Department for Regional Development - TransportNI

YORK STREET INTERCHANGE

Public Inquiry

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Proof of Evidence:

Daylight Assessment

by

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1. INTRODUCTION

1.1.1.1 My name is Foroutan Parand and I am a Technical Director with URS, Consulting Engineers. I have an MSc in Mechanical Engineering and PhD in Physics (Solar Energy Utilization). I am an Energy Assessor and lead URS' building physics team which carries out energy and thermal analysis of buildings as well as daylight, sunlight and overshadowing for new developments.

1.1.1.2 URS was acquired by AECOM in October, 2014. Together AECOM and URS are one of the world's premier, fully integrated infrastructure and support services firms. For the purpose of this Proof of Evidence, any reference to URS may include reference to its former legacy companies, including Scott Wilson.

1.1.1.3 Daylight enhances the appearance of a space, and people expect good natural light in their homes. Daylight also helps reduce the need for artificial lighting, thus decreasing energy consumption. The quantity and quality of natural light is dependent on the design of the interior spaces. This encompasses the depth and shape of rooms, size and position of windows and colours of internal surfaces. Daylight is also influenced by the external environment and obstructions such as other buildings and objects.

1.1.1.4 The changes associated with the York Street Interchange (the Proposed Scheme) would potentially have an impact on the natural daylight received by local residential buildings at Little Georges Street and Molyneaux Street. The Proposed Scheme would require the removal of all existing vegetation to facilitate the widening of the existing road embankment using a reinforced soil slope and a 1.5m high noise attenuator adjacent to the road.

1.1.1.5 Drawing YSI-URS-XX-XX-DR-RE-LA265 in Appendix A illustrates the proposed changes to the road layout adjacent to the properties at Little Georges Street.

1.1.1.6 As part of the completed Landscape and Visual Effects assessment, a number of photomontages have been prepared and included as Figure 11.6 (Sheet 1 of 7) and Figure 11.6 (Sheet 2 of 7) in Volume 3 of the published Environmental Statement. In addition, Figures 1 to 3 provide additional photomontages of the existing scenario and the proposed retaining solution for the Winter, Year 1 scenario and the Summer, Year 15 scenarios respectively.

Figure 1: Receptor G025 (No. 9 Little Georges Street), Existing View

Figure 2: Receptor G025 (No. 9 Little Georges Street), Winter, Year 1

Figure 3: Receptor G025 (No. 9 Little Georges Street), Summer, Year 15

1.1.1.7 There are concerns that the Proposed Scheme may adversely impact the right to light of the existing houses adjacent to it.

1.1.1.8 URS has undertaken an analysis of the likely impact of the Proposed Scheme on daylight availability to the existing adjacent residential buildings on North Queen Street, Little Georges Street and Molyneaux Street.

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2. APPROACH AND METHODOLOGY

2.1 Overview

2.1.1.1 Carrying out a detailed right to light assessment requires detailed survey of the buildings and their interior layout. This report attempts to identify and quantify the impact of the development on the availability of daylight to the external surfaces of the houses in North Queen Street, Little Georges Street and Molyneaux Street, which are immediately adjacent to the Proposed Scheme and may be prone to adverse impact. This allows identification of the worst affected houses and a quantification of the level of the impact.

2.1.1.2 In assessing the impact of the development on the access to daylight the BRE Guidelines, BR209-2011 entitled "Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice", have been used. These guidelines are recommended by local authorities for assessing the availability of daylight before and after the development for planning purposes.

2.2 Assessment of Access to Daylight

2.2.1.1 The BRE Guidelines proposes three methods for assessing the access to daylight on the surface of a wall and inside a room:

- Visible sky angle: If the angle of visible sky measured from the centre of a conventionally designed window is greater than 65^{o}, the room behind that window will receive sufficient daylight. The visible sky angle is hard to calculate where obstructions are not continuous and have varying heights. Considering the varying height of the existing canopy of trees adjacent to the properties in question, this method of assessment was not adopted.

- Vertical Sky Component: The amount of light from sky falling on a vertical window or wall can be quantified as vertical sky component (VSC). This is the ratio of direct sky illuminance falling on the vertical wall at a reference point (usually the centre of the window), to the simultaneous horizontal illuminance under an unobstructed sky. The standard CIE (Commission Internationale de L'Eclairage – International Commission on Illumination) overcast sky is used, and the ratio is usually expressed as a percentage. The maximum value is 40% for a completely unobstructed wall. A point on a wall with a visible sky angle of 65^{o} will achieve a VSC of 27%. Therefore any point on a vertical wall or window not achieving a VSC of 27% due to adjacent obstructions may not achieve sufficient daylight inside the room behind it. However the final test to determine whether this occurs is the Average Daylight Factors (ADF) test.

- Average Daylight Factors: ADF is a measure of daylight within a room. It is calculated as a ratio of illuminance (lux) on a working plane at a height of 0.85m above floor to that of an obstructed horizontal plane outside under the CIE sky defined above. A living room is deemed to receive sufficient daylight if it achieves an ADF of more than 1.5%. ADF depends upon room dimensions, window size, type of glazing and internal and external surface reflectances. A detailed survey of a room is required to calculate its ADF.

2.3 Right to Light

2.3.1.1 Windows and apertures that provide natural light to rooms behind them may enjoy the right to light over adjacent land. The guidelines for calculating the adequacy of light in the context of right to light has been set by Waldram in the 1920s and are still commonly used. Waldram's research showed that tasks requiring visual discrimination – generally clerical type tasks – could be performed if the point at table height (now taken as the 'working plane') in the room could receive light from 1/500th of the total illuminance provided by the sky. The ratio of lumens received at a point in a room on the working plane (defined at a height of 850mm from floor) to that on an unobstructed horizontal plane under the uniform overcast sky is called Sky Factor (SF) and is commonly used to quantify the level of light in a room.

2.3.1.2 Since the whole hemisphere of the sky provides 500 lumens (overcast sky), a point on the working plane must receive one lumen to achieve the minimal light level. This is equivalent to 0.2% of the sky being visible at that point, i.e. a SF of 0.2%.

2.3.1.3 It is commonly accepted that if 50% of a room area (at working plane height) has a SF of 0.2% or more the room is considered adequately lit. This is sometimes referred to as the 50/50 rule.

2.4 Calculation Methodology

2.4.1.1 A study using 3D modelling software to carry out calculations for the methods of assessment discussed above, namely the access to light using the VSC and Average Daylight Factors and the right to light assessment using the area of room that receives 1 lumen of light under overcast winter sky have been undertaken.

2.4.1.2 In order to determine the impact of the Proposed Scheme the above tests will be carried out for three scenarios as follows:

- Scenario 1 – the existing scenario not including local vegetation;
- Scenario 2 – the existing scenario including local vegetation; and

- Scenario 3 – the Proposed Scheme.

2.4.1.3 It is important to calculate the daylight levels for the existing situation with and without vegetation as during the winter months the current dense layer of trees and bushes at the rear of the majority of dwellings will be without leaves which will offer significantly less shading. Scenario 1 will represent this situation. Scenario 2 will offer the situation during the summer and spring months where the vegetation will enable an almost solid layer of shading. Scenario 3 (the Proposed Scheme) does not include any vegetation that overshadows the dwellings.

