

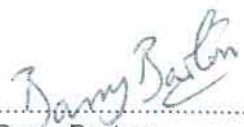


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78 Ryland Road, Welton

Rev No	Comments	Date
Re001A		July 2006

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1

Introduction

- 1.1 Mr Ken Tunstall and Mr Steve Knott are planning to redevelop a site at 78 Ryland Road, Welton. The site has been used as a garage and petrol station, and there is some residential accommodation on site. The proposal is to demolish the existing buildings and to construct six new residential properties.
- 1.2 John Roberts Architects have been appointed to design the proposed buildings and to manage the process of obtaining the necessary planning permission.
- 1.3 As part of the planning application a site-specific flood risk assessment is required. Faber Maunsell were appointed by John Roberts Architects, on behalf of their clients, to carry out the required flood risk assessment. This report contains the results of the assessment together with recommendations for mitigation measures to reduce the level of perceived flood risk.
- 1.4 The assessment has involved a site visit, discussions with relevant authorities and use of data obtained from standard reference sources, e.g. flood maps, sewer records, etc. Water levels in Welton Beck were taken from a hydraulic model prepared for the Environment Agency.
- 1.5 This document has been prepared solely as a report on the Flood Risk Assessment of the proposed residential development site at 78 Ryland Road, Welton for Mr Ken Tunstall and Mr Steve Knott. Faber Maunsell accept no responsibility or liability for any use which is made of this document other than by the client for the purposes for which it was originally commissioned and prepared

2 Site Location

- 2.1 The proposed development site is located in the south-eastern part of the village of Welton, on the south side of Ryland Road. It backs onto Welton Beck and is surrounded by residential development to the north, south, west and east of the site. The location is shown in Figure 1 – Site Location. The national grid reference for the mid-point of the site is TF 017799
- 2.2 Historically the site has been used for commercial purposes. It has an area of approximately 0.18ha (i.e. 1,865m²). The existing layout is shown in Figure 2, the proposed layout in Figure 3, and photographs showing the site and the surrounding area are provided at the end of the report.
- 2.3 As the site is adjacent to Welton Beck it has been shown on the Environment Agency's Flood Map as being partly within a "floodplain", i.e. in an area which would flood if a 1 in 100 year event occurred (assuming that there are no flood defences). Figure 4 shows an extract from the Flood Map.
- 2.4 The site is not in a Drainage Board area. Until recently Welton Beck was maintained as a "critical ordinary watercourse" by West Lindsey District Council. However, in 2005 the watercourse was en-mained by the Environment Agency and is now classified as a Main River. To ascertain a more accurate picture of the potential flood envelope in the area, the Environment Agency has commissioned hydrological and hydraulic studies along the whole length of Welton Beck, from its source to its confluence with Barlings Eau. The results of these studies relative to the development site are referred to in subsequent sections of this report.

3 Sources of Flooding

3.1 Three potential sources of flooding have been identified:-

- From Welton Beck.
- From Anglian Water public sewerage systems.
- From on-site drainage systems.

3.2 A further possibility is a combination of the above sources.

Welton Beck

3.3 Welton Beck is a tributary stream in the River Witham catchment. It connects to Barlings Eau, some 5km to the south east of Welton. It has a small permeable catchment that receives relatively low rainfall. Baseflow contributes a significant proportion of the flow in the stream. No measured flow data is available for Welton Beck. Hence, the guidance provided in the Flood Estimation Handbook (FEH) relating to flow estimation on ungauged catchments was used to estimate flows in a study carried out for the Environment Agency. Welton Beck is adjacent to the southern boundary of the site, and overflow of the left-hand bank could cause flooding on the site, assuming that water and levels were high enough and flooding pathways were available.

Anglian Water – Public Sewers

3.4 In Ryland Road, to the north of the development site, there is a 150mm diameter (vitrified clay) foul sewer which flows eastwards past Dunholme Road, into a 225mm v.c pipe in Eastfield Lane. Manholes nearest to the development site vary between 1.8 metres and 2.1 metres deep. If the systems in the area became surcharged and overflow occurred from manholes, flows would tend to be down Ryland Road, to the east where the junction with Eastfield Lane is over 1½ metres lower than the road level outside the redevelopment site. It is unlikely that the site would be affected by any "overland" flows.

On-Site Drainage Systems

3.5 On-site drainage systems will connect to the Anglian Water foul system and to Welton Beck (surface water). Blockages in these systems could cause localised, shallow flooding. The systems should be designed to take account of the impacts of climate change and to facilitate regular inspection and maintenance. Both foul and surface water discharge points will be near the head of their respective receiving systems. Hence, there is unlikely to be large volumes of water in either system to impact on the development site.

4 Existing Flood Alleviation Measures

- 4.1 There are no formal flood defences on the Welton Beck in the vicinity of the development site, i.e. the standard of protection is determined by the carrying capacity of the channel. Some localised raising of banks has taken place, randomly, and property owners have carried out various minor works along the edges of the Beck. Culverts at road crossings also act as flow regulators, and surface water is discharged into the Beck at several locations.
- 4.2 Maintenance of the Welton Beck channel (by regular clearance of objects which could cause blockages) is essential if flood alleviation measures are to be kept to an acceptable standard. Where channel cross sections are adequate to retain 1 in 100 year flows within the channel, this will only be achieved if the channel is clear. Significant blockages could cause overflow.
- 4.3 Anglian Water are only aware of one location in Welton where lack of adequate capacity in the public sewerage system could lead to flooding. This is in Westhall Road, which is approximately 250 metres to the north-west of the development site. This potential flooding source can be discounted as far as the development site is concerned and standards of "flood alleviation" provided by the public sewerage systems can be regarded as adequate.
- 4.4 Highway flooding sometimes occurs as a result of blocked gullies and this aspect of "flood alleviation" is the responsibility of the highways authority. Highway flooding could impact on Ryland Road but this would be unlikely to affect the development site to any significant degree. Safe access would probably still be available via Ryland Road. If flood depths increased, water would tend to flow eastwards, towards Eastfield Lane.

5 Flood Events

- 5.1 No evidence was found during this assessment of any flooding on the development site.
- 5.2 Several local residents were questioned during the study and none of them recollected overflow from the Beck in the vicinity of Ryland Road (some had been resident in the village for over 20 years). Residents did recollect the Beck virtually drying up on several occasions, and some referred to temporary highway flooding caused (they thought) by blocked gullies.

