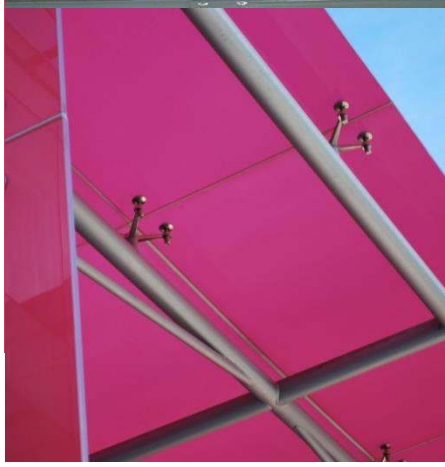

Newcastle High School for Girls

FRA and Outline Drainage Strategy - All Weather Pitch

Curtins Ref: 75221-FRA2-SAB

Revision: 0

Issue Date: 31 July 2014

Client Name: The Girls Day School Trust

Client Address: The Girls Day School Trust, 100 Rochester Row, London, SW1P 1JP

Site Address: Tankerville Terrace, Newcastle upon Tyne, Tyne and Wear, NE2 3BA

Curtins
Woodside Mews, Clayton
Wood Close,

Rev	Description	Issued by	Checked	Date
00	Planning Submission	SAB	SB	31/07/2014

This report has been prepared for the sole benefit, use, and information for the client. The liability of Curtins Consulting Limited with respect to the information contained in the report will not extend to any third party.

Author	Signature	Date
Steve Bowles **IEng AMICE MIHT** Principal Engineer		31/07/2014

Reviewed	Signature	Date
Stuart Baker **BEng (Hons)** Associate		31/07/2014

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1.0 Project Background

1.01 Curtins Consulting has been appointed by The Girls Day School Trust to prepare a site specific Flood Risk Assessment (FRA) for the proposed all weather pitches for Newcastle High School for Girls.

1.02 It is understood that existing grassed playing fields are proposed to be largely converted to synthetic all weather pitch facilities to allow their use for a greater proportion of the year.

1.03 The outcome of the study will be used to support a planning application in order to demonstrate the current flood risk status and to ascertain that redevelopment of the site area will not increase flood risk either to the site itself or others within the local drainage catchment.

2.0 Scope of Flood Risk and Drainage Strategy Study

2.01 The main aim of this study is to carry out desktop research to establish the flood and drainage constraints of the proposed development/refurbishment site area.

The current development proposal is for the conversion of grassed sports pitches to synthetic all weather pitches. The proposals do not include for any provision of sanitary facilities therefore no reference will be made to foul discharge from the site.

2.02 On this basis, the study will consider:-

- Primary flood risk from tidal and river sources
- Secondary flood risks
- Highways surface water flood risk
- Outline surface water drainage and discharge requirements
- Other drainage or flood constraints to the site area
- Mitigation measures required to ensure the site is flood safe and does not increase flood risk to others

2.03 In order to establish the flood risk and outline drainage strategy requirements Curtins have carried out liaison with the following Authorities/Bodies:-

- The Environment Agency
- Local Council Flood Management Team ¯ Newcastle City Council
- Northumbrian Water Limited ¯ via the pre-development enquiry process

2.04 In order to carry out the assessment the following data has been utilised:-

- Environment Agency online flood mapping
- Northumbrian Water pre-development enquiry response and sewer mapping
- Site topographical and utility survey drawings
- Newcastle City Council Preliminary Flood Risk Assessment 2011

- Newcastle Strategic Flood Risk Assessment Level 1 2010
- Newcastle Strategic Flood Risk Assessment Level 2 2011
- Newcastle Gateshead Surface Water Management Plan 2011

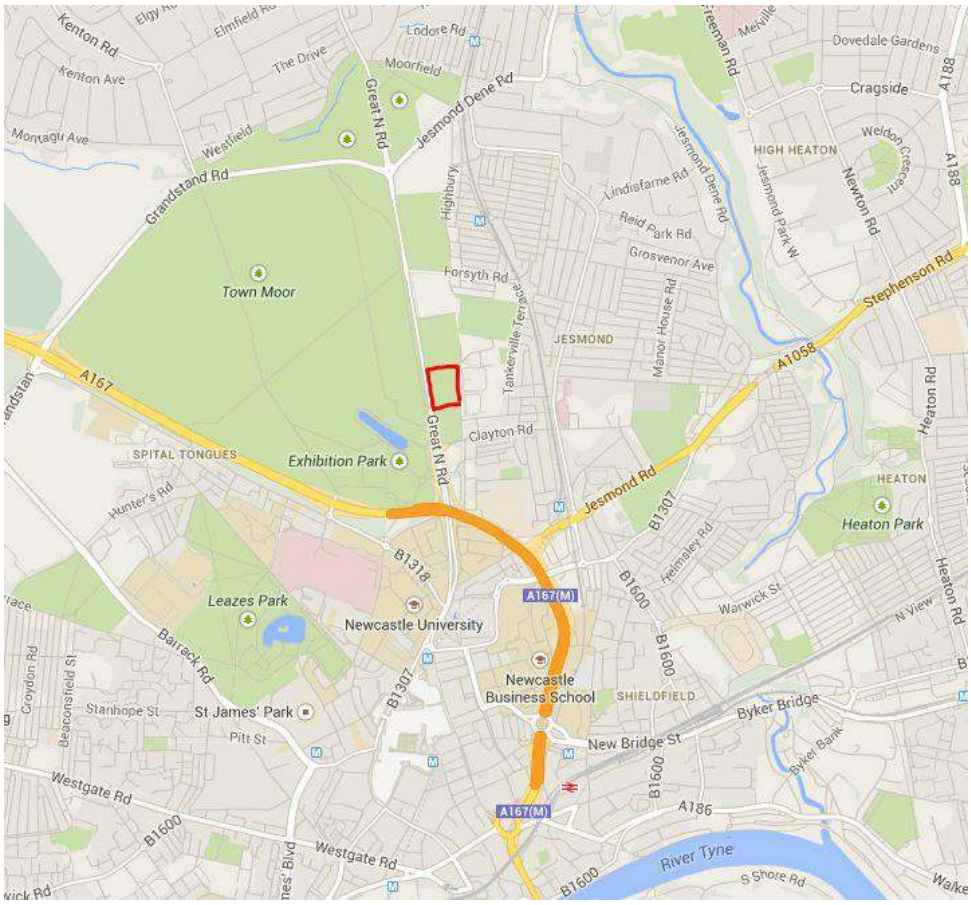
3.0 Site Location, Current Use and Development Proposals

3.01 The site is located between Princess Mary Court residential development and the B1318 Great North Road approximately 1.5 kilometres to the North of Newcastle City centre. The River Tyne is located approximately 1.8 kilometres to the South and the A167(M) approximately 500 metres to the South. The site covers an area of approximately 1.4 hectares in total although less than half of this total area is proposed to be converted to a synthetic pitch surface.

3.02 The site is bounded to the east by Princess Mary Court residential development, to the north and south by further grassed open space and to the west by the B1318 Great North Road.

