Job No. W14017

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Abbey Quarter Urban Park and Street,

Kilkenny

Services Design and Methodology

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Contents Amendment Record

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Title: Services Design & Methodology – Abbey Quarter Urban Park & Street

Job Number: W14017

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1.0 Introduction

1.1 Site Description

The Abbey Quarter Urban Park and Street site is located on the western bank of the River Nore, in the townland of Gardens. The site is divided by the River Bregagh, which flows in a west to east direction through the site. Historically the area to the south of the river Bregagh was known as Englishtown with the area to the north known as Irishtown. The site is bounded to the north by residential and commercial properties, which front onto Green Street. To the west are the Commercial buildings along Parliament Street and Horse Barrack Lane; while to the south is the Bateman Quay area with commercial units and a large car park.

Figure 1.1 illustrates the extent of the Abbey Quarter Urban Park and Street site which this report addresses. This site forms part of the overall Kilkenny County Council Master plan for the Abbey Creative Quarter **figure 1.2**

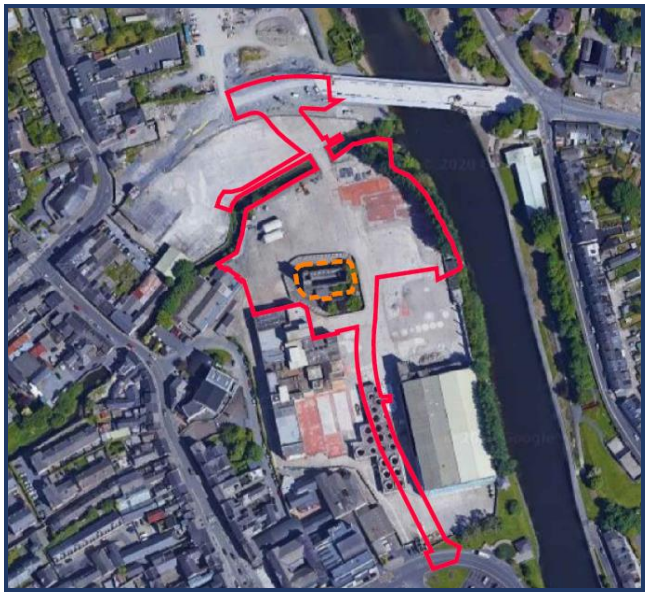


Fig 1.1 – Site Boundary Abbey Quarter Urban Park and Street

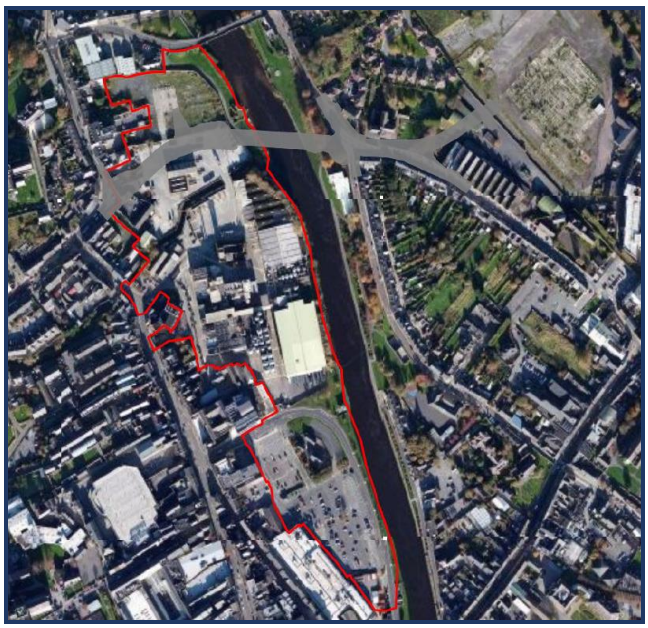


Fig 1.2 – Site Boundary Abbey Creative Quarter

1.2 Scope of Design

The Utility Services Design will include provision for the following services:

- Surface water drainage,
- Foul drainage,
- Water supply,
- Electricity,
- Broadband/Telecommunications,
- Gas.

The Utility Services design has been based on the design layout for the development of the site as outlined in the Masterplan. The preliminary design has been developed using the various building plots identified as being available for development surrounding the Abbey Quarter Urban Park and Street, it has been assumed that the buildings to be developed will be in the order of three to five storeys high.

Figure 1.3 shows the plots which will have service connections allowed for as part of the Abbey Quarter Urban Part and Street services design. These plots are B4, B5, B6, B7, B9, B12, B13 and A8.

Fig 1.3 – Proposed Site Layout

Services will run north to south through the site under the proposed urban street. Spurs will be provided into each individual site. Future connection enquiries can be made by the individual site owners to the utility providers for the spurs provided.

2.0 Existing Services

This section of the report presents a review of the existing services within and surrounding the Abbey Quarter Urban Park and Street site.

2.1 Existing Surface Water Drainage

The proposed site is served by three separate surface water drainage networks with three separate outfalls. Two of these networks are located within the site to the south of the River Bregagh while one network serves the section of the site to the north of the River Bregagh.

There are two separate surface water drainage networks within the southern section of the brewery site. Run-off from the northern and western parts of the site is collected by gullies and ACO drains with concrete sewers conveying run-off to the river Bregagh through a flap valve as illustrated in **figure 2.1**.

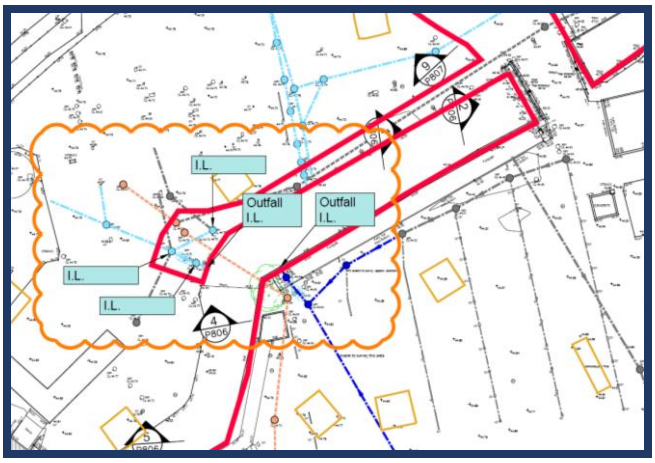


Fig 2.1 – Existing Outfall to River Bregagh

Run-off from the south-eastern part of the site is collected by gullies and conveyed to a large chamber upstream of the outfall to the River Nore. Downstream of this chamber, two 225 mm diameter concrete sewers convey surface water run-off to the River Nore as illustrated in **figure 2.2**.

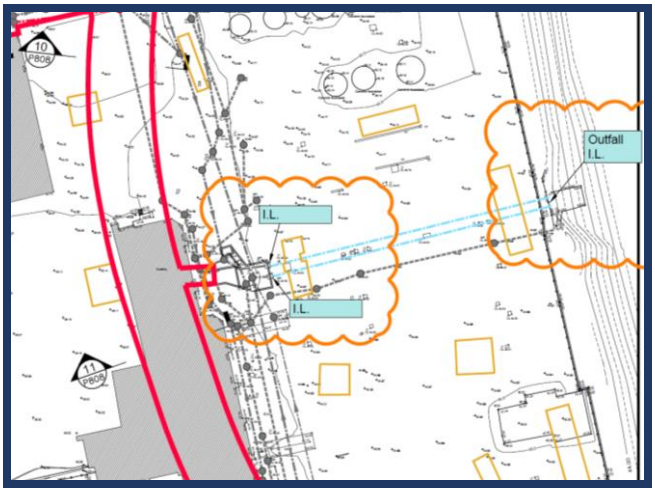


Fig 2.2 – Existing Outfall to River Nore

Through a review of historic mapping available for the site, it appears that the two 225 mm diameter outfall pipes run within a historic culvert which discharged to the River Nore.

There are flap valves on the outfalls to the River Nore however it was not clear on site if the historic culvert is open to the River Nore or if it is sealed against entry of river flows. Invert levels of the culvert were not available. The existing surface water drainage network layout is illustrated on drawing P812 in Appendix B.

2.2 Existing Foul Water Drainage

Record drawings provided by Kilkenny County Council indicate that there is a large combined sewer running from north to south along the western boundary of the site. Through discussions with Kilkenny County Council, it was established that this combined sewer serves a large section of the north of Kilkenny City, including the County Hospital and large residential areas. The route of the existing combined sewer in the vicinity of the site is shown in Appendix B.

Immediately to the north of the River Bregagh, the existing combined sewer discharges to a manhole where an existing siphon conveys flow from the north bank of the river to the south. The existing siphon consists of three pipes (6”, 9” & 12”).

Wastewater from the former brewery development discharged to the existing combined sewer at a manhole close to the Market Yard pumping station. Records of wastewater loading from the brewery are not available however, the sewer discharging wastewater from the brewery site to the combined sewer is a 225 mm diameter pipe laid at a gradient of approximately 1 in 100. This sewer would have a full-bore capacity of approximately 45 l/s.

