WML CONSULTING
Civil, Structural and Geotechnical Engineers

Drainage Works Review

for a development at

Elker Lane, Billington, Clitheroe

undertaken on behalf of

Lovell Partnerships Ltd

Report No: 6421-WML-00-XX-RP-C-0001
March 2022

Report Title:	**Drainage Works Review – Elker Lane, Billington, Clitheroe**
Report Reference:	**6421-WML-00-XX-RP-C-0001**
Client:	**Lovell Partnerships Ltd**
Issue Date:	**March 2022**
Drafted By:	**Kevin Tyldesley**
Authorised By:	**Dan Baker**

Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked
01	March 2022	Planning Issue	KPT	DB

The findings and opinions provided in this document are given in good faith and are subject to the limitations imposed by employing site assessment methods and techniques, appropriate to the time of investigation and within the limitations and constraints defined within this document. The findings and opinions are relevant to the dates when the assessment was undertaken, but should not necessarily be relied upon to represent conditions at a substantially later date.

The findings and opinions conveyed in this report are based on information obtained from a variety of sources as detailed and which WML assumes to be reliable, but has not been independently confirmed. Therefore, WML cannot and does not guarantee the authenticity or reliability of third party information it has relied upon.

Where opinions expressed in this report are based on current available guidelines and legislation, no liability can be accepted by WML for the effects of any future changes to such guidelines and legislation.

The limitations of liability of WML for the contents of this document have been agreed with the Client, as set out in the terms and conditions of offer and related contract documentation.

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1.0 INTRODUCTION

1.1 WML Consulting Ltd have been commissioned by Lovell Partnerships Ltd to provide a report in support of a Section 73 planning application for a development at Elker Lane, Billington, Clitheroe.

1.2 It has been deemed by the planning authority, Ribble Valley Borough Council (RVBC), that a Section 73 application should be submitted in respect of the differences between the drainage proposals as submitted as part of the planning application and those actually constructed on the site.

2.0 SITE LOCATION

2.1 The now constructed development is located at Elker Lane, Billington, Clitheroe, BB7 9YB. It is understood that the development is known as Elker Meadows.

2.2 The development is a two storey apartment building with an associated access road, a car parking area and hard and soft landscaped areas.

2.3 The site is located in a relatively rural setting with nearby existing development to the east and south.

3.0 DRAINAGE INFORMATION SUBMITTED AS PART OF THE PLANNING APPLICATION

3.1 The planning application for the proposed development was submitted to RVBC in September 2014, with planning consent subsequently confirmed in November 2014. The planning reference is 3/2014/0801. A copy of the planning consent can be found at Appendix 01.

3.2 It is understood that WML drawing 6421 / E03 Revision P1 was submitted to RVBC as part of the planning application. A copy of this drawing can be found at Appendix 02. It is noted however that this drawing does not appear in the list of documents at condition 2 in line with which the development should have been completed.

3.3 The planning consent contains three conditions that relate to drainage / flood risk matters, these are as follows:-

- Planning condition 17 refers to need for the development to be carried out in line with approved Flood Risk Assessment.
- Planning condition 18 refers to need for the foul drainage from the development to be drained via a separate drainage system.
- Planning condition 19 refers to need for the development's surface water drainage proposals to be approved by the planning authority.

4.0 DRAINAGE INFORMATION SUBMITTED FOLLOWING PLANNING APPROVAL

4.1 Information was submitted Lancashire County Council (LCC) in respect of a Land Drainage Consent application in April 2015. Subsequently LCC confirmed their approval to this application via their letter dated 27th May 2015. A copy of this approval can be found at Appendix 03.

4.2 The approval notice lists the various documents that LCC approved as part of their review, though clearly the principle documents and the ones most relevant to this report are the proposed drainage layout drawings and the associated surface water drainage calculations.

4.3 A copy of the proposed adoptable drainage layout, WML drawing 6421 / E20 Revision P2 can be found at Appendix 04. This drawing illustrates the foul and surface water drainage proposals for the whole development, though in effect there are two distinct surface water drainage systems shown. The first being the system indicated in blue within the access road that was offered for adoption to United Utilities (UU) via a Section 104 agreement.

4.4 The second surface water drainage system being that around the apartment building. This system remained private. A copy of WML drawing 6421 / E01 Revision P1 can be found at Appendix 05. This drawing indicates the private drainage system in greater detail.

4.5 A copy of the surface water drainage calculations for the whole site can be found at Appendix 06.

4.6 It was agreed with LCC and UU that the surface water discharge rate from the site as a whole (the access road and the apartments) should be restricted to around 10 l / sec for all storm events up to and including the 1 in 100 year event plus a 30% climate change allowance. It was also agreed that this overall discharge rate should be divided equally between the access road and the apartments, i.e. each area being restricted to around 5 l / sec.

4.7 With reference to WML drawing 6421 / E01, it can be seen that the discharge rate from the apartment building element of the development is restricted to 5 l / sec via a hydro-brake flow control installed within NEW SW MH 1.004. This can be verified from the calculations at reference PN 1.004.

4.8 With reference to WML drawing 6421 / E20, it can be seen that the discharge rate from the site as a whole is restricted to around 10 l / sec via a hydro-brake flow control installed within NEW SW MH 1.006. This can be verified from the calculations at reference PN 1.006.

4.9 The surface water attenuation storage required to achieve these discharge rates is provided via a swale that runs around the apartment building and via oversized pipework beneath the courtyard area and the access road.

4.10 For completeness we have included a copy of UU's Section 104 approval notice at Appendix 07.

5.0 CHANGES TO THE DRAINAGE PROPOSALS DURING THE CONSTRUCTION PHASE

5.1 During the construction phase a number of alterations were made to the surface water drainage proposals, these being:-

1. Adjacent to the south east corner of the apartment building, a section of the swale was replaced by a 300mm diameter pipe. This alteration was considered necessary due to the poor ground conditions encountered in this area, which led to concerns regarding the excavation required to install the swale potentially undermining the adjacent existing public highway (Elker Lane).

2. Adjacent to the north east corner of the apartment building, two 100mm diameter emergency overflow pipes were installed. These pipes run from the swale to the existing lower ground at the north east corner of the site. This alteration was considered necessary to mitigate the risk of flooding as a result of exceedance flows or local drainage system failure.

6.0 REVIEW OF THE AS BUILT SURFACE WATER DRAINAGE SYSTEM

6.1 A topographic survey was carried out upon completion of the drainage installation works. This survey has been imported into the design drawing and the design amended to suit. A drawing illustrating the results of this exercise can be seen at Appendix 08.

6.2 The surface water drainage calculations have been amended to suit the results of the topographic survey. The results of this exercise can be seen at Appendix 09.

6.3 For simplicity the updated calculations exclude the drainage components serving the adjacent future nursery site and the access road, as such they relate to the private system serving the apartments site only.

6.4 Hence the total drained area served by the reduced network is 2,520m sq. This consists of the roof area (1,340m sq) the car park area (440m sq) and an allowance of 740m sq for the soft landscaped areas around the building.

6.5 It can be seen from these calculations that the discharge rate for the critical 1 in 100 year event plus a 30% climate change allowance is 5 l / sec.

6.6 It can also be seen that maximum water level reached within the swale for the critical 1 in 100 year event plus a 30% climate change allowance is 53.655. This being below the invert levels of the two 100mm diameter emergency overflow pipes, which are at 53.700.

6.7 Hence it is considered that the as built drainage system is in line with the original intent of the design that was approved by LCC, and that the relatively minor alterations made to the design during the construction stage do not have a significant effect on flood risk either to the development or to the surrounding area.

7.0 CONSIDERATION OF OVERLAND FLOW ROUTES

7.1 In the event of a rainfall exceedance event or a local drainage system failure, the water level within the swale would rise until it reaches the level of the two 100mm diameter emergency overflow pipes, which are at 53.700. At which point the excess water would enter these pipes and be discharged onto the lower ground beyond the north east corner of the site.

7.2 As ground levels continue to fall to the north away from the site, any exceedance flows would continue to flow away from the site in a northerly direction and be dispersed within the open farmland.

Appendix 01

Planning Consent

RIBBLE VALLEY BOROUGH COUNCIL

Department of Development

Council Offices, Church Walk, Clitheroe, Lancashire, BB7 2RA

Telephone: 01200 425111 Fax: 01200 414488 Planning Fax: 01200 414487

Town and Country Planning Act 1990

PLANNING PERMISSION

APPLICATION NO: 3/2014/0801
DECISION DATE: 14 November 2014
DATE RECEIVED: 03/09/2014

APPLICANT:
St Vincents HA and Oaks from Acorns
Private Day Nursery
c/o Agent

AGENT:
Avalon Town Planning
2 Reedley Business Centre
Redman Road
Burnley
Lancs
BB10 2TY

DEVELOPMENT PROPOSED: Construction of 19 2-bed apartments for the over 55s and a 120 place childrens day nursery, associated car parking and landscaping

AT: Land off Elker Lane
Billington

Ribble Valley Borough Council hereby give notice that **permission has been granted** for the carrying out of the above development in accordance with the application plans and documents submitted subject to the following condition(s):

1. The development must be begun no later than the expiration of three years beginning with the date of this permission.

   REASON: Required to be imposed in pursuance to Section 91 of the Town and Country Planning Act 1990.