2.5 Assessment of Impact

2.5.1 Availability of Daylight

2.5.1.1 The BRE Guidelines suggest that if the VSC is reduced by more than 20% of its existing value the impact is noticed. However if the VSC is still above 27% adequate daylight is available to the building. In cases where VSC is below 27% Average Daylight Factor will be used to assess whether sufficient daylight is achieved inside a room. A living room that achieves an ADF of 1.5% is deemed to have sufficient daylight.

2.5.2 Injury to Right to Light

2.5.2.1 To assess the impact of a development on the right to light two sets of calculations are carried out and a contour of 0.2% SF is drawn for the 'before' and 'after' situations and the area of the room that has SF greater than 0.2% is calculated. The RICS guidelines, "Rights of light - Practical guidance for chartered surveyors in England and Wales, RICS guidance note", 1st edition (GN 66/2010), is used to assess possible injury as follows:

"Once the two contours have been drawn, it can be seen that there is an area of the room that is 'adequately lit' before and after. Regardless of the amount of light before, if the 'after' proportion is less than 50% of the room area (often referred to as the 'grumble point'), it is conventionally accepted that there is a likelihood of an actionable injury to the light. However, it should be noted that the grumble point, although conventionally used, is not a rule of law and the courts preside over its interpretation."

2.5.3 VSC Receptor Points

2.5.3.1 A list of the addresses that potentially will be impacted by the development are as shown in Table 1:

Table 1: Existing Addresses under study

House Number	Street Name
97	North Queen St
99	North Queen St
1	Little Georges St
3	Little Georges St
5	Little Georges St
7	Little Georges St
9	Little Georges St
11	Little Georges St
13	Little Georges St
15	Little Georges St
17	Little Georges St
19	Little Georges St
21	Little Georges St
23	Little Georges St
25	Little Georges St
27	Little Georges St

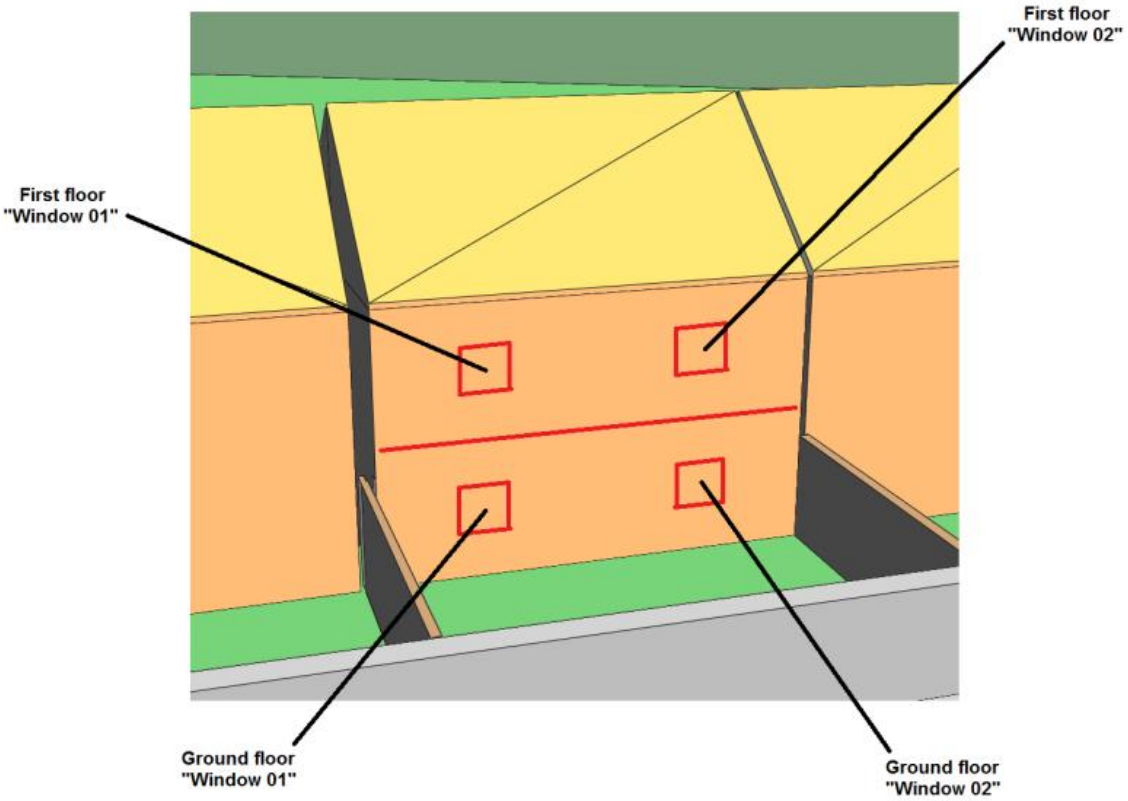
House Number	Street Name
29	Little Georges St
31	Little Georges St
33	Little Georges St
35	Little Georges St
37	Little Georges St
39	Little Georges St
41	Little Georges St
43	Little Georges St
45	Little Georges St
47	Little Georges St
1	Molyneaux St
3	Molyneaux St
5	Molyneaux St
7	Molyneaux St
9	Molyneaux St

2.5.3.2 A plan of the existing scenario, including the existing buildings above, is included as Figure 4.

Figure 4: Plan of Existing Scenario

2.5.3.3 For the access to daylight calculations, i.e. VSC, four receptors were assumed on each wall facing the development for each dwelling. Figure 5 illustrates the location of the receptors for a typical dwelling.

Figure 5: Model image showing typical receptors for a dwelling



2.5.3.4 The VSC is calculated for the centre of each window. If VSC is below 27% then the natural daylight inside the room may not be adequate. An Average Daylight Factor test will then determine whether this would be the case.

2.5.4 Modelling Software

2.5.4.1 The VSC and daylight calculations have been carried out using the Radiance Module of the IES <Virtual Environment> Version 2015.0.0.0. IES is an integrated system of building design and simulation software and Radiance is one of the world's leading software packages for analysis of lighting and daylight.

3. BUILDING INPUT DATA

3.1.1.1 All data used in creating the 3D models for the calculations have been supplied by the URS design team.

3.1.1.2 Geometrical data was supplied in the form of drawings by the URS design team including 3D CAD models and section drawings for each affected property. These are listed below in Table 2:

Table 2: Drawings Used

Name	Drawing No	Date	Rev
Existing 3D CAD Model	York_St_Interchange_existing	-	-
Impact on properties along North Queen St, Little Georges St & Molyneaux St	YSI-URS-XX-XX-DR-RE-LA265	27/02/2015	P0
Existing tree canopy 3D Model	Tree_Canopy_TIN	-	-
Proposed 3D CAD Model	YSI-URS-XX-XX-M3-RE-GE001	-	-

3.1.1.3 Figures 6, 7 and 8 below show the roads and buildings as modelled in IES for the three scenarios discussed in Section 2.2.