6 Local Hydraulics

- 6.1 Factors which could influence local hydraulics and flooding in the vicinity of the site are:-
- Relative land levels in the surrounding area.
 - Levels along Ryland Road.
 - Water levels in Welton Beck.
 - Depths of sewers in Ryland Road.
- 6.2 Levels in Ryland Road fall from 17.98mAOD opposite number 64, to 15.59mAOD at the junction with Dunholme Road. The road level adjacent to the development site is 16.88mAOD. The average gradient is 1 in 84.5 (sloping downwards to the east). The existing buildings on site have floor levels similar to the road levels in Ryland Road, but the bank levels on Welton Beck are approximately 0.5 metres lower than Ryland Road. Average site levels are in the order of 16.50mAOD.
- 6.3 The site photographs show that near the south-west corner of the development site, Welton Beck has been "trained" by construction of a concrete-capped wall. This wall is significantly higher than a similar "training" structure on the opposite bank. Hence, if water levels rise they will lead to "flooding" of land to the south, before the development site is affected (see photograph number 5)
- 6.4 Water levels in Welton Beck are usually low and well contained in the natural channel. In the vicinity of the development site, hydrological analysis and hydraulic modelling has indicated that the 1 in 100 year water level could be in the region of 16.05mAOD. This has been estimated to rise to 16.17mAOD in fifty years time as a result of climate change. Bank levels along the southern boundary of the site are in the order of 16.38mAOD, and along the opposite bank 16.80mAOD. Adjacent to the culvert under Dunholme Road (i.e. at Ryland Bridge), the 1 in 100 year level (plus climate change) is predicted to be 16.13mAOD, which is 0.04 metres above the left-hand bank level. However, there is no readily available pathway for flood water to reach the development site. If overflow from the Beck did occur, shallow flooding may impact on Dunholme Road. Cross sections of Welton Beck used in the ISIS hydraulic model are shown in Figure 5.
- 6.5 The public foul sewer in Ryland Road has a depth of approximately 1.8 metres. Hence, there is enough fall for a connection to be made from the proposed development site.

7

Probabilities of Flooding

- 7.1 Taking into account the hydraulic modelling which has recently been completed, the probability of the site flooding with water from Welton Beck is less than 1% per annum (i.e. a return period of more than 100 years) – see Section 13 for consideration of climate change.
- 7.2 The annual probability of the site flooding from public sewerage system, and from on-site drainage system, is likely to be less than 2% (i.e. less than once in 50 years) provided that those systems are regularly inspected and maintained. On-site systems should be designed to cater for short duration, high intensity storms, using paved areas and vehicle parking areas for temporary retention of surface water runoff. (Allowances should be included in the design of the systems for increased peak rainfall which may arise as a result of climate change).

8

Topography

- 8.1 Ground levels vary within the proposed development site from 16.0mAOD to 16.9mAOD. The majority of the site is at an average level of 16.3mAOD to 16.5mAOD. If any flood water did enter the site in the south-east corner at the 1 in 100 year event (plus climate change allowance) the predicted level of 16.17mAOD would not reach the proposed buildings. (Floor levels will be set at 16.50mAOD). A plan showing the existing layout and levels related to Ordnance Datum is given in Figure 3.
- 8.2 Cross-sections of the site are provided in Figure 6.
- 8.3 The general land levels around the development are described in Section 6.2.

9 Impacts of Flooding

- 9.1 There is virtually no risk of this site being suddenly inundated with flood water which creates danger to life and limb. It is not in a "floodplain" as established by detailed hydrological analysis and hydraulic modelling.
- 9.2 If flooding did occur, it would be the result of an extreme event and, even then, only the south-east corner of the site may be affected.
- 9.3 Shallow flooding may occur on site as a result of short duration, high intensity, local rainstorms. This may create some nuisance and minor disruption if paved areas are temporarily flooded. However, no damage to property is likely and access from Ryland Road to the north is likely to remain available and safe.
- 9.4 If flood levels of proposed buildings are kept at least 150mm above surrounding ground levels – say at 16.50mAOD, this should avoid flooding from localised shallow floods that can occur as a result of high intensity storms. (Note: It is also over 300mm above the 1 in 100 year (plus climate change level in the Beck).

10 Drains

- 10.1 Plans showing the location of Anglian Water's public sewerage systems in the Ryland Road area are provided in Figure 7.
- 10.2 The existing sewerage systems are able to accept discharge from the development site. However, detailed arrangements will have to be agreed with Anglian Water before development commences.
- 10.3 Similarly, agreement will be needed with the Environment Agency regarding discharge of surface water to Welton Beck and permission obtained under the Land Drainage Bye-Laws. They may require construction of a headwall and installation of a flap valve.
- 10.4 On-site drains should be sized to take account of increased runoff which may occur as a result of climate change.
- 10.5 This assessment does not include the detailed surface water drainage design. However, some consideration has been given to the existing and proposed extents of impermeable areas:-
- Existing
- Taking into account roofed areas, concreted areas, stoned and gravel paths and grassland areas, an equivalent impermeable area has been calculated as 943m^2 (using impermeability coefficients of 0.8, 0.6 and 0.2 for the various surfaces).
- Proposed Layout
- Using the same impermeability coefficients, an equivalent impermeable area has been calculated as 863m^2 , i.e. a reduction of 80m^2 compared to the existing. Overall, therefore, it appears that there will be greater permeability after the development and there should not be a significant need for runoff storage or balancing of flows.
- 10.6 The Environment Agency may require the drainage design to cater for a 1 in 100 year storm of five hours duration, with an allowance for climate change (i.e. +20% on peak rainfall intensities). This should be readily achievable on site. However, final designs will depend on the degree to which sustainable drainage elements are included in the design (e.g. soakaways, rainwater collection, swales, etc).

11 Displaced Water

- 11.1 As the development site is not in a "floodplain", the issue of displaced water does not arise.

12 Morphology

- 12.1 There are no significant environmental features associated with the development site. However, there are some well established, mature trees on the site and these should be retained where possible.
- 12.2 Opportunity should be taken to enhance the site by landscaping and planting of appropriate species of trees, plants and shrubs. Possibly a water feature could be created in the southern part of the site.

13 Climate Change

- 13.1 Climate change is predicted to increase the intensity of peak rainfall by 20% over the next 50 years. This will inevitably increase peak water levels in river and arterial drainage systems. An allowance has been made for this in the impacts to the hydraulic modelling which has been carried out on the stream. The analysis shows that the site should not be adversely affected by overflow from the Welton Beck for the foreseeable lifetime of the properties.
- 13.2 Design of on-site drainage systems should take account of the impacts of climate change on peak rainfall intensities and pipes should be sized accordingly.

14 Residual Risk

- 14.1 The residual risks which have been identified for this development site are:
- Flood flows in Welton Beck for extreme events having less than 1% annual probability.
 - Blockages in Welton Beck.
 - Blockages or collapses of Anglian Water sewers.
 - Blockages in on-site drainage systems.

Welton Beck – Extreme Events

- 14.2 The hydraulic modelling of Welton Beck has shown that overflow occurs well upstream of the development site. This will help to protect the site if an extreme event does occur. Also, at the western end of the development site, the right bank of the Beck is lower than the left bank, hence water will tend to flow southwards out of the Beck rather than northwards. Flood water in the area will generally tend to flow down Dunholme Road to the east. Overall, with floor levels kept at least 300mm above the 1 in 100 year (plus climate change) flood level, properties should be well protected against extreme events.

Blockages in Welton Beck

- 14.3 Blockages are unlikely as the Beck which is now a Main River will be subject to routine inspection and maintenance by the Environment Agency. The maintenance work will usually be hand-clearing of fallen trees, debris and vegetation. If a blockage did occur near to the site, the resultant flooding would probably be shallow and localised, and would be very unlikely to affect the properties on site.
- 14.4 Currently, there is some vegetation growth in the Beck adjacent to the development site and it would be sensible to clean this out when the development occurs. There is also a small diameter pipe on the southern boundary of the site which probably discharges surface water into the Beck. The need for retention of this pipe should be addressed as part of the surface water drainage design.