2. This permission shall be implemented in accordance with the proposal as detailed on drawings ELKER/01Dwg03 REVA - proposed plans and elevations; ELKER/01Dwg05 REVA - proposed car parking; 805/A/000 - site location plan; 805/A/001 REV1 (received on 29 October 2014) - proposed site plan; 805/A/002 REVB - ground floor plan; 805/A/003 REVB - first floor plan; 805/A/005 REVA - proposed roof plan; 805/A/006 REVA 2B3P - apartment type 1; 805/A/007 REVA 2B3P - apartment type 2; 805/A/008 REVC - proposed elevations; 805/A/009 REVB - proposed elevations; 805/A/010 REVC - proposed elevations; 805/A/011 - proposed street elevations; 805/A/012 - apartment car park layout; 805/A/013 - 2B3P apartment type 3; 805/A/014 - existing site plan; 310403 - planting plan one of three; 3104/04 - planting plan two of three; 3104/05 - planting one three of three; 3104/01 - landscape layout.

P.T.O.

3. The residential units hereby permitted shall only be used for the purpose of providing affordable housing accommodation as defined in the Housing and Regeneration Act 2008 to be occupied by households or individual in housing need and in accordance with the submitted 'Affordable Housing Condition Terms'. The accommodation is for over 55s or such other persons approved by the HCA in need of 'Care and Support' accommodation.

   This condition and the terms described in the 'Affordable Housing Condition Terms' dated 2/10/2014. shall not be binding upon any of the following:

   a.A mortgagee or chargee (or any receiver appointed by such mortgagee or chargee) of the development or any part thereof (including any individual residential unit or group of residential units) together with the successors in title to such mortgagee, chargee or receiver;

   b.A tenant of a residential unit who exercises any statutory right to buy or right to acquire (or equivalent right) such residential unit together with the mortgagee or chargee (or any receiver appointed by such mortgagee or chargee) of such tenant and successors title;

   c.A lessee of a residential unit held under a shared ownership lease who acquires 100% of the interest held under that lease together with the mortgagee or chargee (or any receiver appointed by such mortgagee or charge) of such lessee and successors in title.

   REASON: for the avoidance of doubt as the application is for a development of 100% affordable housing units and to comply with Policy H2 of the Ribble Valley Districtwide Local Plan and Policy DMH3 of the Core Strategy Submission Version as proposed to be modified.

4. The use of the children's day nursery in accordance with this permission shall be restricted to the hours between 0700 to 1800 Monday to Friday.

   REASON: In order to comply with Policies G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Ribble Valley Core Strategy Submission Version as proposed to be modified. The use of the premises outside these hours could prove injurious to the character of the area and in order to safeguard residential amenities.

5. The approved landscaping scheme as detailed on drawings 3104/03, 3104/04 and 3104/05 (planting plans 1 - 3) shall be implemented in the first planting season following occupation or use of the development and shall be maintained thereafter for a period of not less than 5 years in accordance with the submitted 5 year Landscape Management Plan to the satisfaction of the Local Planning Authority. This maintenance shall include the replacement of any tree or shrub which is removed, or dies, or is seriously damaged, or becomes seriously diseased, by a species of similar size to those originally planted.

   REASON: In the interests of the amenity of the area and to comply with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

P.T.O.

6. Prior to commencement of any site works including delivery of building materials and excavations for foundations or services all trees identified in the arboricultural/ impact assessment and tree constraints plan shall be protected in accordance with the BS5837 2012 [Trees in Relation to Demolition, Design & Construction]

The details of which shall be agreed in writing and implemented in full under the supervision of a qualified arboriculturalist and in liaison with the Countryside/Tree Officer. A tree protection monitoring schedule shall be agreed and tree protection measures inspected by the local planning authority before any site works are begun.

The root protection/exclusion zone shall remain in place until all building work has been completed and all excess materials have been removed from site including soil/spoil and rubble.
During the building works no excavations or changes in ground levels shall take place and no building materials/spoil/soil/rubble shall be stored or redistributed within the protection/exclusion zone, in addition no impermeable surfacing shall be constructed within the protection zone.

No tree surgery or pruning shall be implemented without prior written consent, which will only be granted when the local authority is satisfied that it is necessary is in accordance with BS3998 for tree work and carried out by an approved arboricultural contractor.

REASON: In order to ensure that any trees affected by development and considered to be of visual, amenity and value and making a contribution to landscape character are given maximum physical protection against the potential adverse effects of development and to comply with Policies G1 and ENV13 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

7. No tree felling shall take place until such time that all the trees identified for removal have been conclusively established in relation to their potential use by bats. The trees shall be subject of a detailed investigation prior to the commencement of felling by a qualified and licensed ecologist and in accordance with the Bat Conservation Trust Good Practice Guidelines. The results of the investigation shall be submitted to the Local Planning Authority

REASON: To protect the bat population from damaging activities and reduce/remove the impact of tree felling for development in the interests of protecting nature and co9nservation issues in accordance with Policy ENV7 of the Ribble Valley Districtwide Local Plan and Policy DME3 of the Core Strategy Submission Version as proposed to be modified.

8. The new estate road/access between the site and Elker Lane shall be constructed in accordance with the Lancashire County Council Specification for Construction of Estate Roads to at least base course level before any development takes place within the site.

REASON: To ensure that satisfactory access is provided to the site before the development hereby permitted becomes operative in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

P.T.O.

9. Notwithstanding the provisions of the Town and Country Planning (General Permitted Development) Order 1995 there shall not at any time in connection with the development hereby permitted be erected or planted or allowed to remain upon the land hereinafter defined any building, wall, fence, hedge, tree, shrub or other device over 1m above road level. The visibility splay to be the subject of this condition shall be that land in front of a line drawn from a point 2.4m measured along the centre line of the proposed road from the continuation of the nearer edge of the carriageway of Elker Lane to points measured 43m in each direction along the nearer edge of the carriageway of Elker Lane, from the centre line of the access and shall be maintained at footway/verge level in accordance with a scheme to be agreed by the Local Planning Authority in conjunction with the Highway Authority').

   REASON: To ensure adequate visibility at the street junction or site access in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

10. The car park shall be surfaced or paved in accordance with a scheme to be approved by the Local Planning Authority and the car parking spaces and manoeuvring areas marked out in accordance with the approved plan, before the use of the premises hereby permitted becomes operative.

    REASON: To allow for the effective use of the parking areas in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

11. The cycling facilities to be provided in accordance with a scheme to be approved by the Local Planning Authority and the cycling facilities to be provided in accordance with the approved plan, before the use of the premises hereby permitted becomes operative.

    REASON: To allow for the effective use of the parking areas in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

12. The motorbike facilities to be provided in accordance with a scheme to be approved by the Local Planning Authority and the motorbike facilities to be provided in accordance with the approved plan, before the use of the premises hereby permitted becomes operative.

    REASON: To allow for the effective use of the parking areas in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

13. Prior to the first use of the development hereby permitted, a Travel Plan shall be submitted to, and approved in writing by, the Local Planning Authority in consultation with the Highway Authority. The Business Travel Plan shall be implemented within the timescale set out in the approved plan and will be audited and updated at intervals not greater than 18 months to ensure that the approved Plan is carried out.

    REASON: To promote and provide access to sustainable transport options in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

P.T.O.

14. The development hereby permitted shall be carried out in strict accordance with the mitigation measures outlined in Section 10.1 to 10.3 of the Noise Assessment Report dated 23 October 2014. Precise details of the acoustic barriers shall be submitted to and approved in writing by the Local Planning Authority prior to their installation. The barriers shall thereafter be constructed in accordance with the details so approved and also noise mitigation measures thereafter retained in perpetuity.

REASON: In the interests of amenity in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy submission version as proposed to be modified.

15. The development shall be carried out in accordance with the construction method statement submitted on 12 November 2014. The approved statement shall be adhered to throughout the construction period.

REASON: In the interests of amenity in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy submission version as proposed to be modified.

16. The off-site highway works associated with the creation of the lay-by on the easterly side of Elker Lane shall be fully implemented and available for use prior to the occupation of the first apartments or the Children's Day Nursery whichever is the earlier

REASON: To enable all construction traffic to enter and leave the premises in a safe manner without causing a hazard to other road users in the interests of highway safety in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

17. The development permitted by this planning permission shall only be carried out in accordance with the approved FRA (Ref: B1586 Version 2, dated 11 September 2014) and the mitigation measures detailed within the FRA. The mitigation measures shall be fully implemented prior to occupation and subsequently in accordance with the timing/phasing arrangements embodied within the scheme, or within any other period as may subsequently be agreed, in writing, by the Local Planning Authority.

REASON: To ensure the development is not at an unacceptable risk of flooding or exacerbate flood risk elsewhere in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

18. Foul water shall be drained on a separate system. No building shall be occupied until the approved foul drainage scheme has been completed to serve that building(s) in accordance with the approved details. This development shall be completed, maintained and managed in accordance with the approved scheme.