Figure 6: Scenario 1 (existing, no trees), viewed from a north-east orientation

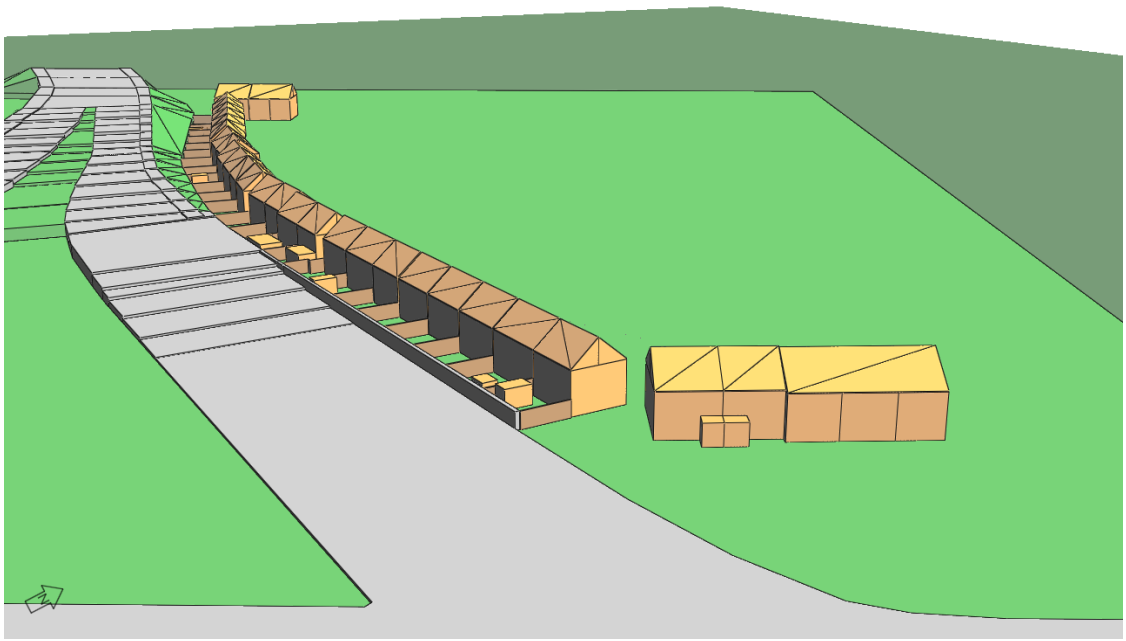


Figure 7: Scenario 2 (existing, with trees), viewed from a north-east orientation

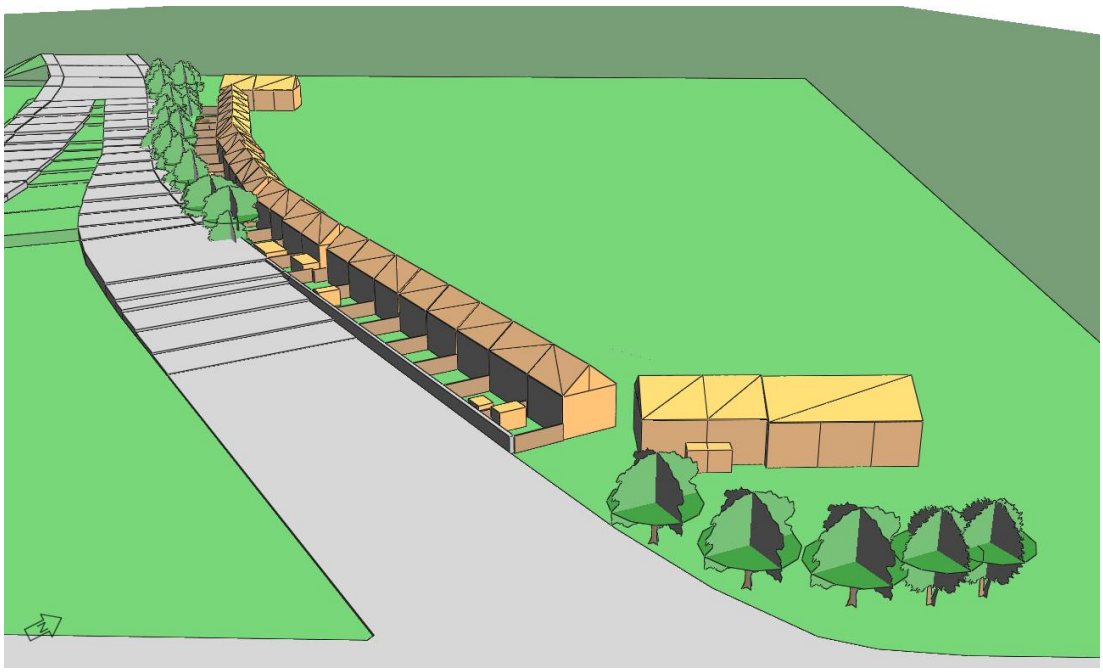
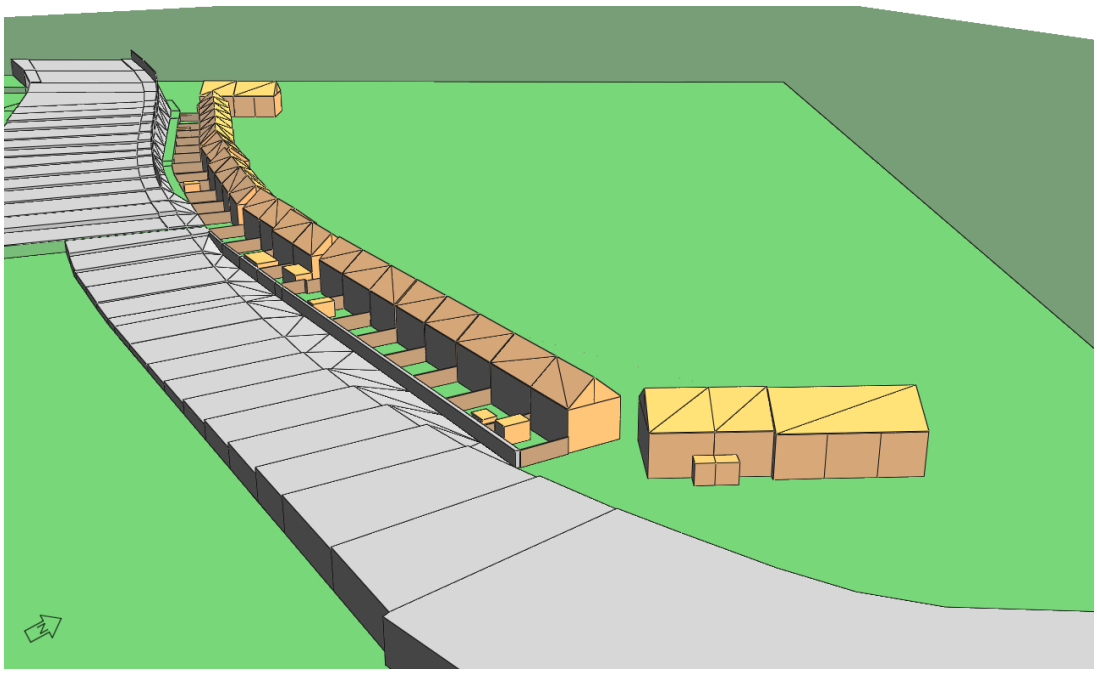


Figure 8: Scenario 3 (Proposed Scheme), viewed from a north-east orientation



4. RESULTS – ACCESS TO DAYLIGHT ASSESSMENT

4.1.1.1 VSC results for all potentially affected existing buildings for all three scenarios are shown in Table 3 below. Receptor points that do not achieve the required VSC of 27% are highlighted in bold typefaces.

