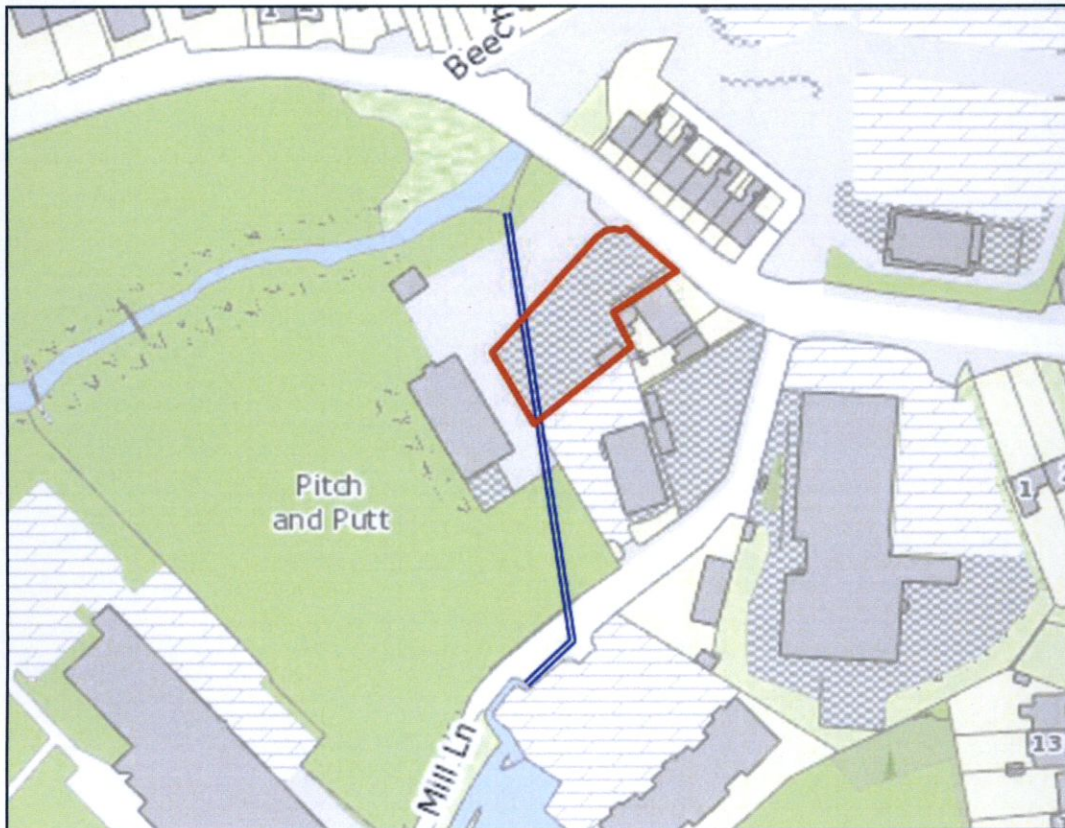


DUBLIN SIMON COMMUNITY

PROPOSED DEVELOPMENT SITE, OLD NANGOR ROAD, DUBLIN 22

EXISTING CULVERT HYDRAULIC ASSESSMENT REPORT



IE CONSULTING
WATER-ENVIRONMENTAL-CIVIL

Integrated Engineering Consulting

DUBLIN SIMON COMMUNITY

PROPOSED DEVELOPMENT SITE, OLD NANGOR ROAD, DUBLIN 22

EXISTING CULVERT HYDRAULIC ASSESSMENT REPORT

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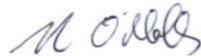

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Appendix A Visual Inspection Photographs

Appendix B Culvert Condition Inspection Report & Topographical Survey

Appendix C Drainage Records

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1 Introduction

IE Consulting was requested by Hayes Higgins Partnership, on behalf of the Dublin Simon Community, to assess the hydraulic capacity of an existing culvert located beneath a site to be developed for social housing at Old Nangor Road, Dublin 22. The proposed development was granted planning permission by South Dublin County Council on the 17th of May 2017 for a three-storey apartment building and all associated works. It is proposed to divert the existing culvert within the boundary of the site to enable development to proceed in accordance with the planning permission granted.

The culvert is a stone arch culvert, which was constructed as part of a paper mill that is no longer in operation. It is approximately 2.47m wide and 1.56m high. Waters spill from the Camac River into the Mill Pond located upstream of the culvert. These waters discharge to a concrete tank, which in turn discharges to a stone channel located on Mill Lane and into the culvert inlet via a large sump. The location of the culvert is shown on *Figure 1* below.