REASON To prevent the increased risk of flooding, both on and off site in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

19. The surface water drainage scheme must be restricted to existing run-off rates unless otherwise agreed in writing by the Local Planning Authority, no surface water shall discharge to the public sewage system either directly or indirectly. The development shall be completed, maintained and managed in accordance with the approved details.

REASON: To prevent the increased risk of flooding, both on and off site in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

P.T.O.

20. Precise specifications or samples of walling and roofing materials and details of any surface materials to be used including their colour and texture shall have been submitted to and approved in writing by the Local Planning Authority before their use in the proposed works.

REASON: In order that the Local Planning Authority may ensure that the materials to be used are appropriate to the locality in accordance with Policy G1 of the Ribble Valley Districtwide Local Plan and Policy DMG1 of the Core Strategy Submission Version as proposed to be modified.

Note(s)

1. For rights of appeal in respect of any condition(s)/or reason(s) attached to the permission see the attached notes.

2. The applicant is advised that should there be any deviation from the approved plan the Local Planning Authority must be informed. It is therefore vital that any future Building Regulation application must comply with the approved planning application.

3. The grant of planning permission will require the applicant to enter into an appropriate Legal Agreement, with the County Council as Highway Authority. The Highway Authority hereby reserves the right to provide the highway works within the highway associated with this proposal. Provision of the highway works includes design, procurement of the work by contract and supervision of the works. The applicant should be advised to contact the contact the Environment Directorate for further information by telephoning the Developer Support Section.

4. Before proceeding with the scheme preparation the Developer should consult with the Environment Director for detailed requirements relating to land arrangements, design, assessment, construction and maintenance of all existing or new highway structures included in, or affected by, the proposed scheme. For this purpose the term highway structure shall include: -

"any bridge or culvert having a span of 1.5 metres or greater, or having a waterway opening cross sectional area exceeding 2.2 square metres {Note: span refers to the distance between centre of supports and not the clear distance between supports},

"any retaining wall supporting the highway (including and supporting land which provides support to the highway),

"Any retaining wall supporting land or property alongside the highway.

The term 'highway' shall include footpaths and bridleways

5. Any works to the watercourses within or adjacent to the site which involve infilling, diversion, culverting or which may otherwise restrict flow, may require the prior formal Consent of the Lead Local Flood Authority (Lancashire County Council) under Section 23 of the Land Drainage Act 1991.

6. Prior to being discharged into any watercourse, surface water sewer or soakaway system, all surface water drainage from parking/servicing areas should be passed through an oil interceptor designed and constructed to have a capacity and details compatible with the site being drained.

7. A separate metered supply to each unit will be required at the applicant's expense and all internal pipe work must comply with current water supply (water fittings) regulations 1999.

JOHN HEAP
DIRECTOR OF COMMUNITY SERVICES

Appendix 02

WML drawing 6421 / E03 Revision P1

DRAINAGE LEGEND:

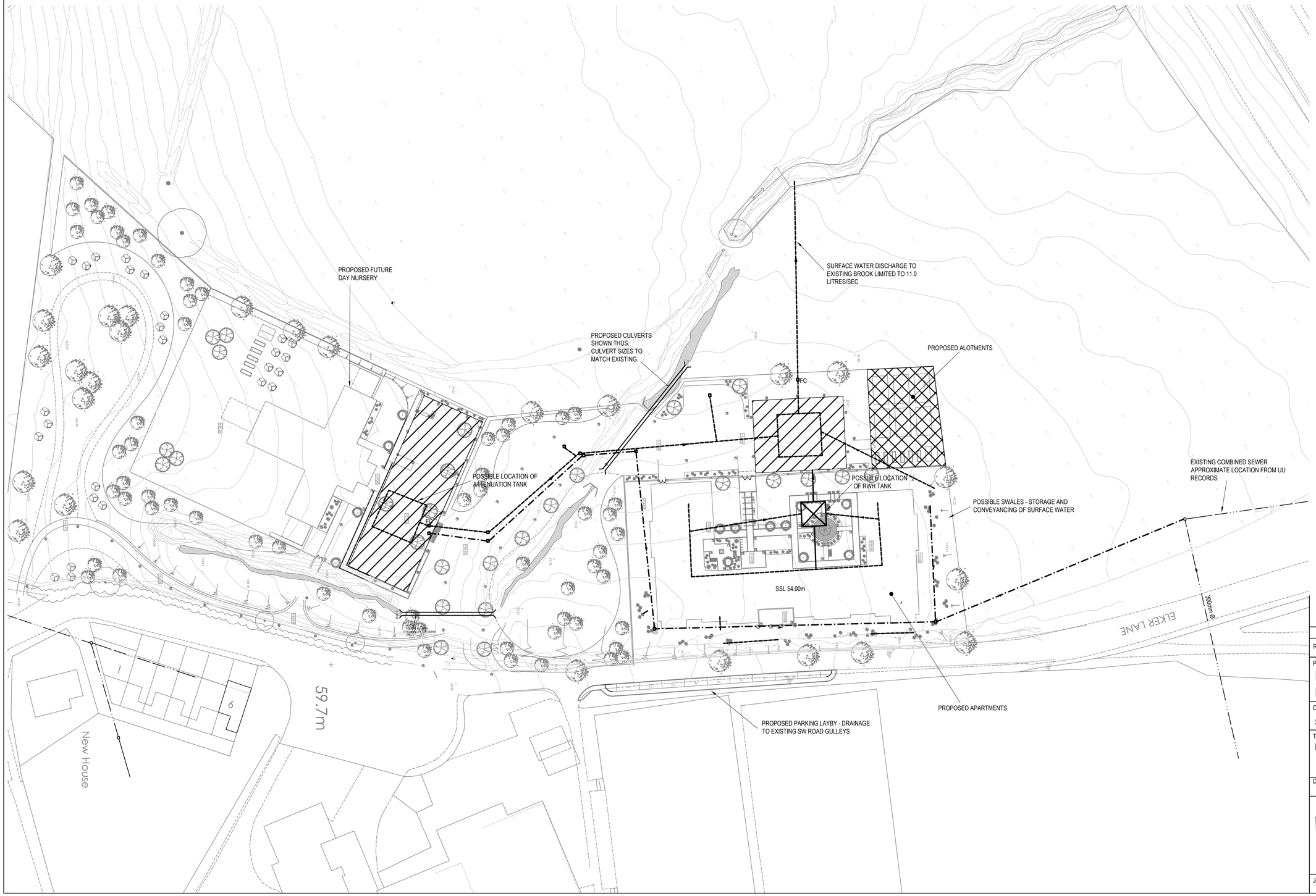
- INDICATES PROPOSED SURFACE WATER DRAIN & MANHOLE/IC
- INDICATES PROPOSED FOUL WATER DRAIN & MANHOLE/IC
- INDICATES EXISTING UU COMBINED SEWER
- INDICATES FLOW CONTROL (FC)

KEY:

- INDICATES PERMEABLE PAVING TO CAR PARK
- INDICATES PROPOSED ALLOTMENTS - POSSIBLE USE FOR HARVESTED RAINWATER

GENERAL NOTES

1. DO NOT SCALE FROM THIS DRAWING WORK TO FIGURED DIMENSIONS ONLY.
2. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS ALLOWED WITHOUT PRIOR PERMISSION IN WRITING.
3. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND THE SPECIFICATION.
4. THE CONTRACTOR SHALL INCORPORATE ALL THE REQUIREMENTS OF THE PRE-TENDER STAGE HEALTH & SAFETY PLAN.



PRELIMINARY DRAWING

Rev.	Amendment	Date	By	Chkd
P1	PRELIMINARY ISSUE.	AUG '14	OC	CM

Project
ELKER LANE
BILLINGTON

Client
ST. VINCENTS HOUSING ASSOCIATION

Title
PRELIMINARY DRAINAGE STRATEGY

Drawn	Checked	Date	Scale
OC	CM	AUG '15	1:250 @ A1

WML CONSULTING
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Job No.	Drawing No.	
6421	E03	P1

Appendix 03

Lancashire County Council Land Drainage Consent

Lancashire County Council

Mr Kevin Tyldesley
WML Consulting Ltd
8 Oak Green
Earl Road
Stanley Green Business Park
CHEADLE HULME
Cheshire
SK8 6QL

Phone: (01772) 537949
Fax: N/A
Email: FRM@lancashire.gov.uk
Your ref
Our ref: LCC/LDC024/2015
Date: 27 May 2015

Dear Mr Tyldesley,

PERMANENT WORKS – Diversion and alterations to existing watercourse and installation of 2 x 450mm diameter culverts – Land off Elker Lane, Billington, Clitheroe, BB7 9JA

Thank you for your application for Ordinary Watercourse Land Drainage consent received by Lancashire County Council.

I **confirm** that your proposed works are considered acceptable to Lancashire County Council.

I enclose consent number **LCC/LDC024/2015** issued under Section 23 of the Land Drainage Act 1991 (as amended).