2.3 Preliminary Methodology for Decommissioning Existing Drainage

Sewers and manholes to be decommissioned are indicated on drawings P801 and P802. Where there is an overlap of proposed drainage and drainage scheduled for decommission the drain scheduled for decommission will be removed, all other drains will remain insitu but will be decommissioned. Refer to the existing and proposed drainage indicated to the south of the River Bregagh.

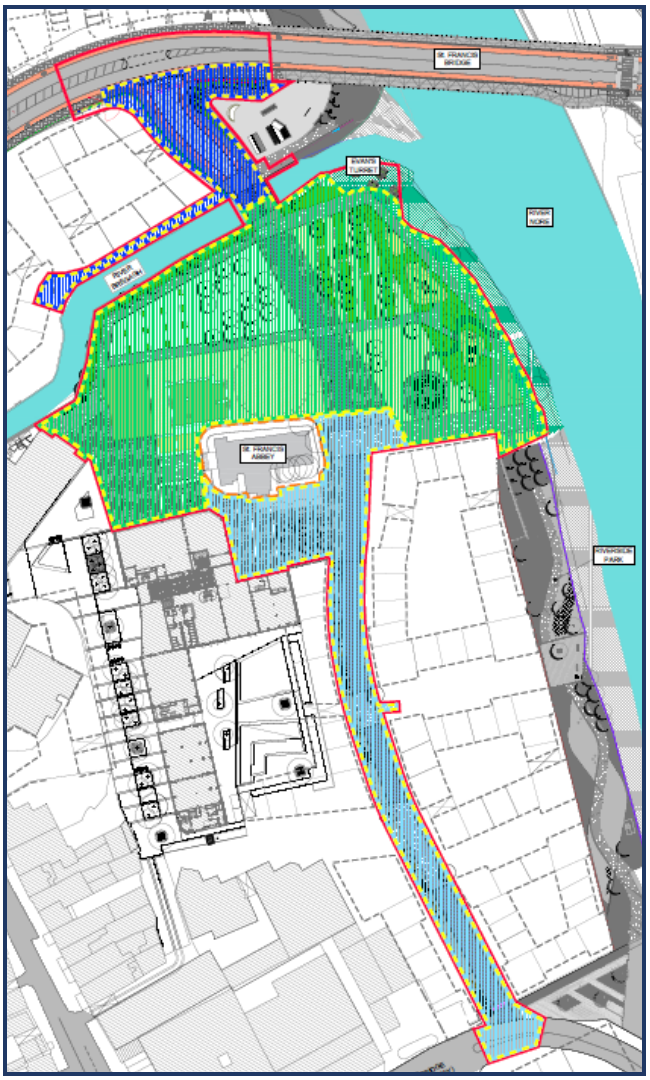
The decommissioning of drainage lines will be carried out as follows.

- The pipes will be sealed with concrete at both ends
- The existing manhole including base will be removed.
- The manhole void will be fill with compacted T2 stone in accordance with SR 21 Annex E

3.0 Scope of Drainage Design

The proposed drainage infrastructure for the Abbey Quarter Urban Park and Street consists of three drainage networks. The drainage networks are:

- Network 1 – North of the River Bregagh
- Network 2 – South of River Bregagh
- Network 3 – Proposed Urban Street



Network 1 - Network 2 - Network 3 -

Fig 3.1 – Proposed Drainage Network Areas

The design intent for the drainage system is to minimise site impact. The following hierarchy was used during the drainage design.

1. Use existing sewers
2. Replace existing sewers in poor condition maintaining original alignment
3. Install new drainage
4. Decommission redundant drainage lines

Surface and foul drainage calculations including preliminary pipe design are included in Appendix A.

3.1 Network 1 – North of River Bregagh

Drainage network 1 is located to the North of River Bregagh as illustrated in **figure 3.2**. A proposed storm sewer (S01 – Ex SMH M1) caters for run-off from the access road including the cycle track, footpath and the future B12 and B13 areas of the development. Surface runoff will be collected in road gullies and discharged to a proposed network of water tight manholes and sewers. The proposed storm sewer connects to existing storm drainage to the north west of the site and discharges to the existing outfall to the River Bregagh. An existing fuel / oil separator located on the existing storm drainage line will be emptied and disposed by a certified waste disposal company and new separator will be installed as indicated on the proposed storm drainage drawing. The existing outfall will be maintained during the works.

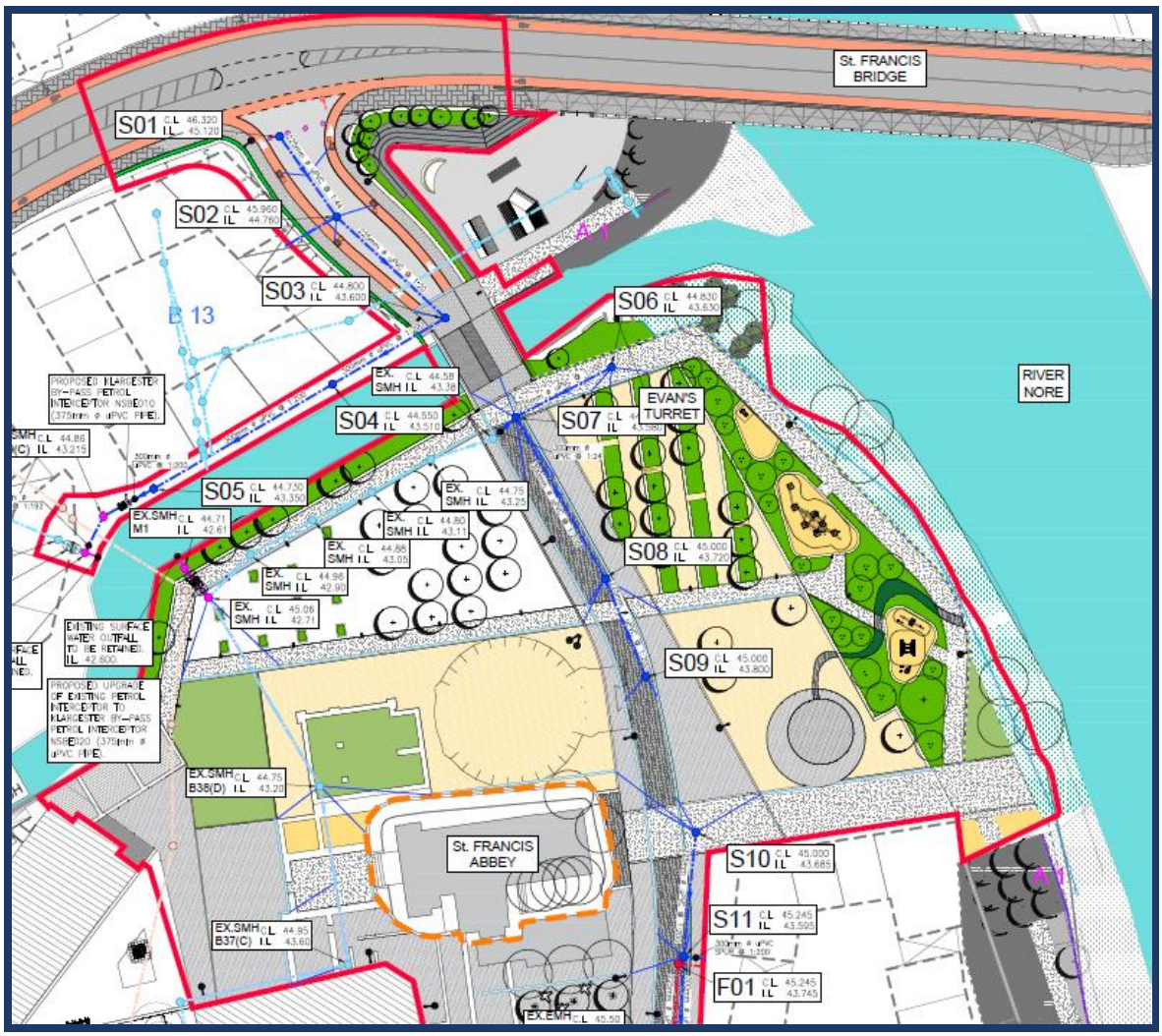


Fig 3.2 – Proposed Drainage Network 1 and 2

In additional to storing oil, fuel oil separators are designed with capacity to remove and store silts. The proposed separator is a Klargester Class 1 Separator type NSBE010. The Class 1 type separator can achieve a concentration of 5mg/l of oil and can store 150 litres of oil. Silt is also removed and stored by the separator. The separator has a capacity to store 1000 litres of silt. The data sheet for the proposed separator is included in Appendix C of this document. Silt will also be removed by the road gully pots. Refer to site development detail drawings for details on the gully pots.

It is proposed that future development areas 12 and 13 will connect to the existing combined sewer directly due to their proximity to this existing line. Connection enquiries can be made directly between the future building owners and Irish Water.

