
>C12-C16 #	<10											<10	ug/l	TM5/PM30
>C16-C21 #	<10											<10	ug/l	TM5/PM30
>C21-C35 #	<10											<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10											<10	ug/l	TM5/TM36/PM30
Aromatics														
>C5-EC7 #	<5											<5	ug/l	TM36/PM12
>EC7-EC8 #	<5											<5	ug/l	TM36/PM12
>EC8-EC10 #	<5											<5	ug/l	TM36/PM12
>EC10-EC12 #	<5											<5	ug/l	TM5/PM30
>EC12-EC16 #	<10											<10	ug/l	TM5/PM30
>EC16-EC21 #	<10											<10	ug/l	TM5/PM30
>EC21-EC35 #	<10											<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10											<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10											<10	ug/l	TM5/TM36/PM30
Phenol	<0.5											<0.5	ug/l	TM26/PM0
Sulphate #	147.96											<0.05	mg/l	TM38/PM0
Chloride #	28.8											<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	5.9											<0.2	mg/l	TM38/PM0
Nitrite as NO2 #^	<0.02											<0.02	mg/l	TM38/PM0
Total Cyanide #	<0.01											<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as NH3 #	<0.03											<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	<0.03											<0.03	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #^	236											<1	mg/l	TM75/PM0
Dissolved Organic Carbon	9											<2	mg/l	TM60/PM0
pH¹ #	7.09											<0.01	pH units	TM73/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 12/4921

SOILS

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All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:

$	Sample temperature on receipt considered inappropriate for analysis requested.
^	Samples exceeding recommended holding times.
&	Samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials).
¹	The pH was not tested within 6 hours of sampling and therefore the sample is considered deviating.
~	No sampling date given, unable to confirm if samples are with acceptable holding times.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

NOTE

Data is only accredited when all the requirements of our Quality System have been met. In certain circumstances where the requirements have not been met, the laboratory may issue the data in an interim report but will remove the accreditation, in this instance results should be considered indicative only. Where possible samples will be re-extracted and a final report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance.
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
NFD	No Fibres Detected

Jones Environmental Laboratory

Method Code Appendix

JE Job No 12/4921

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Air Dried (AD)	Solid Results expressed on Dry/Wet basis
TM4	16 PAH by GC-MS, modified USEPA 8270	PM30	Magnetic stirrer extraction				
TM5	EPH by GC-FID, modified USEPA 8015	PM30	Magnetic stirrer extraction	Yes			
TM5/TM36	TPH CWG by GC-FID	PM30	Magnetic stirrer extraction	Yes			
TM15	VOC - Target by GC-MS, modified USEPA 8260	PM10	VOC GC-MS				
TM15	VOC - Target by GC-MS, modified USEPA 8260	PM10	VOC GC-MS	Yes			
TM26	Phenols by HPLC	PM0	No Preparation				
TM30	Metals by ICP-OES	PM14	Metals by ICP (Waters)				
TM30	Metals by ICP-OES	PM14	Metals by ICP (Waters)	Yes			
TM36	GRO by Headspace GC-FID	PM12	GRO GC-FID	Yes			
TM38	SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN, Hex Cr by Aquakem	PM0	No Preparation	Yes			
TM60	TOC/DOC by NDIR	PM0	No Preparation				
TM61	Mercury - low level CVAF	PM38	Mercury CVAF	Yes			
TM73	pH in by Metrohm	PM0	No Preparation	Yes			
TM75	Alkalinity by Metrohm	PM0	No Preparation	Yes			
TM89	Cyanide by FIA	PM0	No Preparation	Yes			

Appendix E – Geotechnical Laboratory Results

PSL
Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL12/1903

Client's Reference: Report Date: 06 June 2012

Client Name: WYG Manchester
Quay West at MediaCityUK
Trafford Wharf Road
Trafford Park
Manchester
M17 1HH

For the attention of: Richard Jarrett

Contract Title: Stoke College

Date Received: 23-May-12
Date Commenced: 23-May-12
Date Completed: 6-Jun-12

Notes: **Observations and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson	A Watkins	M Beastall
(Director)	(Director)	(Laboratory Manager)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF POINT LOAD TEST RESULTS

POINT LOAD TEST - ISRM

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure	Remarks	Rock Type
			Par / Perp	W	D	(mm2)		(mm)	MPa	kN	(MPa)	F	(MPa)	Type		
RBH01	7.55-7.6	Axial	Par	82	45	2025	4698.25	68.54	1.758	2.35	0.500	1.153	0.58	Valid		Mudstone
RBH01	7.6-7.7	Axial	Par	82	50	2500	5220.28	72.25	5.001	6.68	1.279	1.180	1.51	Valid		Mudstone
RBH01	8.0-8.1	Axial	Par	82	45	2025	4698.25	68.54	0.461	0.62	0.131	1.153	0.15	Valid		Mudstone
RBH01	8.1-8.4	Axial	Par	82	55	3025	5742.31	75.78	0.444	0.59	0.103	1.206	0.12	Valid		Mudstone
RBH01	9.0-9.5	Intact lump	N/A	60	50	2500	3819.72	61.80	0.548	0.73	0.192	1.100	0.21	Valid		Mudstone
RBH01	9.0-9.5	Intact lump	N/A	60	40	1600	3055.77	55.28	0.881	1.18	0.385	1.046	0.40	Valid		Mudstone
RBH03	7.2-7.5	Intact lump	N/A	82	45	2025	4698.25	68.54	0.785	1.05	0.223	1.153	0.26	Valid		Mudstone
RBH03	7.2-7.5	Intact lump	N/A	40	40	1600	2037.18	45.14	1.099	1.47	0.720	0.955	0.69	Valid		Mudstone
RBH03	7.75-7.80	Axial	Par	82	35	1225	3654.20	60.45	1.372	1.83	0.501	1.089	0.55	Valid		Mudstone
RBH03	8.00-8.05	Axial	Par	82	40	1600	4176.23	64.62	5.100	6.81	1.630	1.122	1.83	Valid		Mudstone
RBH03	8.80-8.90	Axial	Par	82	45	2025	4698.25	68.54	0.616	0.82	0.175	1.153	0.20	Valid		Coal
RBH03	9.25-9.43	Axial	Par	82	50	2500	5220.28	72.25	0.414	0.55	0.106	1.180	0.12	Valid		Mudstone

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular

PSL
Professional Soils Laboratory

STOKE COLLEGE **Contract No:** **PSL12/1903** **Client Ref:** **A077515**

Checked by **Date** 06/06/12 **Approved by** **Date** 06/06/12

SUMMARY OF POINT LOAD TEST RESULTS

POINT LOAD TEST - ISRM

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)			D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure	Remarks	Rock Type
			Par / Perp	L	D			(mm)	MPa	kN	(MPa)	F	(MPa)	Type		
RBH01	7.55-7.6	Diametral	Perp		82		6724	82.00	4.560	6.09	0.905	1.249	1.13	Valid		MUDSTONE
RBH01	7.6-7.7	Diametral	Perp		82		6724	82.00	4.160	5.55	0.826	1.249	1.03	Valid		MUDSTONE
RBH01	8.0-8.1	Diametral	Perp		82		6724	82.00	0.296	0.40	0.059	1.249	0.07	Valid		MUDSTONE
RBH01	8.1-8.4	Diametral	Perp		82		6724	82.00	0.109	0.15	0.022	1.249	0.03	Valid		MUDSTONE
RBH03	7.75-7.80	Diametral	Perp		82		6724	82.00	0.521	0.70	0.103	1.249	0.13	Valid		MUDSTONE
RBH03	8.00-8.05	Diametral	Perp		82		6724	82.00	5.365	7.16	1.065	1.249	1.33	Valid		MUDSTONE
RBH03	8.80-8.90	Diametral	Perp		82		6724	82.00	0.212	0.28	0.042	1.249	0.05	Valid		COAL
RBH03	9.25-9.43	Diametral	Perp		82		6724	82.00	0.191	0.25	0.038	1.249	0.05	Valid		MUDSTONE

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular

PSL
Professional Soils Laboratory

STOKE COLLEGE **Contract No:** **PSL12/1903** **Client Ref:** **A077515**

Checked by **Date** 06/06/12 **Approved by** **Date** 06/06/12

5/7 Hexthorpe Road
Hexthorpe, Doncaster, DN4 0AR
tel: +44 (0)844 8156641
fax: +44 (0)844 8156642
e-mail: awatkins@prosoils.co.uk

PSL
Professional Soils Laboratory

Date: 06-Jun-12
Contract Number: PSL12/1903
Location: STOKE COLLEGE
Sample Type: Core
Sample Preparation: Cutting
Operator: S Royal

Determination of Unconfined Compressive Strength.