Please notify our consent officer, Sudhakar Yallanki no less than seven days before commencement and upon completion of the works via one of the methods of contact above, quoting the consent number for reference.

Yours sincerely,

Rachel Crompton
Flood Risk Manager

Land Drainage Consent

Land Drainage Act 1991

Lovell Partnerships, St Johns House, Barrington Road, ALTRINCHAM, WA14 1JY

PERMANENT WORKS – Diversion and alterations to existing watercourse and installation of 2 x 450mm diameter culverts – Land off Elker Lane, Billington, Clitheroe, BB7 9JA

Consent Number: LCC/LDC024/2015

Date Issued: 27 May 2015

Lancashire County Council

www.lancashire.gov.uk

Introduction

This Note does not form part of the Certificate of Authorisation.

Lancashire County Council Land Drainage Consents are required by virtue of the Land Drainage Act 1991. The following activities on an Ordinary (non-main) Watercourse require consent:

Under Section 23 of the Land Drainage Act 1991:

- The erection or alteration of any mill dam, weir or other like obstruction to the flow of any watercourse.
- The erection or alteration of any culvert that would be likely to affect the flow of any watercourse.

Note: Consent under the above legislation is required irrespective of whether the works are permanent or temporary.

Contraventions

In relation to Ordinary Watercourses, Lancashire County Council can under Section 24 of the Land Drainage Act 1991, serve a legal notice requiring the person to abate the nuisance within a specified time. Failure to abide by such a notice can result in Lancashire County Council carrying out the necessary remedial work and seeking to recover costs.

Land Drainage Act 1991

Land Drainage Consent

Control of works affecting watercourses and/or flood defences
Consent number: **LCC/LDC024/2015**

To: Lovell Partnerships, St Johns House, Barrington Road, ALTRINCHAM, WA14 1JY

Lancashire County Council, in exercise of its powers under Section 23 of the Land Drainage Act 1991 and subject to the conditions attached, hereby grants its consent in relation to the works or operations described in this Consent.

Watercourse: Not known

Location: Land off Elker Lane, Billington, Clitheroe, BB7 9JA

Map reference: E: 371862 N:435652

Description of works: Diversion and alterations to existing watercourse and installation of 2 x 450mm diameter culverts

As detailed on plans, sections and documents:

- 6421/E15 – Proposed Highway Works - Section 38 Drawings - Typical Construction Details
- 6421/E21 – Proposed Drainage Works - Section 104 Drawings - Detailed Manhole Plans
- 6421 – Elker Lane, Billington – Adoptable Drainage Design – Rev 03
- 6421/E10 - Proposed Highway Works - Section 38 Drawings - Topographical Survey Data
- 6421/E12 - Proposed Highway Works - Section 38 Drawings – Setting Out Data
- 6421/E13 - Proposed Highway Works - Section 38 Drawings – Longitudinal Sections Sheet 1 of 2
- 6421/E14 - Proposed Highway Works - Section 38 Drawings – Longitudinal Sections Sheet 2 of 2
- Extended Phase 1 Habitat Survey
- 6421 – Elker Lane, Watercourse Works – Diagram of Method Statement
- 6421/E20 - Proposed Drainage Works - Section 104 Drawings – Proposed Drainage Layout
- STND/00/006/B – United Utilities Plc - Standard Details – Networks Typical Outfall Details D, E and F
- 6421 – Drawing Issue Sheet – Elker Lane, Billington – S38 and S104 Drawings
- 6421/E11 - Proposed Highway Works - Section 38 Drawings – Agreement and General Arrangement
- 6421 – Elker Lane – Existing Runoff Assessment
- MS51 – Method Statement

Lancashire County Council does not accept any responsibility for the design and construction of the works referred hereto and any liability for any loss or damage which may arise out of their design, construction, maintenance or use.

This Consent shall come into effect on 27 May 2015

Prepared by

Approved by

Signed on behalf of Lancashire County Council

Rachel Crompton, Flood Risk Manager, Lancashire County Council

Date of signing 27/5/2015

Conditions – General

1. The applicant is required to notify Lancashire County Council no less than seven days before commencement of the works.
2. It is the responsibility of the applicant to ensure he obtains the consent/permission of any owners and occupiers affected by the works.
3. The Consent does not confer any rights of entry or rights over property.
4. The Consent does not remove from the applicant the necessity to obtain other licences, consents, approvals or permissions (including planning permission) which may be required in law in order to comply with any duties or responsibilities for conservation or protection of the environment.
5. Works should be arranged to ensure there is no increase in flood risk to third parties. All reasonable precautions should be taken during the undertaking of the works so as not to obstruct, impede or interfere with the flow of water in, into or out of the watercourse and not to damage the banks or bed or any drainage works.
6. All reasonable care should be taken to ensure that the watercourse is kept free of foreign matter and floating debris during the construction period and on completion. Netting and other arrangements must be used to ensure that debris does not fall into the watercourse.
7. Works must be undertaken fully in accordance with PPG5, the pollution prevention guidelines on works or maintenance in or near water. These guidelines are important and comprehensive and should be studied carefully by those contemplating works. A copy of PPG 5 can be downloaded from the Environment Agency web site at http://www.environment-agency.gov.uk/business/topics/pollution/39083.aspx
8. Should any pollution problems occur on site the Environment Agency must be informed immediately on 0800 807060 and Lancashire County Council informed.
9. If over pumping is used a suitable screen/strainer should be used to prevent fish and other material being drawn in. Over pumping should be undertaken only in a manner that minimises bed disturbance, avoids movement of silt and minimises scour.
10. Wet concrete must not be released into the watercourse.
11. Material used for backfilling must be inert and not contain any material that could potentially leach out into the watercourse.
12. Any landscaping of banks must be restricted to native species only.
13. Invasive species such as Japanese Knotweed, if encountered, must be managed and controlled on site.
14. On completion of the works all debris and surplus material shall be removed from the banks of the watercourse. The bed and banks of the watercourse which have been disturbed by the works shall be reinstated to the satisfaction of Lancashire County Council.

15. On completion of the works the applicant shall inform Lancashire County Council in writing.

16. As built drawings of the work must be provided to Lancashire County Council within 3 months of completion.

Conditions – Timing

The works referred to in this Consent shall be commenced within one year of the date of issue; otherwise a further application for Consent must be made.

Conditions Temporary Works

None

Conditions - Site Specific

None

Other Information

Recommendations in the Extended Phase 1 Habitat Survey should be implemented

Appendix 04

WML drawing 6421 / E20 Revision P2

North

EXISTING 450 DIAMETER CULVERT
UPSTREAM IL 51.550

EXISTING WATERCOURSE TO BE
DEEPENED OVER THIS LENGTH TO
SUIT LEVELS SHOWN

NEW SW OUTFALL
NOMINAL BED LEVEL 51.650
NOMINAL WATER LEVEL 51.750
PIPE IL 52.050
TOP OF BANK LEVEL 53.000
OUTFALL AS UU DRAWING
STND / 00 / 006 TYPICAL DETAIL F

225 DIA
1 IN 165 FALL

NEW 6m WIDE UNITED UTILITIES EASEMENT FOR
PROPOSED OUTFALL CONNECTION

CULVERT 2 OUTLET
NOMINAL BED LEVEL 52.400
NOMINAL WATER LEVEL 52.500
PIPE IL 52.700
TOP OF BANK LEVEL 53.400

NEW SW
MH 1.006
CL 53.500
IL 52.120
HYDROBRAKE
CHAMBER

CULVERT 2 INLET
NOMINAL BED LEVEL 53.000
NOMINAL WATER LEVEL 53.100
PIPE IL 53.000
TOP OF BANK LEVEL 54.000

NEW CULVERT 2
450mm DIA
24m LONG
1 IN 80 FALL
BED TYPE Z

NEW SW
MH 3.003
CL 54.900
IL 52.240

2 X 450 DIA
1 IN 400 FALL

2 X 450 DIA
1 IN 400 FALL

NEW SW
MH 1.005
CL 53.600
IL 52.150

PROPOSED FUTURE
DAY NURSERY
FFL 59.200m

2 X 450 DIA
1 IN 400 FALL

NEW SW
MH 3.002
CL 56.950
IL 52.345

EXISTING CULVERT TO BE
REMOVED AND REPLACED
WITH NEW CULVERT 1

DIVERTED WATERCOURSE TO BE
FORMED BY APPROX 1m DEEP
CHANNEL WITH 0.6m WIDE STREAM
BED AND 1 IN 3 SIDE SLOPES UP TO
EXISTING GROUND LEVEL

CULVERT 1 INLET
NOMINAL BED LEVEL 55.500
NOMINAL WATER LEVEL 55.600
PIPE IL 55.500
TOP OF BANK LEVEL 56.500

NEW CULVERT 1
450mm DIA
29m LONG
1 IN 70 FALL
BED TYPE S

CULVERT 1 OUTLET
NOMINAL BED LEVEL 55.000
NOMINAL WATER LEVEL 54.900
PIPE IL 55.100
TOP OF BANK LEVEL 56.000

WORKS TO EXISTING
WATERCOURSE TO
BE AGREED WITH
THE LOCAL
PLANNING
AUTHORITY

PROPOSED
APARTMENTS
FFL 54.000m

ELKER LANE

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4. THE CONTRACTOR SHALL INCORPORATE ALL THE REQUIREMENTS OF THE PRE-TENDER STAGE HEALTH & SAFETY PLAN.