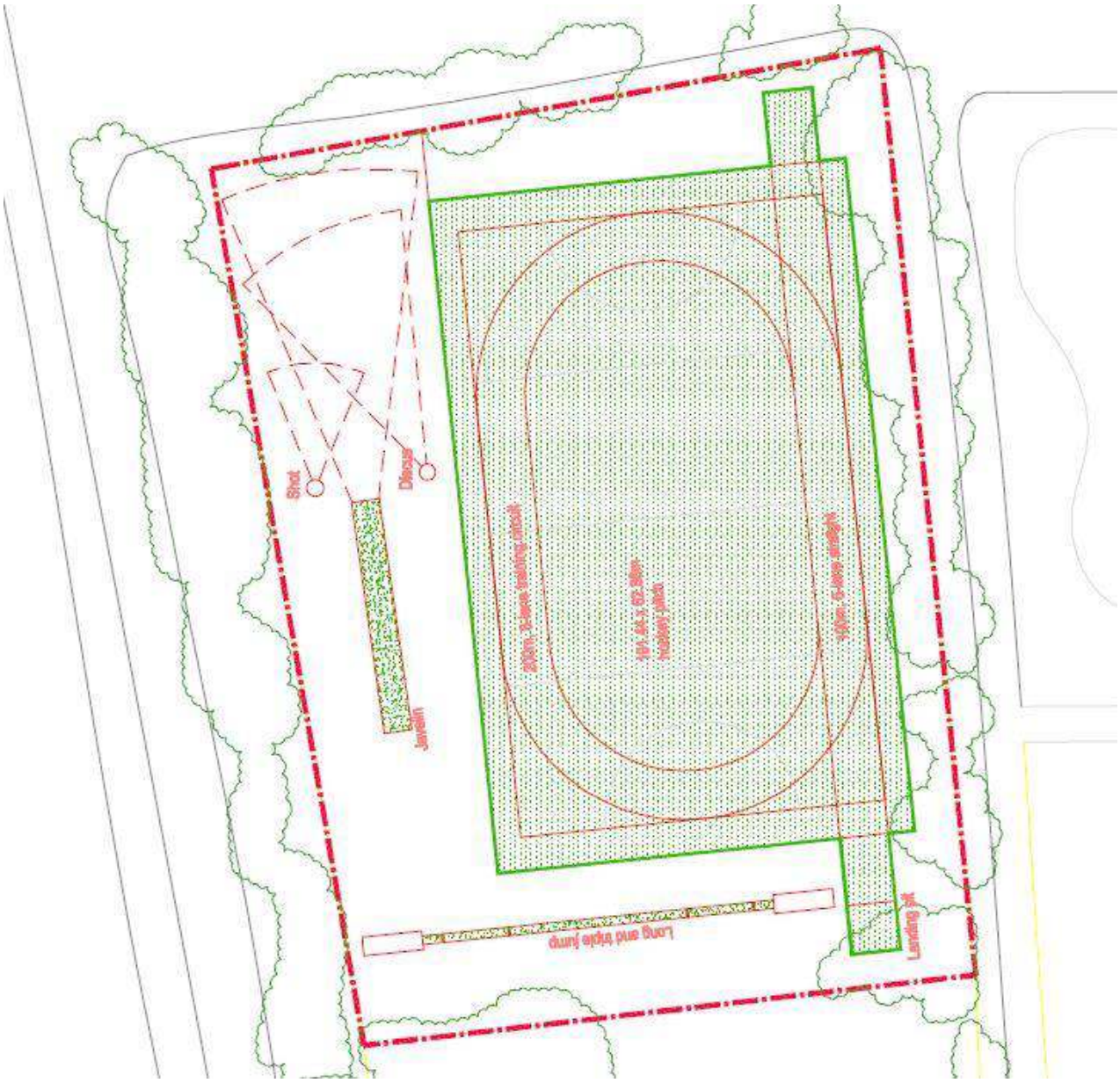
3.03 The following mapping, courtesy of Google, in figure 1 shows the approximate location of the site.

Figure 1. Location Plan



Approximate location of site shown outlined in **RED**.

3.04 Development proposals for the site are shown on the Architects plans forming part of the planning submission documents. Outdoor Sports and Recreation areas fall into the 'Water compatible development' category under NPPF.



Proposed pitch layout from EWA Architects drawings.

3.05 The following sections of this report consider both flood risk and drainage strategy in compliance with the NPPF requirements in order to support a planning application for the synthetic pitch proposals. This report has drawn on the findings, requirements and recommendations of the Newcastle Strategic Flood Risk Assessment (levels 1 and 2) and the subsequent Newcastle Gateshead Surface Water Management Plan.

4.0 Flood Risk

4.1 Flood Risk Zone Classification

4.11 To assess the NPPF flood risk classification for the site area the first step is to inspect the Environment Agency web based flood mapping data (extract shown in Figure 2 below).

Figure 2. Extract of Environment Agency Flood Mapping Risk of Flooding From River and Sea

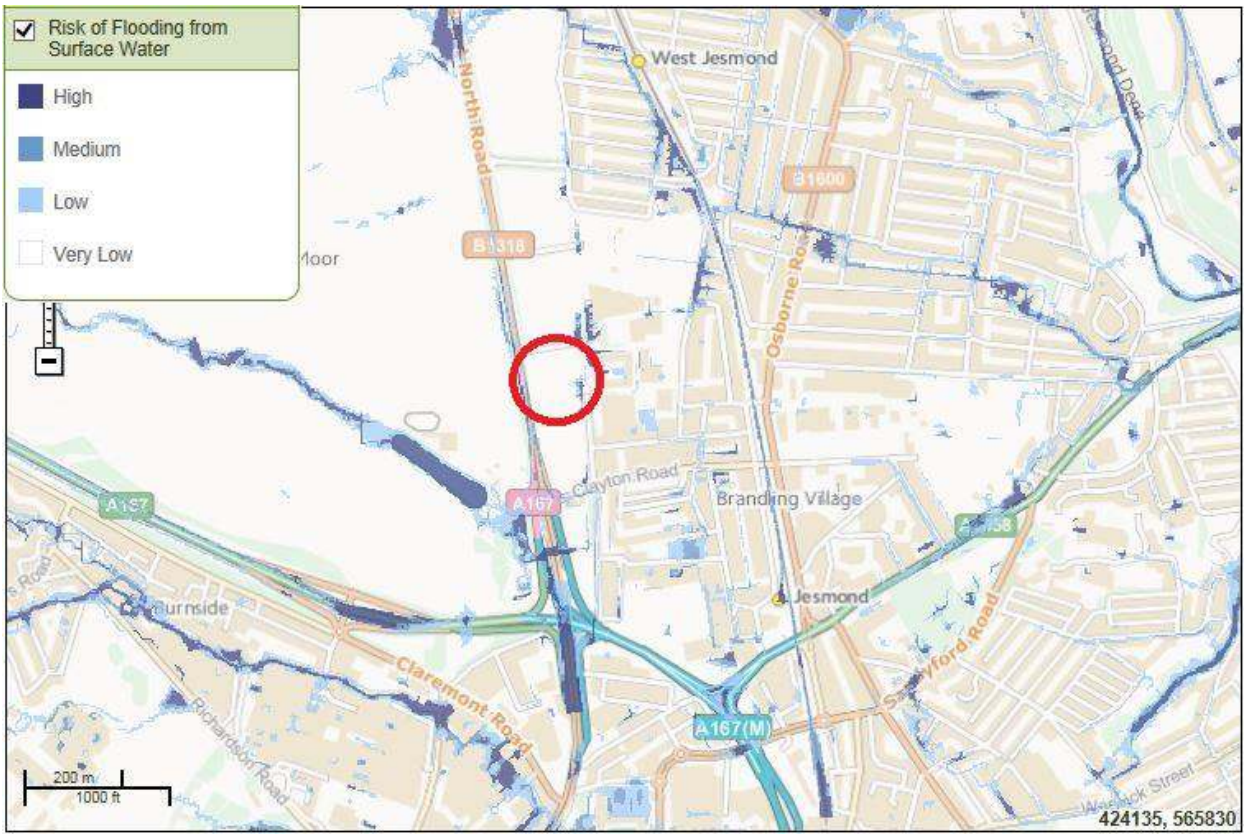
Approximate site location shown ringed in **RED**.

4.12 It can be seen from this mapping that the site (shown ringed in red) is entirely clear of the flood zones shown blue and turquoise shaded noted on the drawing key as areas subject to either river or tidal flooding (blue), or areas of extreme flooding (turquoise).

4.13 The high risk flood zone (blue shading) to the east is associated with the river Ouseburn. The dark blue line denotes the main river status.

4.14 On this basis all types of building vulnerability (NPPF Table 2) can be considered and the SEQUENTIAL or EXCEPTION tests which would normally be applied for higher risk flood zones are not relevant.

Figure 3. Extract of Environment Agency Flood Mapping Risk of Flooding From Surface Water



Approximate site location shown ringed **RED**.

4.15 It can be seen from this mapping that there a small area of surface water flooding risk ranging from low to high that appears to be restricted to the wooded margin on the eastern boundary of the site. Such areas of surface water flood risk are often present on or adjacent to long standing sites that have expanded over a period of years thereby reducing the permeable areas of the sites and increasing the impermeable areas, often without an attendant increase in the capacity of the drainage network on site or downstream. This area of flooding is expected to be as a result of insufficient surface water drainage capacity in the Abbotsford Terrace/Princess Mary Court .junction area rather than as a result of surface water overland flow from the grassed site under consideration.