ISRM Suggested Methods, pp 111 –116, 1981.

Borehole Number	Depth Top (m)	Depth Bottom (m)	Diameter (mm)	Length (mm)	Height: ratio	Initial mass g	Bulk Density Mg/m3	MC %	Dry Density Mg/m3	Load Failure	MCS(MPA)	Mode OF FAILURE	Date Tested	Remarks
RBH03	9.45	9.75	82.00	150.00	1.8	2044	2.58	8.0	2.31	4.0	0.8	Brittle	25-May-12	

Checked by: ..... Date 06/06/2012

Approved by: ..... Date 06/06/2012

PSL
Professional Soils Laboratory

LABORATORY REPORT

4043

Contract Number: PSL12/2235

Client's Reference: Report Date: 11 July 2012

Client Name: WYG Manchester
Quay West at Media City UK
Trafford Wharf Road
Trafford Park
Manchester
M17 1HH

For the attention of: Danny Bardsley

Contract Title: Graphene Hub

Date Received: 29-Jun-12
Date Commenced: 29-Jun-12
Date Completed: 11-Jul-12

Notes: **Observations and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson	A Watkins	M Beastall
(Director)	(Director)	(Laboratory Manager)

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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
CP1		B	1.20-1.70	Brown very gravelly clayey silty SAND.
CP1		B	2.00-2.50	Brown very gravelly slightly clayey silty SAND.
CP1		B	3.00-3.50	Brown silty SAND & GRAVEL.
CP1		B	4.00-4.50	Brown slightly gravelly very silty SAND.
CP2		B	3.00-3.50	Brown very sandy silty GRAVEL.
CP2		B	4.00-4.50	Brown slightly gravelly very clayey silty SAND.
TP2		B	2.70	Brown slightly sandy slightly silty GRAVEL with cobbles.
TP5		B	2.80	Brown gravelly very clayey sandy very silty CLAY.

PSL Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	11/07/12		11/07/12		11/07/12
GRAPHENE HUB.				Contract No:	PSL12/2235
				Client Ref:	A076252

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.	Plasticity Index % Clause 6.	% Passing .425mm	Remarks
CP1		B	1.20-1.70	13					NP			
CP1		B	2.00-2.50	9.7					NP			
TP5		B	2.80	16				32	18	14	90	Low plasticity CL.

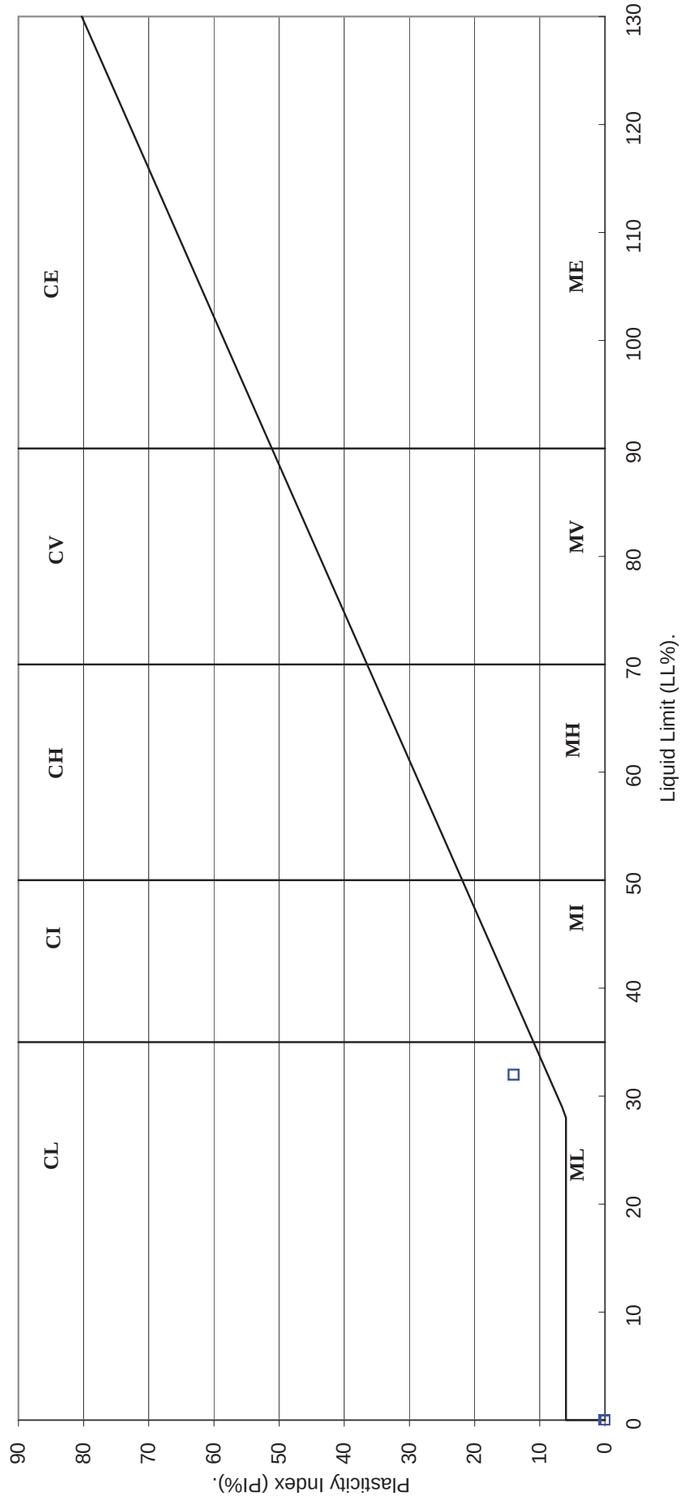
SYMBOLS : NP : Non Plastic *** : Liquid Limit and Plastic Limit Wet Sieved.**

PSL Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	11/07/12		11/07/12		11/07/12
GRAPHENE HUB.				Contract No:	PSL12/2235
				Client Ref:	A076252

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



	Date	Checked by	Date	Approved by	Date
Compiled by	11/07/12		11/07/12		11/07/12

GRAPHENE HUB.

Contract No: PSL12/2235

Client Ref: A076252

PSL Professional Soils Laboratory

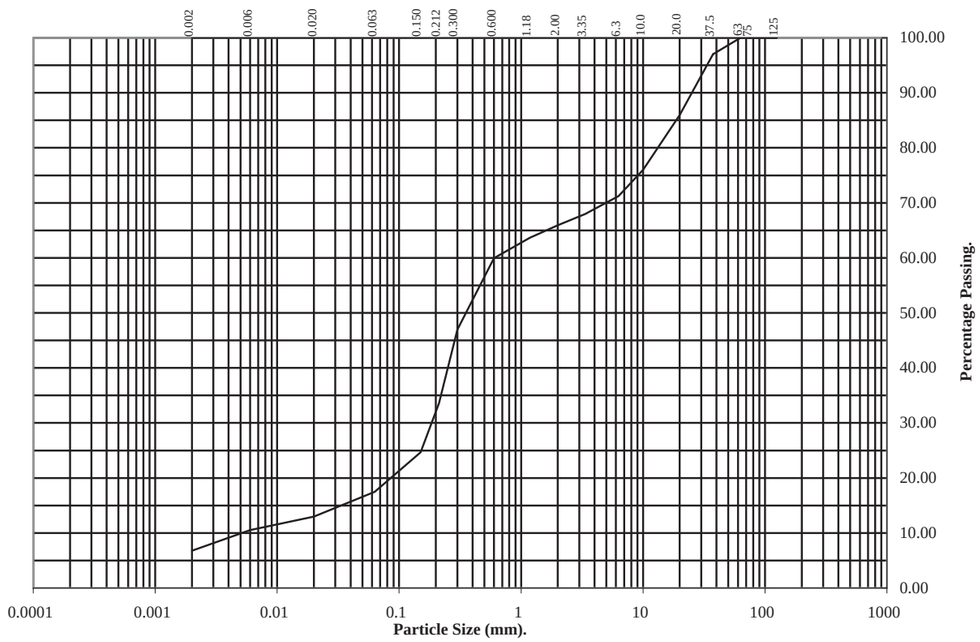
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: CP1 **Depth (m):** 1.20-1.70