PRELIMINARY

Rev.	Amendment	Date	By	Chkd
P2	AMENDED TO SUIT UU AND LCC COMMENTS.	09.04.15	KPT	CM
P1	PRELIMINARY ISSUE.	23.02.15	KPT	CM

Project
ELKER LANE
BILLINGTON

Client
ST VINCENTS HOUSING ASSOCIATION

Title
PROPOSED DRAINAGE WORKS
SECTION 104 DRAWINGS
PROPOSED DRAINAGE LAYOUT

Drawn	Checked	Date	Scale
KPT	CM	FEBRUARY 2015	1:250 @ A1

WML CONSULTING
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Job No. 6421

Drawing No. E20 P2

Appendix 05

WML drawing 6421 / E01 Revision P1

North

TIE INTO EXISTING SITE LEVELS AT TOP OF PROPOSED EMBANKMENT

TIE INTO EXISTING SITE LEVELS AT BOTTOM OF PROPOSED EMBANKMENT

GENTLE GRADE (1 IN 6 MAX) TO EXISTING LEVELS AT SITE BOUNDARY

DOUBLE ROAD GULLY WITH DISHED CONCRETE CHANNEL TO EITHER SIDE OF CAR PARK

ALARMED CLASS 1 BYPASS INTERCEPTOR. KLARGESTER NSBP003 OR SIMILAR CL 53.630 IL 52.650 (IN) IL 52.550 (OUT)

NEW SW MH (CP) 1.003 CL 53.800 IL 52.480 (PIPES) IL 52 180 (CHAMBER) 1200 DIA PCC WITH 100mm ORIFACE PLATE BOLTED OVER OUTGOING PIPEWORK \

TIE INTO EXISTING SITE LEVELS AT TOP OF PROPOSED EMBANKMENT

PROPOSED FUTURE DAY NURSERY
FFL 59.200m

15m LONG STUB FOR FUTURE DEVELOPMENT WITH TEMPORARY PLUG TO UPSTREAM END. 150 DIA AT MIN 1 IN 100 FALL

NEW FW MH 8.000 CL 57.500 IL 54.000 1200 DIA PCC

PIPE TO PASS BENEATH WATERCOURSE DIVERSION AT APPROX IL 53.100. CONCRETE SURROUND TO PIPE FOR 6m EITHER SIDE OF WATERCOURSE DIVERSION.

TIE INTO EXISTING SITE LEVELS AT TOP OF PROPOSED EMBANKMENT

TIE INTO EXISTING SITE LEVELS AT BOTTOM OF PROPOSED EMBANKMENT

NOMINAL GROUND LEVEL TO TOP OF SWALE 53.800

1 IN 3 MAX GRADE UP TO EXISTING GROUND LEVEL FROM APARTMENT PLATEAU LEVEL

APPROX EXTENTS OF 1m HIGH RETAINING STRUCTURE

150 DIA AT 1 IN 45 FALL FOUL DRAINAGE CONNECTION FROM FUTURE NURSERY DEVELOPMENT

TIE INTO EXISTING SITE LEVELS AT BOTTOM OF PROPOSED EMBANKMENT

NEW SW MH 1.004 CL 53.800 IL 52.260 (150) IL 52.260 (525) 1500 DIA PCC

NEW SW (CP) MH 2.000 CL 53.600 IL 52.675 (PIPES) IL 52.375 (CHAMBER) 1200 DIA PCC

NEW SW MH 2.001 CL 53.650 IL 52.525 1200 DIA PCC

16m LONG 525 DIA 1 IN 400

NEW SW MH 2.003 CL 53.800 IL 52.300 (150) IL 52.300 (525) 1500 DIA PCC

HYDROBRAKE CHAMBER TO RESTRICT SURFACE WATER DISCHARGE TO 5 l / sec FOR UPTO AND INCLUDING THE CRITICAL 1 IN 100 YEAR EVENT PLUS 30% CLIMATE CHANGE ALLOWANCE
HYDROBRAKE TYPE MD-SHE-0105-5000-1000-5000.
DESIGN HEAD 1.0m
DESIGN FLOW 5 l / sec

TRAPPED RODDABLE YARD GULLIES

28m LONG 525 DIA 1 IN 400

NEW SW MH 2.002 CL 53.800 IL 52.370 (150) IL 52.370 (525) 1500 DIA PCC

600 DEEP 450 DIA SW PPICS INDICATED THUS

NEW FW MH 1.004 CL 53.850 IL 52.700

NEW FW MH 7.000 CL 53.850 IL 53.225

NEW FW MH 1.005 CL 53.800 IL 52.600

ALL RWPS TO CONNECT TO BELOW GROUND PIPEWORK VIA SEALED RODDABLE BACK INLET GULLIES

GENTLE GRADE (1 IN 6 MAX) TO EXISTING LEVELS AT SITE BOUNDARY

NOMINAL GROUND LEVEL TO TOP OF SWALE 53.800

RAINWATER PIPES TO DISCHARGE DIRECTLY TO SWALE

ALL NEW MAIN SURFACE WATER DRAINAGE CONNECTIONS TO BE 100 DIA AT 1 IN 40 MINIMUM FALL UNLESS NOTED OTHERWISE

ALL NEW MAIN FOUL DRAINAGE CONNECTIONS TO BE 100 DIA AT 1 IN 40 MINIMUM FALL UNLESS NOTED OTHERWISE

ALL NEW MAIN FOUL DRAINAGE PIPEWORK TO BE 150 DIA AT 1 IN 150 MINIMUM FALL UNLESS NOTED OTHERWISE

PROPOSED APARTMENTS
FFL 54.000m

NEW FW MH 1.000 CL 53.850 IL 53.225

NEW FW MH 2.001 CL 53.850 IL 53.145

NEW FW MH 2.000 CL 53.850 IL 53.225

NEW FW MH 8.001 CL 53.800 IL 52.450 1200 DIA PCC

NEW FW MH 9.000 CL 53.850 IL 53.225

NEW FW MH 3.000 CL 53.850 IL 53.225

NEW FW MH 10.000 CL 53.850 IL 53.175

NEW FW MH 4.000 CL 53.850 IL 53.225

NEW FW MH 5.000 CL 53.850 IL 53.225

NEW FW MH 11.000 CL 53.850 IL 53.225

NEW FW MH 6.000 CL 53.850 IL 53.225

NEW FW MH 11.001 CL 53.850 IL 53.125

EXISTING LEVELS / FALLS (1 IN 80 APPROX) RETAINED WITHIN PROPOSED ALLOTMENTS

ALL NEW FOUL DRAINAGE ACCESS POINTS TO BE 450 DIA PPIC UNLESS NOTED OTHERWISE

NEW FW MH 1.006 CL 53.800 IL 51.575 1200 DIA PCC

GENTLE GRADE (1 IN 6 MAX) TO EXISTING LEVELS AT SITE BOUNDARY

FOUL DRAINAGE FROM THE PROPOSED DEVELOPMENT TO DISCHARGE TO THE EXISTING ADOPTED COMBINED SEWER NETWORK APPROXIMATELY 80m NORTH OF THE SITE.

APPROXIMATE LOCATION OF EXISTING COMBINED UU SEWER AND LOCATION OF EXISTING CHAMBER ARE TAKEN FROM THE UU SEWER RECORDS AND ARE SUBJECT TO CONFIRMATION ONCE WORK COMMENCES ON SITE.
THE FINAL CONNECTION OF THE PROPOSED FOUL WATER DRAINAGE SYSTEM IS TO BE MADE AT THIS POSITION.
THE CONTRACTOR IS TO CONFIRM THE EXACT POSITION, INVERT LEVEL, CONDITION AND SIZES OF SEWER AND CHAMBER AND TO ADVISE ENGINEER ACCORDINGLY PRIOR TO COMMENCEMENT OF DRAINAGE WORKS.