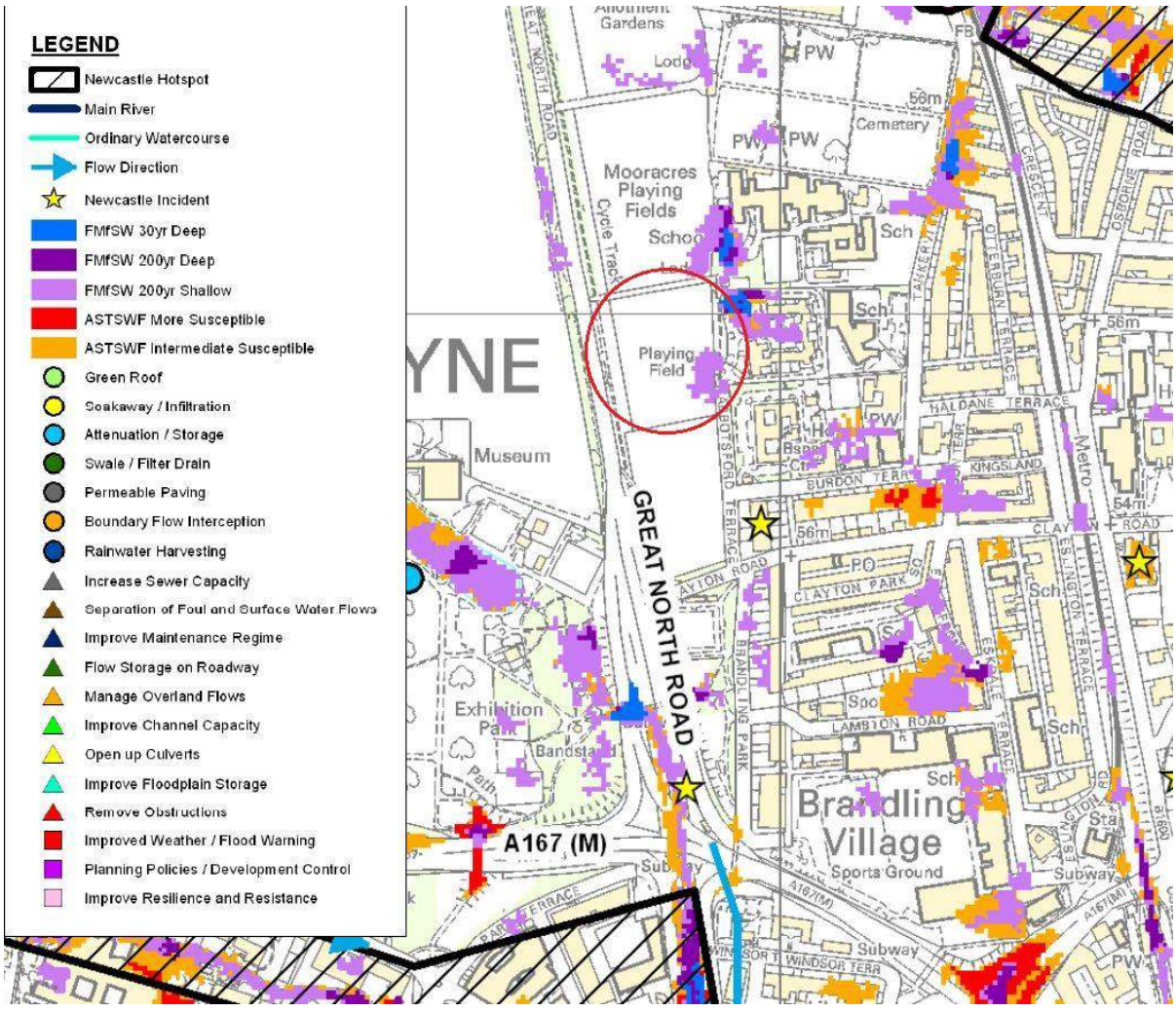
4.16 Investigation of flood risk information relative to the site location has identified that Strategic Flood Risk Assessments (SFRA's) Levels 1 and 2 have been undertaken for the Newcastle City Council area. From these documents a Surface Water Management Plan (SWMP) has been produced and as such the more detailed information contained within the SWMP will take precedence over the other data sources identified. The SFRA's were carried out by JBA Consulting on behalf of Newcastle City Council whilst the SWMP was produced by Aecom. No Internal Drainage Board has been identified covering this area.

4.2 Newcastle Gateshead SWMP

4.21 The SWMP provides a detailed insight to the various forms of flooding that may affect the greater Newcastle area. Examination of the report confirms that the proposed redevelopment area is covered by the document.

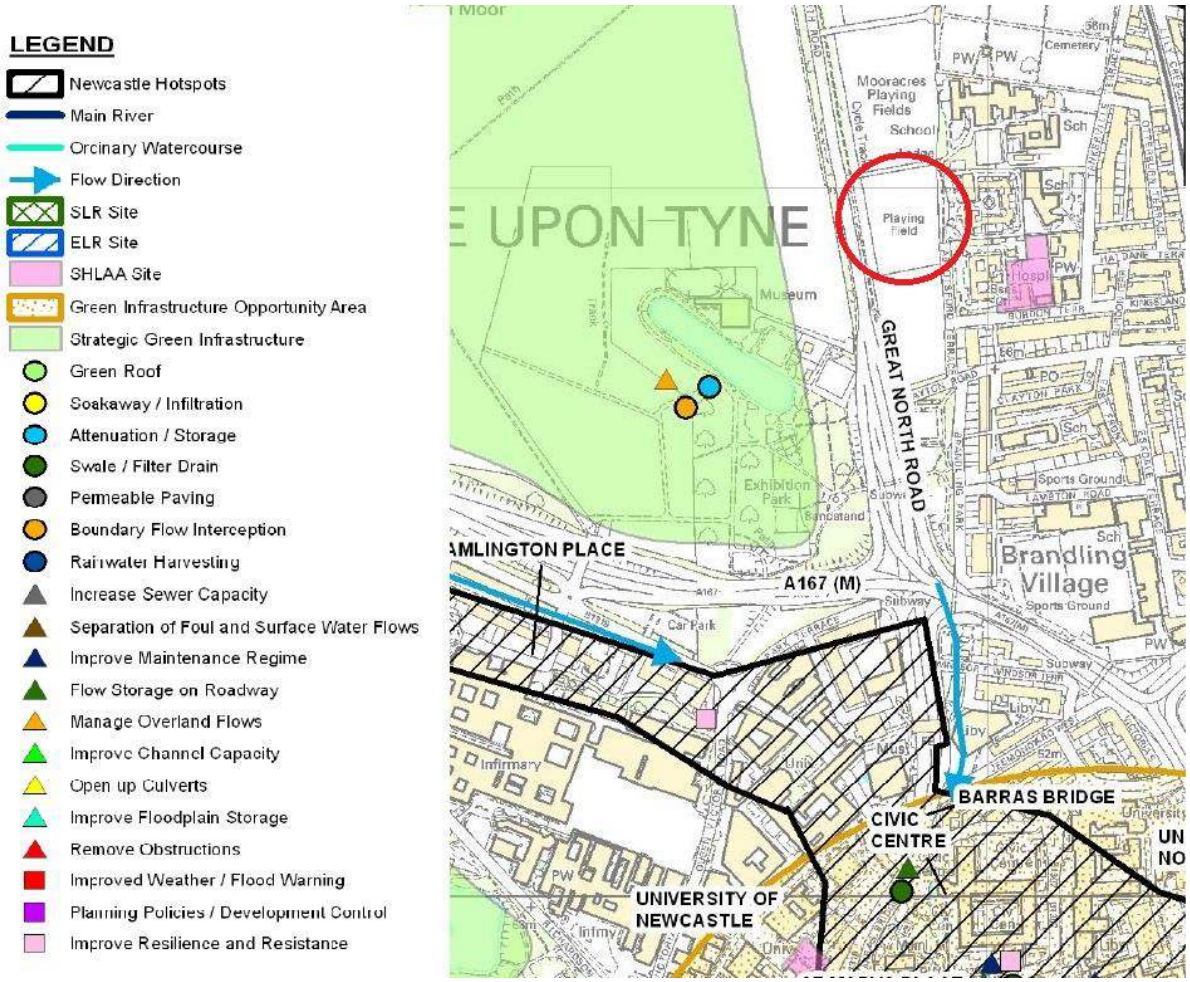
4.22 The SWMP document shows that the site under consideration lies outside of the areas identified as `surface water hotspots_ with the closest of these(NH14 Jesmond) being some 100m away from the site whilst NH15 City Centre ¯ Central and East is a little more than 500m away.

Figure 4. Extract from SWMP drawing No. 60198244/STAGE3/OPT/NH15 – Surface Water Risks



Approximate site location shown ringed **RED**.

Figure 5. Extract from SWMP drawing No. 60198244/STAGE3/OPT/NH15 – Green Infrastructure and Critical Infrastructure



Approximate site location shown ringed **RED**.

4.23 The maps contained in the SWMP indicate that some surface water flood risk is present within and adjacent to the playing fields area. This concurs with the EA mapping. The nature of the proposed development and the proposed surface water attenuation and drainage strategy are considered to have no adverse impact on the surface water flooding identified in the area and should improve the situation by the provision of a surface water attenuation reservoir as part of the proposed infiltration drainage.

4.3 Secondary Flood Risks

4.31 It is an important part of a flood risk assessment to consider secondary flood risks not associated with Tidal, River or Surface Water flooding.

4.32 Surface water flooding has been assessed in the preceding sections and will not be increased by the proposed development and its associated drainage proposals.

The outline drainage proposals will be considered in more detail in the following sections of this report.