3.2 Network 2 – South of River Bregagh

Drainage network 2 caters for drainage from the area comprising of soft and hard landscaping south of the River Bregagh and the existing plot A8 as illustrated in **figure 3.2 and 3.4**.

The surface water from soft landscaped areas will drain by infiltration. 200mm diameter cores at 2m grid centres will be removed from the existing concrete pavement in this area. The proposed soft landscaping located over of the existing concrete pavement will drain to the soil through the cores as illustrated in **figure 3.3**.

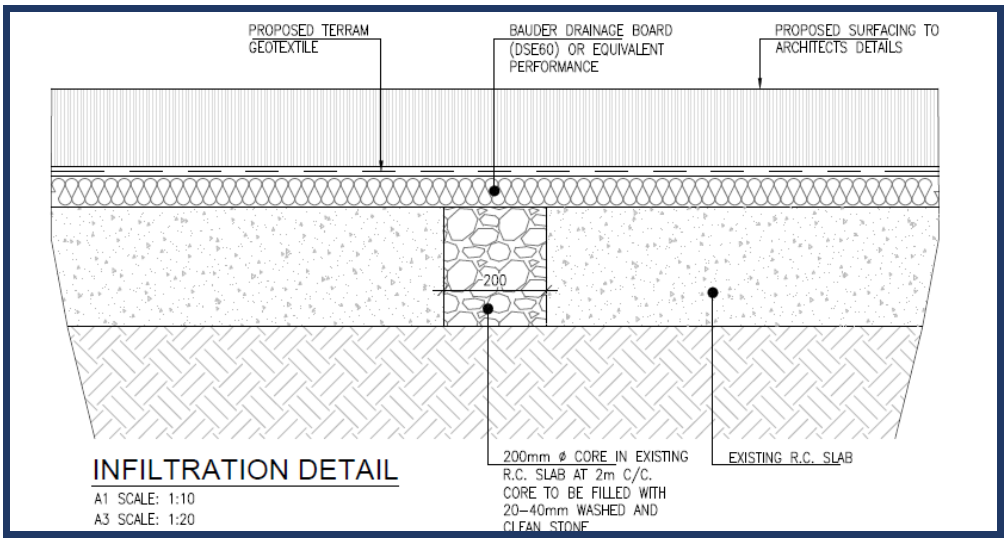


Fig 3.3 – Proposed Infiltration Detail

A proposed drainage board forms part of the landscape build-up over the concrete pavement. The purpose of the drainage board is to retain 10-12 litres of water per m^2. The water will support the growth of grass and planted areas. The drainage board is formed from high density polyethylene, 1m x 2m in plan and 0.06m deep with a compressive strength of 100kN / m^2.

Proposed storm sewer caters for run-off from the hard landscaped in this area. Sections of existing storm sewer in poor condition will be replaced. To minimise impact when replacing the pipes, the new sections of pipe will be laid in the same alignment as the original lines. This area is drained by surface channels (ACO drains). A silt bucket will form part of the ACO drain and will reduce silt discharge to the sewers. The surface water discharges to a network of proposed water tight manholes and sewers.

The surface water from the hard-landscaped area in this area discharges to the River Bregagh at the north west corner of the zone. The surface water flows through a fuel / oil separator before discharging through the existing outfall to the river which will be retained as part of the development. The existing separator will be emptied and disposed to a certified waste disposal company and upgraded to a Class 1 Klargester Separator type NSBE020. The Class 1 type separator can achieve a concentration of 5mg/l of oil and can store 300 litres of oil. Silt is also removed and stored by the separator. The separator has a capacity to store 2000 litres of silt. The data sheet for the proposed separator is included in Appendix C of this document.

3.3 Network 3 – Proposed Urban Street

Network 3 serves the proposed urban street of the Abbey Quarter as illustrated in **figure 3.4**. Proposed foul and storm drainage networks are proposed for this area to cater for surface water run-off and foul discharge from future developments B4, B5, B6, B7, B9 and the proposed street.

The foul sewer flows from north to south and connects to an existing foul sewer inside the southern site boundary. The foul water load generated within the site has been estimated as outlined in Section 3.6.5 of *Irish Water Code of Practice for Wastewater Infrastructure, (December 2017)*. This document states that the load on the network shall be estimated "*in accordance with IS EN 752-4 or, in the absence of appropriate detail, 0.6 litres/ sec/ ha (normal flow) of development land*". The foul water network consists of water tight manholes and pipes. Sealed spurs from the foul network are included on the line for future connections.

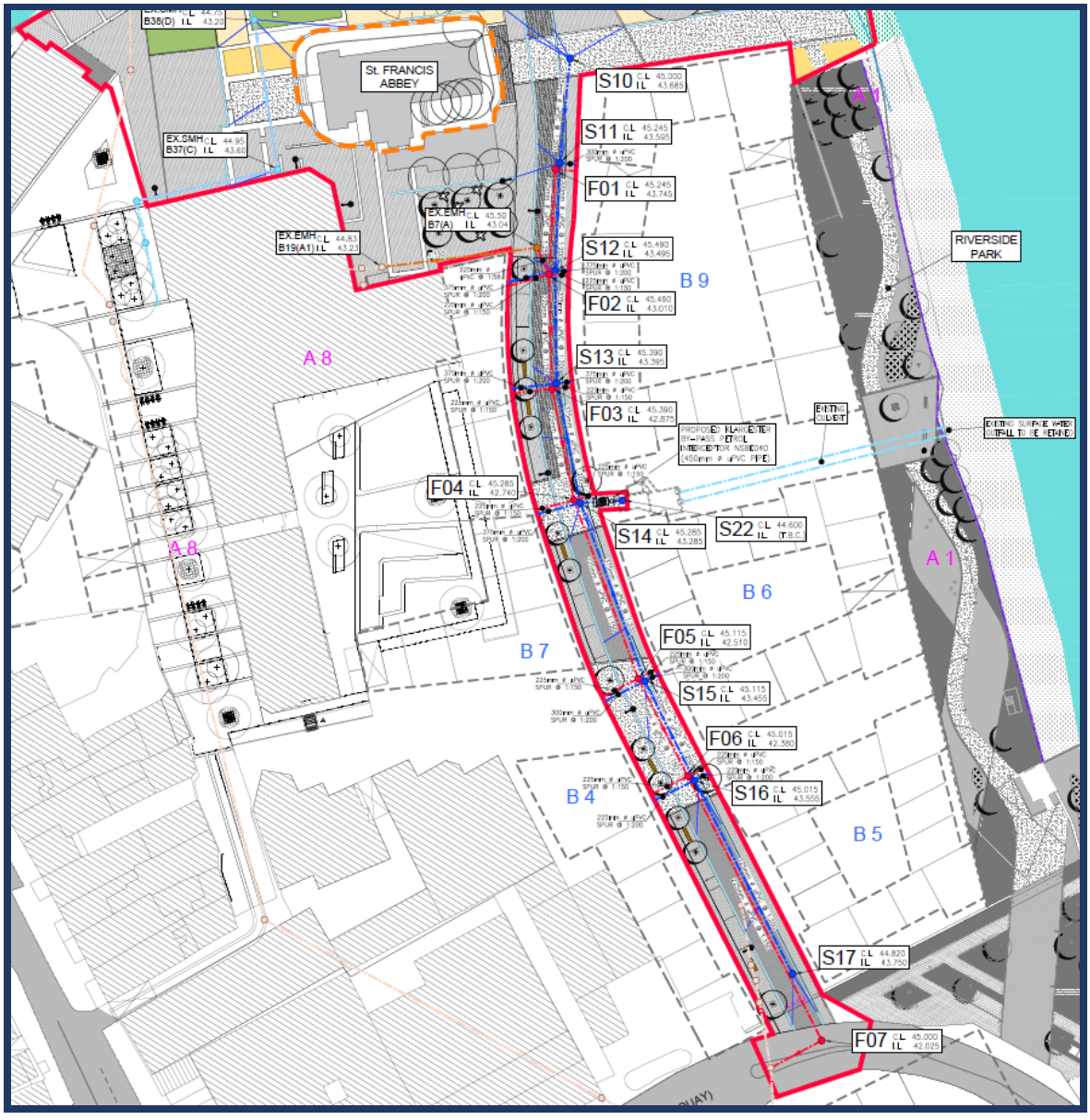


Fig 3.4 – Proposed Drainage Network 3

Surface water from the urban street is collected by surface channels (ACO drains). Silt buckets will form part of the ACO drains. The silt buckets will reduce silt discharge to the sewers. Surface water run from the future developments will also discharge to the proposed storm sewer. Sealed

spurs from the storm sewer are included for future connections. The surface water network will be formed with water tight manholes and sewers.

Surface water from this area flows to S14 at the centre of the urban street. At S14 the surface water flows through a proposed fuel oil separator before discharging to the existing outfall located on the western bank of the River Nore. The proposed separator is Klargester Class 1 Separator type NSBE040. The Class 1 type separator can achieve a concentration of 5mg/l of oil and can store 600 litres of oil. Silt is also removed and stored by the separator. The separator has a capacity to store 4000l of silt. The data sheet for the proposed separator is included in Appendix 2 of this document.