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	97
20	86
10	76
6.3	71
3.35	68
2	66
1.18	64
0.6	60
0.3	47
0.212	34
0.15	25
0.063	17

Particle Diameter	Percentage Passing
0.02	13
0.006	11
0.002	7

Soil Fraction	Total Percentage
Cobbles	0
Gravel	34
Sand	49
Silt	10
Clay	7

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	11/07/12		11/07/12

PSL Professional Soils Laboratory | **GRAPHENE HUB.** | **Contract No.: PSL12/2235**

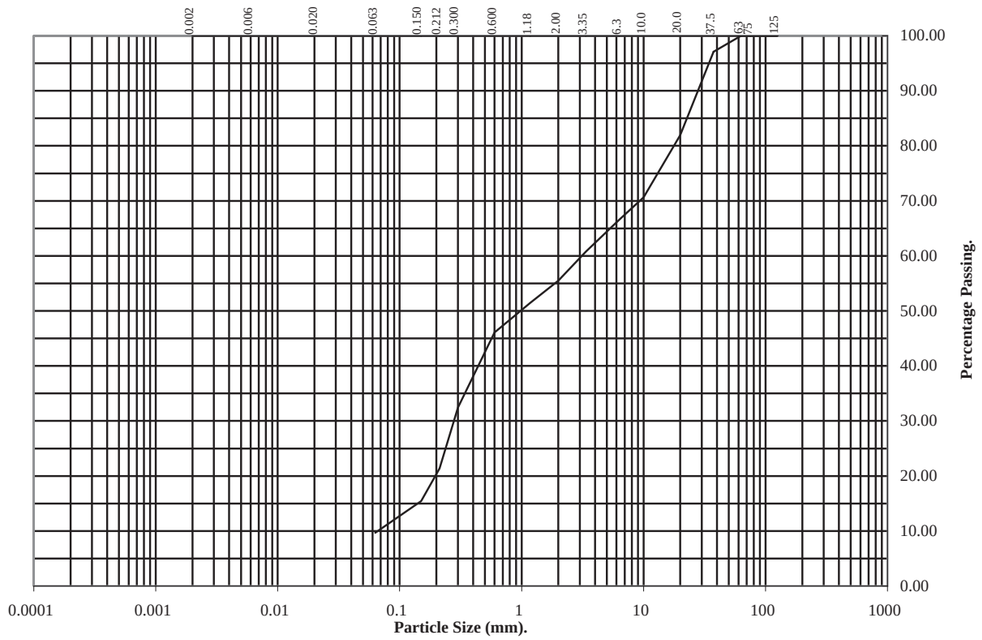
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: CP1 **Depth (m):** 3.00-3.50

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	97
20	82
10	71
6.3	67
3.35	61
2	56
1.18	51
0.6	46
0.3	32
0.212	21
0.15	15
0.063	10

Soil Fraction	Total Percentage
Cobbles	0
Gravel	44
Sand	46
Silt / Clay	10

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	11/07/12		11/07/12

PSL Professional Soils Laboratory	GRAPHENE HUB.	Contract No.: PSL12/2235

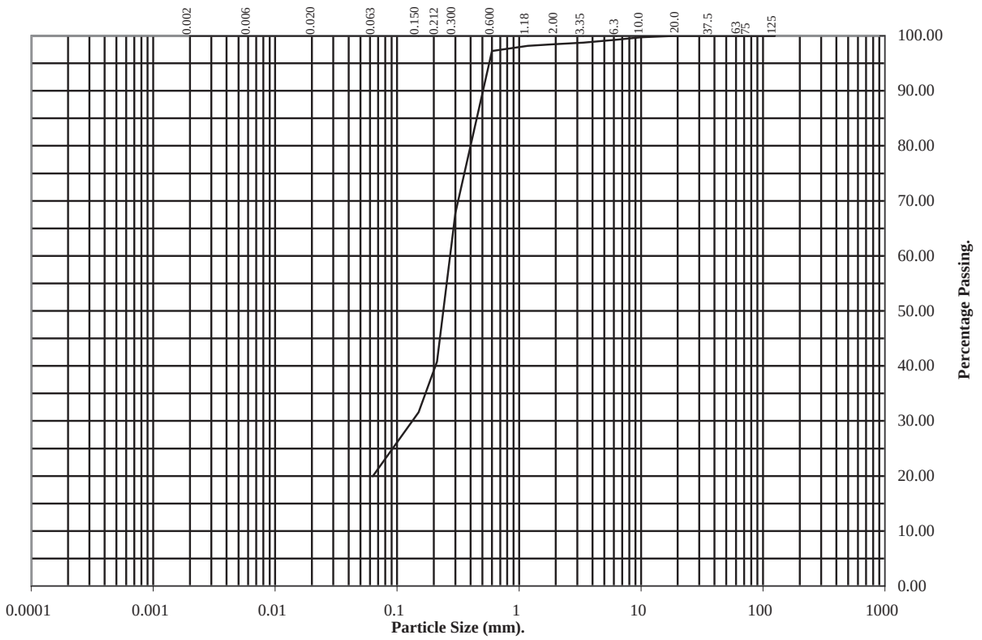
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: CP1 **Depth (m):** 4.00-4.50

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	99
3.35	99
2	98
1.18	98
0.6	97
0.3	68
0.212	41
0.15	32
0.063	20

Soil Fraction	Total Percentage
Cobbles	0
Gravel	2
Sand	78
Silt / Clay	20

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	11/07/12		11/07/12

PSL Professional Soils Laboratory	GRAPHENE HUB.	Contract No.: PSL12/2235

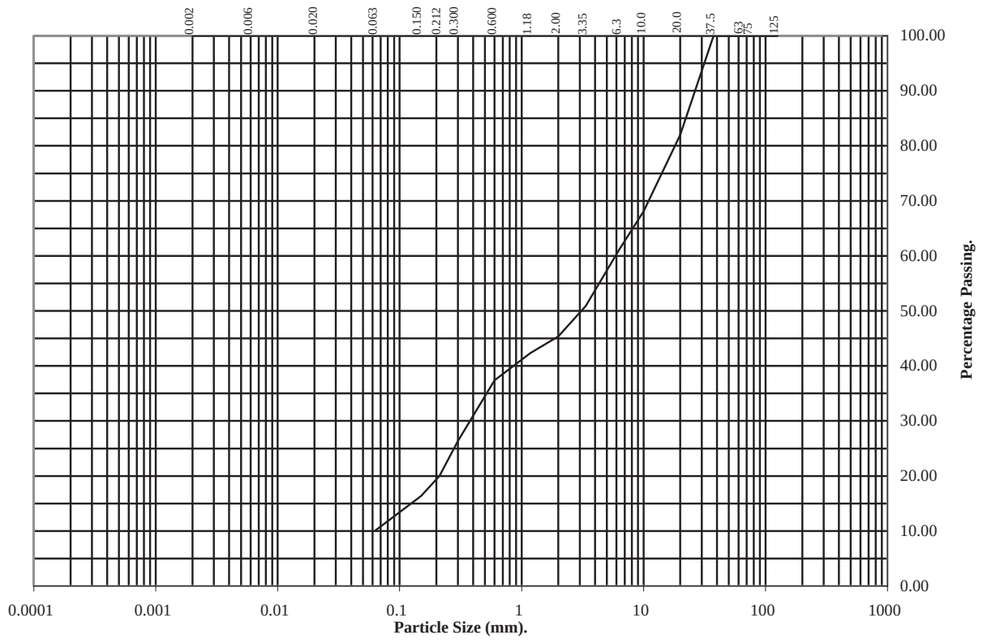
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: CP2 **Depth (m):** 3.00-3.50

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	82
10	68
6.3	61
3.35	51
2	45
1.18	42
0.6	37
0.3	26
0.212	20
0.15	16
0.063	10