4.33 One of the other main contributors to secondary flood risks are ground water issues. Geo-environmental investigations have been carried out and form part of the planning submission documents. These investigations suggest the risk from ground water flooding is likely to be low.

4.34 Surface water run-off from other sites can be another secondary flood risk issue. The predominant risk would typically be from adjacent highways although no serious risk is identified upon either Environment Agency or SWMP mapping.

4.35 Flooding from existing sewers can also represent a secondary flood risk. Northumbrian Water sewer mapping has been obtained for the site through the pre-development enquiry which has also included the provision of mapping that identified map grids where a property has flooded as a result of sewer flooding.

Observation of this mapping does not identify any flood issues within the immediate vicinity of the playing fields site.

4.36 The school site is at risk from some limited surface water flooding that appears to be mainly confined to the eastern wooded margin of the site. Given that Outdoor Sports and Recreation areas are classed as water compatible development under NPPF and that the proposed drainage strategy will provide some storage capacity for surface water to preclude overland flow from the proposed pitches for storm events up to 30 year return periods, it is considered that the existing surface water flooding will not be increased and may be mitigated by the proposed development.

.

5.0 Surface Water Drainage

5.01 The response from Northumbrian Water to the pre-development enquiry contained in Appendix A states that `no surface water flow from the proposed development will be allowed to connect into the existing public sewer network.

5.02 Further testing to determine the viability of the local soils to allow infiltration to ground will be undertaken during the detailed design period to verify the assumptions made in the outlined drainage design.

5.03 Site visits and examination of local mapping have not revealed the presence of any land drainage ditches or ordinary watercourses crossing or adjacent to the site to allow the surface water to be discharged in this manner.

5.04 The outline drainage strategy drawing contained in Appendix B has been designed based on a very low infiltration rate to try to give a robust design based on assumptions rather than results. The proposed strategy provides an infiltration blanket across the underside of the proposed synthetic pitches to mimic the existing drainage regime through the grass and also includes a volume of storage within the synthetic pitch foundations to accommodate the surface water associated with 30 year return period storm events thereby precluding any overland flow for storm events up to this magnitude.

5.05 Results of quick storage estimates based on the proposed all weather pitch layout and a low rate of infiltration (as a robust design assumption) are contained in Appendix C

6.0 Conclusion

6.01 The site is shown on Environment Agency mapping to be located within a Flood Zone 1 low risk flood zone. This is confirmed by the findings of the level 1 SFRA, the level 2 SFRA and the subsequent SWMP.

6.02 There is a limited amount of surface water flooding risk identified on the site by both the Environment Agency and the Newcastle Gateshead SWMP but this is expected to be mitigated or unchanged as a result of the construction of the synthetic sports surfaces.

6.03 Under the requirements of the NPPF this FRA is suitable to support the planning application to demonstrate the low flood risk of flood from rivers and sea and low risk of flooding from surface water that the surface water drainage proposals will not increase flood risk either on site or off site.

6.04 The redevelopment of the site mimics the current surface water discharge from the site and provides attenuation thereby reducing the risk of overland flows of surface water up to the design limit of the proposed infiltration drainage system.

6.05 It is recommended that a detailed drainage design is developed for construction based on the outline proposals contained in this report which will ensure that there is no increase in flood risk brought about by the proposals either on site or downstream of it. The proposed drainage strategy does not restrict the discharge of any property other than the development proposals it relates to and therefore will not increase the flood risk to properties upstream.

6.06 This Flood Risk Assessment and the drainage strategy it contains are in keeping with national policies and guidance and have been developed to reflect the requirements of the Newcastle Gateshead Surface Water Management Plan to ensure that the proposals mitigate the flood risks associated with new development.

6.07 The proposed all weather pitches are classed as water compatible development under the NPPF and the design proposes to mimic the existing surface water drainage regime on the site. The proposals also provide some surface water attenuation that will reduce the likelihood and volume of overland flow potentially mitigating the identified surface water flooding on the eastern wooded margin of the site.

Appendices

Appendix A ¯ Northumbrian Water Information

Steve Bowles

From: Laura Cape <Laura.Cape@nwl.co.uk>
Sent: 07 May 2014 09:08
To: Steve Bowles
Subject: RE: Newcastle Girls High School - Pre-development Enquiry Ref 14NO2E04BC

Hi Steve

We wouldn't be able to accept any surface water discharge from the sports pitches into the combined sewerage network as there are flooding issues in the downstream network.

Regards

Laura Cape

Technical Administration Assistant
Development Control
New Development

Direct Line: 0191 419 6646
Email: laura.cape@nwl.co.uk

From: Steve Bowles [mailto:Steve.Bowles@curtins.com]
Sent: 16 April 2014 11:05
To: Laura Cape
Cc: Andy Saville
Subject: Newcastle Girls High School - Pre-development Enquiry Ref 14NO2E04BC

Laura,

Further to our telephone conversation this morning concerning the Pre-development Enquiry for draining the proposed works at Newcastle Girls High School, please find attached the currently proposed layout for the revised sports pitches associated with the school re-development. The sports facilities are proposed to be all weather (Sports England standard) facilities for use throughout the year.

By modified rational method (50mm per hour) we estimate that the unrestricted discharge from the sports facilities to be of the order of 115l/s unrestricted.

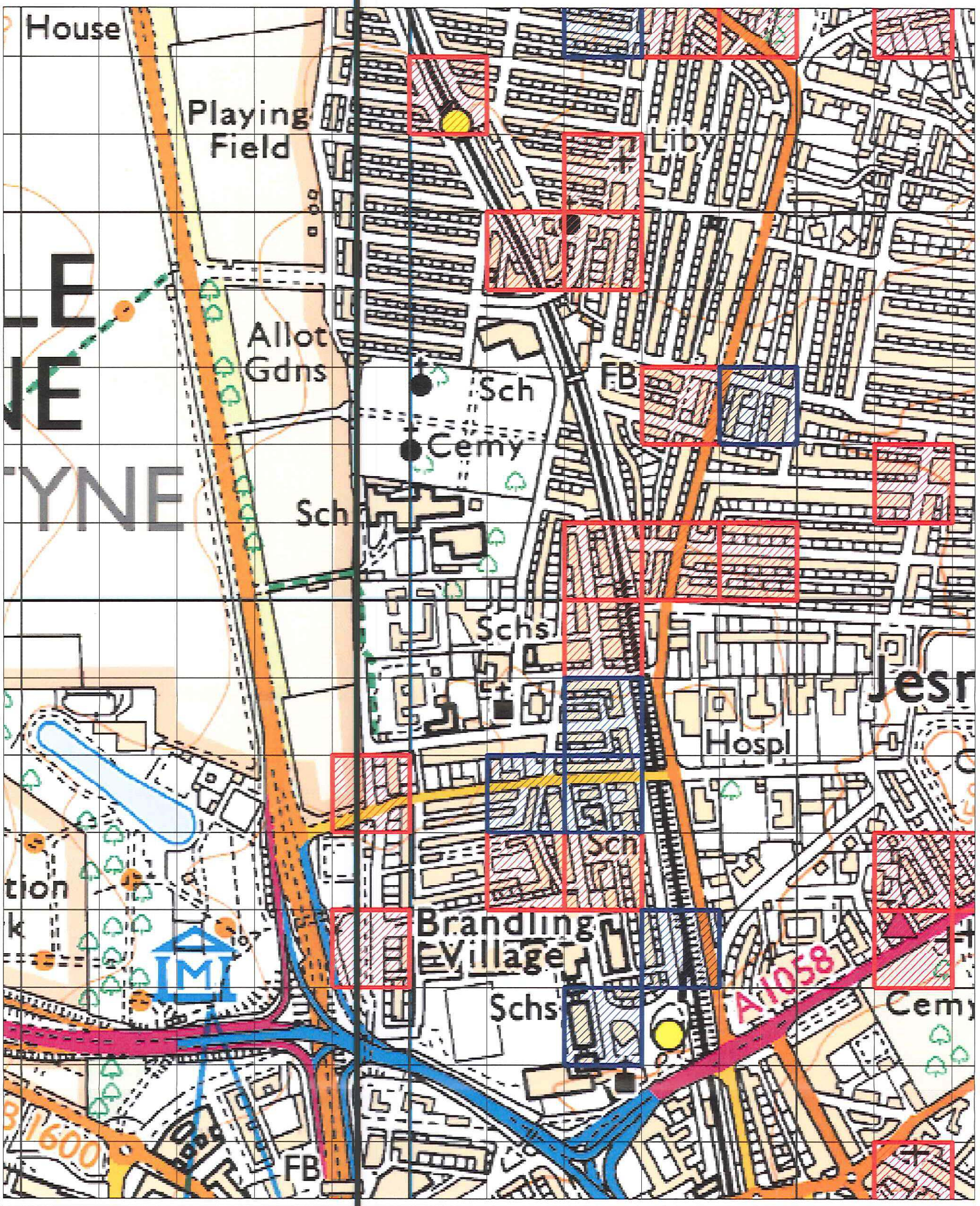
Can you confirm whether the discharge from these pitches would be accepted into the NWL sewer (either on the east side of the playing fields or in the B1318 Great North Road) in principle and whether the discharge would need to be attenuated?