EMBANKMENTS 1 IN 3 ADJACENT TO PROPOSED RETAINING STRUCTURE

TIE INTO EXISTING SITE LEVELS AT TOP OF PROPOSED EMBANKMENT

ALL NEW MAIN SURFACE WATER DRAINAGE PIPEWORK TO BE 150 DIA AT 1 IN 100 MINIMUM FALL UNLESS NOTED OTHERWISE

ELKER LANE

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PRELIMINARY

Rev.	Amendment	Date	By	Chkd
P1	PRELIMINARY ISSUE.	20.04.15	KPT	CM

Project
ELKER LANE
BILLINGTON

Client
ST VINCENTS HOUSING ASSOCIATION

Title
PROPOSED PRIVATE DRAINAGE LAYOUT

Drawn	Checked	Date	Scale
KPT	CM	APRIL 2015	1:250 @ A1

WML CONSULTING
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Job No. 6421 | Drawing No. E01 P1

Appendix 06

Surface water drainage calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.294	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	5	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.292	4-8	0.392	8-12	0.027

Total Area Contributing (ha) = 0.710

Total Pipe Volume (m³) = 164.597

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.000	40.000	0.015	2666.7	0.036	5.00	0.0	0.600	-SW	-1	
1.001	80.000	0.020	4000.0	0.055	0.00	0.0	0.600	-SW	-1	
1.002	38.000	0.015	2533.3	0.043	0.00	0.0	0.600	-SW	-1	
1.003	22.000	0.220	100.0	0.000	0.00	0.0	0.600	o	150	
2.000	15.000	0.250	60.0	0.044	5.00	0.0	0.600	o	150	
2.001	18.000	0.180	100.0	0.000	0.00	0.0	0.600	o	150	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	5.00	6.08	53.350	0.036	0.0	0.0	0.0	0.62	462.9	0.5
1.001	5.00	8.74	53.335	0.091	0.0	0.0	0.0	0.50	376.4	1.2
1.002	5.00	9.74	53.315	0.134	0.0	0.0	0.0	0.63	475.1	1.8
1.003	5.00	10.10	52.480	0.134	0.0	0.0	0.0	1.00	17.8	1.8
2.000	5.00	5.19	52.800	0.044	0.0	0.0	0.0	1.30	23.0	0.6
2.001	5.00	5.49	52.550	0.044	0.0	0.0	0.0	1.00	17.8	0.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
2.002	28.000	0.070	400.0	0.048	0.00	0.0	0.600	o	525	
2.003	16.000	0.040	400.0	0.024	0.00	0.0	0.600	o	525	
1.004	10.000	0.110	90.9	0.000	0.00	0.0	0.600	o	150	
3.000	50.000	0.300	166.7	0.175	5.00	0.0	0.600	o	300	
4.000	50.000	0.300	166.7	0.175	5.00	0.0	0.600	o	300	
3.001	12.000	1.405	8.5	0.000	0.00	0.0	0.600	o	150	
3.002	41.000	0.105	390.5	0.046	0.00	0.0	0.600	oo	43	
3.003	35.000	0.090	388.9	0.034	0.00	0.0	0.600	oo	43	
1.005	11.000	0.030	366.7	0.030	0.00	0.0	0.600	oo	43	
1.006	12.000	0.070	171.4	0.000	0.00	0.0	0.600	o	225	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.002	5.00	5.91	52.370	0.092	0.0	0.0	0.0	1.11	241.1	1.2
2.003	5.00	6.15	52.300	0.116	0.0	0.0	0.0	1.11	241.1	1.6
1.004	5.00	10.26	52.260	0.250	0.0	0.0	0.0	1.05	18.6	3.4
3.000	5.00	5.69	56.000	0.175	0.0	0.0	0.0	1.22	85.9	2.4
4.000	5.00	5.69	56.000	0.175	0.0	0.0	0.0	1.21	85.9	2.4
3.001	5.00	5.74	55.700	0.350	0.0	0.0	0.0	3.47	61.3	4.7
3.002	5.00	6.41	52.345	0.396	0.0	0.0	0.0	1.02	325.2	5.4
3.003	5.00	6.98	52.240	0.430	0.0	0.0	0.0	1.02	325.9	5.8
1.005	5.00	10.43	52.150	0.710	0.0	0.0	0.0	1.06	335.7	9.6
1.006	5.00	10.63	52.120	0.710	0.0	0.0	0.0	1.00	39.6	9.6

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006		52.700	52.050	0.000	0	0

Online Controls for Storm

Orifice Manhole: 4, DS/PN: 1.003, Volume (m³): 128.4

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 52.480

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 6.1

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	105
Invert Level (m)	52.260
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.295	4.9
Kick-Flo®	0.636	4.0
Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.4	3.000	8.3	7.000	12.4
0.200	4.8	1.400	5.8	3.500	8.9	7.500	12.8
0.300	4.9	1.600	6.2	4.000	9.5	8.000	13.2
0.400	4.9	1.800	6.5	4.500	10.1	8.500	13.6
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.0
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.4
0.800	4.5	2.400	7.5	6.000	11.5		
1.000	5.0	2.600	7.8	6.500	12.0		

Hydro-Brake Optimum® Manhole: 12, DS/PN: 3.001, Volume (m³): 8.9

Unit Reference	MD-SHE-0109-5000-0800-5000
Design Head (m)	0.800
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	109
Invert Level (m)	55.700
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Hydro-Brake Optimum® Manhole: 12, DS/PN: 3.001, Volume (m³): 8.9

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	5.0
Flush-Flo™	0.242	5.0
Kick-Flo®	0.537	4.2
Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	6.0	3.000	9.3	7.000	13.9
0.200	5.0	1.400	6.5	3.500	10.0	7.500	14.4
0.300	5.0	1.600	6.9	4.000	10.6	8.000	14.8
0.400	4.8	1.800	7.3	4.500	11.3	8.500	15.2
0.500	4.5	2.000	7.7	5.000	11.8	9.000	15.7
0.600	4.4	2.200	8.0	5.500	12.4	9.500	16.1
0.800	5.0	2.400	8.4	6.000	12.9		
1.000	5.5	2.600	8.7	6.500	13.4		

Hydro-Brake Optimum® Manhole: 11, DS/PN: 1.006, Volume (m³): 12.3

Unit Reference	MD-SHE-0125-6500-0500-6500
Design Head (m)	0.500
Design Flow (l/s)	6.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	125
Invert Level (m)	52.120
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	6.4
Flush-Flo™	0.194	6.4
Kick-Flo®	0.379	5.7
Mean Flow over Head Range	-	5.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.5	0.500	6.4	1.200	9.7	2.000	12.3
0.200	6.4	0.600	7.0	1.400	10.4	2.200	12.9
0.300	6.2	0.800	8.0	1.600	11.1	2.400	13.5
0.400	5.8	1.000	8.9	1.800	11.7	2.600	14.0

Hydro-Brake Optimum® Manhole: 11, DS/PN: 1.006, Volume (m³): 12.3

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
3.000	15.0	5.000	19.1	7.000	22.5	9.000	25.6
3.500	16.1	5.500	20.0	7.500	23.3	9.500	26.3
4.000	17.2	6.000	20.9	8.000	24.1		
4.500	18.2	6.500	21.7	8.500	24.9		

Storage Structures for Storm

Tank or Pond Manhole: 12, DS/PN: 3.001

Invert Level (m) 55.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	300.0	1.400	0.0	2.800	0.0	4.200	0.0
0.200	300.0	1.600	0.0	3.000	0.0	4.400	0.0
0.400	300.0	1.800	0.0	3.200	0.0	4.600	0.0
0.600	300.0	2.000	0.0	3.400	0.0	4.800	0.0
0.800	300.0	2.200	0.0	3.600	0.0	5.000	0.0
1.000	300.0	2.400	0.0	3.800	0.0		
1.200	0.0	2.600	0.0	4.000	0.0		

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.294
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	1	0%					
1.001	15 Winter	1	0%					
1.002	15 Winter	1	0%					
1.003	120 Winter	1	0%	30/15 Summer				
2.000	15 Winter	1	0%	30/180 Winter				
2.001	15 Winter	1	0%	30/15 Summer				
2.002	180 Winter	1	0%	30/120 Winter				
2.003	180 Winter	1	0%	30/60 Winter				
1.004	180 Winter	1	0%	1/15 Summer				
3.000	15 Winter	1	0%	100/15 Winter				
4.000	15 Winter	1	0%	100/15 Winter				
3.001	240 Winter	1	0%	30/30 Summer				
3.002	240 Winter	1	0%	30/120 Winter				
3.003	240 Winter	1	0%	30/60 Winter				
1.005	240 Winter	1	0%	30/60 Summer				
1.006	240 Winter	1	0%	1/30 Winter				

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	2	53.445	-0.405	0.000	0.01	0.0	3.9	OK
1.001	2	53.437	-0.398	0.000	0.01	0.0	8.3	OK
1.002	3	53.402	-0.413	0.000	0.02	0.0	11.7	OK
1.003	4	52.598	-0.032	0.000	0.25	0.0	4.2	OK
2.000	5	52.851	-0.099	0.000	0.25	0.0	5.2	OK
2.001	6	52.608	-0.092	0.000	0.31	0.0	5.2	OK
2.002	7	52.555	-0.340	0.000	0.02	0.0	3.2	OK
2.003	8	52.555	-0.270	0.000	0.02	0.0	3.9	OK
1.004	9	52.554	0.144	0.000	0.26	0.0	4.3	SURCHARGED
3.000	10	56.104	-0.196	0.000	0.26	0.0	20.7	OK
4.000	11	56.104	-0.196	0.000	0.26	0.0	20.7	OK
3.001	12	55.819	-0.031	0.000	0.08	0.0	4.4	OK
3.002	13	52.498	-0.297	0.000	0.02	0.0	5.1	OK
3.003	14	52.497	-0.193	0.000	0.02	0.0	4.6	OK
1.005	10	52.496	-0.104	0.000	0.03	0.0	7.4	OK
1.006	11	52.494	0.149	0.000	0.19	0.0	6.4	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.294
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	30	0%					
1.001	15 Winter	30	0%					
1.002	15 Winter	30	0%					
1.003	480 Winter	30	0%	30/15 Summer				
2.000	480 Winter	30	0%	30/180 Winter				
2.001	480 Winter	30	0%	30/15 Summer				
2.002	480 Winter	30	0%	30/120 Winter				
2.003	480 Winter	30	0%	30/60 Winter				
1.004	480 Winter	30	0%	1/15 Summer				
3.000	15 Winter	30	0%	100/15 Winter				
4.000	15 Winter	30	0%	100/15 Winter				
3.001	240 Winter	30	0%	30/30 Summer				
3.002	480 Winter	30	0%	30/120 Winter				
3.003	480 Winter	30	0%	30/60 Winter				
1.005	480 Winter	30	0%	30/60 Summer				
1.006	480 Winter	30	0%	1/30 Winter				