Blockages or Collapses in Anglian Water Sewers

- 14.5 Blockages and collapses in public sewerage systems can lead to localised flooding. However, these are usually shallow and dealt with promptly by over-pumping, diversion of flows, etc. The levels of the proposed buildings relative to the levels of the sewerage systems should ensure that there are no direct flooding impacts on the site from this type of incident.

Blockages in On-Site Drainage Systems

- 14.6 Blockages in on-site systems can be minimised by regular inspection and maintenance. If they do occur, the resultant flooding is likely to be shallow and it can usually be cleared quite quickly by rodding or, in extreme cases, by excavating and removing the blockage. Properties are unlikely to be damaged and flooding is more likely to occur on access roads, paved areas, etc.

15 Conclusions and Recommendations

15.1

As a result of this assessment the following conclusions have been reached:-

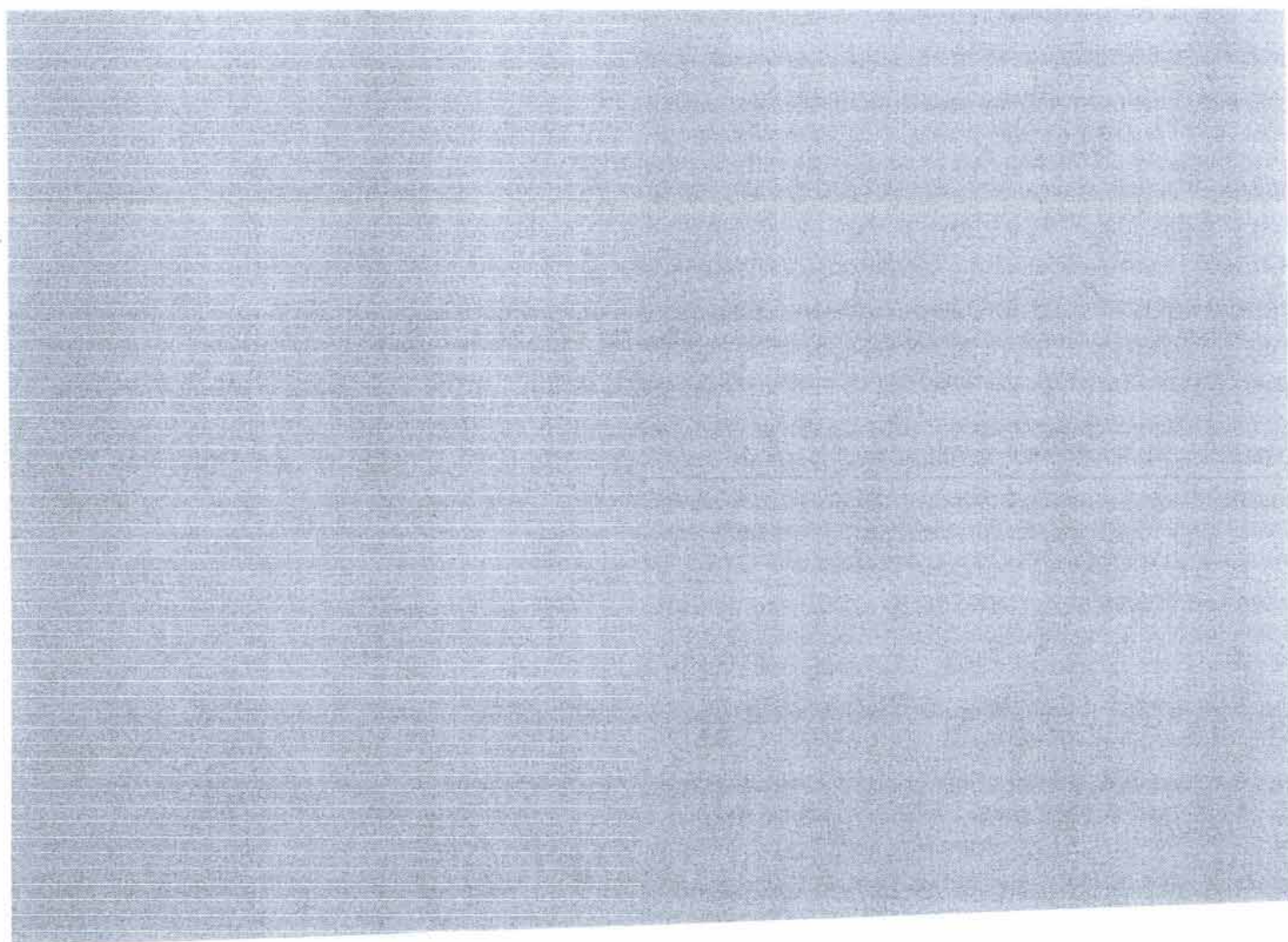
- The development site is not in a functional floodplain nor in a notional Zone 3 floodplain.
- The probability of the site flooding from the various sources of flooding are:-
 - Welton Beck – less than 1% (less than once in 100 years).
 - Anglian Water Sewers – less than 2% (less than once in 50 years).
 - On-site drains and sewers – depends on design standard (will probably be between 1 in 50 and 1 in 100 years).
- The site is probably in Zone 2 – as defined in PPG25.
- Foul sewage from the site could be accepted into Anglian Water's public sewerage system, and surface water into Welton Beck (subject to prior permission being obtained).
- Displaced water is not an issue with this development.
- Impacts of short duration, high intensity, localised storms are likely to be temporary and confined to shallow flooding of drives and car parking areas.
- There are no severe residual risks envisaged for this site. However, mitigation could be provided by keeping floor levels at 16.5mAOD – which is 300mm above the 1 in 100 year flood level in Welton Beck (plus climate change allowance).
- No evidence has been discovered during this assessment of any previous flooding on the site – but some highway flooding has occurred on Ryland Road and Dunholme Road as a result of blocked gullies.
- Levels in Ryland Road are such that there should always be safe access/egress available to and from the site even if some local flooding occurs.
- There are no significant morphological features associated with the site but mature trees should be retained, if possible, and appropriate bushes, plants, shrubs, etc planted to enhance the environment.
- Overall, subject to the detailed drainage design being acceptable to the relevant authorities and to the inclusion of appropriate mitigation measures, the site will be appropriately protected against the impacts of flooding for the next 50 years.

15.2

It is recommended that:-

- Floor levels of the new buildings are set at not less than 16.5mAOD.
- On-site drainage systems should allow for increased surface water runoff arising from the impacts of climate change and these systems should be regularly inspected and maintained.
- Detailed drainage designs should be agreed with the relevant authorities before development commences (and should include elements of SUDS where appropriate).
- If a new outfall is proposed for surface water to discharge to Welton Beck, Land Drainage Bye-Law consent should be obtained from the Environment Agency.
- Opportunities should be taken to enhance the environment by landscaping and planting of suitable trees and shrubs.