4.0 Surface Water Drainage – Preliminary Design

4.1 Introduction

This section of the report presents the preliminary design of the surface water drainage infrastructure to serve the site. Drawing P812 (Appendix B) should be read in conjunction with this section of the report.

The proposed surface water drainage network design has been carried out in line with:

- BS EN 752: 2008 for Drain and Sewer Systems outside buildings,
- Greater Dublin Strategic Drainage Study (GDSDS) – Volume 2, New Development, 2005,
- Environment Agency Pollution Prevention Guideline 03 (PPG 3) 'Use and design of oil separators in surface water drainage systems', 2006.
- Part H Building Regulations.

The majority of the existing site is covered by a concrete slab which was part of the original Diageo facility. The site is relatively flat with a slight fall in level toward the River Bregagh. Existing ground levels within the site range from 42 m to 44 m OD Malin with the lowest point in the vicinity of the Abbey.

The proposed surface water drainage network was assessed in terms of its capacity to cater for changes in rainfall caused by climate change. The rainfall intensities have been increased by a factor of 10% to allow for increases in intensity associated with Climate Change.

Surface water run-off within the proposed site must be collected and treated prior to discharge to watercourses. As part of the preliminary surface water drainage network design the following steps were taken:

- Calculation of total hardstanding areas within the proposed site,
- Calculation of total landscape areas with the proposed site,
- Calculation of total hardstanding areas within the proposed development plots,
- Preliminary design of preferred surface water drainage network,
- Estimation of peak run-off from proposed hardstanding areas.

4.2 Estimated Surface Water Discharge

It should be noted that the majority of the existing site is hardstanding. The proposed site layout will likely incorporate a number of landscaped/grassed areas. The proposal of planted and grass areas, a drainage board in drainage network 2 and infiltration holes in soft landscaped areas will result in a reduction of surface water discharge. The design provides a natural attenuation. Therefore, while it is not proposed to attenuate run-off from the site, there will be an overall reduction of surface water run-off from the proposed development.

- For the purposes of this preliminary design the proposed site was assumed as hardstanding with a percolation factor of 0.95 with landscaping areas (.25 Ha) south of the River Bregagh having a percolation factor of 0.05.
- Using Met Eireann rainfall data, the peak flow rate has been calculated as 1-hour rainfall with a 100-year return period (41.4mm) + allowing 10% for climate change = 46mm/hr.

- Taking 50mm/hour for rainfall in this preliminary design as this is in accordance with clause 1.5.7 of Part H (Water and Waste Water Disposal) in the Building Regulations.

Network	Discharge Location	Approximate Discharge Areas (Ha)
Storm Network 1	Northern bank of R. Bregagh Including proposed future development areas B12 & B13	0.68
Storm Network 2	Southern bank of R. Bregagh, including existing development plot A8	1.04
Storm Network 3	Western Bank of River Nore Including proposed future development areas B4, B5, B6, B7 & B9	1.37

Table 4.1 – Proposed Site Surface Areas

Surface water run-off from the existing and proposed site layouts have been calculated using the Modified Rational Method;

RATE OF FLOW / RUNOFF = Q = 2.78 x C x A x I

Where:

RAINFALL INTENSITY BASED ON 100 YEAR RETURN

I = 50 mm per Hour (factor of 1.1 included for climate change)

A = Site Area in Hectares

C= Percolation Co-efficient

4.3 Surface Water Summary

The maximum design flows for the storm water networks are tabulated in the table below.

Network	Discharge Location	Design Flow (l/s)
Storm Network 1	Northern bank of R. Bregagh	88.9
Storm Network 2	Southern bank of R. Bregagh	137.1
Storm Network 3	Western Bank of River Nore	180.8

Table 4.2 – Discharge Summary

4.4 Attenuation

The majority of the existing site is hardstanding; therefore, the existing site would generate well in excess of calculated greenfield run-off rates. The proposed Urban Park site layout incorporates a number of green areas which will result in a reduction of run-off rates when compared with the existing site. Therefore, while it is not proposed to attenuate run-off from the site, there is an overall improvement in surface run-off as a result of the proposed development.

5.0 Foul Water Drainage – Preliminary Design

This section of the report presents the preliminary design of the foul water drainage infrastructure to serve the Site. Drawing P812 (Appendix B) illustrates the existing combined sewer layout and the proposed foul water drainage network layout. The proposed foul water drainage network design has been carried out in line with:

- Irish Water Code of Practice for Wastewater Infrastructure (December 2017),
- EN 752 – 2008, Drain and sewer systems outside buildings,
- EN 12056-2 – 2000, Gravity Drainage Systems Inside Buildings – Part 2: Sanitary Pipework, Layout and Calculation.

Wastewater from the proposed Abbey Quarter Urban Park and Street will be discharged to the existing combined sewer which runs through and along the west and south of the site. The existing gravity sewer falls in a southerly direction toward the existing pumping station at John's Bridge.

5.1 Estimated Foul Water Discharge

The pipe sizing is a function of the volume of foul water generated within the site. The foul water load generated within the site has been estimated as outlined in Section 3.6.5 of *Irish Water Code of Practice for Wastewater Infrastructure, (December 2017)*. This document states that the load on the network shall be estimated *"in accordance with IS EN 752-4 or, in the absence of appropriate detail, 0.6 litres/ sec/ ha (normal flow) of development land"*.

The foul water load for the proposed network 3 as a result of the surrounding future development sites has been conservatively calculated based on 4 storey buildings. The floor areas and estimated foul water load associated with each building is included in **table 5.1**.

Buildings 3, 8, 10, 11, 12 and 13 are omitted from **table 5.1** as it is understood they will connect to the existing combined sewer directly due to their close proximity to this existing line.

Building Zone Reference	Building Area (m2)	Total Floor Area 4 Storey Building (m2)	Total Floor Area (Ha)	Average Flow (DWF)	Peak Flow (6DWF)
				(L/S)	(L/S)
B4	750	3000	0.300	0.18	1.08
B5	1100	4400	0.440	0.26	1.58
B6	1500	6000	0.600	0.36	2.16
B7	1100	4400	0.440	0.26	1.58
B9	2000	8000	0.800	0.48	2.88
A08	1900	7600	0.760	0.46	2.74

Table 5.1 – Discharge Areas

5.2 Foul Water Summary

Network	Proposed Site DWF (l/s)	Proposed Site 6DWF (l/s)
Network 3	2	12

Table 5.2 – Discharge summary

6.0 Specifications – Drainage Components

The proposed drainage shall comply with;

- Irish Water Code of Practice for Wastewater Infrastructure, December 2017.
- TII Specification for Road Works Series 500.
- IS EN 1401 or BS 4660 or BS 5481 or IS EN 13476 or IS EN 13598-1
- IS EN 1917:2004
- BS 5911-6:2004

6.1 Pipes

Surface water sewers proposed within the site shall be unplasticised polyvinylchloride (uPVC) and shall comply with Table 5/1 of Series 500 of the TII Specification for Road Works.

6.2 Pipe Bedding and Surround

Pipe bedding and surround shall comply with Clause 503 of Series 500 of the TII Specification for Road Works.

6.3 Manholes

Manholes will be constructed using a precast concrete base, concrete rings and cover slab. The manholes will be encased with 150mm of concrete fill. The manholes conform to IS EN 1917:2004 and achieve water tightness to 0.5 bar.

6.4 Covers & Gratings

Covers and gratings are in accordance with the Architect's specification. All covers and gratings shall comply with EN 124:2015.

6.5 Gully pots

Concrete gully pots will be trapped and confirm to BS 5911-6:2004. The gully pot will be watertight in accordance with BS5911-6 2004 +A1 :2010 Annex D.

7.0 Water Supply Network

7.1 Existing Network

The existing water supply network in the vicinity of the Masterplan site is illustrated in **Figure 7.1**, as provided by Kilkenny County Council.