We trust that the above and attached is clear but please do not hesitate to contact me should you need to discuss this matter or require further information.

Regards,

Steve Bowles
Principal Engineer
T. 0113 274 8496
steve.bowles@curtins.com

Leeds LS16 6QE



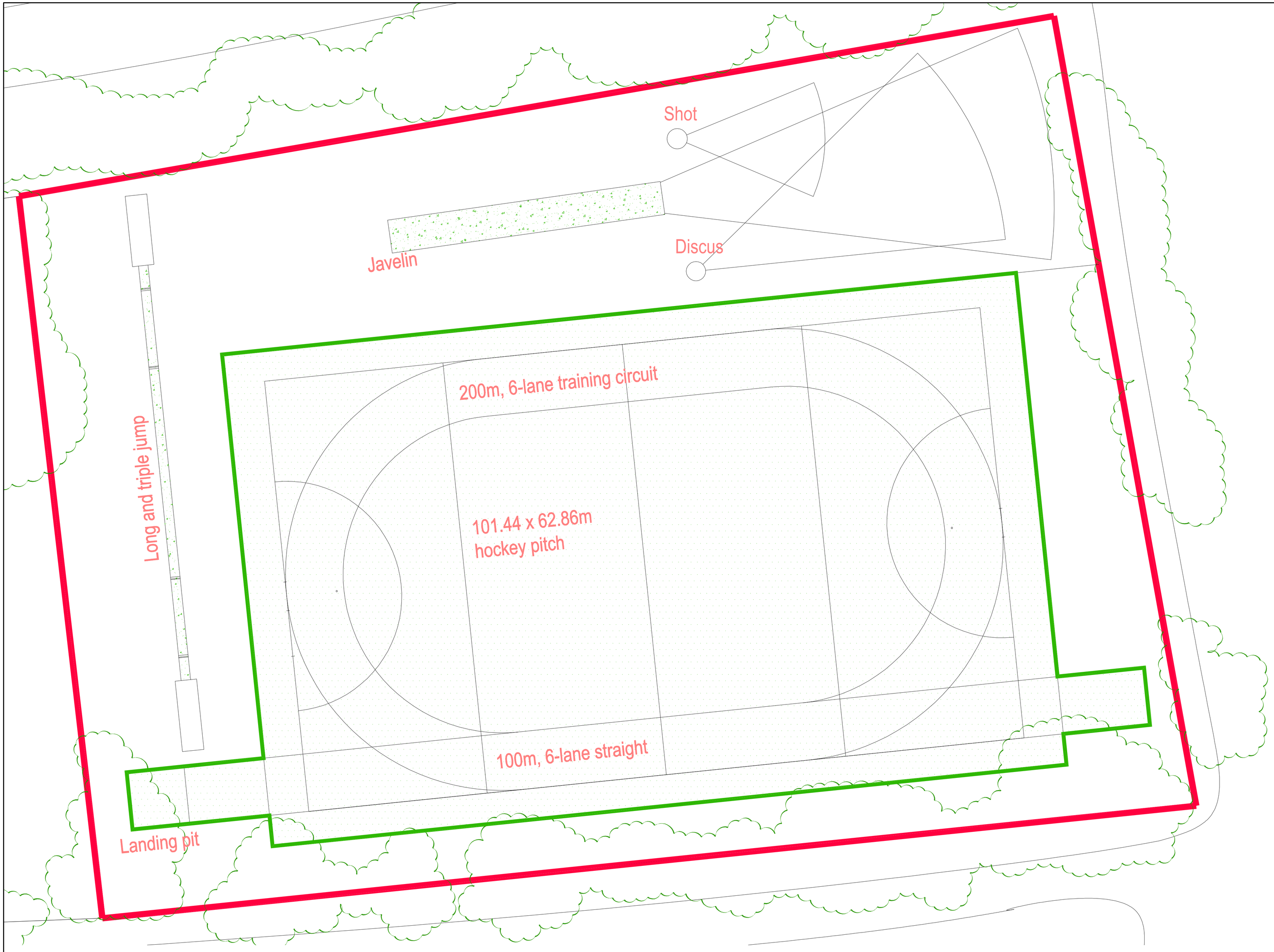
100m grid square where there has been reported sewer flooding.

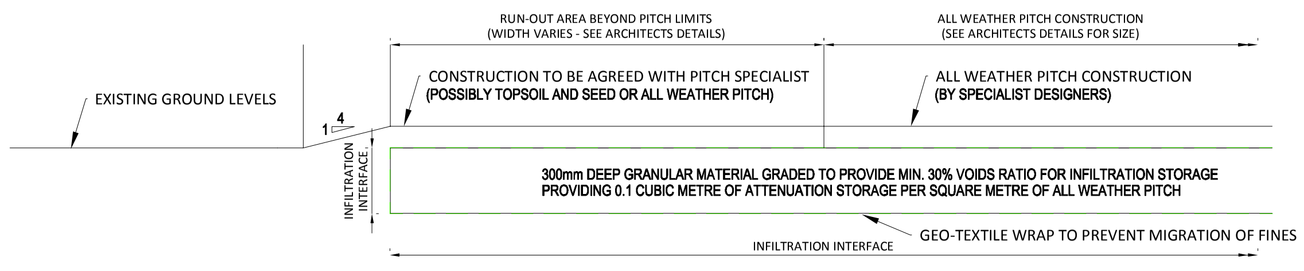
100m grid square where there has been reported sewer flooding in an extreme event.

Author	: CAPEL	Date	: 17-02-2014
Title	: Newcastle High Schoo	Sheet:	NZ2565
Centre Point	: 425103,565995	Scale	: 1:4600

NORTHUMBRIAN WATER

Appendix B ¯ Drainage Strategy Drawing





TYPICAL ALL WEATHER PITCH DRAINAGE CONSTRUCTION DETAIL

NOT TO SCALE

NOTES:

1. THIS DRAWING HAS BEEN BASED UPON THE ARCHITECTS PROPOSED SITE LAYOUT ISSUED TO CURTINS ON 16TH JUNE 2014 .
2. NORTHUMBRIAN WATER HAVE CONFIRMED THAT NO DISCHARGE TO THE PUBLIC SEWER NETWORK IS ACCEPTABLE FROM THE ALL WEATHER PITCHES.
3. THERE ARE NO KNOWN WATERCOURSES IN THE VICINITY OF THE PROPOSED ALL WEATHER PITCHES TO ACCEPT THE DISCHARGE.
4. THE ALL WEATHER PITCH CONSTRUCTION WILL BE DESIGNED BY A PITCH SPECIALIST.
5. THE VOLUME OF ATTENUATION REQUIRED HAS BEEN DETERMINED USING A VERY LOW INFILTRATION RATE OF 1x10-6 (IN THE ABSENCE OF TEST DATA). IN-SITU SOAKAWAY TESTING IS REQUIRED TO CONFIRM THE VOLUME OF ATTENUATION REQUIRED. THIS RESULTS IN A REQUIREMENT FOR 603CUBIC METRES OF ATTENUATION STORAGE BENEATH THE ALL WEATHER PITCH AREA OF 6590 SQUARE METRES.
6. THE PRELIMINARY PITCH DRAINAGE HAS BEEN DESIGNED TO ACCOMMODATE 30 YEAR RETURN PERIOD STORM EVENTS. IT IS RECOMMENDED THAT THE ALL WEATHER PITCHES ARE CONSTRUCTED SLIGHTLY HIGHER THAN THE SURROUNDING GROUND LEVELS (UP TO 100mm), TO ENSURE THAT RAINFALL EVENTS BEYOND THE 30YEAR RETURN PERIOD DESIGNED FOR, SHED FROM THE PITCHES WITHOUT DAMAGING THE UNDERLYING CONSTRUCTION.
7. THE DESIGNS SHOWN ON THIS DRAWING ARE INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN AND CO-ORDINATION WITH THE SPECIALIST PITCH DESIGNERS.