Figures



Rev: 00



This Drawing Is Based on Dwg No 492/001
Topographical Survey (14.06.05) by Shire
Surveys

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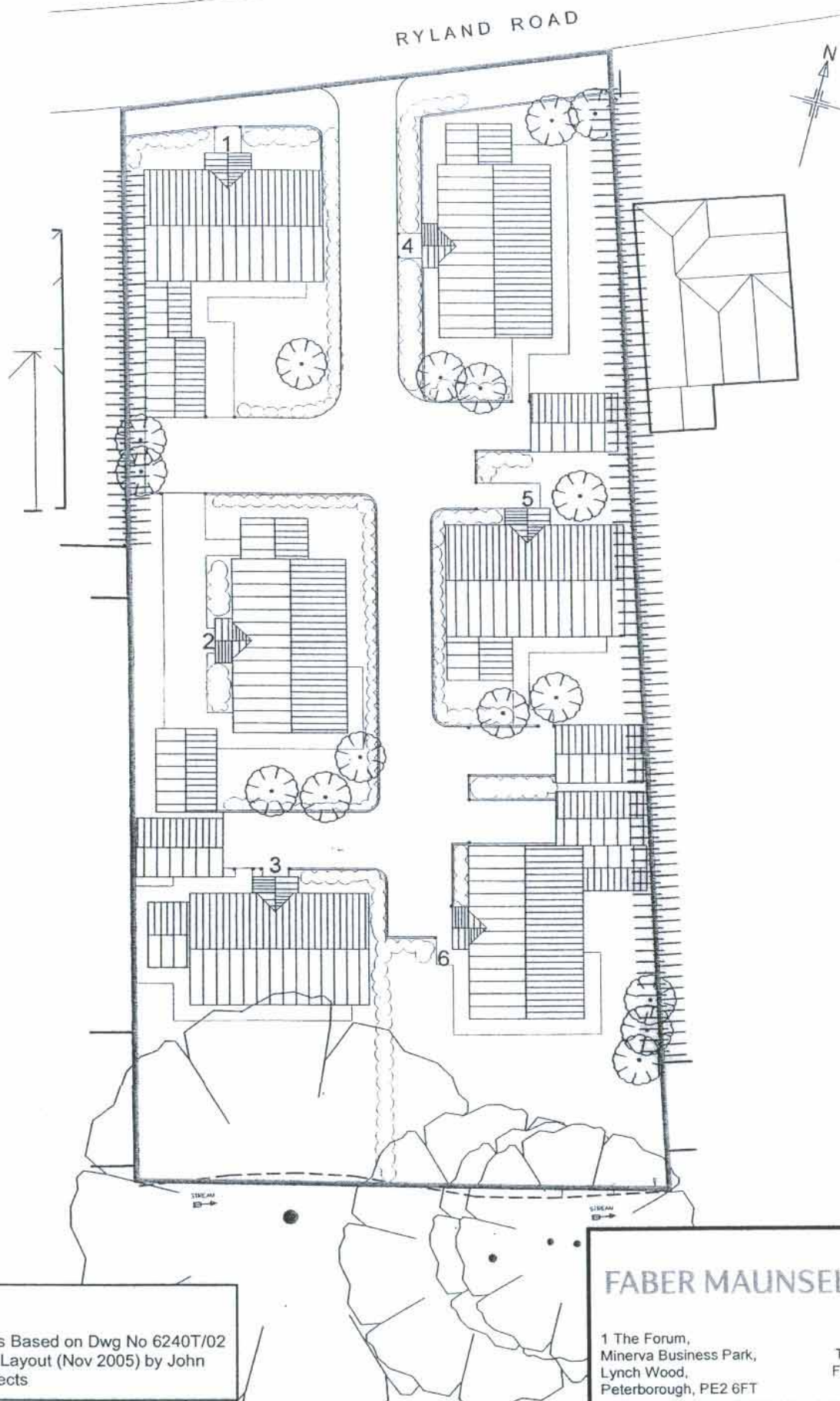
john roberts architects

FIGURE 2.0
SITE PLAN

78 RYLAND ROAD, WELTON
FLOOD RISK ASSESSMENT

Scale: Not To Scale

Rev: 00



Note:

This Drawing Is Based on Dwg No 6240T/02
Proposed Site Layout (Nov 2005) by John
Roberts Architects

Client:

john roberts architects

Project:

78 RYLAND ROAD, WELTON
FLOOD RISK ASSESSMENT

Title:

**FIGURE 3.0
PROPOSED SITE LAYOUT**

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Chk'd: Clive Mason

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Date: July 2006

Scale: Not To Scale



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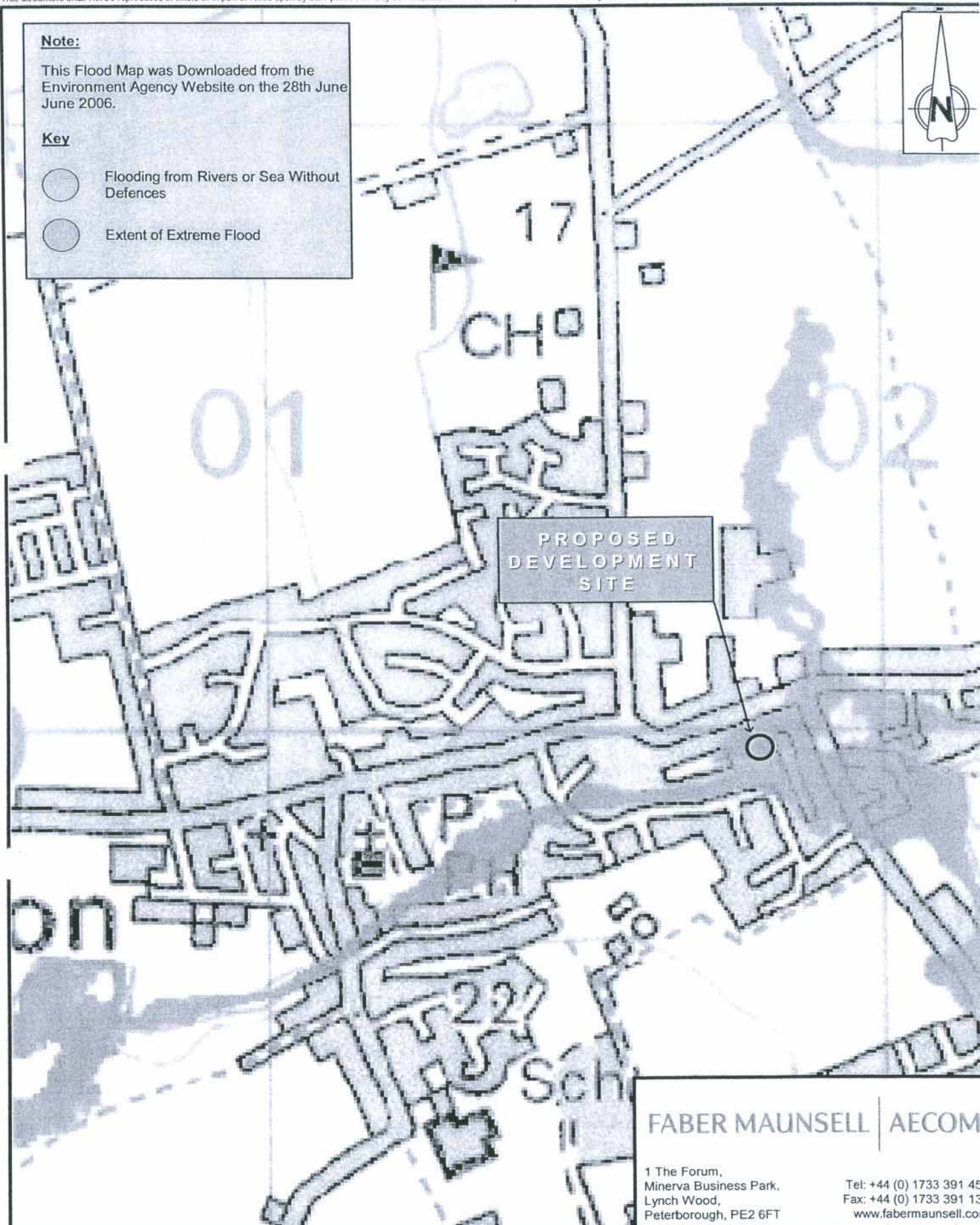
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Note:

This Flood Map was Downloaded from the Environment Agency Website on the 28th June 2006.