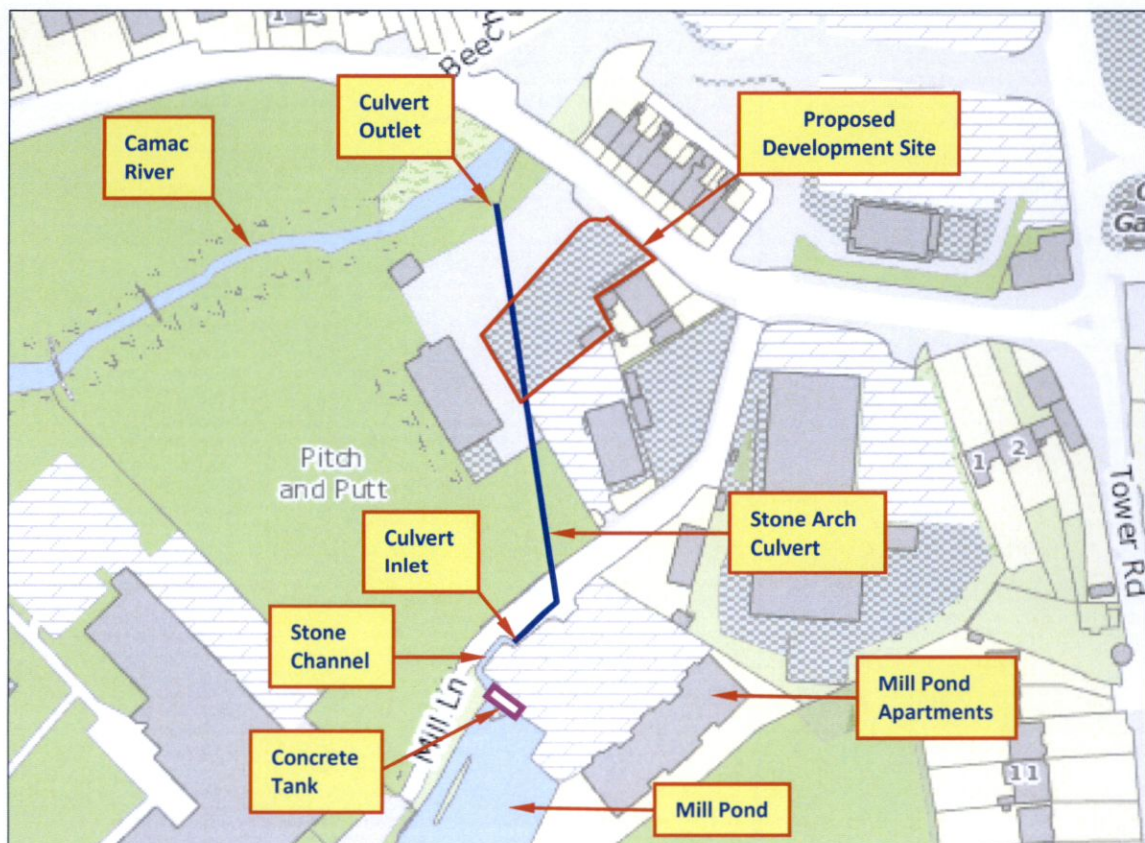


Figure 1 - Culvert Layout Plan

2 Site Investigation Works

A site walkover survey was carried out by an Engineer from IE Consulting on the 31st of January 2020. This included meeting with the Area Engineer Graham Murphy from South Dublin County Council (SDCC). A visual inspection was carried out of the culvert inlet and culvert outlet as well as the lake feeding the culvert, upstream concrete tank and stone channel. Refer to *Appendix A* for photographs of the visual inspection carried out.

A topographical survey and culvert inspection survey were procured by IE Consulting and the works were awarded to Murphy Surveys. The purpose of these surveys was to determine the culvert structural condition, any surface water connections from adjacent developments and to determine the flows catered for by the culvert.

The surveys were carried out by Murphy Surveys on the 6th of March 2020, an Engineer from IE Consulting and Graham Murphy from SDCC were also present on site. The culvert inspection was carried out at the culvert inlet which included man-entry. Access into the culvert was however not possible as the culvert was almost completely full of stone. It was noted by the surveyor that a manhole chamber was constructed with the culvert aperture a short distance (estimated by the surveyor to be approximately 8m) downstream of the culvert inlet.