Rev:	Description:	Date:	By:	Chkd:

curtins

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Status:
PRELIMINARY

Project:
Newcastle High School For Girls

Drg Title:
All Weather Pitch Drainage Principles

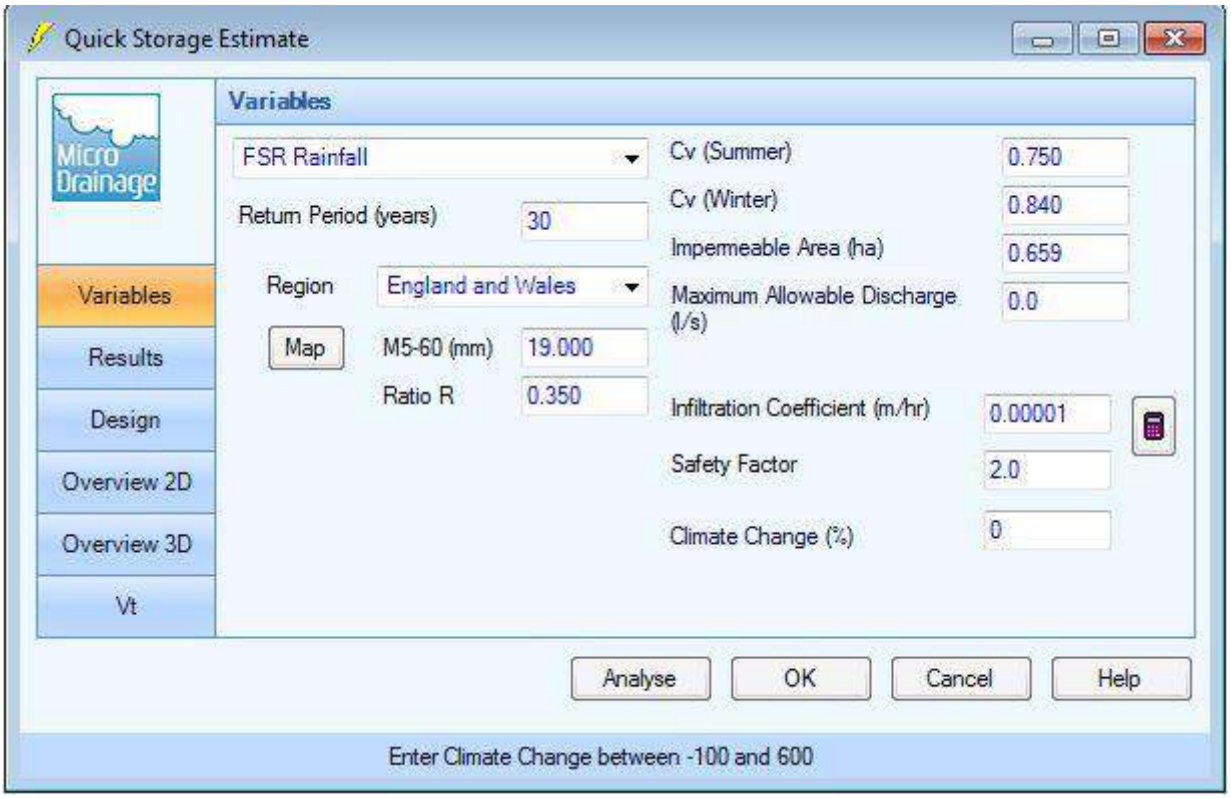
Scale:	Size:	First Issue:	Drawn:	Checked:
1:250	A1	July 2014	SAB	SAB