Table 3: VSC Results

Property	Floor	Receptor	Scenario 1 Existing, No Trees	Scenario 2 Existing, With Trees	Scenario 3 Proposed Scheme
99 Queen St, North West façade	Ground	Window 01	38.3%	37.9%	37.6%
		Porch	39.4%	39.2%	38.9%
		Window 02	37.6%	36.7%	36.4%
	1st	Window 01	39.4%	38.5%	39.2%
		Window 02	39.4%	39.4%	39.0%
99 Queen St, South West façade	Ground	Window 01	35.5%	28.6%	30.4%
		Porch	35.5%	22.4%	27.8%
		Window 02	31.1%	18.4%	26.9%
	1st	Window 01	38.8%	31.9%	35.6%
		Window 02	38.8%	27.0%	34.4%
97 Queen St, South East façade	Ground	Window 01	34.6%	28.7%	32.5%
		Window 02	34.2%	30.9%	32.7%
	1st	Window 01	38.8%	32.1%	35.8%
		Window 02	38.4%	34.5%	37.0%
1 Little Georges St	Ground	Window 01	35.1%	**21.2%**	**25.7%**
		Window 02	33.7%	**20.7%**	**23.9%**
	1st	Window 01	39.0%	**26.6%**	30.8%
		Window 02	38.5%	27.7%	30.2%
3 Little Georges St	Ground	Window 01	33.4%	**23.1%**	**24.1%**
		Window 02	30.9%	**24.0%**	**23.3%**
	1st	Window 01	38.5%	28.6%	29.9%
		Window 02	37.9%	29.8%	30.0%

Property	Floor	Receptor	Scenario 1 Existing, No Trees	Scenario 2 Existing, With Trees	Scenario 3 Proposed Scheme
5 Little Georges St	Ground	Window 01	33.6%	**25.6%**	**24.5%**
		Window 02	34.7%	**25.9%**	**24.9%**
	1st	Window 01	38.2%	30.4%	30.7%
		Window 02	38.5%	31.1%	31.2%
7 Little Georges St	Ground	Window 01	34.8%	**26.2%**	26.8%
		Window 02	34.0%	**24.8%**	27.2%
	1st	Window 01	38.7%	31.2%	32.3%
		Window 02	39.0%	29.4%	33.0%
9 Little Georges St	Ground	Window 01	33.4%	**22.1%**	**26.5%**
		Window 02	34.0%	**21.4%**	27.9%
	1st	Window 01	39.0%	28.4%	33.1%
		Window 02	39.0%	27.4%	34.2%
11 Little Georges St	Ground	Window 01	34.3%	**20.1%**	28.0%
		Window 02	34.4%	**19.5%**	28.6%
	1st	Window 01	39.0%	26.4%	34.9%
		Window 02	39.3%	**24.8%**	35.2%
13 Little Georges St	Ground	Window 01	35.1%	**21.8%**	29.9%
		Window 02	34.8%	**23.5%**	31.0%
	1st	Window 01	39.2%	27.5%	36.3%
		Window 02	39.2%	28.2%	36.6%
15 Little Georges St	Ground	Window 01	34.3%	**23.6%**	31.7%
		Window 02	33.3%	**22.2%**	30.6%
	1st	Window 01	39.4%	28.7%	37.1%
		Window 02	38.9%	28.0%	36.6%
17 Little Georges St	Ground	Window 01	28.9%	**20.1%**	27.1%
		Window 02	32.4%	**21.1%**	32.4%
	1st	Window 01	38.9%	27.0%	36.9%
		Window 02	38.9%	27.8%	38.0%

Property	Floor	Receptor	Scenario 1 Existing, No Trees	Scenario 2 Existing, With Trees	Scenario 3 Proposed Scheme
19 Little Georges St	Ground	Window 01	35.1%	**23.3%**	32.9%
		Window 02	35.3%	**23.4%**	34.3%
	1st	Window 01	38.6%	31.0%	38.2%
		Window 02	38.8%	30.5%	38.5%
21 Little Georges St	Ground	Window 01	34.6%	**21.4%**	34.3%
		Window 02	34.7%	**22.8%**	34.4%
	1st	Window 01	39.2%	28.0%	38.8%
		Window 02	39.1%	29.4%	38.8%
23 Little Georges St	Ground	Window 01	36.4%	**23.6%**	36.2%
		Window 02	36.6%	**21.0%**	36.3%
	1st	Window 01	38.9%	31.5%	38.8%
		Window 02	39.2%	28.3%	39.1%
25 Little Georges St	Ground	Window 01	36.1%	**15.3%**	35.9%
		Window 02	35.4%	**13.8%**	35.2%
	1st	Window 01	39.5%	**23.0%**	39.3%
		Window 02	39.5%	**22.1%**	39.4%
27 Little Georges St	Ground	Window 01	34.0%	**17.3%**	33.9%
		Window 02	35.4%	**23.4%**	35.3%
	1st	Window 01	39.2%	**23.9%**	39.1%
		Window 02	38.9%	30.5%	38.8%
29 Little Georges St	Ground	Window 01	26.7%	**25.1%**	26.6%
		Window 02	25.5%	**25.0%**	25.3%
	1st	Window 01	38.6%	35.4%	38.5%
		Window 02	38.9%	38.0%	38.8%

Property	Floor	Receptor	Scenario 1 Existing, No Trees	Scenario 2 Existing, With Trees	Scenario 3 Proposed Scheme
31 Little Georges St	Ground	Window 01	32.6%	32.6%	31.2%
		Conservatory West façade	26.9%	**26.2%**	**25.4%**
		Conservatory South façade	35.9%	35.4%	35.8%
	1st	Window 01	39.7%	39.1%	39.6%
		Window 02	39.7%	39.1%	39.6%
33 Little Georges St	Ground	Window 01	34.8%	33.3%	34.7%
		Window 02	33.9%	33.3%	33.8%
	1st	Window 01	39.1%	38.8%	39.0%
		Window 02	39.1%	38.8%	39.0%
35 Little Georges St	Ground	Window 01	29.5%	29.2%	29.4%
		Window 02	33.9%	33.7%	33.8%
	1st	Window 01	38.9%	38.7%	38.8%
		Window 02	38.9%	38.7%	38.8%
37 Little Georges St	Ground	Window 01	34.6%	34.5%	34.5%
		Window 02	33.5%	33.4%	33.5%
	1st	Window 01	39.3%	39.1%	39.2%
		Window 02	39.1%	38.9%	39.1%
39 Little Georges St	Ground	Window 01	34.4%	34.3%	34.3%
		Window 02	34.8%	34.7%	34.4%
	1st	Window 01	39.1%	38.8%	39.0%
		Window 02	39.1%	38.8%	39.0%
41 Little Georges St	Ground	Window 01	34.4%	30.3%	34.0%
		Window 02	35.7%	33.2%	35.3%
	1st	Window 01	38.9%	38.9%	38.8%
		Window 02	39.1%	38.9%	39.0%