Soil Fraction	Total Percentage
Cobbles	0
Gravel	55
Sand	35
Silt / Clay	10

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	11/07/12		11/07/12

PSL Professional Soils Laboratory	GRAPHENE HUB.	Contract No.: PSL12/2235

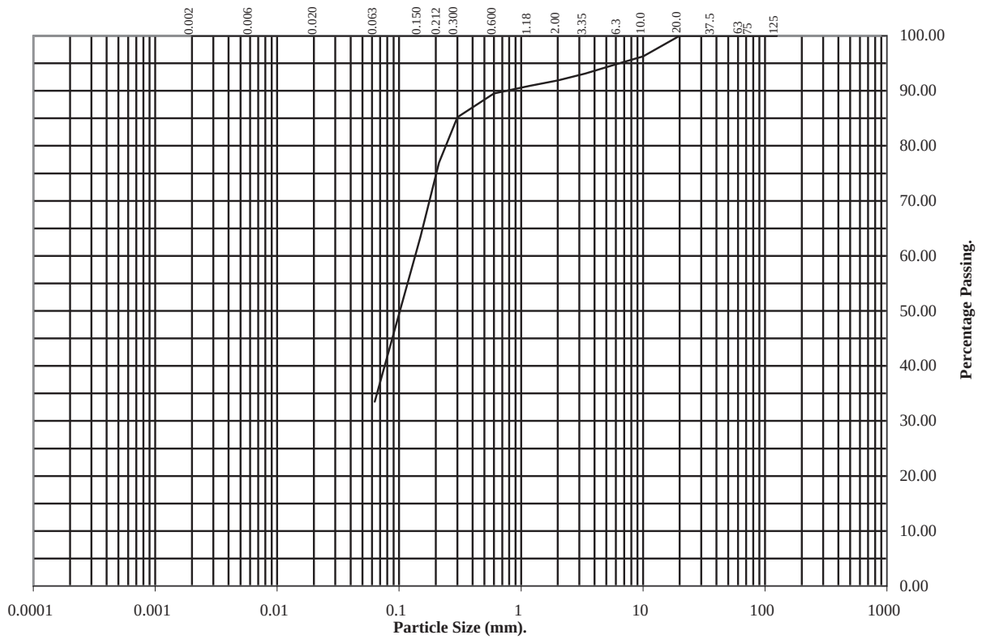
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: CP2 **Depth (m):** 4.00

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	96
6.3	95
3.35	93
2	92
1.18	91
0.6	90
0.3	85
0.212	77
0.15	64
0.063	33

Soil Fraction	Total Percentage
Cobbles	0
Gravel	8
Sand	59
Silt / Clay	33

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	11/07/12		11/07/12

PSL Professional Soils Laboratory	GRAPHENE HUB.	Contract No.: PSL12/2235

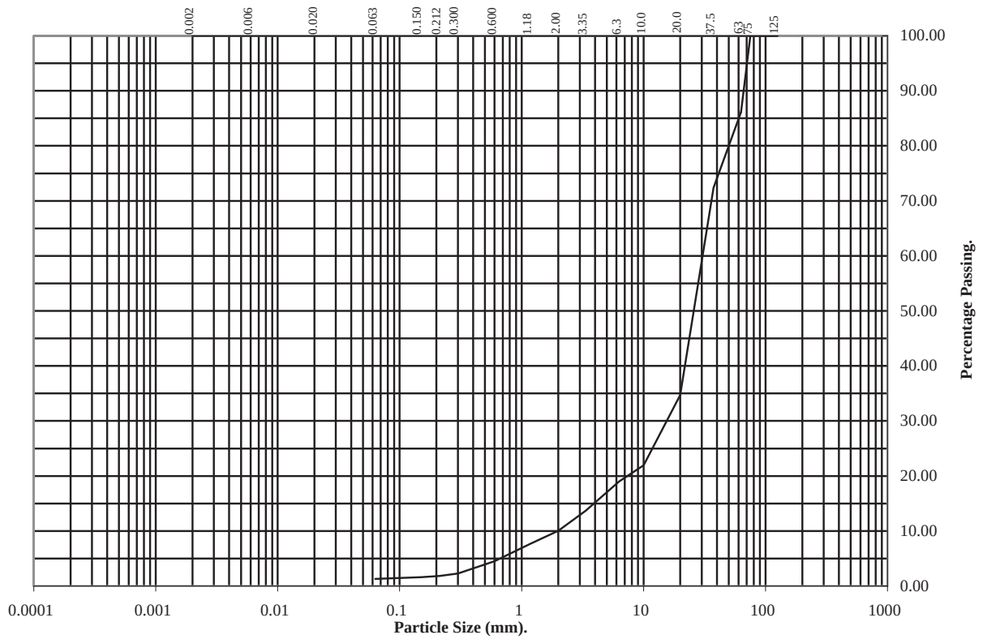
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP2 **Depth (m):** 2.70

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	86
37.5	72
20	35
10	22
6.3	19
3.35	14
2	10
1.18	8
0.6	4
0.3	2
0.212	2
0.15	2
0.063	1

Soil Fraction	Total Percentage
Cobbles	14
Gravel	76
Sand	9
Silt / Clay	1

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	11/07/12		11/07/12

PSL Professional Soils Laboratory	GRAPHENE HUB.	Contract No.: PSL12/2235

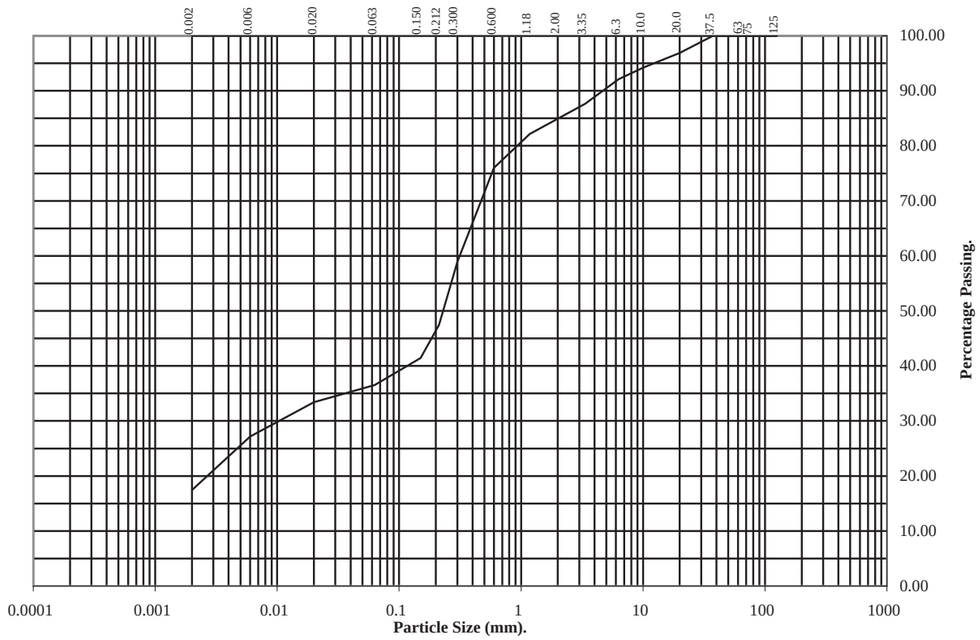
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP5 **Depth (m):** 2.80

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	97
10	94
6.3	92
3.35	88
2	85
1.18	82
0.6	76
0.3	59
0.212	47
0.15	41
0.063	37

Particle Diameter	Percentage Passing
0.02	33
0.006	27
0.002	17

Soil Fraction	Total Percentage
Cobbles	0
Gravel	15
Sand	48
Silt	20
Clay	17

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	11/07/12		11/07/12

PSL Professional Soils Laboratory	GRAPHENE HUB.	Contract No.: PSL12/2235

2531

ANALYTICAL TEST REPORT

Contract no: 45478

Contract name: A076252 Graphene Hub

Client reference: PSL12/2235

Clients name: Professional Soils Laboratory

Clients address: 5-7 Hexthorpe Road
Doncaster
DN4 0AR

Samples received: 03 July 2012

Analysis started: 03 July 2012

Analysis completed: 06 July 2012

Report issued: 06 July 2012

Notes:
Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd were not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, withour prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key:
U UKAS accredited test
M MCERTS & UKAS accredited test
$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing

Approved by:

Karan Campbell — Director
John Campbell — Director

Unit 25a-25b Number One Industrial Estate, Consett, County Durham, DH8 6TJ
Tel 01207 581260 Fax 01207 581582 Email info@chemtech-env.co.uk