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	2	53.502	-0.348	0.000	0.01	0.0	9.9	FLOOD RISK*
1.001	2	53.493	-0.342	0.000	0.03	0.0	21.5	OK
1.002	3	53.449	-0.366	0.000	0.04	0.0	26.8	OK
1.003	4	53.039	0.409	0.000	0.25	0.0	4.2	SURCHARGED
2.000	5	53.022	0.072	0.000	0.09	0.0	1.8	SURCHARGED
2.001	6	53.020	0.320	0.000	0.10	0.0	1.7	SURCHARGED
2.002	7	53.018	0.123	0.000	0.02	0.0	3.5	SURCHARGED
2.003	8	53.018	0.193	0.000	0.02	0.0	3.5	SURCHARGED
1.004	9	53.018	0.608	0.000	0.24	0.0	4.0	SURCHARGED
3.000	10	56.174	-0.126	0.000	0.62	0.0	49.9	OK
4.000	11	56.174	-0.126	0.000	0.62	0.0	49.9	OK
3.001	12	55.994	0.144	0.000	0.09	0.0	5.0	SURCHARGED
3.002	13	52.963	0.168	0.000	0.02	0.0	6.5	SURCHARGED
3.003	14	52.962	0.272	0.000	0.02	0.0	6.3	SURCHARGED
1.005	10	52.961	0.361	0.000	0.04	0.0	8.4	SURCHARGED
1.006	11	52.959	0.614	0.000	0.24	0.0	8.2	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.294
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	480 Winter	100	+30%					
1.001	480 Winter	100	+30%					
1.002	480 Winter	100	+30%					
1.003	480 Winter	100	+30%	30/15 Summer				
2.000	60 Winter	100	+30%	30/180 Winter				
2.001	60 Winter	100	+30%	30/15 Summer				
2.002	60 Winter	100	+30%	30/120 Winter				
2.003	60 Winter	100	+30%	30/60 Winter				
1.004	60 Winter	100	+30%	1/15 Summer				
3.000	15 Winter	100	+30%	100/15 Winter				
4.000	15 Winter	100	+30%	100/15 Winter				
3.001	360 Winter	100	+30%	30/30 Summer				
3.002	360 Winter	100	+30%	30/120 Winter				
3.003	360 Winter	100	+30%	30/60 Winter				
1.005	360 Winter	100	+30%	30/60 Summer				
1.006	360 Winter	100	+30%	1/30 Winter				

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	2	53.551	-0.299	0.000	0.00	0.0	2.5	FLOOD RISK*
1.001	2	53.551	-0.284	0.000	0.01	0.0	6.4	FLOOD RISK*
1.002	3	53.551	-0.264	0.000	0.01	0.0	9.4	FLOOD RISK*
1.003	4	53.551	0.921	0.000	0.25	0.0	4.2	FLOOD RISK
2.000	5	53.633	0.683	0.000	0.49	0.0	10.4	FLOOD RISK
2.001	6	53.603	0.903	0.000	0.52	0.0	8.7	FLOOD RISK
2.002	7	53.571	0.676	0.000	0.10	0.0	19.5	FLOOD RISK
2.003	8	53.567	0.742	0.000	0.12	0.0	19.6	FLOOD RISK
1.004	9	53.563	1.153	0.000	0.30	0.0	4.9	FLOOD RISK
3.000	10	56.315	0.015	0.000	1.02	0.0	82.1	SURCHARGED
4.000	11	56.315	0.015	0.000	1.02	0.0	82.2	SURCHARGED
3.001	12	56.283	0.433	0.000	0.09	0.0	5.0	SURCHARGED
3.002	13	53.502	0.707	0.000	0.03	0.0	7.5	SURCHARGED
3.003	14	53.500	0.810	0.000	0.03	0.0	8.1	SURCHARGED
1.005	10	53.499	0.899	0.000	0.05	0.0	10.9	FLOOD RISK
1.006	11	53.497	1.152	0.000	0.31	0.0	10.3	FLOOD RISK

Appendix 07

United Utilities Section 104 approval notice

Kevin Tyldesley

Subject: FW: 6421 - ELKER LANE, BILLINGTON
Attachments: Elker Lane pre start form .doc

From: O'Mara, Colin [mailto:Colin.O'Mara@uuplc.co.uk]
Sent: 27 April 2015 16:06
To: Kevin Tyldesley
Cc: SewerAdoptions
Subject: RE: 6421 - ELKER LANE, BILLINGTON

Hi Kevin,

ELKER LANE DEVELOPMENT, RIBBLE VALLEY, UU REF 4200010032

I refer to your email today, and would inform you that your submission is now satisfactory for incorporating into a Water Industry Act 1991, Section 104 Agreement, providing that the works can be constructed in full accordance with the acceptable drawings numbered as follows:-.

Drainage Layout – E20
Manhole Schedule – E21
Long Sections – E13 & 14
United Utilities Typical Details (copy not required)

To enable the Section 104 Agreement to be completed, I would be grateful if you could now provide me with **a PDF copy** of each of the above plans. The Drainage layout plan should be coloured up as follows: - Foul Water sewers – Brown, Surface Water sewer – Blue, Combined sewers – Red, Site Boundary – Green and Easement areas Yellow. Please do not colour highway drainage, existing sewers or private drainage connections, as they do not form part of this agreement.

I will also require:

- Developer's FULL name, registered address and registration number (if a company) or full address if not
- FULL name of surety, registered address, company registration number.
- Is the Developer the owner of the land? If not then please provide FULL name of land owner, Registered address and registration number or if not a company full postal address
- Solicitors' or Agents details with full contact name, address, DX address, telephone number and **email contact**.
- **A PDF copy of a plan** with Full extent of land edged green shown, Scale as near to 1:1250 as possible, North Arrow, Landmarks and road names, Easement strip coloured yellow (if there are any), **No bigger than A3 paper size**

I attach a copy of our "Request for approval to commence construction of sewers before signing of agreement form" for this development. If the developer wishes to commence work on site before the Section 104 Agreement document has been finalised, and providing that there are no live public sewers to be diverted as part of the works, he should complete this form and return with the drawings requested above, together with payment for the Section 104 fee specified on the form.

Full details of this arrangement are in our 'Developers Guide to Wastewater Adoptions' document a copy of which should already have been provided.

The Developer or his contractor is responsible for verifying all existing service positions and levels on site, including those of the existing public sewerage system, before work commences.

Any costs associated with service diversions required to enable the scheme to be carried in accordance with the acceptable drawings must be borne by the developer.
Where connections are to be made to existing public sewer manholes, the costs for rebuilding the manhole to United Utilities requirements, if deemed necessary by U.U. Field Staff, must be borne by the developer.
If the works cannot be constructed in accordance with the acceptable plans, the developer must submit revised proposals for appraisal before continuing with the works.

The developer must also obtain specific permission to construct any new manhole or make any connections to the public sewerage system. Please visit our web-site where you will find the S106 Sewer Connection Application form. The form is in two parts but only the second part is required for this scheme which is called **'Request for permission to work on a public sewer'** application form, which the appointed contractor must complete and return to the address on the form. Here is the link to the form: http://www.unitedutilities.com/connecting-public-sewer.aspx

I look forward to receiving the drawings and information requested above at your earliest convenience, but should you require any further information in the meantime, please do not hesitate to contact me.