Key

-  Flooding from Rivers or Sea Without Defences
-  Extent of Extreme Flood



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FIGURE 4.0
ENVIRONMENT AGENCY
INTERNET FLOOD MAP

Project:

78 RYLAND ROAD, WELTON
FLOOD RISK ASSESSMENT

Design: Clive Mason

CAD: Stephen Wright

Chk'd: Clive Mason

App'd: Clive Mason

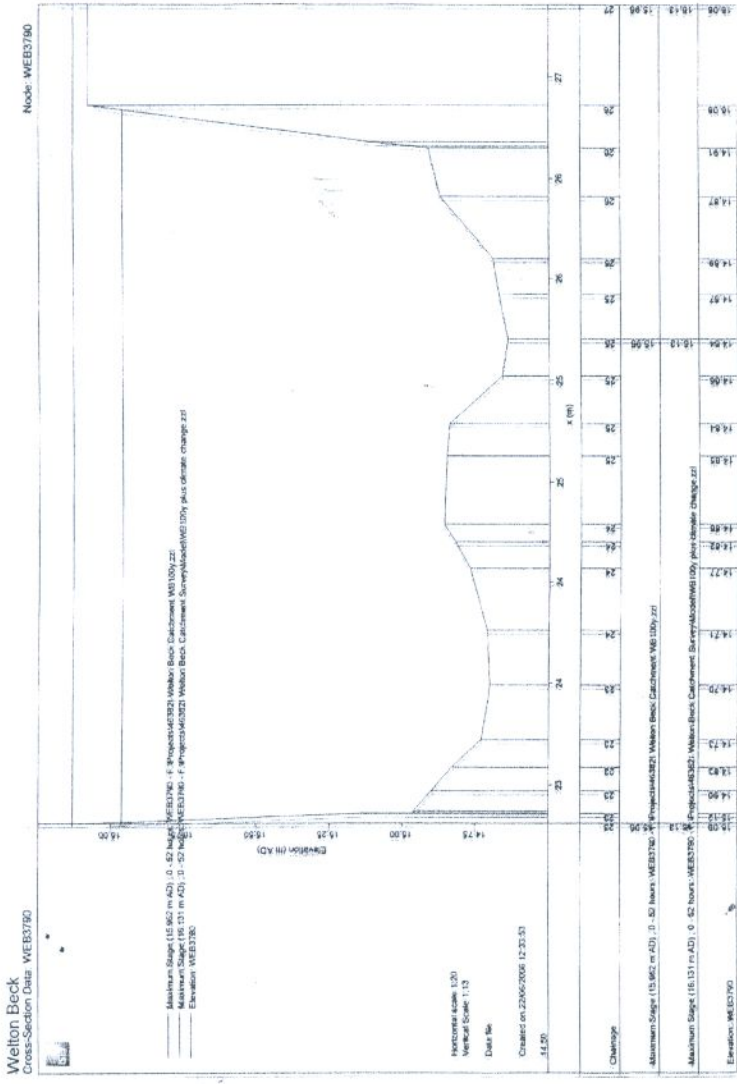
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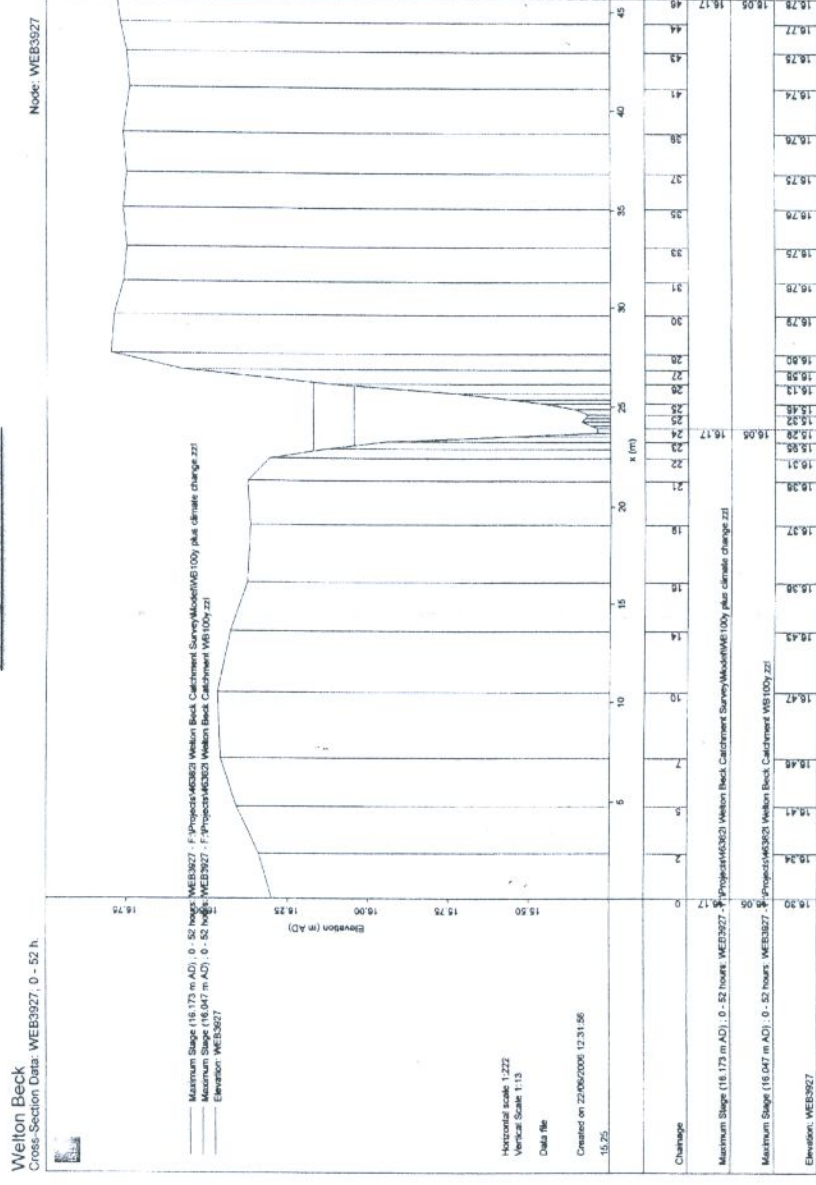
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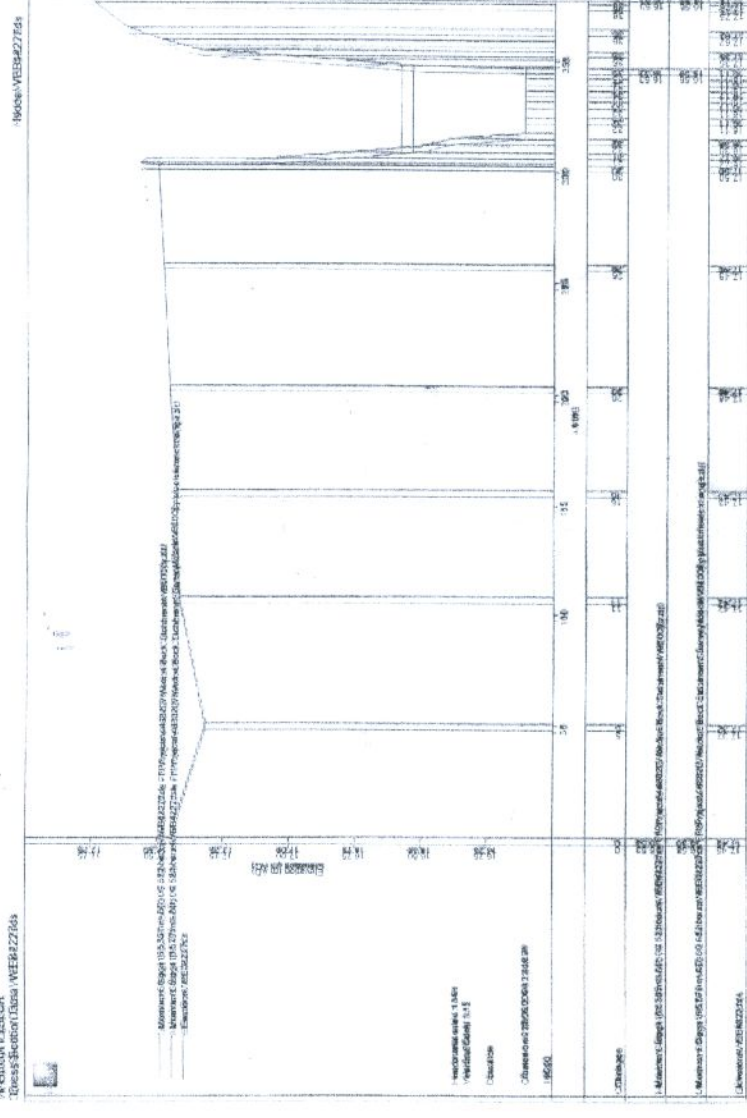
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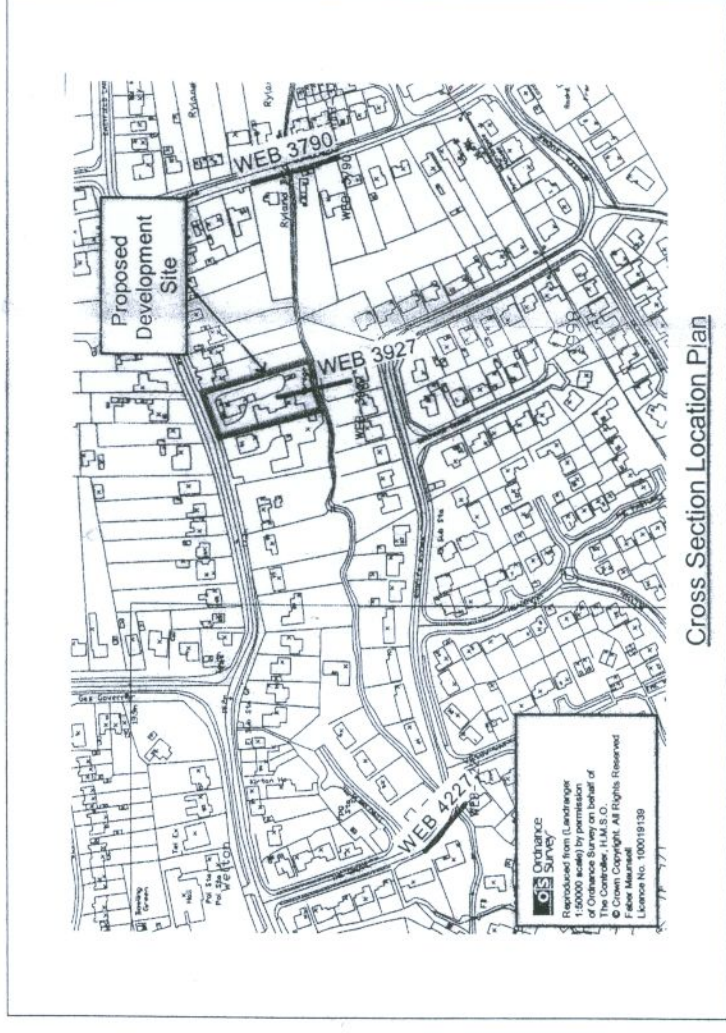
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Cross Section WEB 3927