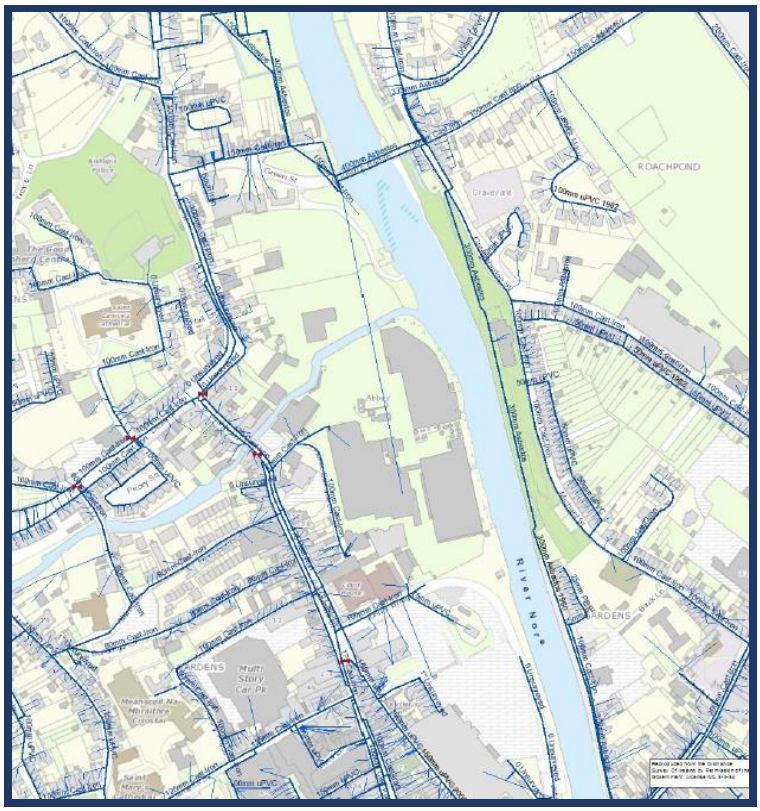


Fig 7.1 – Existing Water Supply Network

There are existing watermains located to the west and south of the site. As part of the provision of the St. Francis Bridge Scheme, to the north of the site, a new 200 mm diameter watermain will be provided. The preliminary layout of the proposed watermain within the site has been designed and agreed with Irish Water based on the proposed connection to the St. Francis Bridge Scheme watermain.

7.2 Assessment of Existing Network

In 2019 Kilkenny County Council *on behalf of* Kilkenny Abbey Quarter Development Limited commissioned Larsen to carry out a Fire Flow Simulation Test to assess the capacity of the existing water distribution network at Horse Barrack Lane in Kilkenny. Location of test points illustrated in **figure 7.2**.

Fig 7.2 – Test Points

The objective of the flow test was to determine the maximum fire-flow capacity of the existing watermain and to measure the impact this flow has on the hydraulic capacity on the network. The hydraulic capacity of the network is assessed through pressure-logging the 'residual pressure' before and during the flow testing.

Table 7.1 is a summary of the pressure logging results.

Pressure Point	Maximum Pressure	Minimum Pressure	Average Daytime Pressure
FH-A	48.5 m	31.5 m	39.5 m

Table 7.1 – Pressure Results

Table 7.2 is a summary of the flow and residual pressure test results.

Hydrant Flow Test	Flow Capacity (litres / minute)	Residual Pressure (meters head)	
		FH-A	FH-B
FH-A	1407 l/min	-	25.9 m
FH-B	1140 l/min	29.4 m	-

Table 7.2 – Flow and Residual Pressure Test Results

The following is a brief synopsis of the findings:

- The maximum sustainable fire flow capacity recorded on Fire Hydrant FH-A was 1,407 litres / minute (or 23.5 l/s), with a residual pressure of 25.9m.

- The maximum sustainable fire flow capacity recorded on Fire Hydrant FH-B was 1,140 litres / minute (or 19.0 l/s), with a residual pressure of 29.4m.

Full testing report from Larsen included in Appendix E.

7.3 Preliminary Water Supply Design

The wastewater load estimated for the site is presented in Section 5.2. It is considered that the principle of 'water in equals water out' will apply to this site as the proposed use of the development does not require significant water supply for industrial uses. Therefore, the estimated water demand associated with the proposed Masterplan Site is approximately 12 l/s.

Based on *'Design Guidelines for Modelling – Clean Water'* issued by Irish Water the approximate capacity of the proposed 200 mm water main has been estimated. It was found that with an allowable velocity of 1 m/s, a 200 mm watermain would be capable of providing a flow rate of 31.4 l/s. Provided there is sufficient supply upstream of the Masterplan Site, the proposed 200 mm watermain would provide sufficient capacity to supply the site with the required potable water.

7.4 Fire Flow Requirements

The proposed 200mm diameter water supply main proposed would have adequate capacity to satisfy the firefighting requirements of 92m^3/hr or 25l/s in accordance with *Kilkenny Fire and Rescue Service "Guidance Specification for Fire Hydrants and Fire Fighting Water Supplies" June 2018 Version 20.1*, provided that the wider Kilkenny City supply network can convey sufficient flow to the site.

Based on the test carried out by Larsen in 2019 and the summary of results above **in table 7.2**, the existing maximum flow available for firefighting in the vicinity of the Masterplan site is approximately 23.5 and 19.0 l/s respectively and therefore doesn't satisfy firefighting requirement of 25 l/s set out by *Kilkenny Fire and Rescue Service*. Therefore, the existing infrastructure feeding the site would need to be upgraded or water storage tank provided on site to satisfy firefighting requirements.

7.5 Specification – Watermain

7.5.1 Materials

As presented in Irish Water Code of Practice for Water Infrastructure, December 2017, watermains shall be either ductile iron (DI) or polyethylene (PE), with PE80 or PE100 rating (MDPE, HDPE, HPPE). All plastic water pipes shall be blue in colour. U-PVC pipes shall not be used on water supply networks, unless a compelling reason is provided for its use. It is proposed to provide a 200 mm diameter HDPE watermain. All HDPE shall be of a type PE100 and have an SDR 17 rating.

They shall conform to the following:

- ISEN 12201: Part 1 and Part 2 (Plastic Systems for Water Supply, Drainage and Sewerage under Pressure – Part 1, General, and Part 2, Pipes) and,

- ISEN 12201-3 (plastic Systems for Water Supply, Drainage and Sewerage Under Pressure – Part 3: Fittings).

Polyethylene pipes shall also conform to the following UK Water Industry Specifications (WIS):

- 4-32-08: Specification for the fusion jointing of polyethylene pressure pipeline systems using PE80 and PE100 materials;
- 4-32-16: Specification for Butt Fusion Jointing Machines,
- 4-32-19: Specification for polyethylene pressure pipeline systems with an aluminium barrier layer for potable water supply in contaminated land,
- IGN 4-01-03: Pressure Testing of Pressure Pipes and Fittings for use by Public Water Supplies.

Service Connection pipes suitable for Works and approved by Irish Water shall be of HPPE material with type PE100 and an SDR 17 rating. HPPE service pipes shall comply with the following:

- IS EN 12201 Part 2 (Plastic Systems for Water Supply, Drainage and Sewerage Under Pressure – Part 2, Pipes),
- IS EN 12201 Part 3 (Plastic Systems for Water Supply, Drainage and Sewerage Under Pressure – Part 3: Fittings) and with

UK WIS 4-32-08 (Specification for the fusion jointing of polyethylene pressure pipeline systems using PE80 and PE100 materials).

7.5.2 Pipe Joints

Pipe joints shall be in accordance with the manufacturer's instructions for the pipe material. Pipe joints will generally be one of the following:

- Push in rubber ring joint;
- Bolted flanged joint;
- Flexible mechanical coupling with protective coating;
- Fusion welded joints, site fusion jointing shall be strictly in accordance with UK 3.10.4WIS 4-32-08 (Specification for Fusion Jointing of Polyethylene Pressure Pipeline Systems Using PE80 and PE100 Materials). Equipment used for butt fusion welding shall be in accordance with UK WIS 4-32-16 (Butt Fusion Joining Machines).

Pipe joints shall comply with Section 3.10 of the Irish Water Code of Practice for Water Infrastructure, December 2016, (IW-CDS-5020-03).

7.5.3 Depth of cover

The minimum depth of cover from the finished ground level to the external crown of a watermain shall be 900 mm. Depths may be altered to avoid obstructions, including separation distances between other utility services. The maximum cover for a service connection or watermain is 1200mm where practicable.

7.5.4 Pipe Bedding, Haunch and Surrounds

Pipe bedding, haunch and surround material for buried pipelines shall comply with WIS 4-08-02 and its associated Guidance Note, IGN 4-08-01, UK Water Industry Specifications. Granular material shall be 14mm to 5mm graded aggregate or 10mm single sized aggregate, complying with the requirements of IS EN 13242, and should have a compaction factor value not greater

than 0.2 when measured in accordance with BS EN 752. Such material is generally referred to as Type A Granular Material.

Pipes shall not be supported on stones or rock at any point along the trench. Rock shall be excavated to a depth of 150mm below the Water Service actual depth of the trench required and the void backfilled with Clause 808 granular material in accordance with the Transport Infrastructure Ireland Specification for Road Works. The granular bedding material shall be laid above this void backfill material.

Pipe bedding, to a depth of 150mm at least and up to 200mm for pipes in excess of 250mm diameter, and haunch side fill granular material should be placed uniformly underneath and on either side of the pipe, in layers not exceeding 100mm, each layer being compacted by hand tamping until the required depth of bedding and side fill has been achieved. Pipe surround should be placed above the side fill material in a similar fashion to bedding and side fill. Surround material shall be installed to the required depth above the pipe crown, with a minimum depth of 200mm and to a thickness of 300mm where pipes are located in or adjacent to trafficked areas. Care should be taken that the process of placing the bedding, side fill and surround material does not displace the pipe from its correct line and level.