Property	Floor	Receptor	Scenario 1 Existing, No Trees	Scenario 2 Existing, With Trees	Scenario 3 Proposed Scheme
43 Little Georges St	Ground	Window 01	34.8%	34.0%	34.7%
		Window 02	35.2%	35.2%	35.1%
	1st	Window 01	39.1%	39.1%	39.0%
		Window 02	39.1%	39.1%	39.0%
45 Little Georges St	Ground	Window 01	34.8%	34.4%	34.7%
		Window 02	33.9%	33.8%	33.8%
	1st	Window 01	38.9%	38.9%	38.8%
		Window 02	39.1%	38.8%	39.0%
47 Little Georges St South façade	Ground	Window 01	33.5%	32.0%	31.4%
		Window 02	35.2%	35.2%	33.4%
	1st	Window 01	39.6%	39.4%	39.4%
		Window 02	39.8%	39.7%	39.4%
47 Little Georges St East façade	Ground	Window	31.0%	29.5%	29.5%
	1st	Window	36.9%	36.3%	36.6%
9 Molyneaux St South West façade	Ground	Window	32.0%	31.9%	31.9%
	1st	Window	37.1%	37.0%	37.0%
9 Molyneaux St South East façade	Ground	Window	38.6%	33.9%	36.3%
		Porch	39.8%	35.0%	38.6%
	1st	Window 01	39.9%	37.4%	39.8%
		Window 02	39.6%	37.1%	39.5%
7 Molyneaux St	Ground	Porch	39.6%	35.2%	38.8%
		Window	36.1%	33.9%	34.9%
	1st	Window 01	39.6%	36.9%	39.5%
		Window 02	39.2%	36.8%	39.1%

Property	Floor	Receptor	Scenario 1 Existing, No Trees	Scenario 2 Existing, With Trees	Scenario 3 Proposed Scheme
5 Molyneaux St	Ground	Window	38.8%	35.4%	37.8%
	1st	Window	39.6%	37.5%	39.4%
3 Molyneaux St	Ground	Window	38.8%	35.8%	38.0%
	1st	Window	39.6%	37.7%	39.4%
1 Molyneaux St	Ground	Window	39.0%	36.6%	38.4%
	1st	Window	39.6%	38.2%	39.5%

4.2 Conclusions from Daylight VSC Calculations

- **Scenario 1, Existing without trees:** All existing buildings in the current situation will comply with the BRE guidelines when overshadowing by trees is not considered.
- **Scenario 2, Existing with trees:** A number of existing dwellings on the west side of Little Georges Street may not receive adequate daylight when the trees are in full bloom.
- **Scenario 3, Proposed Scheme**: Majority of existing buildings when the Proposed Scheme is applied will comply with the BRE guidelines, i.e. achieve a VSC above 27%, and therefore residents should not notice significant reduction in daylight caused by the proposed development. Some buildings achieve VSC below 27%.
- The Proposed Scheme, Scenario 3, offers improved levels of daylight when compared with Scenario 2 - on average around 17% better.
- Nos. 1, 3, 5 and 7 Little Georges Street are affected by the Proposed Scheme with more than 20% reduction in VSC compared to Scenario 1. No. 1 Little Georges Street is most affected by the Proposed Scheme, however No. 3 Little Georges Street has the lowest VSC.
- Nos. 9, 11, 13 and 15 Little Georges Street are affected by the Proposed Scheme but the impact is not significant, i.e. impacts are less than 20% reduction in VSC compared to Scenario 1. No. 17 is largely unaffected.

- As a result four houses were selected for further detailed studies, namely Average Daylight Factor test and Right to Light 50/50 Rule test:
  - Nos. 1 and 3 Little Georges Street, which are the worst affected houses;
  - No. 11 Little Georges Street, which is a moderately affected building; and
  - No. 17 Little Georges Street, which is almost unaffected.

4.3 Survey of Houses for Detailed Calculations

4.3.1.1 Nos. 1, 3, 11 and 17 Little Georges Street were surveyed to allow detailed calculations for ADF and SF to be carried out. Appendix A includes drawings of the surveyed buildings.

4.3.1.2 The survey showed that with the exception of one window on the ground floor, all other windows are providing light to non-occupied spaces, e.g. stairs lobby, landing, and bathroom/toilet. Therefore only the living rooms of the selected houses were modelled in detail to calculate the ADF and Sky Factor.

4.4 Average Daylight Factors Tests

4.4.1.1 Table 5 below shows the results of ADF for the living rooms of the two of the worst affected houses, i.e. Nos. 1 and 3 Little Georges Street.

4.4.1.2 The BRE recommended Average Daylight Factor for living rooms is 1.5%. The worst affected living rooms tested achieve ADF higher than 1.5% when the proposed development is in place. This means that all other living rooms are expected to achieve ADFs higher than 1.5% after the development.

4.4.1.3 The impact of the development on ADF is less than 20% for No. 1 Little Georges Street and 10% for No. 3 Little Georges Street when compared to Scenario 1.

Table 5: Average Daylight Factor Tests Results

Property	Scenario 1 Existing, No Trees	Scenario 2 Existing, With Trees	Scenario 3 Proposed Scheme
1 Little Georges St	2.5	2.0	2.1
3 Little Georges St	2.0	1.8	1.8

A living room is deemed to receive sufficient daylight if it achieves an ADF of more than 1.5%.

4.5 Right to Light Assessment

4.5.1.1 Sky Factor (SF) (for 50/50 rule) tests were carried out for all four houses surveyed, namely Nos. 1, 3, 11 and 17 Little Georges Street.

4.5.1.2 Table 6 below gives the results for the SF test. The table shows the percentage of area within the room that is above 0.2% SF.

Table 6: Sky Factor Results

	Percentage of area of the living room at working plane 0.85m above floor that has Sky Factor > 0.2%		
Property	**Scenario 1 Existing, No Trees**	**Scenario 2 Existing, With Trees**	**Scenario 3 Proposed Scheme**
1 Little Georges St	96.6%	94.4%	95.2%
3 Little Georges St	98.2%	93.5%	91.1%
11 Little Georges St	95.9%	91.1%	92.1%
17 Little Georges St	95.6%	94.0%	94.2%

4.5.1.3 The results show that there is a very slight reduction of SF when the Proposed Scheme (Scenario 3) is in place compared to Scenario 1. However, the majority of cases tested show a slight improvement when comparing the results from Scenario 3 with those for Scenario 2.

4.5.1.4 No. 3 Little Georges Street is the worst affected with the lowest SF achieved after the Proposed Scheme is in place (Scenario 3). However it still achieves a SF of 91.1%, which is considerably higher than the required 50% area in Waldram test, the 50/50 rule. All other houses achieve SFs better than 91%.

4.5.1.5 Since we have tested the worst affected buildings it can be concluded that the impact of the development on all existing buildings will be negligible when using the SF test for the Right to Light assessment.