There was no evidence of a manhole from the road surface in this location and therefore the manhole was likely to have been paved over. The SDCC Area Engineer subsequently located the manhole from the surface with a metal detector and plans to have the cover level raised. Refer to *Appendix A* for the location of the manhole identified.

No further access to the culvert was possible and no attempt to access the culvert from the outlet was carried out due to the risk of collapse identified during a previous inspection survey carried out in 2019. The topographical survey of the culvert inlet and outlet was completed with no issue. Refer to *Appendix B* for the culvert inspection report and topographical survey prepared by Murphy Surveys.

3 Existing Culvert Flow Estimation

3.1 Contributing Flow from Mill Pond

The culvert was originally constructed as part of a paper mill, which is no longer in existence. It does however provide a hydraulic conveyance function to allow waters that spill into the Mill Pond from the Camac River to flow back into the river downstream. The rate of discharge from the pond is limited by an opening in the side of the concrete tank located upstream of the culvert inlet as shown in *Figure 2* below.



Figure 2 – Concrete Tank Outlet

In order to determine the peak flow discharging from the Mill Pond a hydraulic model was developed using HEC RAS software of the outlet from the concrete tank, the stone channel and the inlet into the sump at the culvert inlet. The existing stone arch culvert has not been included in the hydraulic assessment. It is currently significantly blocked with stone, however if it was free from blockage the capacity of the culvert would be significantly greater than the rate of discharge from the Mill Pond. The extent of the model is shown in *Figure 3* below:

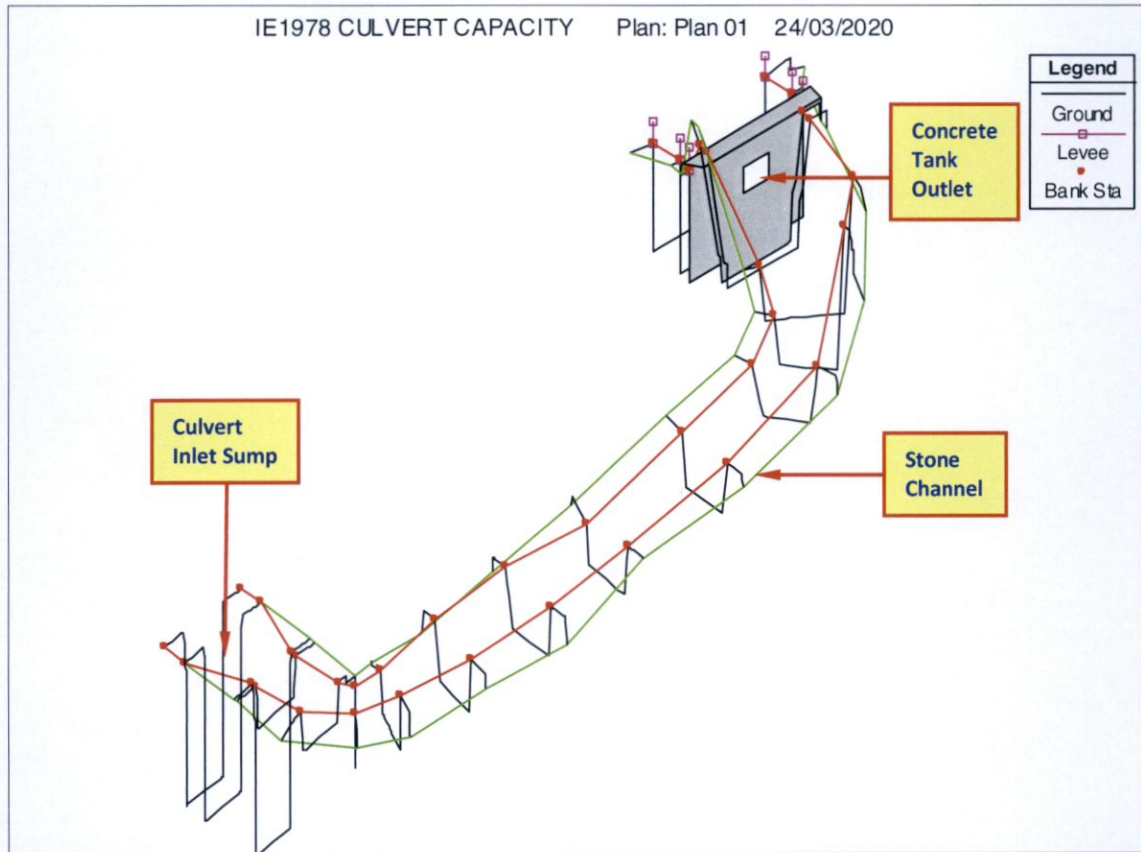


Figure 3 – Hydraulic Model

The flow limiting factor into the culvert is likely to be the Concrete tank outlet, which was assessed by increasing the flow into the hydraulic model until such time that the water levels surcharge above the top of the concrete tank roof level.