7.5.5 Backfill

Backfill to the pipe trench above the pipe granular surround material and beneath the road surface shall be to the requirements of "Guidelines for the Opening, Backfilling and Reinstatement of "Trenches in Public Road", Second Edition, or subsequent amendments published by Department of the Transport, Tourism and Sport, unless otherwise specified and to the requirements of the relevant Local Authority Roads Department's Road Opening Licence.

The opening, backfilling and reinstatement of trenches on National Roads shall be in accordance with the NRA "Specification for the Reinstatement of Openings in National Roads" July 2011, unless otherwise specified. Backfill to the pipe trench shall comply with section 4.9 of Irish Water Code of Practice for Water Infrastructure, December 2017.

8.0 Electrical Supply Network

The proposed electrical layout for the site is included in Appendix B of this document.

The existing electrical infrastructure consists of an ESB substation (MVSB-001) within the Mayfair Building.

Presently there is sufficient capacity on the ESB network to cater for the Brewhouse and the Mayfair buildings however as the site develops ESB Networks will provide additional capacity from McDonagh Substation as part of an upgrade to the area.

It is anticipated that a further two number ESB substations will be required MVSB-002 & MVSB-003 to provide capacity for the future developments. **Table 8.1** allocates each of the proposed buildings to the relevant sub-stations.

Building	Electrical Supply
Building No 14 (Community Housing)	Existing supply at Kilkenny Inn Hotel
Building No 13	Existing supply at Kilkenny Inn Hotel
Building No 12	Existing supply at Kilkenny Inn Hotel
Building No 08	MVSB-001
Building No 10	MVSB-001
Building No 11	MVSB-001
Building No 07	MVSB-001
Building No 04	MVSB-002
Building No 09	MVSB-002
Building No 06	MVSB-002
Building No 05	MVSB-002
Building No 03	MVSB-003
Building No 02	MVSB-003
Building No 15	(Linear Park) MVSB-003
Building No 01	MVSB-003

Table 8.1 – Allocation of Development to Proposed Substation

Ducting to comply with ESB Networks;

- Standard Specification for ESB MV/LV Networks Ducting

9.0 Gas Supply Network

This section of the report describes the preliminary design of the gas network to serve the Abbey Creative Quarter, Kilkenny. The proposed layout is shown in Appendix B of the report.

The proposed gas network will connect into the existing gas network in two locations. This is to reduce the trenching required in the archaeologically sensitive area surrounding the existing Abbey. The main connection will be on Horse Barrack Lane where the former Smithwick's Brewery originally connected to the gas network. The existing 90 PE-80 75 mbar pipework for the Brewery will be stripped out and removed back to the connection point. The second connection will be at the north of the housing development off road R693 by Bridgecourt House.

The proposed layout will introduce a 4 bar 125Ø HDPE network throughout the site, this will connect to the proposed heating centre and to each individual building. Each building will require a connection point that will be easily accessible by Gas Networks Ireland (GNI) for metering purposes. Contact with GNI has confirmed that there is sufficient capacity in the network to enable the proposed development to connect into the existing network.

10.0 Broadband/Telecommunication Supply Network

Details of the proposed layout are included in Appendix B of this document.

10.1 E-NET Telecommunications and Broadband

The proposed supply will originate from two separate points located North and South of the Masterplan area thus ensuring resilience of the network and continuity of supply.

A new exchange will be constructed by E-Net adjacent to the proposed development No. 14. The second supply will come from an existing exchange (L076) at the junction between Parliament Street and Johns Bridge.

The proposed development will be connected to E-Nets metropolitan area network (MAN) which offers an open access platform. This means any licensed service provider can have access to it and sell services over it. This gives the end user a greater choice in the first instance and allows you to switch suppliers, should the need arise.

Fibre optic cable will be supplied to each unit via dedicated ELV ducting as per the proposed services drawing P813 in Appendix B of this document.

APPENDIX A – Drainage Calculations

CALCULATION SHEET FOR FOUL WATER

Malone O'Regan Consulting Engineers
3/4 Canada Street Waterford

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e-mail: info@waterford.morce.ie

Job:	Abbey Quarter Urban Park & Street
Job No:	W14017
Sheet No:	1
Ref to Drg No:	P812
Prepared By:	TN
Checked By:	PR
Client:	Kilkenny County Council

PIPE RUN	Building Area (m2)	Total Floor Area 4 Storey Building (m2)	Total Floor Area (Ha)	Average Flow (DWF) (L/S)	Peak Flow (6DWF) (L/S)	Cumulative Flow (L/S)	PIPE Ø (mm)	GRADIENT	LENGTH (m)	CAPACITY (L/S)	VELOCITY (m/s)
B9-F01	2000	8000	0.800	0.48	2.88	2.88	225	1:150	20.0	37.7	0.95
F01-F02	0	0	0.000	0.00	0.00	2.88	225	1:25	19.0	105.9	2.66
A8-F02	1900	7600	0.760	0.46	2.74	2.74	225	1:150	40.0	37.7	0.95
B7-F02	1100	4400	0.440	0.26	1.58	1.58	225	1:150	20.0	37.7	0.95
F02-F03	0	0	0.000	0.00	0.00	7.20	225	1:150	20.0	37.7	0.95
F03-F04	0	0	0.000	0.00	0.00	7.20	225	1:150	20.0	37.7	0.95
F04-F05	0	0	0.000	0.00	0.00	7.20	225	1:150	35.0	37.7	0.95
B6-F05	1500	6000	0.600	0.36	2.16	2.16	225	1:150	20.0	37.7	0.95
F05-F06	0	0	0.000	0.00	0.00	9.36	225	1:150	20.0	37.7	0.95
B4-F06	750	3000	0.300	0.18	1.08	1.08	225	1:150	20.0	37.7	0.95
B5-F06	1100	4400	0.440	0.26	1.58	1.58	225	1:150	20.0	37.7	0.95
F06-F07	0	0	0.000	0.00	0.00	12.02	225	1:150	53.0	37.7	0.95

CALCUATING SHEET FOR SURFACE WATER

MALONE O'REGAN CONSULTING ENGINEERS

Malone O'Regan
Consulting Engineers 3/4
Canada Street Waterford

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Job:	Abbey Quarter Urban Park & Street
Job No:	W14017
Sheet No:	1
Ref to Drg No:	P812
Prepared By:	TN
Checked By:	PR
Client:	Kilkenny County Council

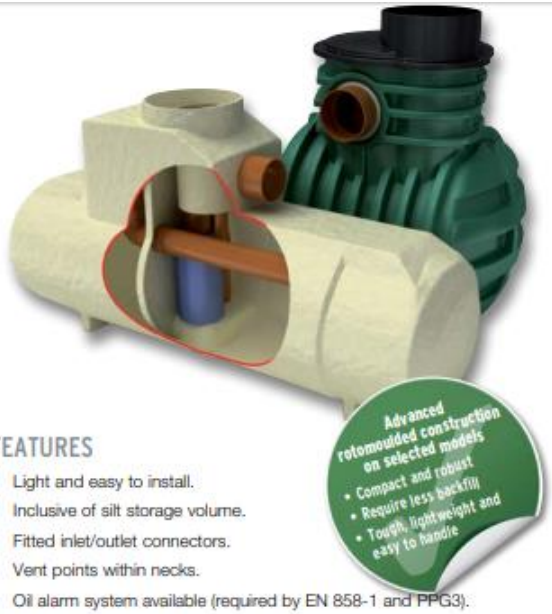
PIPE RUN	Approximate IMPEREABLE AREA (ha)	CUM. IMPEREABLE AREA (ha)	FLOW (Q) (L/S)	PIPE Ø (mm)	GRADIENT	LENGTH (m)	CAPACITY (L/S)	VELOCITY (m/s)
S01-S02	0.052	0.052	7.26	**225**	1:44	15.0	79.6	2.00
B13-S02	0.190	0.190	26.41	**225**	1:200	20.0	37	0.93
S02-S03	0.029	0.271	37.63	**225**	1:20	22.0	118.4	3.00
S03-S04	0.019	0.290	40.28	**300**	1:200	20.0	79.3	1.12
S04-S05	0.011	0.301	41.86	**300**	1:200	31.0	79.3	1.12
S05-Ex G29	0.014	0.315	43.84	**300**	1:200	10.0	79.3	1.12
Ex G29-Ex G28	0.000	0.315	43.84	**300**	1:200	8.0	79.3	1.12
B12-Ex G28	0.324	0.324	45.03	**300**	1:200	20.0	79.3	1.12
Ex G28-Interceptor	0.000	0.639	88.87	**375**	Interceptor NSBE010			
S06-S07	0.076	0.076	10.56	**225**	1:200	12.0	37	0.93
S09-S08	0.095	0.095	13.21	**225**	1:200	16.0	37	0.93
S08-S07	0.119	0.214	29.71	**300**	1:200	30.0	79.3	1.12
S07-S20	0.071	0.361	50.18	**300**	1:200	45.0	79.3	1.12
S20-S21	0.031	0.392	54.47	**300**	1:200	9.0	79.3	1.12
S18-S19	0.044	0.044	6.07	**225**	1:200	30.0	37	0.93
A08-Ex B37	0.314	0.314	43.58	**225**	1:70	26.0	63	1.59
Ex B37-Ex B38	0.057	0.371	51.50	**300**	1:70	27.0	134.7	1.90
Ex B38-S19	0.114	0.485	67.35	**300**	1:70	21.0	134.7	1.90
S19-S21	0.067	0.595	82.66	**300**	1:70	12.0	134.7	1.90
S21-Ex M1	0.000	0.987	137.13	**375**	Interceptor NSBE020			
S10-S11	0.119	0.119	16.51	**225**	1:200	18.0	37	0.93
B9-S11	0.107	0.226	31.43	**300**	1:200	20.0	79.3	1.12
S11-S12	0.100	0.326	45.29	**300**	1:200	20.0	79.3	1.12
B9-S12	0.107	0.433	60.21	**375**	1:200	20.0	140	1.29
S12-S13	0.015	0.448	62.26	**375**	1:200	20.0	140	1.29
B9-S13	0.107	0.555	77.18	**375**	1:200	20.0	140	1.29
S13-S14	0.015	0.570	79.23	**375**	1:200	22.0	140	1.29
B7-S14	0.107	0.677	94.15	**375**	1:200	20.0	140	1.29
S17-S16	0.049	0.049	6.87	**225**	1:200	40.0	37	0.93
B4-S16	0.100	0.100	13.92	**225**	1:200	20.0	37	0.93
B5-S16	0.165	0.165	22.87	**225**	1:200	20.0	37	0.93
S16-S15	0.031	0.345	48.01	**300**	1:200	20.0	79.3	1.12
B6-S15	0.215	0.215	29.90	**300**	1:200	20.0	79.3	1.12
S15-S14	0.031	0.592	82.27	**375**	1:200	35.0	140.8	1.29
S14-S22	0.031	1.301	180.78	**450**	Interceptor NSBE040			