Vat Reg No. 772 5703 18 Reg in England No. 4284013

Chemtech Environmental Limited

SOILS

Lab number			45478-1	45478-2	45478-3	45478-4	45478-5	45478-6
Sample id			CP 1	CP 1	CP 2	CP 2	TP 4	WS 4
Depth (m)			3.00-3.50	4.00-4.50	2.00-2.50	4.50	2.30	2.00-3.00
Date sampled			-	-	-	-	-	-
Test	**Method**	**Units**						
pH	CE004 M	units	7.8	7.8	7.9	7.2	7.8	6.9
Sulphate (2:1 water soluble)	CE049 U	g/l SO_4	0.01	0.01	0.01	0.02	0.02	<0.01
Organic matter content	CE005 M	% w/w	-	-	-	-	1.05	1.37

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE049	Sulphate (2:1 water soluble)	Aqueous extraction, IC-COND	Dry	U	0.01	g/l SO_4
CE005	Organic matter content	Based on BS 1377, Colorimetry	Dry	M	0.01	% w/w

Appendix F – Monitoring Results

GROUNDWATER MONITORING & SAMPLING RECORD SHEET

Client **University of Manchester**
Project **Graphene Innovation Hub**
Job Number **A76252**

Date	Installation	Elevation of cover (mAOD)	DTW (mbgl)	DTB (mbgl)	Calculated 1 well volume (l)	Volume Purged (l)	Free Product present? (Y(mm)/N)	Samples Collected (Y/N)	Remarks
28.06.12	WS1	38.175	DRY	1.5	-	-	-	-	Insufficient water to sample.
28.06.12	WS6	38.236	DRY	2	-	-	-	-	Insufficient water to sample.
28.06.12	CP1	38.170	DRY	1.55	-	-	-	-	Insufficient water to sample.
28.06.12	CP2	38.197	3.61	4.00	0.39	-	-	-	Insufficient water to sample.
28.06.12	RBH2	38.209	WAB	6.92	-	-	-	-	Insufficient water to sample.
28.06.12	RBH3	38.308	7.12	7.65	0.53	0.5	N	Y	Well purged dry after 0.5 litres extracted. Insufficient water available to undertake field measurements. Red brown silt in sample.

Notes:

If free product is identified, sample the free product using a disposable bailer before purging.

Remarks should include well recovery (fast/moderate/slow, if went dry), water colour, odour, turbidity and sediment content e.t.c.

Wells should be sampled in order of anticipated contamination, with the cleanest well sample first.

Dedicated sampling equipment (bailer or tubing) should be used where possible. If not, then sampling water should be rinsed with Decon90 and deionised water between each monitoring well.

Purging:

LPH Guidance Document v2.5 (May 2000) states that it is "best practice" to remove at least three standpipe volumes of water prior to groundwater sampling.

Wells screened in low permeability strata (i.e. clays) may go dry before 3 well volumes are removed. If this occurs the well should be left for a period of time, then the recharge sampled.

An alternative procedure is to take regular field measurements of pH, Temperature, Conductivity and Dissolved Oxygen until successive consistent field readings (i.e. within 10% of previous readings) are recorded prior to sam

Approximate well volume calculations for use in field:

For a 35mm well, 1 well volume (l) = 1 x (DTB - DTW)

For a 50mm well, 1 well volume (l) = 2 x (DTB - DTW)

For a 100mm well, 1 well volume (l) = 8 x (DTB - DTW)

GAS & GROUNDWATER MONITORING RECORD SHEET 1 of 2

Client **University of Manchest**
Project **Graphene Innovation Hub**
Job Number **A076252**

Visit No. 1 **Date** 05/07/2012 **Start** 10:55 **End** 12:15 **By** JAL **AP Trend** Rising **Weather** Sunny, spells, light breeze, warm, ground water logged.

Instruments used - GA2000 with flow pod, PID Minirae 2000, Oil/Water Interface Dip Meter

Background (start) **CH_4** <0.1% **CO_2** <0.1% **O_2** 19.3% **VOCs** 2.6-5.0ppm **AP** 1007mb

Background (end) **CH_4** <0.1% **CO_2** <0.1% **O_2** 20.0% **VOCs** 0.4 **AP** 1007mb

Installation	Elevation of cover (mAOD)	CH_4		CH_4 % LEL		CO_2		O_2	CO	H_2S	VOC	Flow Rate		Atmospheric Pressure (mbar)	Depth to Water (mbgl)	Depth to Base (mbgl)	Water Level (mAOD)	Remarks
		Peak (% vol)	Steady (% vol)	Peak (% vol)	Steady (% vol)	Peak (% vol)	Steady (% vol)	Steady (% vol)	Av. (ppm)	Av. (ppm)	Av. (ppm)	Peak (l/h)	Steady (l/h)					
WS1	38.175	<0.1	<0.1	<0.1	<0.1	9.0	9.0	9.0	<1	<1	8.4	0.1	0	1007	WAB	1.50	WAB	Peak VOC concentration was 35.1ppm which dropped to average over 5 minutes.
WS6	38.236	<0.1	<0.1	<0.1	<0.1	2.9	2.9	16.0	<1	<1	3.2	0.1	0.1	1007	DRY	1.57	DRY	Peak VOC concentration was 5ppm.
CP1	38.170	<0.1	<0.1	<0.1	<0.1	2.5	2.5	16.0	<1	<1	6.1	0.0	-0.1	1007	DRY	1.55	DRY	Peak VOC concentration was 35.8ppm which dropped to average over 3 minutes.
CP2	38.197	<0.1	<0.1	<0.1	<0.1	7.1	7.1	9.5	<1	<1	12.4	0.2	0	1007	3.65	4.00	34.547	Peak carbon monoxide 1ppm.
RBH2	38.209	<0.1	<0.1	<0.1	<0.1	4.5	4.5	14.7	<1	<1	16.4	0	-0.1	1007	WAB	6.93	WAB	
RBH3	38.308	<0.1	<0.1	<0.1	<0.1	2.3	2.3	12.9	<1	<1	3.3	0.1	0	1007	7.55	7.64	30.758	Peak VOC concentration was 8ppm which dropped to average over 30 seconds. Carbon monoxide peak concentration was 1ppm.
Maximum	-	<0.1	<0.1	<0.1	<0.1	9.0	9.0	-	<1	<1	16.4	0.2	0.1	-	-	-	-	-

Visit No. 2 **Date** 12/07/2012 **Start** 13:30 **End** 14:20 **By** KE **AP Trend** Falling **Weather** Dry, cloudy with sunny spells, slight breeze, ground slightly damp.

Instruments used - GA2000 with flow pod, Dip Meter

Background (start) **CH_4** <0.1% **CO_2** <0.1% **O_2** 19.7% **VOCs** - **AP** 1008mb

Background (end) **CH_4** <0.1% **CO_2** <0.1% **O_2** 19.1% **VOCs** - **AP** 1008mb

Installation	Elevation of cover (mAOD)	CH_4		CH_4 % LEL		CO_2		O_2	CO	H_2S	VOC	Flow Rate		Atmospheric Pressure (mbar)	Depth to Water (mbgl)	Depth to Base (mbgl)	Water Level (mAOD)	Remarks
		Peak (% vol)	Steady (% vol)	Peak (% vol)	Steady (% vol)	Peak (% vol)	Steady (% vol)	Steady (% vol)	Av. (ppm)	Av. (ppm)	Av. (ppm)	Peak (l/h)	Steady (l/h)					
WS1	38.175	<0.1	<0.1	<0.1	<0.1	8.7	8.4	7.2	<1	<1	-	-0.1	-0.1	1008	WAB	1.50	36.675	
WS6	38.236	<0.1	<0.1	<0.1	<0.1	3.0	3.0	17.0	<1	<1	-	0.1	-0.1	1008	DRY	1.56	36.676	
CP1	38.170	<0.1	<0.1	<0.1	<0.1	1.6	1.6	18.2	<1	<1	-	0.3	0.1	1008	DRY	1.52	36.650	
CP2	38.197	<0.1	<0.1	<0.1	<0.1	7.4	7.4	8.9	<1	<1	-	0.0	0.0	1008	3.63	4.15	34.047	
RBH2	38.209	<0.1	<0.1	<0.1	<0.1	4.8	4.8	14.6	<1	<1	-	0.7	0.7	1008	WAB	7.06	31.149	
RBH3	38.308	<0.1	<0.1	<0.1	<0.1	0.7	0.3	17.9	<1	<1	-	0.1	-0.1	1008	7.50	7.80	30.508	
Maximum	-	<0.1	<0.1	<0.1	<0.1	8.7	8.4	-	<1	<1	-	0.7	0.7	-	-	-	-	-

Notes:

Peak reading = maximum recorded level during a monitoring event.