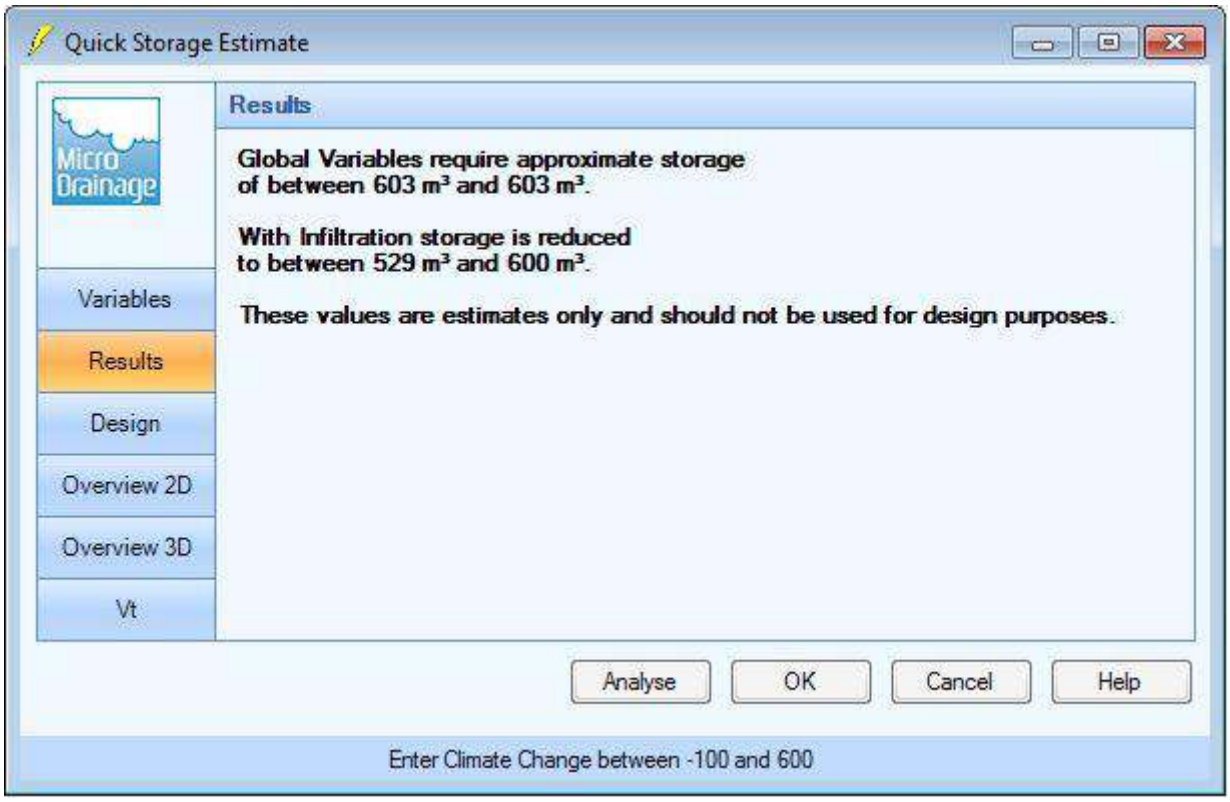
Drg No: 75521/C/002

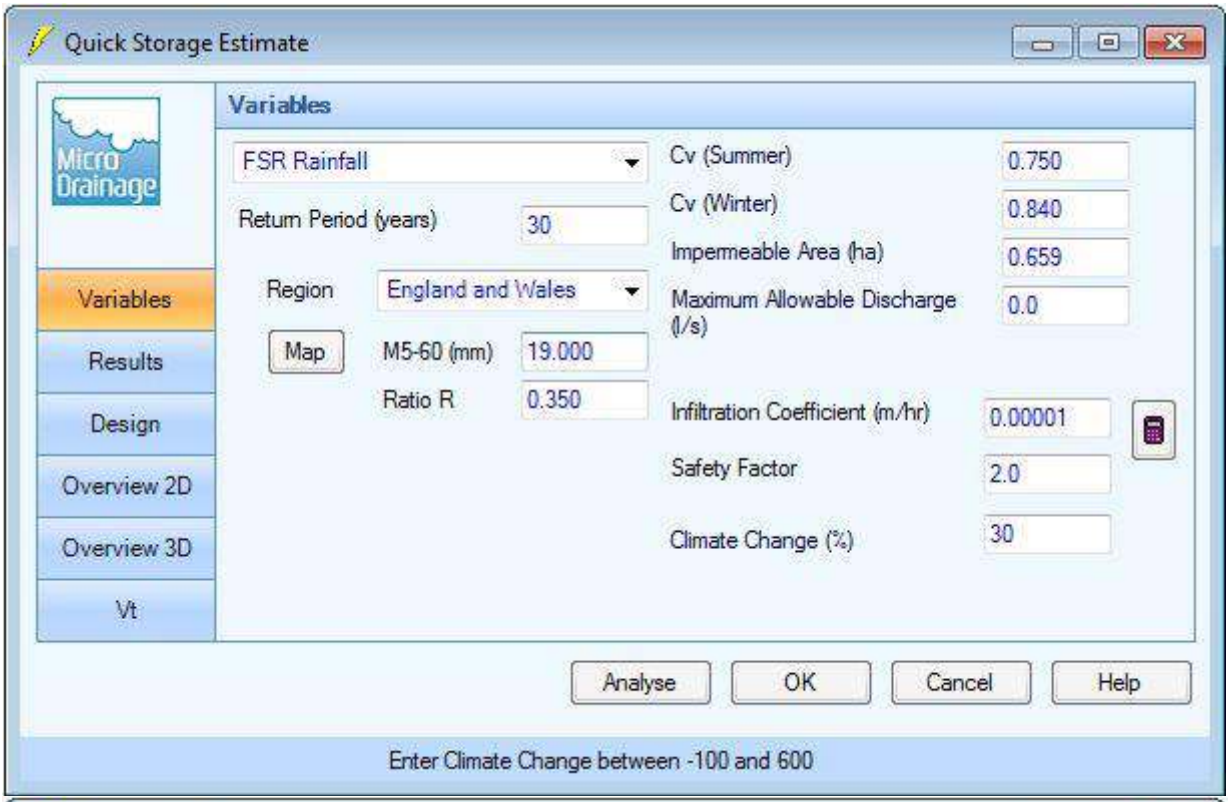
Rev: -

Appendix C ¯ Micro Drainage Quick Storage Estimates

Appendix C Quick Storage Estimates to inform outline design



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Overview 3D
Vt
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Ratio R 0.350
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 0.659
Maximum Allowable Discharge (l/s) 0.0
Infiltration Coefficient (m/hr) 0.00001
Safety Factor 2.0
Climate Change (%) 30
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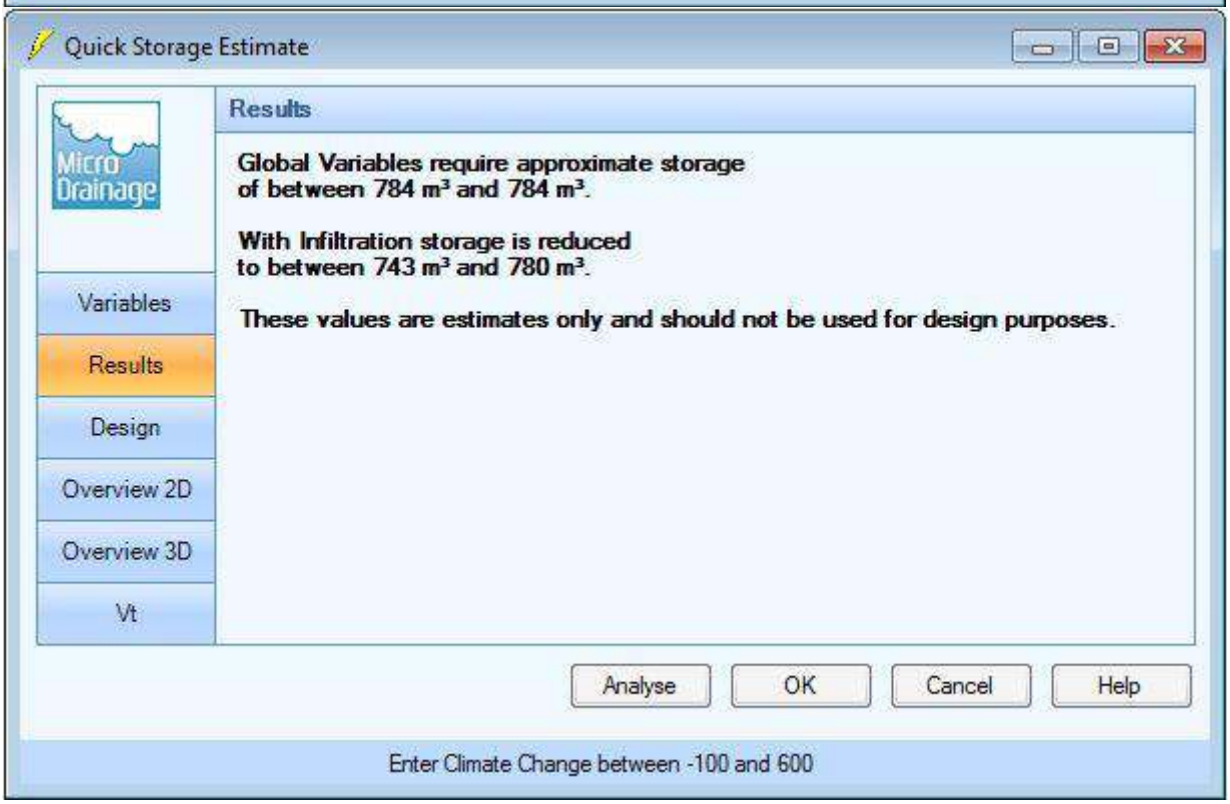
Enter Climate Change between -100 and 600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Overview 3D
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Results
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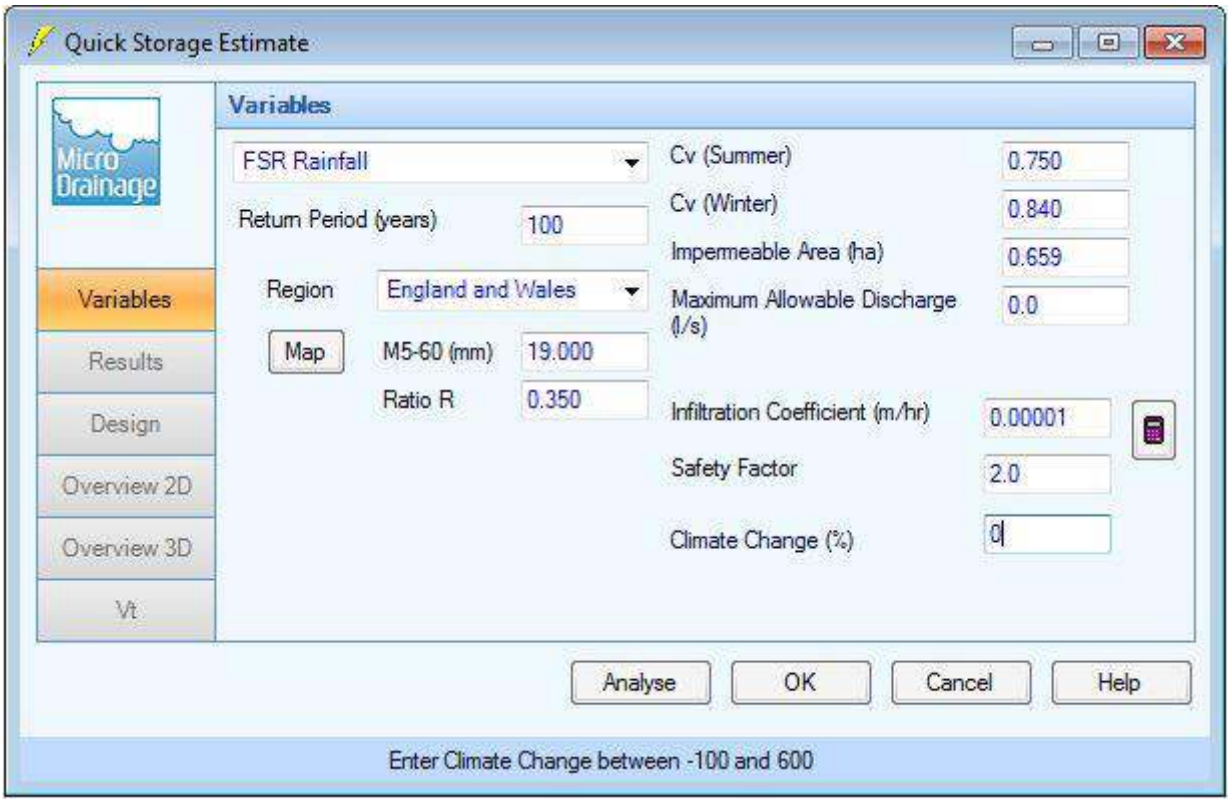
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Cv (Winter) 0.840
Impermeable Area (ha) 0.659