Colin O'Mara
Developer Services Engineer (North Area)
Developer Services and Planning
Business Operations
United Utilities
T: 01925 679358
unitedutilities.com

United Utilities Water LTD - Developer Services and Planning
Warrington North Wastewater Treatment Works
Barnard Street Off Old Liverpool Road
Gatewarth Industrial Estate
Warrington
WA5 1DS

Appendix 08

As built surface water drainage drawing

NEW SW MH (CP)
1.003
CL 53.800
IL 52.480 (PIPES)
IL 52 180 (CHAMBER)
1200 DIA PCC WITH 100mm
ORIFACE PLATE BOLTED
OVER OUTGOING
PIPEWORK

NEW SW
MH 1.006
CL 53.500
IL 52.120
HYDROBRAKE
CHAMBER

2 X 450 DIA
1 IN 400 FALL

NEW SW
MH 1.005
CL 53.600
IL 52.150

2 X 450 DIA
1 IN 400 FALL

NEW SW
MH 1.004
CL 53.800
IL 52.260 (150)
IL 52.260 (525)
1500 DIA PCC

NEW SW (CP)
MH 2.000
CL 53.600
IL 52.675 (PIPES)
IL 52.375 (CHAMBER)
1200 DIA PCC

NEW SW
MH 2.001
CL 53.650
IL 52.525
1200 DIA PCC

OUTFALL
IL 53.160

HYDROBRAKE CHAMBER TO RESTRICT SURFACE WATER
DISCHARGE TO 5 l / sec FOR UPTO AND INCLUDING THE
CRITICAL 1 IN 100 YEAR EVENT PLUS 30% CLIMATE CHANGE
ALLOWANCE.
HYDROBRAKE TYPE MD-SHE-0105-5000-1000-5000.
DESIGN HEAD 1.0m
DESIGN FLOW 5 l / sec

600 DEEP
450 DIA SW PPICS
INDICATED THUS

ALL RWPS TO CONNECT TO
BELOW GROUND PIPEWORK
VIA SEALED RODDABLE BACK
INLET GULLIES

START OF NEW SWALE SECTION 1
(NETWORK NODE REF 1.000)
GL 53.900
IL 53.580

16m LONG
525 DIA
1 IN 400

NEW SW
MH 2.003
CL 53.800
IL 52.300 (150)
IL 52.300 (525)
1500 DIA PCC

TRAPPED
RODDABLE
YARD GULLIES

28m LONG
525 DIA
1 IN 400

NEW SW
MH 2.002
CL 53.800
IL 52.370 (150)
IL 52.370 (525)
1500 DIA PCC

ALL NEW MAIN SURFACE
WATER DRAINAGE PIPEWORK
TO BE 150 DIA AT 1 IN 100
MINIMUM FALL UNLESS NOTED
OTHERWISE

RAINWATER PIPES TO
DISCHARGE DIRECTLY
TO SWALE

ALL NEW MAIN SURFACE
WATER DRAINAGE
CONNECTIONS TO BE 100 DIA
AT 1 IN 40 MINIMUM FALL
UNLESS NOTED OTHERWISE

NEW SWALE
SECTION 2
21m LONG

START OF NEW
SWALE SECTION 2
(NETWORK NODE
REF 1.002)
GL 53.900
IL 53.240

46m LONG
300 DIA

END OF NEW SWALE SECTION 1
(NETWORK NODE REF 1.001)
GL 53.900
IL 53.350

NEW SWALE SECTION 1
85m LONG

NEW 2 x 100mm DIA
EMERGENCY OVERFLOW
PIPES

Appendix 09

As built surface water drainage calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.294	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	5	Min Design Depth for Optimisation (m)	0.100
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.149	4-8	0.103

Total Area Contributing (ha) = 0.252

Total Pipe Volume (m³) = 90.346

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.000	85.000	0.230	369.6	0.083	5.00	0.0	0.600	\/	-2	
1.001	46.000	0.110	418.2	0.036	0.00	0.0	0.600	o	300	
1.002	21.000	0.080	262.5	0.022	0.00	0.0	0.600	\/	-3	
1.003	21.000	0.220	95.5	0.000	0.00	0.0	0.600	o	150	
2.000	5.000	0.150	33.3	0.044	5.00	0.0	0.600	o	150	
2.001	16.000	0.155	103.2	0.000	0.00	0.0	0.600	o	150	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	5.00	5.81	53.580	0.083	0.0	0.0	0.0	1.74	1025.1	1.1
1.001	5.00	6.82	53.350	0.119	0.0	0.0	0.0	0.76	53.9	1.6
1.002	5.00	6.95	53.240	0.141	0.0	0.0	0.0	2.63	3343.6	1.9
1.003	5.00	7.29	52.480	0.141	0.0	0.0	0.0	1.03	18.2	1.9
2.000	5.00	5.05	52.675	0.044	0.0	0.0	0.0	1.75	30.9	0.6
2.001	5.00	5.32	52.525	0.044	0.0	0.0	0.0	0.99	17.5	0.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
2.002	28.000	0.070	400.0	0.040	0.00	0.0	0.600	o	525	
2.003	16.000	0.040	400.0	0.027	0.00	0.0	0.600	o	525	
1.004	8.000	0.110	72.7	0.000	0.00	0.0	0.600	o	150	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.002	5.00	5.74	52.370	0.084	0.0	0.0	0.0	1.11	241.1	1.1
2.003	5.00	5.98	52.300	0.111	0.0	0.0	0.0	1.11	241.1	1.5
1.004	5.00	7.41	52.260	0.252	0.0	0.0	0.0	1.18	20.9	3.4

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 6.1

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	105
Invert Level (m)	52.260
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.295	4.9
Kick-Flo®	0.636	4.0
Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.4	3.000	8.3	7.000	12.4
0.200	4.8	1.400	5.8	3.500	8.9	7.500	12.8
0.300	4.9	1.600	6.2	4.000	9.5	8.000	13.2
0.400	4.9	1.800	6.5	4.500	10.1	8.500	13.6
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.0
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.4
0.800	4.5	2.400	7.5	6.000	11.5		
1.000	5.0	2.600	7.8	6.500	12.0		

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.294
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	OFF		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	1	0%					
1.001	15 Winter	1	0%					
1.002	15 Winter	1	0%					
1.003	60 Winter	1	0%	30/15 Summer				
2.000	15 Winter	1	0%	30/60 Summer				
2.001	15 Winter	1	0%	30/15 Summer				
2.002	60 Winter	1	0%	30/120 Winter				
2.003	60 Winter	1	0%	30/60 Winter				
1.004	60 Winter	1	0%	1/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	2	53.608	-0.407	0.000	0.01	0.0	9.5	FLOOD RISK*
1.001	2	53.446	-0.204	0.000	0.23	0.0	12.3	OK*
1.002	3	53.262	-0.678	0.000	0.01	0.0	11.9	OK
1.003	4	52.582	-0.048	0.000	0.27	0.0	4.6	OK
2.000	5	52.722	-0.103	0.000	0.22	0.0	5.2	OK
2.001	6	52.584	-0.091	0.000	0.32	0.0	5.2	OK
2.002	7	52.566	-0.329	0.000	0.03	0.0	5.1	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
2.003	8	52.566	-0.259	0.000	0.03	0.0	4.7	OK
1.004	9	52.566	0.156	0.000	0.27	0.0	4.9	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.294
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	OFF		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	30	0%					
1.001	15 Winter	30	0%					
1.002	15 Winter	30	0%					
1.003	120 Winter	30	0%	30/15 Summer				
2.000	120 Winter	30	0%	30/60 Summer				
2.001	120 Winter	30	0%	30/15 Summer				
2.002	120 Winter	30	0%	30/120 Winter				
2.003	120 Winter	30	0%	30/60 Winter				
1.004	120 Winter	30	0%	1/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	2	53.635	-0.380	0.000	0.02	0.0	23.4	FLOOD RISK*
1.001	2	53.501	-0.149	0.000	0.49	0.0	26.4	OK*
1.002	3	53.290	-0.650	0.000	0.02	0.0	26.5	OK
1.003	4	52.953	0.323	0.000	0.27	0.0	4.6	SURCHARGED
2.000	5	52.947	0.122	0.000	0.19	0.0	4.7	SURCHARGED
2.001	6	52.946	0.271	0.000	0.26	0.0	4.3	SURCHARGED
2.002	7	52.942	0.047	0.000	0.04	0.0	8.1	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
2.003	8	52.942	0.117	0.000	0.05	0.0	7.8	SURCHARGED
1.004	9	52.942	0.532	0.000	0.27	0.0	4.9	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.294
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	OFF		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	100	+30%					
1.001	15 Winter	100	+30%					
1.002	180 Winter	100	+30%					
1.003	180 Winter	100	+30%	30/15 Summer				
2.000	180 Winter	100	+30%	30/60 Summer				
2.001	480 Winter	100	+30%	30/15 Summer				
2.002	480 Winter	100	+30%	30/120 Winter				
2.003	480 Winter	100	+30%	30/60 Winter				
1.004	480 Winter	100	+30%	1/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	2	53.655	-0.360	0.000	0.04	0.0	39.1	FLOOD RISK*
1.001	2	53.559	-0.091	0.000	0.80	0.0	43.1	OK*
1.002	3	53.392	-0.548	0.000	0.01	0.0	19.4	OK
1.003	4	53.392	0.762	0.000	0.29	0.0	4.9	SURCHARGED
2.000	5	53.386	0.561	0.000	0.22	0.0	5.4	FLOOD RISK
2.001	6	53.398	0.723	0.000	0.16	0.0	2.6	FLOOD RISK
2.002	7	53.404	0.509	0.000	0.02	0.0	5.0	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
2.003	8	53.402	0.577	0.000	0.04	0.0	6.3	SURCHARGED
1.004	9	53.405	0.995	0.000	0.28	0.0	5.1	SURCHARGED