Steady reading = level which remained constant after approximately 1 minute.

LEL = Lower Explosive Limit

GSV = Gas Screening Value - the maximum percentage steady CH_4 or CO_2 multiplied by the gas flow rate.

WAB = Wet At Base

Atmosphric Pressure (AP) trend obtained from Met Office Website (http://www.metoffice.gov.uk/education/archive/uk/)

Ground Investigation Report

Graphene Innovation Hub, Manchester

Appendix G – Tier 1 Screening Assessment and Statistical Analysis

Graphene Innovation Hub

A076252

Report:			Sample ID		TP1	TP2	TP3	TP4	TP5	CP2	CP1	WS3	WS6	WS1A	TP1	CP2					
			Depth (m bgl)		0.7	0.9	0.3	1.4	1.0	0.7	1.4	0.4	0.6	0.3	2.8	2.2					
JE Lab Job No:	12/4921		Sample Type		Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Sand & Gravel	Sand						
Location:	GRAPHENE		Sampled Date		18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	19/06/2012	18/06/2012	20/06/12	20/06/12	05/07/12	18/06/2012	18/06/2012					
Client ref:	A076252		Sample Received Date		20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	26/06/2012	20/06/2012	29/06/12	29/06/12	06/07/12	20/06/2012	20/06/2012					
Test	**Method**	**Units**	**LOD**	**TSV**													**No. of Samples**	**MIN**	**MAX**	**No. > TSV**
Metals/Inorganics																				
pH I ##	TM73/PM11	pH units	<0.01	<6 >9	8.51	8.59	8.39	8.24	8.59	8.64	8.46	8.16	8.41	8.37	8.13	8.44	12	8.13	8.64	0
Arsenic ##	TM30/PM15	mg/kg	<0.5	640	15.4	16.2	12.8	8.3	10.4	10.2	5.8	50.6	17.7	39.1	7.6	4.5	12	4.5	50.6	0
Beryllium	TM30/PM15	mg/kg	<0.5	420	1.3	-	-	1	1	-	-	-	-	1.6	-	-	4	1	1.6	0
Cadmium ##	TM30/PM15	mg/kg	<0.1	230	0.8	0.9	0.4	< 0.1	< 0.1	< 0.1	< 0.1	0.4	0.7	6.4	< 0.1	< 0.1	12	0.1	6.4	0
Chromium ##	TM30/PM15	mg/kg	<0.5	30400	32	23.4	19.6	21.5	19.2	26.6	16.5	28.2	19.3	38.5	16.3	13.5	12	13.5	38.5	0
Hexavalent Chromium	TM38/PM20	mg/kg	<0.3	35	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	1.3	< 0.3	< 0.3	12	0.3	1.3	0
Copper ##	TM30/PM15	mg/kg	<1	71700	126	71	40	20	20	36	15	97	170	348	12	14	12	12	348	0
Lead ##	TM30/PM15	mg/kg	<5	4640	525	379	121	152	39	79	36	875	324	911	10	7	12	7	911	0
Mercury ##	TM30/PM15	mg/kg	<0.1	26	0.6	0.3	0.3	< 0.1	< 0.1	0.2	< 0.1	1.3	0.9	2.3	< 0.1	< 0.1	12	0.1	2.3	0
Nickel ##	TM30/PM15	mg/kg	<0.7	1800	28.3	25.8	24	19.9	17.3	26.1	16	36.6	22	67.1	18.1	13.9	12	13.9	67.1	0
Selenium ##	TM30/PM15	mg/kg	<1	13000	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	3	< 1	< 1	12	1	3	0
Vanadium	TM30/PM13	mg/kg	<1	3160	33	-	-	29	29	-	-	-	-	32	-	-	4	29	33	0
Water Soluble Boron ##	TM74/PM13	mg/kg	<0.1	192000	0.5	0.8	0.6	0.7	1.1	0.9	0.4	1.3	0.7	0.7	0.3	0.3	12	0.3	1.3	0
Zinc ##	TM30/PM15	mg/kg	<5	665000	404	261	153	67	48	79	50	277	219	1156	54	39	12	39	1156	0
Sulphate as SO4 (2:1 Ext)	TM38/PM20	g/l	<0.0015		< 0.0181	0.0269	0.1676	0.0368	0.0106	0.0232	0.0152	0.02	0.013	0.0198	0.0099	0.0153	12	0.0099	0.1676	0
Free Cyanide	TM89/PM45	mg/kg	<0.5	36	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	12	0.5	0.5	0
PAH																				
Naphthalene ##	TM4/PM8	mg/kg	<0.04	200	1.74	0.07	0.32	< 0.04	< 0.04	0.07	< 0.04	0.61	7.22	99.01	< 0.04	< 0.04	12	0.04	99.01	0
Acenaphthylene	TM4/PM8	mg/kg	<0.03	84000	0.42	0.06	0.24	< 0.03	< 0.03	0.06	< 0.03	< 0.15	5.92	16.08	< 0.03	< 0.03	12	0.03	16.08	0
Acenaphthene ##	TM4/PM8	mg/kg	<0.05	85000	8.15	0.14	0.38	< 0.05	< 0.05	0.12	< 0.05	0.51	13.27	21.59	< 0.05	< 0.05	12	0.05	21.59	0
Fluorene ##	TM4/PM8	mg/kg	<0.04	64000	5.72	0.09	0.39	< 0.04	< 0.04	0.07	< 0.04	0.2	11.34	32.29	< 0.04	< 0.04	12	0.04	32.29	0
Phenanthrene ##	TM4/PM8	mg/kg	<0.03	22000	51.04	1.19	3.85	< 0.03	< 0.03	0.92	< 0.03	4.19	117.68	218.47	< 0.03	< 0.03	12	0.03	218.47	0
Anthracene #	TM4/PM8	mg/kg	<0.04	530000	8.63	0.32	0.95	< 0.04	< 0.04	0.23	< 0.04	0.57	21.95	50.99	< 0.04	< 0.04	12	0.04	50.99	0
Fluoranthene #	TM4/PM8	mg/kg	<0.03	23000	42.12	2.52	5.34	< 0.03	< 0.03	1.92	< 0.03	9.01	135.45	192.9	< 0.03	< 0.03	12	0.03	192.9	0
Pyrene #	TM4/PM8	mg/kg	<0.03	54000	40.27	1.87	4.55	< 0.03	< 0.03	1.67	< 0.03	9.48	111.93	165.04	< 0.03	< 0.03	12	0.03	165.04	0
Benzo(a)anthracene #	TM4/PM8	mg/kg	<0.06	90	21.32	1.09	2.98	< 0.06	< 0.06	0.85	< 0.06	4.31	54.01	89.49	< 0.06	< 0.06	12	0.06	89.49	0
Chrysene ##	TM4/PM8	mg/kg	<0.02	140	19.47	1.06	2.31	< 0.02	< 0.02	0.88	< 0.02	7.38	64.92	69.47	< 0.02	< 0.02	12	0.02	69.47	0
Benzo(b)fluoranthene	TM4/PM8	mg/kg	<0.05	100	17.54	1.38	3.06	< 0.05	< 0.05	0.94	< 0.05	3.99	49.38	90.22	< 0.05	< 0.05	12	0.05	90.22	0
Benzo(k)fluoranthene	TM4/PM8	mg/kg	<0.02	140	6.82	0.54	1.19	< 0.02	< 0.02	0.36	< 0.02	1.55	19.2	35.08	< 0.02	< 0.02	12	0.02	35.08	0
Benzo(a)pyrene #	TM4/PM8	mg/kg	<0.04	14	16.24	1.1	2.72	< 0.04	< 0.04	0.84	< 0.04	2.52	41.46	78.02	< 0.04	< 0.04	12	0.04	78.02	3