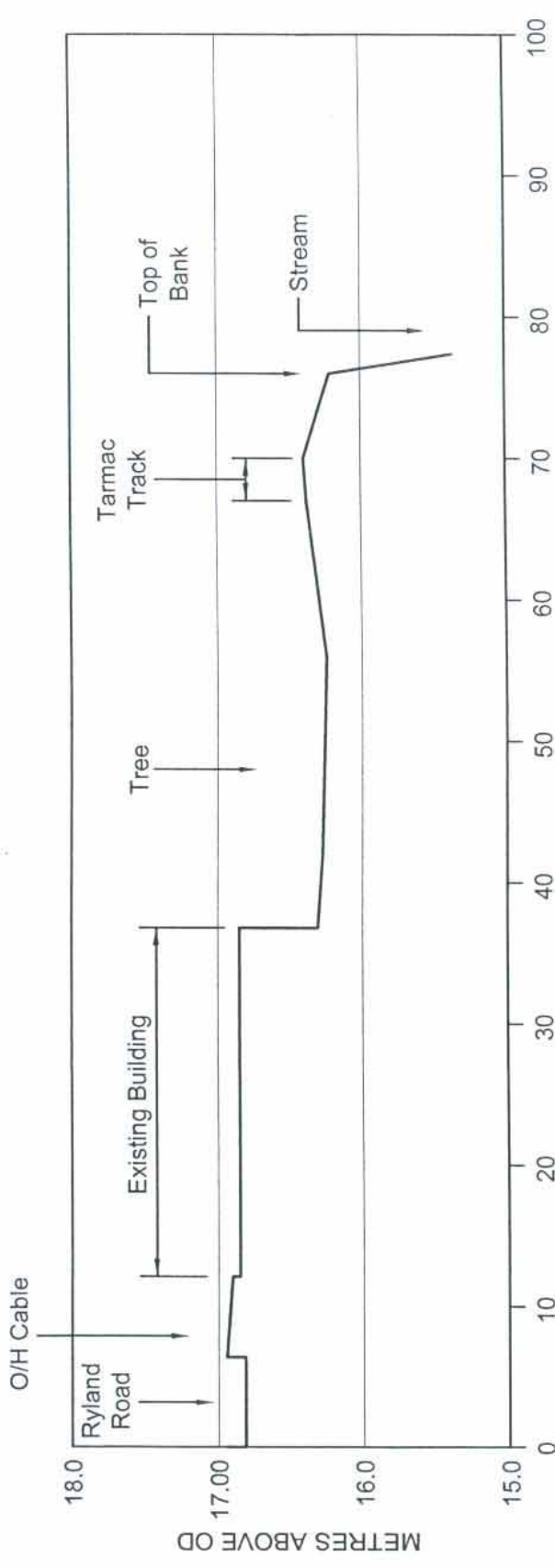
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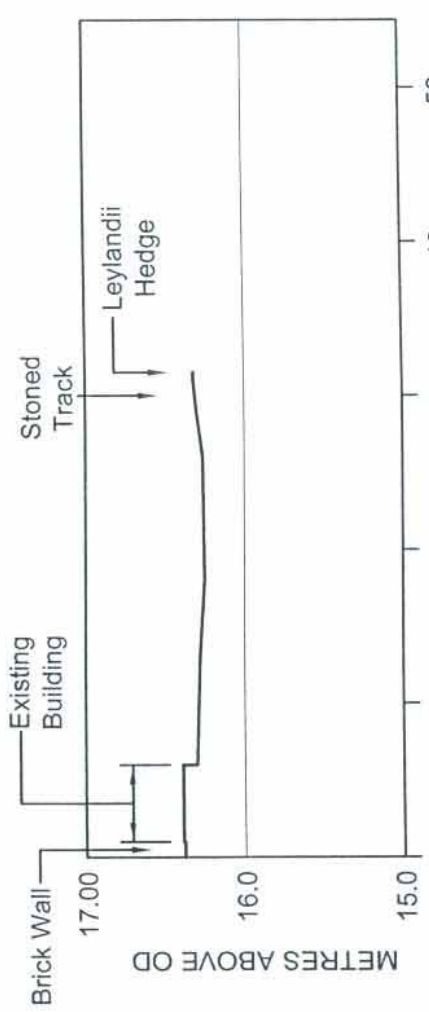
Note:
Cross Sections based on I/S/S Modelling carried out by Faber Maunsell