5. CONCLUSIONS

5.1.1.1 **Daylight:** Using the BRE Guidelines the results of this study show that all living rooms, which are the only occupied rooms of the existing buildings that are affected by the Proposed Scheme, will still achieve adequate daylight.

5.1.1.2 **Right to Light:** Using the Waldram test, i.e. achieving a SF of 0.2% for at least 50% of the area of a room (the so called 50/50 rule) the results of this study show that the Proposed Scheme's impact on the level of adequate light within the rooms is very slight as all living rooms in the affected buildings will still achieve a SF of 0.2% on the working plane for at least 91% of their areas.

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APPENDIX A DRAWINGS

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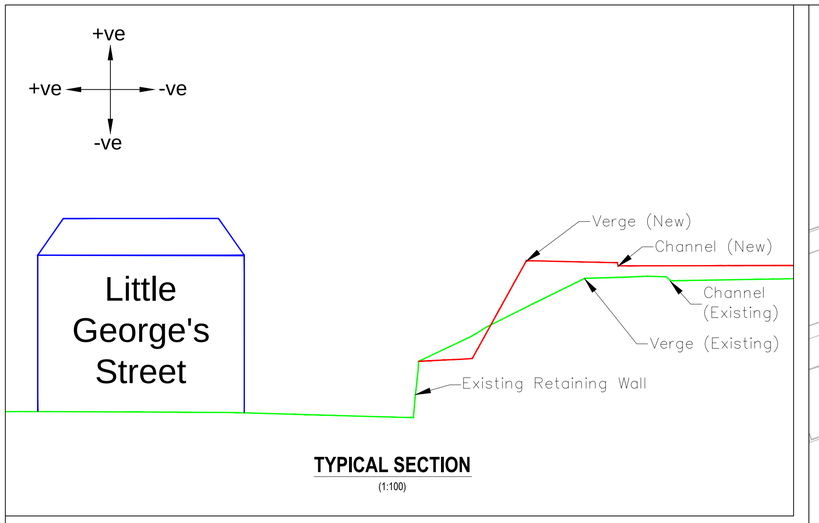

TYPICAL SECTION
(1:100)

PLAN
(1:500)

ROAD LAYOUT SHOWN IS PRELIMINARY AND SUBJECT TO CHANGE AS PART OF DESIGN DEVELOPMENT

Street Name	House No.	Verge		Channel	
		Horizontal	Vertical	Horizontal	Vertical
North Queen Street	97	5.017	0.263	4.482	0.253
	99	5.023	0.261	4.482	0.253
Little George's Street	1	3.984	0.550	3.542	0.506
	3	3.992	0.550	3.542	0.506
	5	3.101	0.652	2.582	0.566
	7	2.841	0.627	2.213	0.561
	9	1.912	0.574	1.711	0.479
	11	1.889	0.488	1.313	0.413
	13	1.375	0.275	0.700	0.255
	15	1.443	0.191	0.388	0.127
	17	0.560	0.034	0.033	0.021
	19	-0.229	-0.127	-0.553	-0.127
	21	-0.881	-0.274	-1.179	-0.227
	23	-1.504	-0.416	-1.804	-0.363
	25	-2.702	-0.569	-2.822	-0.486
	27	-3.719	-0.565	-3.866	-0.491
	29	-4.645	-0.411	-4.952	-0.417
	31	-4.766	-0.371	-5.163	-0.382
	33	-6.035	0.058	-6.554	0.037
	35	-6.623	0.344	-7.051	0.323
	37	-6.639	0.705	-7.471	0.698
	39	-7.125	1.188	-7.876	1.151
	41	-7.452	1.690	-8.034	1.651
	43	-7.396	2.238	-7.963	2.198
	45	-7.071	2.789	-7.657	2.782
	47	-6.468	3.393	-7.057	3.370
Molyneaux Street	1	-3.144	3.700	-2.510	3.715
	3	-2.396	3.924	-1.960	3.968
	5	-1.907	4.079	-1.491	4.109
	7	-1.267	4.148	-1.125	4.159
	9	-3.460	4.242	0.825	4.298

Plot Date: : 03 March 2015 11:24:02
File Name: : I:\BF-SWA\250\WP\PROJECTS\250K YORK STREET INTERCHANGE - DRAWINGS\02 PRELIMINARY STAGE 3 SPECIMEN (DESIGN 4 LA) LANDOWOY'S\URS-XX-XX-DR-RE-LA265

Revision Details	By / Check	Date	Suffix

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Purpose of issue: PRELIMINARY

Client: Transport NI

Project Title: York Street Interchange

Drawing Title: Impact on Properties Along North Queen Street, Little George's Street & Molyneaux Street

Designed	Drawn	Checked	Approved	Date
PS	AN	JMB	MM	27/02/2015

URS Internal Project No.: 47037827
Suitability:
Scale @ A1: 1:500
Zone / Mileage: N/A

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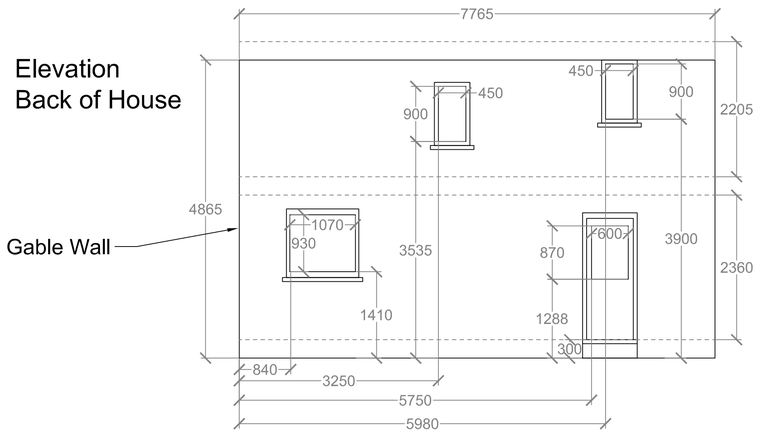
Beechill House
Beechill Road, Belfast
BT8 7RP
Tel:T: +44 (0)28 9070 5111
Fax:F: +44 (0)28 9079 5651
www.ursglobal.com

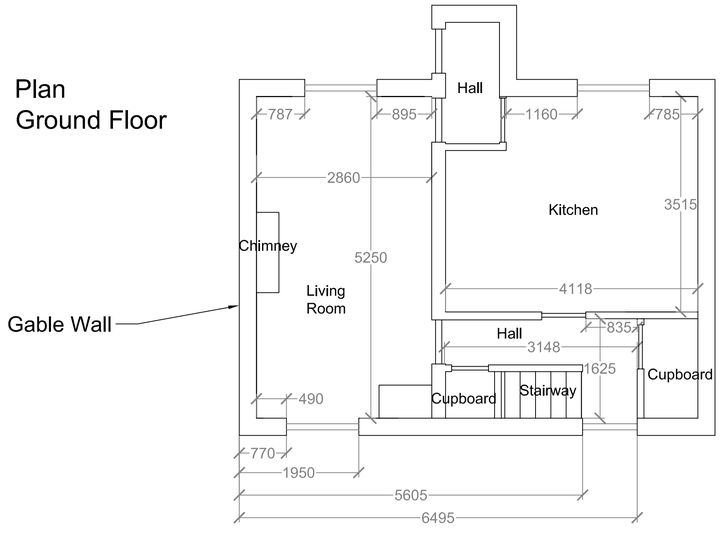
Drawing Number: YSI-URS-XX-XX-DR-RE-LA265
Rev: P0