Indeno(123-cd)pyrene ##	TM4/PM8	mg/kg	<0.04	60	10.14	0.77	1.86	< 0.04	< 0.04	0.43	< 0.04	1.63	32.8	50.9	< 0.04	< 0.04	12	0.04	50.9	0
Dibenz(ah)anthracene #	TM4/PM8	mg/kg	<0.04	13	1.64	0.14	0.32	< 0.04	< 0.04	0.08	< 0.04	0.47	5.93	7.74	< 0.04	< 0.04	12	0.04	7.74	0
Benzo(ghi)perylene #	TM4/PM8	mg/kg	<0.04	650	9.92	0.6	1.45	< 0.04	< 0.04	0.43	< 0.04	2.23	28.97	43.4	< 0.04	< 0.04	12	0.04	43.4	0
PAH 16 Total	TM4/PM8	mg/kg	<0.6		261.2	12.9	31.9	< 0.6	< 0.6	9.9	< 0.6	48.8	721.43	1260.7	< 0.6	< 0.6	12	0.6	1260.7	0
Petroleum Hydrocarbons																				
GRO (>C4-C8) ##	TM36/PM12	ug/kg	<100	3400000	-	< 100	< 100	-	-	< 100	< 100	< 100	< 100	< 100	< 100	< 100	8	100	100	0
GRO (>C8-C12) ##	TM36/PM12	ug/kg	<100	8300000	-	< 100	< 100	-	-	< 100	< 100	< 100	< 100	< 100	< 100	< 100	8	100	100	0
GRO (>C4-12) ##	TM36/PM12	ug/kg	<100	3400000	-	< 100	< 100	-	-	< 100	< 100	< 100	< 100	< 100	< 100	< 100	8	100	100	0
MTBE #	TM31/PM12	ug/kg	<5	7900	< 5	-	-	< 5	< 5	-	-	-	< 5	< 5	-	-	5	5	5	0
Benzene #	TM31/PM12	ug/kg	<5	95000	< 5	-	-	< 5	< 5	-	-	-	< 5	< 5	-	-	5	5	5	0
Toluene #	TM31/PM12	ug/kg	<5	4400	< 5	-	-	< 5	< 5	-	-	-	< 5	< 5	-	-	5	5	5	0
Ethylbenzene #	TM31/PM12	ug/kg	<5	2800	< 5	-	-	< 5	< 5	-	-	-	< 5	< 5	-	-	5	5	5	0
m/p-Xylene #	TM31/PM12	ug/kg	<5	3200	< 5	-	-	< 5	< 5	-	-	-	< 5	< 5	-	-	5	5	5	0
o-Xylene #	TM31/PM12	ug/kg	<5	2600	< 5	-	-	< 5	< 5	-	-	-	< 5	< 5	-	-	5	5	5	0
EPH >C10-C12 ##	TMS/PM8	mg/kg	<10	10000	-	< 10	< 10	-	-	< 10	< 10	< 10	49	-	< 10	< 10	8	10	49	0
EPH >C12-C16 ##	TMS/PM8	mg/kg	<10	36000	-	< 10	< 10	-	-	< 10	< 10	12	257	-	< 10	< 10	8	10	257	0
EPH >C16-C21 ##	TMS/PM8	mg/kg	<10	28000	-	< 10	58	-	-	22	< 10	124	1261	-	< 10	< 10	8	10	1261	0
EPH >C21-C40	TMS/PM8	mg/kg	<10	28000	-	95	466	-	-	150	< 10	492	3074	-	< 10	< 10	8	10	3074	0
EPH >C10-C40	TMS/PM8	mg/kg	<30	1000	-	95	524	-	-	172	< 30	628	4641	-	< 30	< 30	8	30	4641	1
Aliphatics >C5-C6 ##	TM36/PM12	mg/kg	<0.1	3400	< 0.1	-	-	< 0.1	< 0.1	-	-	-	< 0.1	< 0.1	-	-	5	0.1	0.1	0
Aliphatics >C6-C8 ##	TM36/PM12	mg/kg	<0.1	8300	< 0.1	-	-	< 0.1	< 0.1	-	-	-	< 0.1	< 0.1	-	-	5	0.1	0.1	0
Aliphatics >C8-C10	TM36/PM12	mg/kg	<0.1	2100	< 0.1	-	-	< 0.1	< 0.1	-	-	-	< 0.1	< 0.1	-	-	5	0.1	0.1	0
Aliphatics >C10-C12 ##	TMS/PM16	mg/kg	<0.2	10000	< 0.2	-	-	< 0.2	< 0.2	-	-	-	0.9	< 0.2	-	-	5	0.2	0.9	0
Aliphatics >C12-C16 ##	TMS/PM16	mg/kg	<4	61000	< 4	-	-	< 4	< 4	-	-	-	10	< 4	-	-	5	4	10	0
Aliphatics >C16-C21 ##	TMS/PM16	mg/kg	<7		< 7	-	-	< 7	< 7	-	-	-	9	27	-	-	5	7	27	0
Aliphatics >C21-C35 ##	TMS/PM16	mg/kg	<7		23	-	-	7	< 7	-	-	-	17	241	-	-	5	7	241	0
Aliphatics >C16-C35 ##	Calc. from Above			1600000	30			< 14	< 14	-	-	-	26	268	-	-	5	14	268	0
Aliphatics >C35-C44	TMS/PM16	mg/kg	<7	1600000	< 7	-	-	< 7	< 7	-	-	-	-	36	-	-	4	7	36	0
Total Aliphatics C5-44	TMS/TMS/PM16	mg/kg	<26		< 26	-	-	26	< 26	-	-	-	-	304	-	-	4	26	304	0
Aromatics >C5-EC7	TM36/PM12	mg/kg	<0.1	28000	< 0.1	-	-	< 0.1	< 0.1	-	-	-	< 0.1	< 0.1	-	-	5	0.1	0.1	0
Aromatics >EC7-EC8	TM36/PM12	mg/kg	<0.1	59000	< 0.1	-	-	< 0.1	< 0.1	-	-	-	< 0.1	< 0.1	-	-	5	0.1	0.1	0
Aromatics >EC8-EC10 ##	TM36/PM12	mg/kg	<0.1	3700	< 0.1	-	-	< 0.1	< 0.1	-	-	-	< 0.1	< 0.1	-	-	5	0.1	0.1	0
Aromatics >EC10-EC12 ##	TMS/PM16	mg/kg	<0.2	17000	< 0.2	-	-	< 0.2	< 0.2	-	-	-	3.1	< 0.2	-	-	5	0.2	3.1	0
Aromatics >EC12-EC16 ##	TMS/PM16	mg/kg	<4	36000	5	-	-	< 4	< 4	-	-	-	128	15	-	-	5	4	128	0
Aromatics >EC16-EC21 ##	TMS/PM16	mg/kg	<7	28000	49	-	-	< 7	< 7	-	-	-	800	101	-	-	5	7	800	0
Aromatics >EC21-EC35 ##	TMS/PM16	mg/kg	<7	28000	159	-	-	< 7	< 7	-	-	-	1260	445	-	-	5	7	1260	0
Aromatics >EC35-EC44	TMS/PM16	mg/kg	<7	28000	< 7	-	-	< 7	< 7	-	-	-	-	22	-	-	4	7	22	0
Total Aromatics C5-44	TMS/TMS/PM16	mg/kg	<26		213	-	-	26	< 26	-	-	-	-	583	-	-	4	26	583	0
Total aliphatics and aromatics(C5-35)	TMS/TMS/PM16	mg/kg	<38	1000									2228	-	-	-	1	2228	2228	1
Total aliphatics and aromatics(C5-44)	TMS/TMS/PM16	mg/kg	<52	1000	213	-	-	< 52	< 52	-	-	-	-	87	-	-	4	52	213	0
Phenol																				
Total Phenols HPLC	TM26/PM21	mg/kg	<0.15	3200	-	< 0.15	< 0.15	-	-	< 0.15	< 0.15	< 0.15	< 0.15	-	< 0.15	< 0.15	8	0.15	0.15	0
Phenol	TM26/PM21	mg/kg	<0.01	3200	< 0.01	-	-	< 0.01	< 0.01	-	-	-	-	< 0.01	-	-	4	0.01	0.01	0
Organic Matter																				
Fraction Organic Carbon	TM21/PM24	None	<0.001		0.04	-	-	0.006	0.01	-	-	-	-	0.057	-	-	4	0.006	0.057	0
SOM	Cal from above				6.896551724			1.034482759	1.724137931	-	-	-	-	9.827586207	-	-	4	1.03	9.83	0
Asbestos Screen																				
Fibre Screen*	Subcontracted	None		Presence	NFD		NFD	NFD	NFD	NFD	-	NFD	NFD	NFD	-	-	9	-	-	0

Notes:
EA SGV Commercial 1% SOM
LQM GAC Commercial 1% SOM
WYG TSV Commercial 1% SOM
RSC/AGS/CL:AIRE Commercial 1% SOM
WYG TSV based on professional judgement
Soil Result exceeds TSV
- UKAS accredited
M - MCERTs accredited
SVOC and VOC results awaited.