Client:	JOHN ROBERTS ARCHITECTS	Title:	FIGURE 5.0 WELTON BECK CROSS SECTIONS	FABER MAUNSELL AECOM 1 The Forum, Minerva Business Park, Lynch Wood, Peterborough, PE2 6FT Tel: +44 (0) 1733 391 456 Fax: +44 (0) 1733 391 139 www.fabermaunsell.com	Design: Clive Mason	MapInfo: Stephen Wright	Rev: 00	
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NORTH - SOUTH CROSS SECTION THROUGH DEVELOPMENT SITE

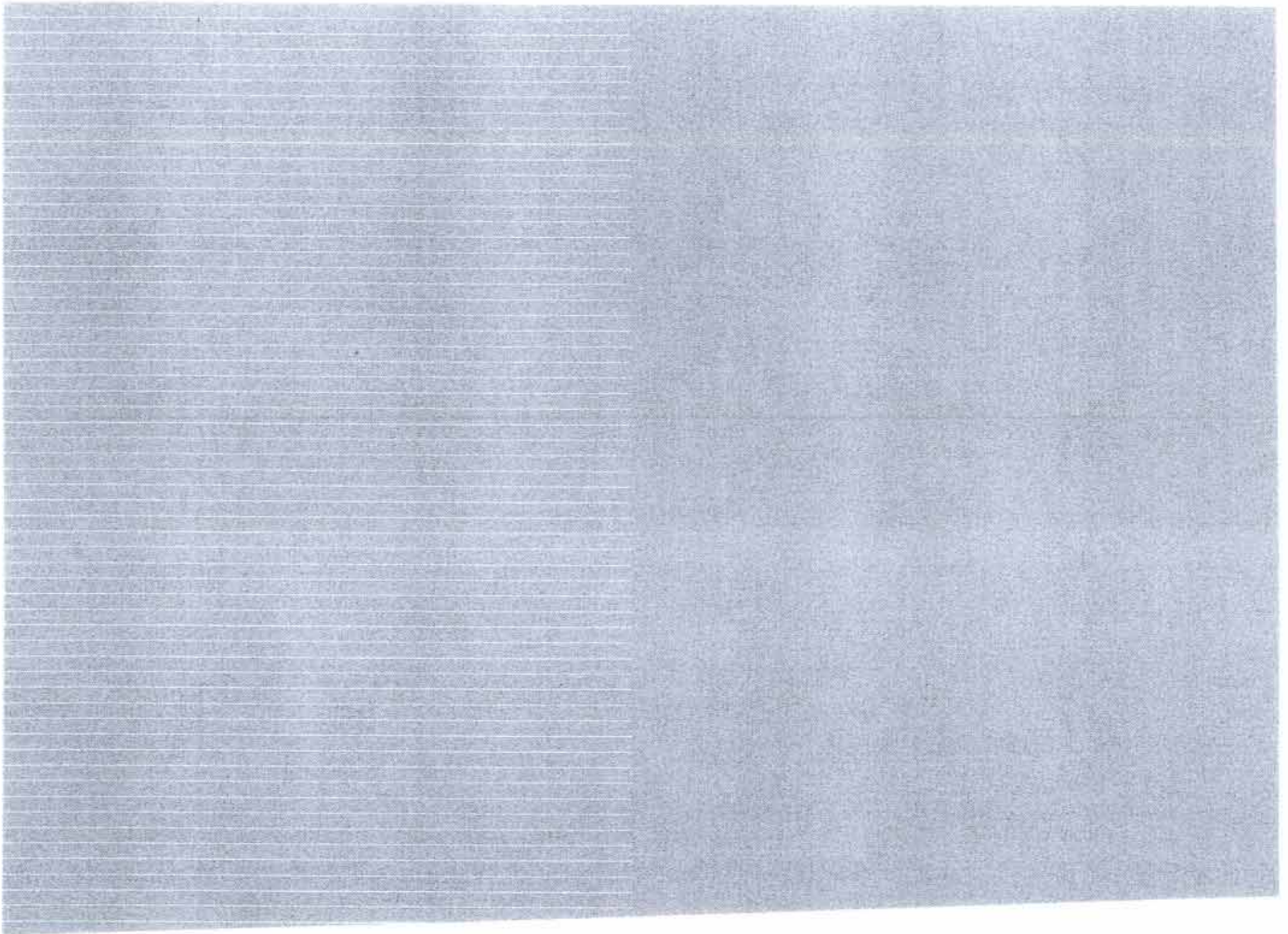


WEST - EAST CROSS SECTION THROUGH DEVELOPMENT SITE

SCALE HOR 1 : 500 VER 1 : 50

Client:	JOHN ROBERTS ARCHITECTS	Title:	FIGURE 6.0 CROSS SECTIONS THROUGH DEVELOPMENT SITE	FABER MAUNSELL AECOM		Design: Clive Mason	CAD: Stephen Wright	
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						Date: July 2006	Scale: As Shown	
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						No. 49632 / IPER / 006		Rev: 00

Photographs





Photograph 1 – Proposed Development Site
Existing Buildings and Concreted Area.