Maximum Allowable Discharge (l/s) 0.0
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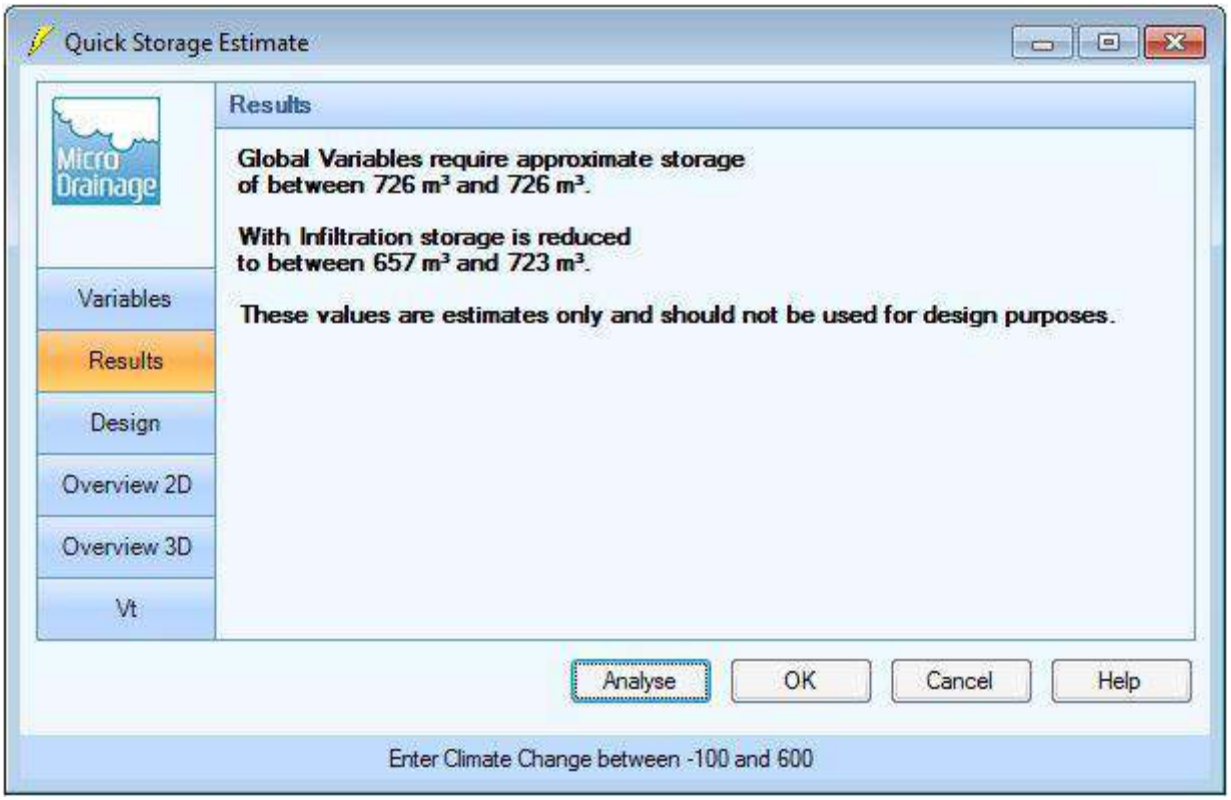
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Global Variables require approximate storage of between 726 m³ and 726 m³.
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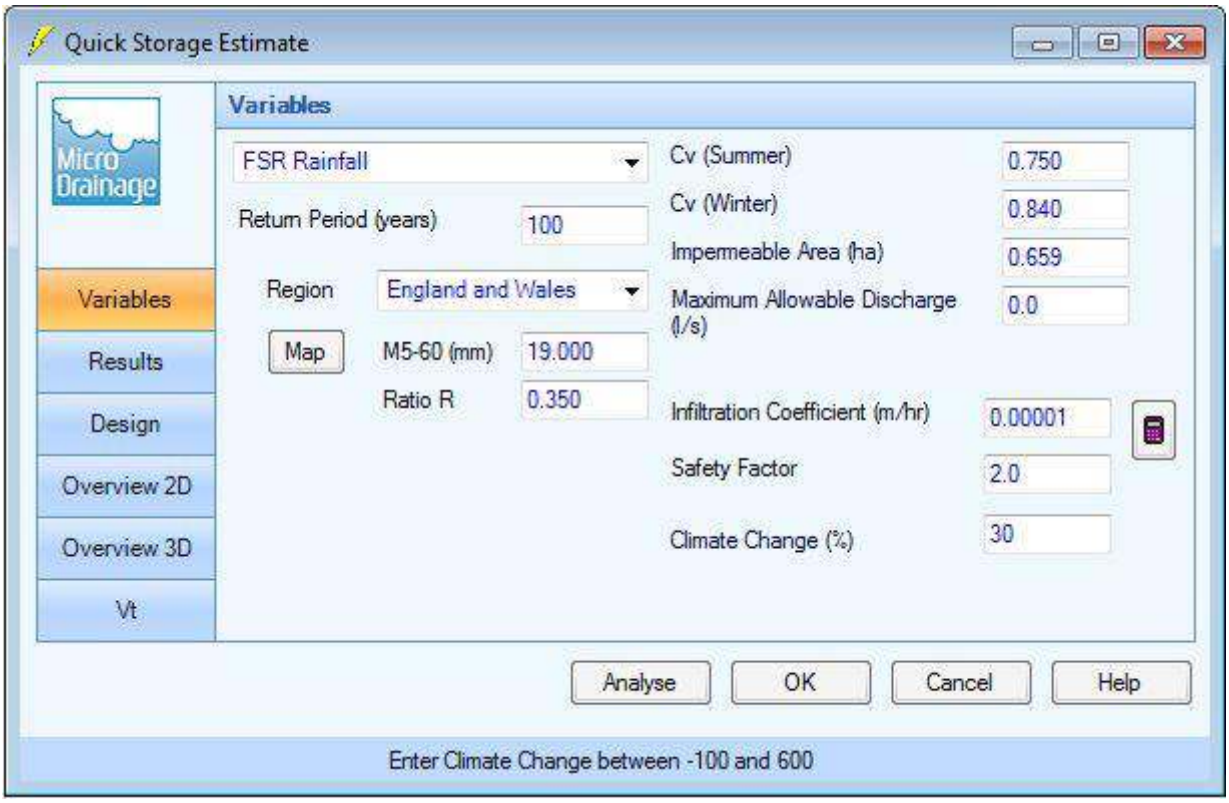
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Overview 3D
Vt
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Ratio R 0.350
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 0.659
Maximum Allowable Discharge (l/s) 0.0
Infiltration Coefficient (m/hr) 0.00001
Safety Factor 2.0
Climate Change (%) 30
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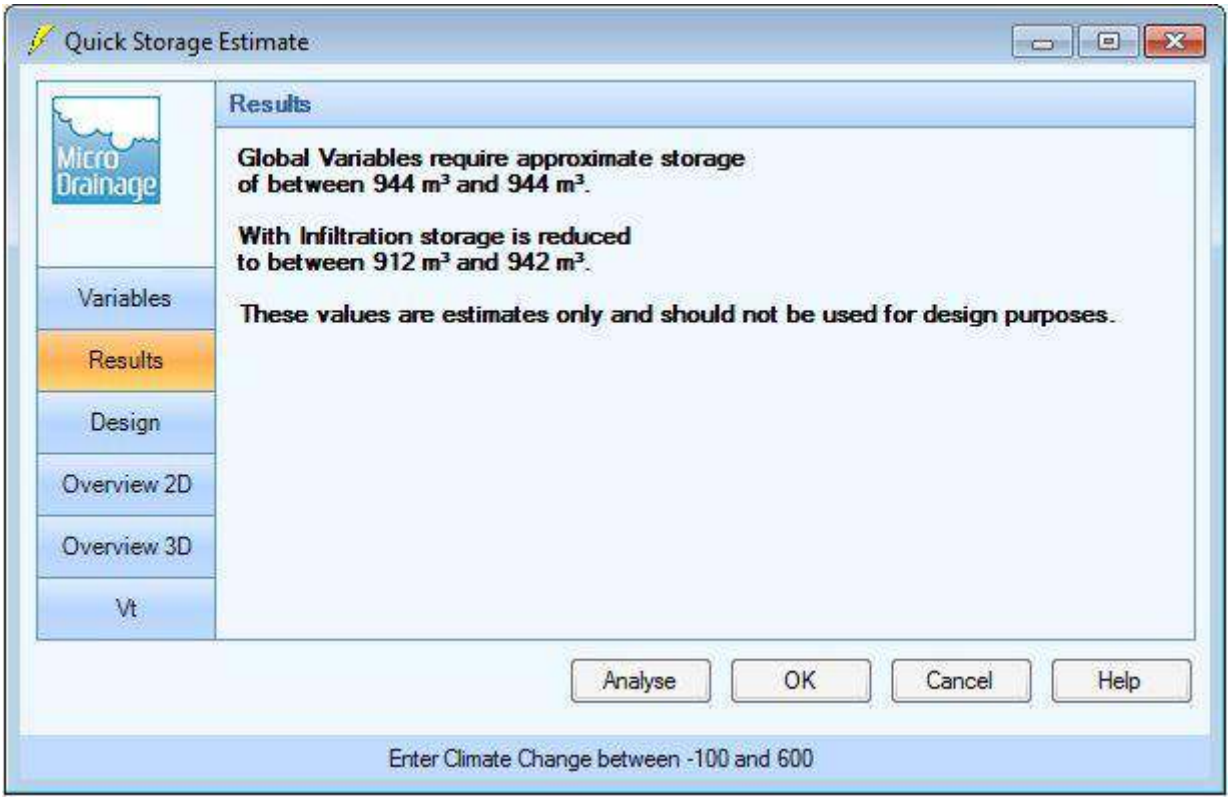
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Overview 3D
Vt
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These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600

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