1 Little George's Street

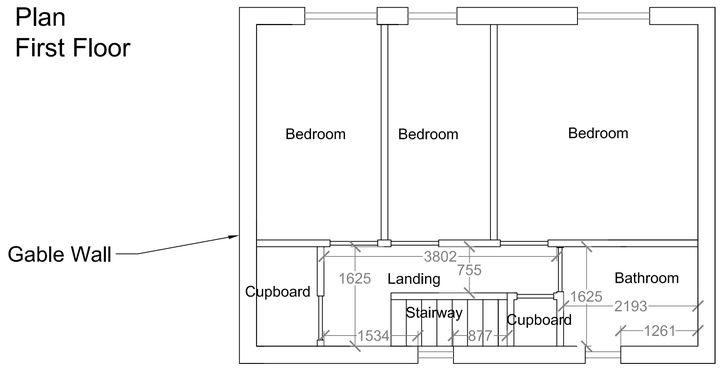
Elevation
Back of House



Plan
Ground Floor



Plan
First Floor



First Issue	JM / JM	18/10/15	P01
Revision Details	By / Check	Date	Suffix

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Purpose of issue

INFORMATION

Client

TRANSPORT NI

Project Title

YORK STREET INTERCHANGE

Drawing Title

GENERAL
PLAN & ELEVATION
LITTLE GEORGE'S STREET
HOUSE NO. 1

Designed	Drawn	Checked	Approved	Date
EB	JM	JM	JM	18/10/15

URS Internal Project No.: 47037827

Suitability: Fit for Information

Scale @ A1: 1:50

Zone / Mileage

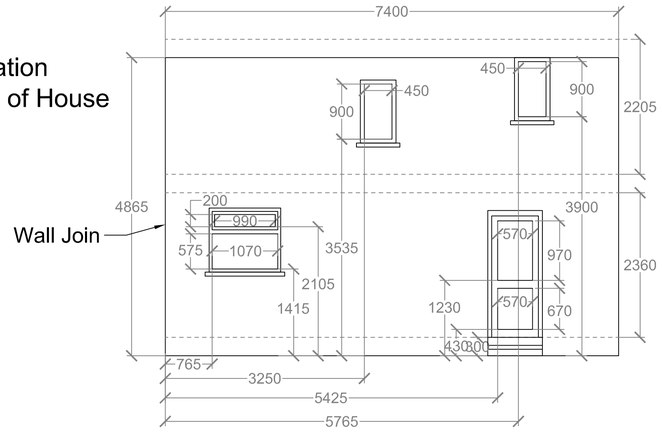
URS Infrastructure & Environment Ltd (EMI)
Beechill House
Beechill Road
Belfast
Tel:+44 2890 705 111
Fax:+44 2890 795 651
www.ursglobal.com

Drawing Number: TNI_YSI-URS-HGN-0062-SK-HY-000001

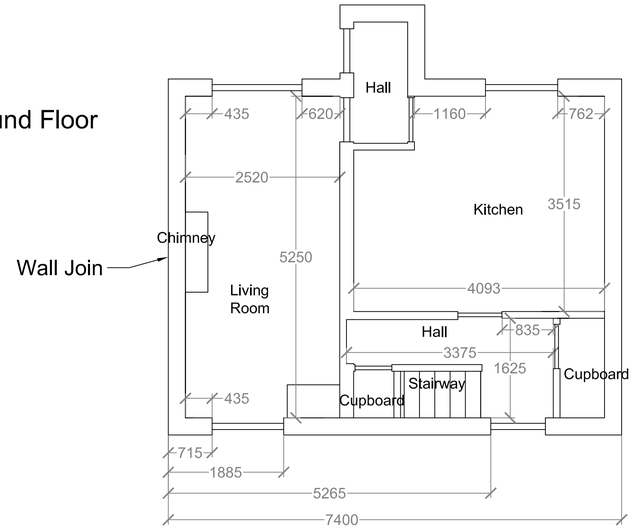
Rev: P01

3 Little George's Street

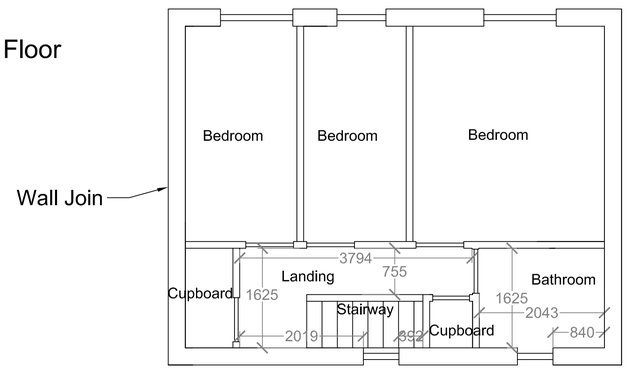
Elevation
Back of House



Plan
Ground Floor



Plan
First Floor



First Issue	JM / JM	18/10/15	P01
Revision Details	By / Check	Date	Suffix

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Purpose of Issue: INFORMATION

Client: TRANSPORT NI

Project Title: YORK STREET INTERCHANGE

Drawing Title: GENERAL PLAN & ELEVATION LITTLE GEORGE'S STREET HOUSE NO. 3

Designed	Drawn	Checked	Approved	Date
EB	JM	JM	JM	18/10/15

URS Internal Project No.: 47037827

Suitability: Fit for Information

Scale @ A1: 1:50

Zone / Mileage:

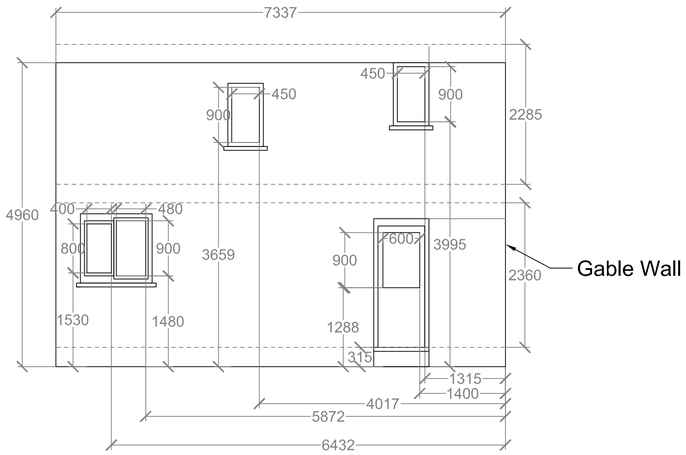
URS Infrastructure & Environment Ltd (EMI)
Beechill House
Beechill Road
Belfast
Tel:+44 2890 705 111
Fax:+44 2890 795 651
www.ursglobal.com