APPENDIX B – Drawings

see attached

APPENDIX C – Fuel/Oil Separator Data Sheet

Bypass NSB RANGE



APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Kingspan Klargester Bypass separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Oil storage volume.
- Silt storage capacity.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m²)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA.
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

Rotomoulded chamber construction GRP chamber construction * Some units have more than one access shaft – diameter of largest shown.

APPENDIX D – Fire Flow Stimulation Test Report

Horse Barrack Lane
Kilkenny

Fire Flow Simulation Test

for

and on behalf of

KILKENNY ABBEY QUARTER DEVELOPMENT LTD

September 2019

LARSEN
WATER MANAGEMENT

Contents

LARSEN WATER MANAGEMENT

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JOB CODE: 15388
DATE: September 2019
CLIENT: Kilkenny County Council *on behalf of* Kilkenny Abbey Quarter Dev. Ltd
SITE: Horse Barrack Lane, Kilkenny, Co. Kilkenny.
PROJECT: Fire Flow Simulation Test

1 OVERVIEW

Kilkenny County Council *on behalf of* Kilkenny Abbey Quarter Development Limited commissioned Larsen to carry out a Fire Flow Simulation Test to assess the capacity of the existing water distribution network at Horse Barrack Lane in Kilkenny.

The objective of the flow test was to determine the maximum fire-flow capacity of the existing watermain and to measure the impact this flow has on the hydraulic capacity on the network. The hydraulic capacity of the network is assessed through pressure-logging the 'residual pressure' before and during the flow testing.

2 PROCEDURES

The following briefly outlines the procedures followed during the course of conducting a Fire Flow Simulation Test: -

2.1 Review the available water network layout drawings and through consultation with the client identify the most suitable locations for the flow simulation test points.

2.2 Agree a timetable of the works with the water network operator and inform the relevant parties that pressure-logging equipment will be installed on fire hydrants.

2.3 Pressure data loggers are installed in advance of the flow test to record the static network pressure. The data obtained is used to determine the time of peak-demand.

2.4 The flow simulation test is undertaken by installing a digital 'Hydrant Flow Meter' on the hydrant at the Flow Simulation Test points. The flow is drawn-off, and increased incrementally to determine the maximum sustainable fire-flow capacity of the network.

2.5 Residual Pressure data loggers record the impact the flow test has on the hydraulic operation of the network.

3 PRESSURE LOGGING RESULTS

One fire hydrant was selected for the 7-day pressure monitoring; hydrant FH-A. This hydrant is located on the Local Authority watermain outside the site; - see site schematic in Appendix-A for the location of the hydrant.

Figure 3.1 is a graph of the pressure logging recorded from the 23rd to the 29th of September 2019, which was the 7-day period prior to the Flow Simulation Test.

Figure 3.1 Pressure Logging - Hydrant FH-A

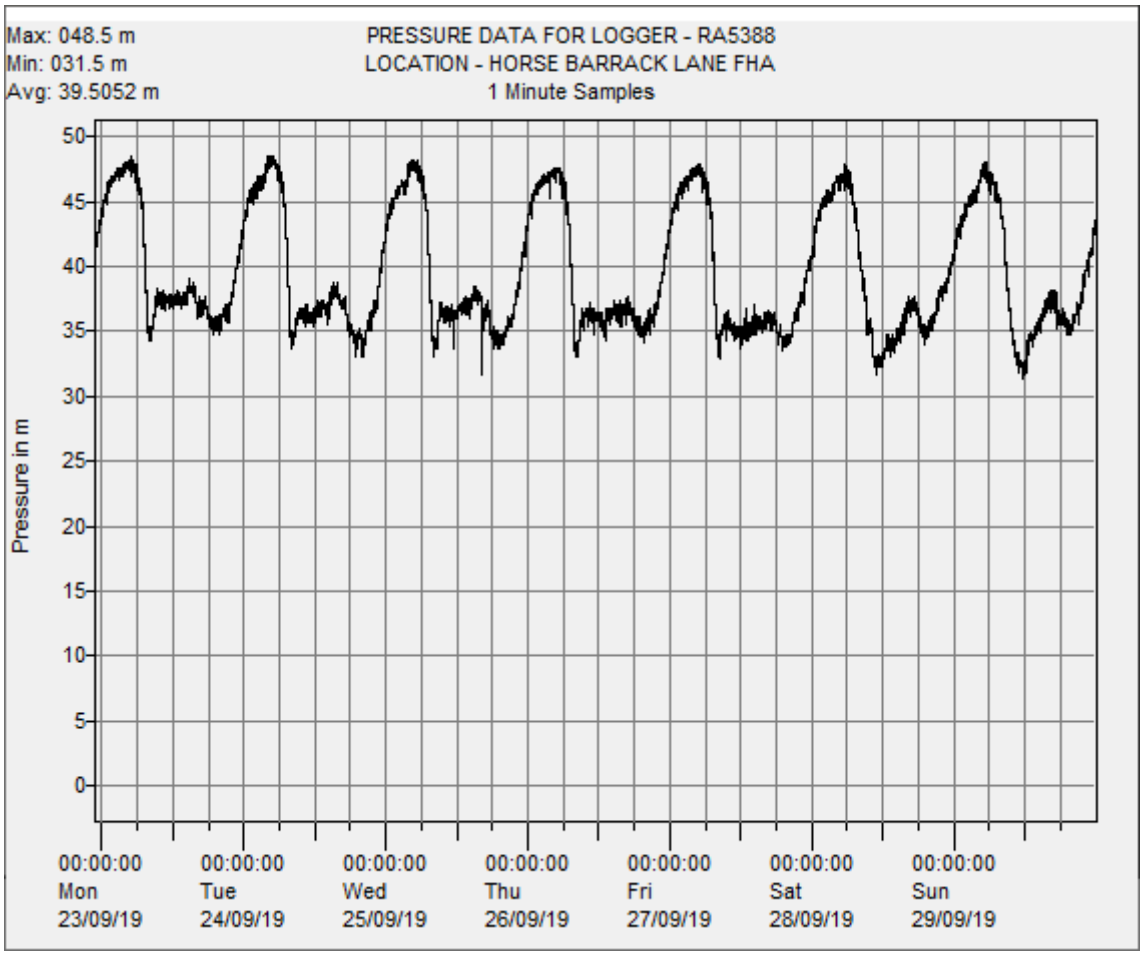


Table 3.1 is a summary of the pressure logging results.

Table 3.1 – Summary of Pressures Recorded

Pressure Point	Maximum Pressure	Minimum Pressure	Average Daytime Pressure
FH-A	48.5 m	31.5 m	39.5 m

4 FLOW TEST RESULTS

The Flow Testing was carried out on Monday 30th September 2019. Two hydrants were flow tested, Fire Hydrant FH-A and FH-B.