Photograph 2 – Welton Beck
View Near South-West Corner



Photograph 3 – Proposed Development Site
General View from South-East Side



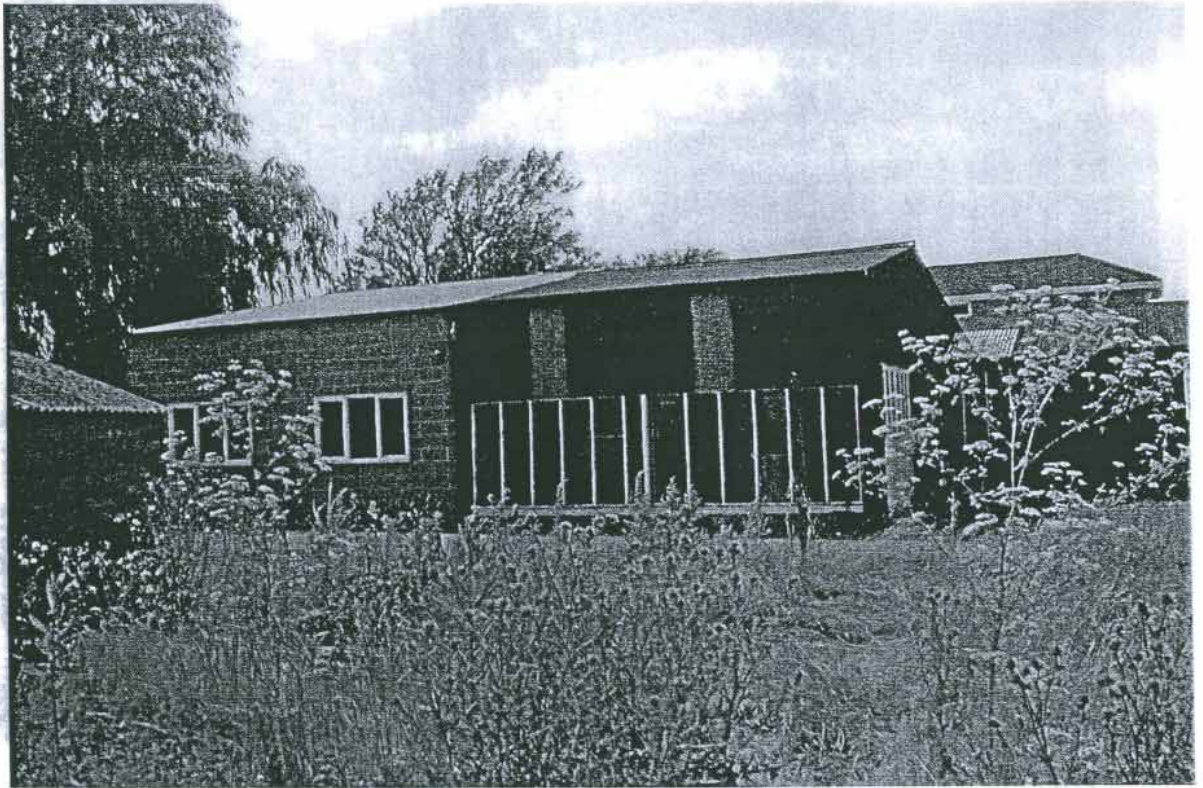
Photograph 4 – Proposed Development Site
General Site View



Photograph 5 – Welton Beck
View Looking Eastwards.



Photograph 6 – Welton Beck
Vegetation Growth



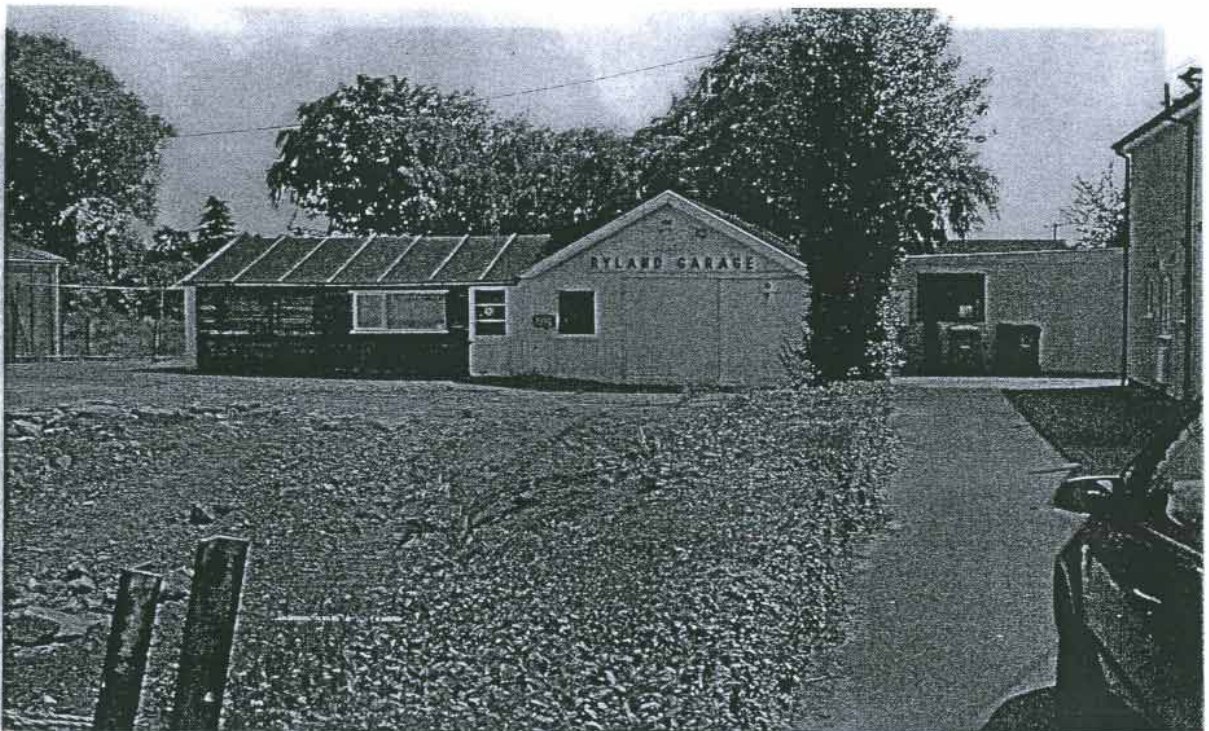
Photograph 7 – Proposed Development Site
Site View – Existing Buildings



Photograph 8 – Proposed Development Site
Existing Site Buildings



Photograph 9 – Welton Beck
Vegetation Growth



Photograph 10 – Proposed Development Site
Site View – Western Access / Boundary



Photograph 11 – Proposed Development Site
General Site View



Photograph 12 – Proposed Development Site
Eastern Boundary – South End of Drive



Photograph 13 – Proposed Development Site
Frontage of Re-Development Site



Photograph 14 – Proposed Development Site
Eastern site Access



Photograph 15 – Proposed Development Site
Eastern Boundary and Stone Drive



Photograph 16 – Ryland Road
View Looking Eastwards