Drawing Number: TNI_YSI-URS-HGN-0062-SK-HY-000002

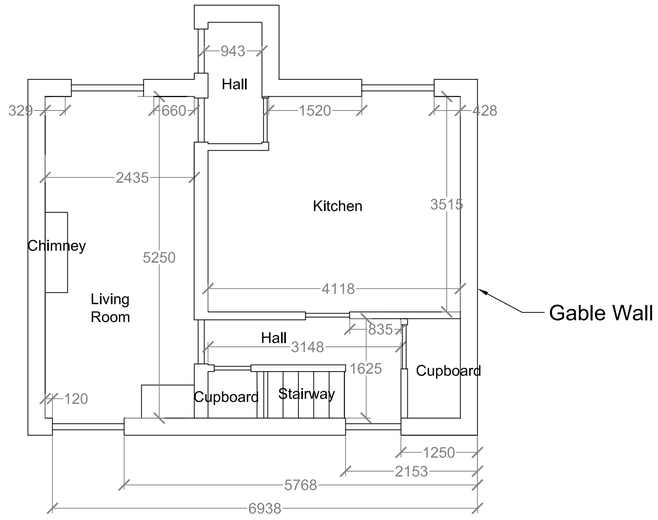
Rev: P01

11 Little George's Street

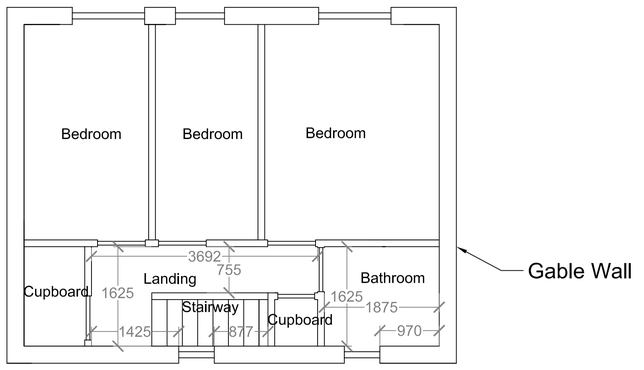
Elevation
Back of House



Plan
Ground Floor



Plan
First Floor



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Purpose of issue
INFORMATION

Client
TRANSPORT NI

Project Title
YORK STREET INTERCHANGE

Drawing Title
GENERAL
PLAN & ELEVATION
LITTLE GEORGE'S STREET
HOUSE NO. 11

Designed	Drawn	Checked	Approved	Date
EB	JM	JM	JM	18/10/15

URS Internal Project No.: 47037827
Suitability: Fit for Information
Scale @ A1: 1:50
Zone / Mileage:

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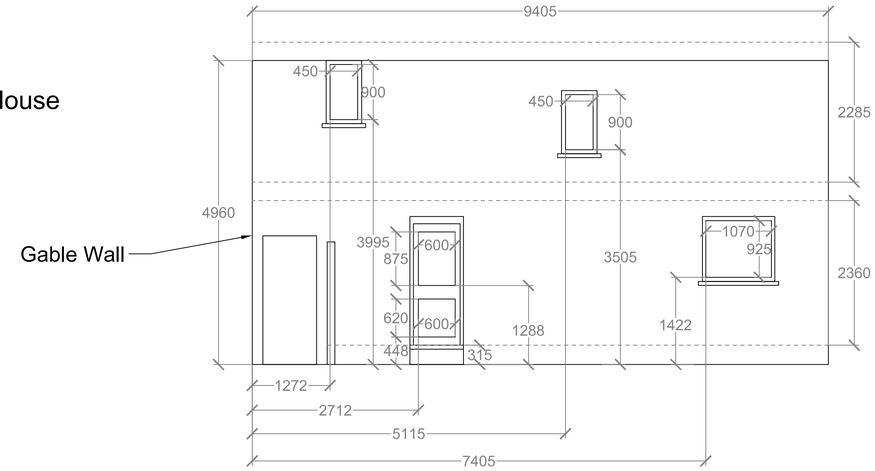
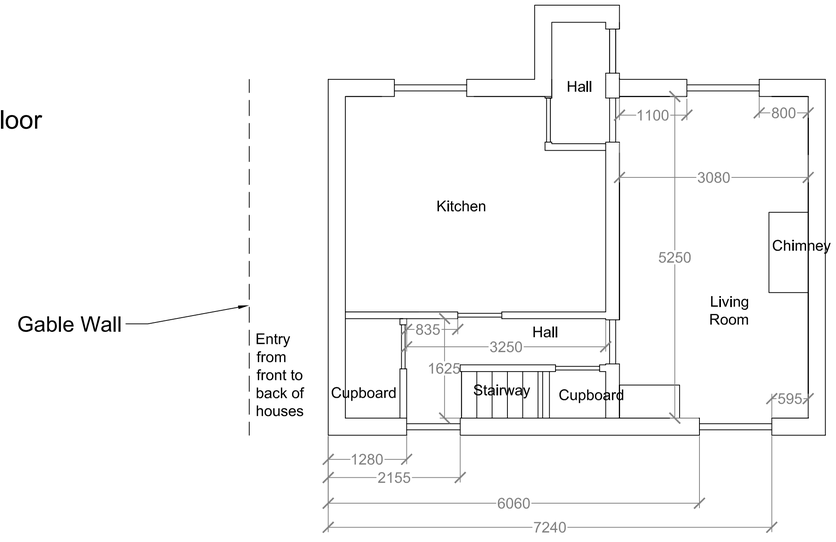
Drawing Number: TNI_YSI-URS-HGN-0062-SK-HY-000003
Rev: P01

17 Little George's Street

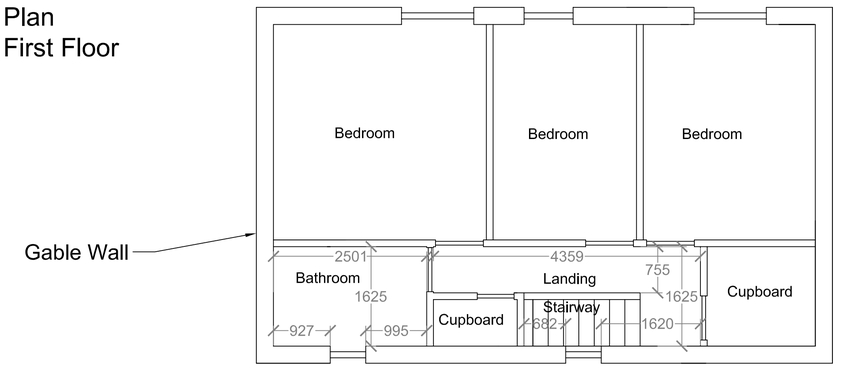
Elevation
Back of House



Plan
Ground Floor



Plan
First Floor



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Purpose of issue

INFORMATION

Client

TRANSPORT NI

Project Title

YORK STREET INTERCHANGE

Drawing Title

GENERAL
PLAN & ELEVATION
LITTLE GEORGE'S STREET
HOUSE NO. 17

Designed	Drawn	Checked	Approved	Date
EB	JM	JM	JM	18/10/15

URS Internal Project No.: 47037827

Suitability: Fit for Information

Scale @ A1: 1:50

Zone / Mileage:

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