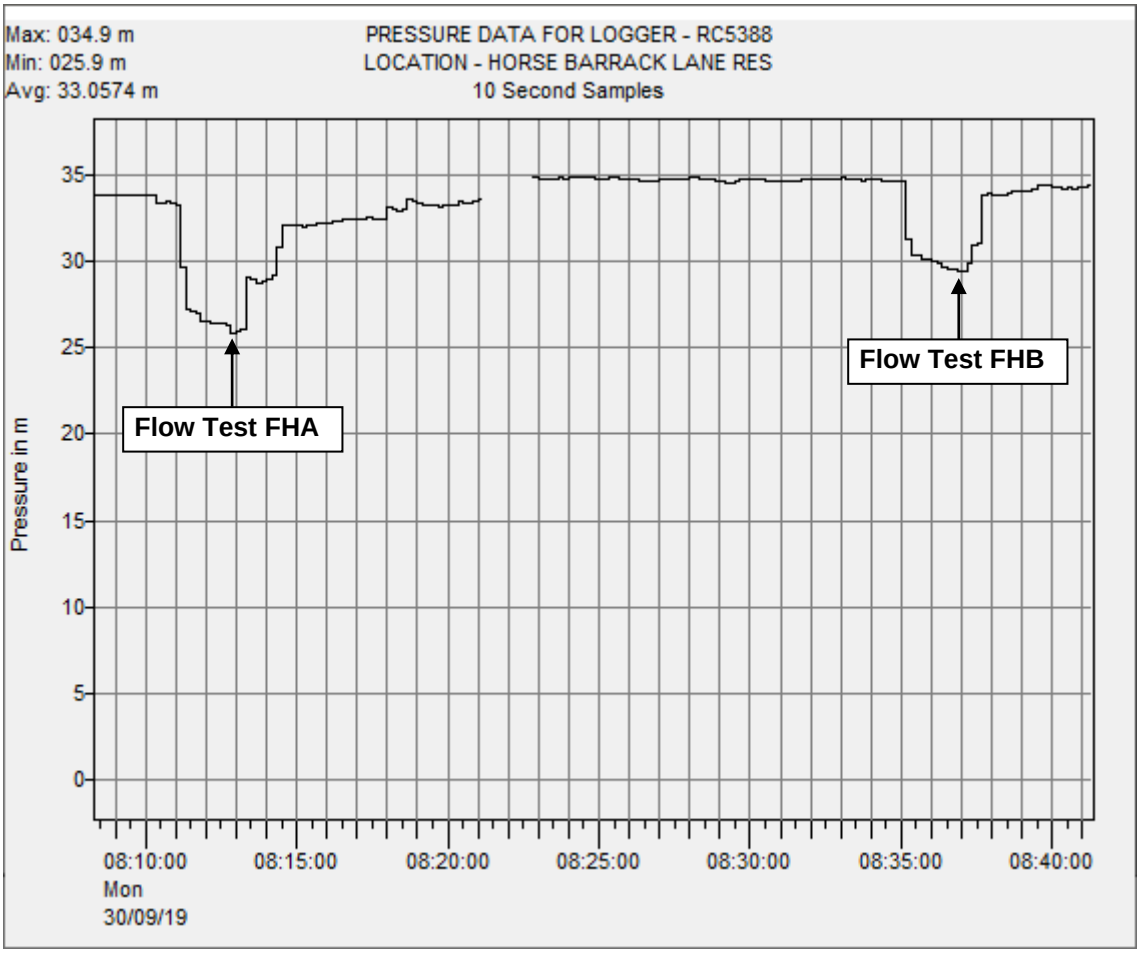
Table 4.1 is a summary of the flow test results and residual pressures recorded during each test. The flows are recorded directly from the Hydrant Flow Meter connected to each hydrant. The Residual Pressures were recorded by a pressure logger fitted to the adjacent hydrant.

Table 4.1 Flow and Residual Pressure Test Results

Hydrant Flow Test	Flow Capacity (litres / minute)	Residual Pressure (meters head)	
		FH-A	FH-B
FH-A	1407 l/min	-	25.9 m
FH-B	1140 l/min	29.4 m	-

Figure 4.1 is a graph of the Residual Pressures recorded during the respective flow tests.

Figure 4.1 Residual Pressure Loggings



5 COMMENTARY

The purpose of this survey was to establish the fire flow capacity of the existing watermain at Horse Barrack Lane, Kilkenny.

The following is a brief synopsis of the findings:

- The maximum sustainable fire flow capacity recorded on Fire Hydrant FH-A was 1,407 litres / minute (or 23.5 l/s), with a residual pressure of 25.9m.
- The maximum sustainable fire flow capacity recorded on Fire Hydrant FH-B was 1,140 litres / minute (or 19.0 l/s), with a residual pressure of 29.4m.

The location of each hydrant is marked on the site schematic in **Appendix A**.

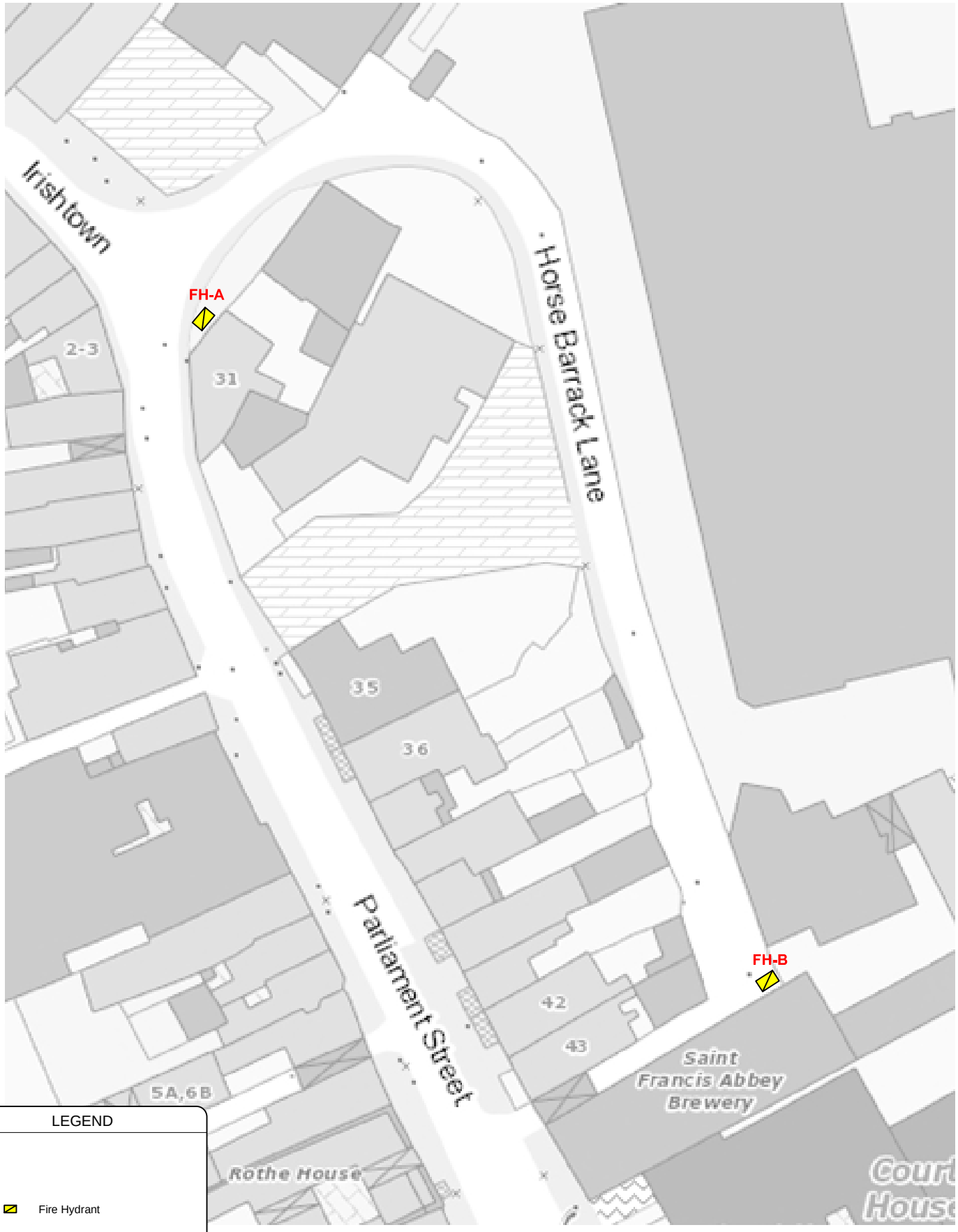
Should you have any queries in relation to the findings please contact the undersigned.

For LARSEN WATER MANAGEMENT

_____ _____

David Smith Date
Project Manager

APPENDIX-A SITE SCHEMATIC



LEGEND

FH Fire Hydrant

CLIENT:	Kilkenny County Council
SITE:	Horse Barrack Lane
PROJECT:	Fire Flow Simulation Test
JOB CODE:	15388
DATE:	September 2019

NOTES:

NOT TO SCALE

N W E S

The information on this site schematic is a general guide and the accuracy cannot be guaranteed. No liability is accepted for any discrepancy, omission or deviation from the actual position of watermain, services, or site and building layout.

LARSEN WATER MANAGEMENT

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