		Sample ID	TP1	TP2	TP3	TP4	TP5	CP2	CP1	WS3	WS6	WS1A	TP1	CP2
Report:	**Solid**	**Depth (m bgl)**	**0.7**	**0.9**	**0.3**	**1.4**	**1.0**	**0.7**	**1.4**	**0.4**	**0.6**	**0.3**	**2.8**	**2.2**
JE Lab Job No:	12/4921	**Sample Type**	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Sand & Gravel	Sand
Location:	GRAPHENE	**Sampled Date**	18/06/2012	18/06/2012	18/06/2012	18/06/2012	18/06/2012	19/06/2012	18/06/2012	20/06/12	20/06/12	05/07/12	18/06/2012	18/06/2012
Client ref:	A076252	**Sample Received Date**	20/06/2012	20/06/2012	20/06/2012	20/06/2012	20/06/2012	26/06/2012	20/06/2012	29/06/12	29/06/12	06/07/12	20/06/2012	20/06/2012

| Test | Method | Units | LOD | TSV | | |

		Sample ID		**TP1**	**TP4**	**TP5**	**WS6**	**WS1A**
Report:	**Solid**	**Depth (m bgl)**		**0.7**	**1.4**	**1.0**	**0.6**	**0.3**
JE Lab Job No:	12/4921	**Sample Type**		Made Ground	Made Ground	Made Ground	Made Ground	Made Ground
Client:	WYG	**Sampled Date**		18/06/2012	18/06/2012	18/06/2012	20/06/12	05/07/12
Client ref:	A076252	**Sample Received Date**		20/06/2012	20/06/2012	20/06/2012	29/06/12	06/07/12
Location:	GRAPHENE							
Test	**Method**	**Units**	**LOD**	**TSV**				
Aliphatics >C5-C6 #M	TM36/PM12	mg/kg	<0.1	3400	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatics >C6-C8 #M	TM36/PM12	mg/kg	<0.1	8300	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatics >C8-C10	TM36/PM12	mg/kg	<0.1	2100	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatics >C10-C12 #M	TM5/PM16	mg/kg	<0.2	10000	< 0.2	< 0.2	< 0.2	0.9	< 0.2
Aliphatics >C12-C16 #M	TM5/PM16	mg/kg	<4	61000	< 4	< 4	< 4	10	< 4
Aliphatics >C16-C35 #M	Calc. from Above			1600000	30	< 14	< 14	26	27
Aliphatics >C35-C44	TM5/PM16	mg/kg	<7	1600000	< 7	< 7	< 7		36
Aromatics >C5-EC7	TM36/PM12	mg/kg	<0.1	28000	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatics >EC7-EC8	TM36/PM12	mg/kg	<0.1	59000	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatics >EC8-EC10 #M	TM36/PM12	mg/kg	<0.1	3700	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatics >EC10-EC12 #M	TM5/PM16	mg/kg	<0.2	17000	< 0.2	< 0.2	< 0.2	3.1	< 0.2
Aromatics >EC12-EC16 #M	TM5/PM16	mg/kg	<4	36000	5	< 4	< 4	128	15
Aromatics >EC16-EC21 #M	TM5/PM16	mg/kg	<7	28000	49	< 7	< 7	800	101
Aromatics >EC21-EC35 #M	TM5/PM16	mg/kg	<7	28000	159	< 7	< 7	1260	583
Aromatics >EC35-EC44	TM5/PM16	mg/kg	<7	28000	< 7	< 7	< 7		22
				Hazard Quotient	2.9E-05	2.9E-05	2.9E-05	2.9E-05	2.9E-05
					1.2E-05	1.2E-05	1.2E-05	1.2E-05	1.2E-05
					4.8E-05	4.8E-05	4.8E-05	4.8E-05	4.8E-05
					2.0E-05	2.0E-05	2.0E-05	9.0E-05	2.0E-05
					6.6E-05	6.6E-05	6.6E-05	1.6E-04	6.6E-05
					1.9E-05	8.8E-06	8.8E-06	1.6E-05	1.7E-05
					4.4E-06	4.4E-06	4.4E-06		2.3E-05
					3.6E-06	3.6E-06	3.6E-06	3.6E-06	3.6E-06
					1.7E-06	1.7E-06	1.7E-06	1.7E-06	1.7E-06
					2.7E-05	2.7E-05	2.7E-05	2.7E-05	2.7E-05
					1.2E-05	1.2E-05	1.2E-05	1.8E-04	1.2E-05
					1.4E-04	1.1E-04	1.1E-04	3.6E-03	4.2E-04
					1.8E-03	2.5E-04	2.5E-04	2.9E-02	3.6E-03
					5.7E-03	2.5E-04	2.5E-04	4.5E-02	2.1E-02
					2.5E-04	2.5E-04	2.5E-04		7.9E-04
				Hazard Index	8.1E-03	1.1E-03	1.1E-03	7.8E-02	2.6E-02

Notes:

LQM GAC Commercial 1% SOM

Soil Result exceeds TSV

Hazard Index Exceeds 1

- UKAS accredited

M - MCERTs accredited

		Sample ID	**TP1**	**TP3**	**WS1A**	**TP1**
Report:	**CEN 10:1 1 Batch**	**Depth (m bgl)**	**0.7**	**0.3**	**0.3**	**2.8**
JE Lab Job No:	12/4921	**Sample Type**	Made Ground	Made Ground	Made Ground	Sand & Gravel
Location:	GRAPHENE	**Sampled Date**	18/06/2012	18/06/2012	05/07/2012	18/06/2012
Client ref:	A076252	**Sample Received Date**	20/06/2012	20/06/2012	06/07/2012	20/06/2012

Test	**Method**	**Units**	**LOD**	**TSV**							
Dissolved Arsenic #	TM30/PM14	ug/l	<0.9	7.5	7.3		11.3	5.2	4.6
Dissolved Boron #	TM30/PM14	ug/l	<12	750	< 12		43	< 12	< 12
Dissolved Cadmium #	TM30/PM14	ug/l	<0.03	3.75	0.08		0.07	0.04	0.49
Dissolved Chromium #	TM30/PM14	ug/l	<0.2	37.5	9.9		3.5	4	4.2
Dissolved Copper #	TM30/PM14	ug/l	<3	1500	9		9	14	4
Dissolved Lead #	TM30/PM14	ug/l	<0.4	18.8	30.5		8.6	5.8	4
Dissolved Nickel #	TM30/PM14	ug/l	<0.2	15	< 0.2		0.9	1.2	0.7
Dissolved Selenium #	TM30/PM14	ug/l	<1.2	10	< 1.2	< 1.2	2.1	< 1.2
Dissolved Zinc #	TM30/PM14	ug/l	<3	3750	6	< 3	8	5
Mercury Dissolved by CVAF #	TM61/PM38	ug/l	<0.01	0.75	0.53	0.19	3.23	0.18
Sulphate #	TM38/PM0	mg/l	<0.05	188	5.1	32.18	7.18	4.09
Ammoniacal Nitrogen as N #	TM38/PM0	mg/l	<0.03	2.9	0.05	0.06	0.17	< 0.03
Total Cyanide #	TM89/PM0	mg/l	<0.01	0.05	< 0.01	< 0.01	0.02	< 0.01
pH	TM73/PM0	pH units	<0.01	<6.5 > 10	8.15	8.34	8.14	7.56

Notes:

TSVs are based on The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010 - Groundwater Drinking Water Protected areas, unless otherwise stated.

TSV based on UK Drinking Water Standard

Soil Result exceeds TSV

- UKAS accredited