A peak flow of $0.695\text{m}^3/\text{s}$ was determined to be the peak flow that may discharge from the outlet of the concrete tank.

The model simulation is represented by a longitudinal profile through the modelled reach as shown in *Figure 4* below.

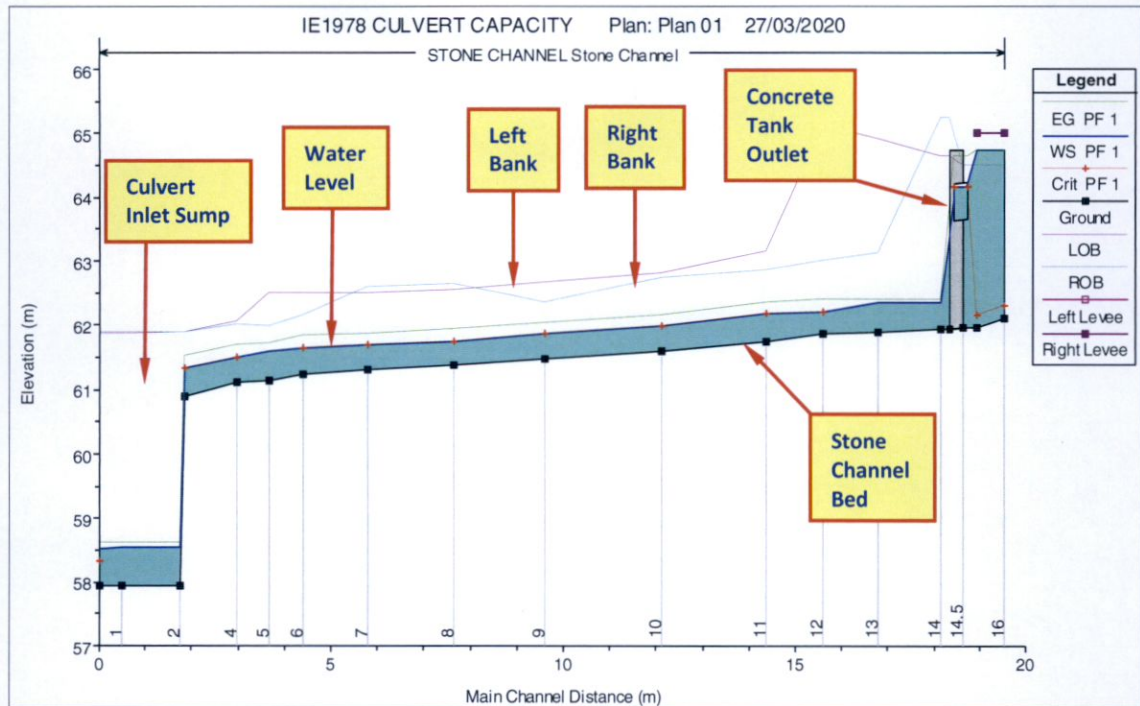


Figure 4 – Model Longitudinal Profile

3.2 Contributing Flow from Stormwater Connections

Drainage records were obtained from SDCC and Irish Water to determine the location of any stormwater connections to the culvert. These records do not show the presence of any connections to the culvert. The SDCC online planning system was utilised to review planning applications in the vicinity of the culvert. There was no information available that showed any stormwater connections to the culvert. Refer to *Appendix C* for details of the drainage records obtained.

The culvert inspection survey was not able to determine the location of any stormwater connections discharging to the culvert from adjacent properties due to significant blockage at the culvert inlet. It is likely however that the Mill Pond Apartments and the Pitch and Putt facility may have a stormwater connection to the culvert. The manhole identified within the culvert is likely to be the connection point from the Mill Pond apartments. There are also two stormwater gullies located within the car park of the Pitch and Putt. It is possible given their location that these are connected to the stone arch culvert. The anticipated location of these connections is shown in *Figure 5* below. Although the stormwater connection from the Pitch and Putt is likely to be located downstream of the proposed development site for the purposes of this assessment it is assumed to be located upstream of the site as a possible manhole was identified upstream of the site as shown in *Figure 5* below.

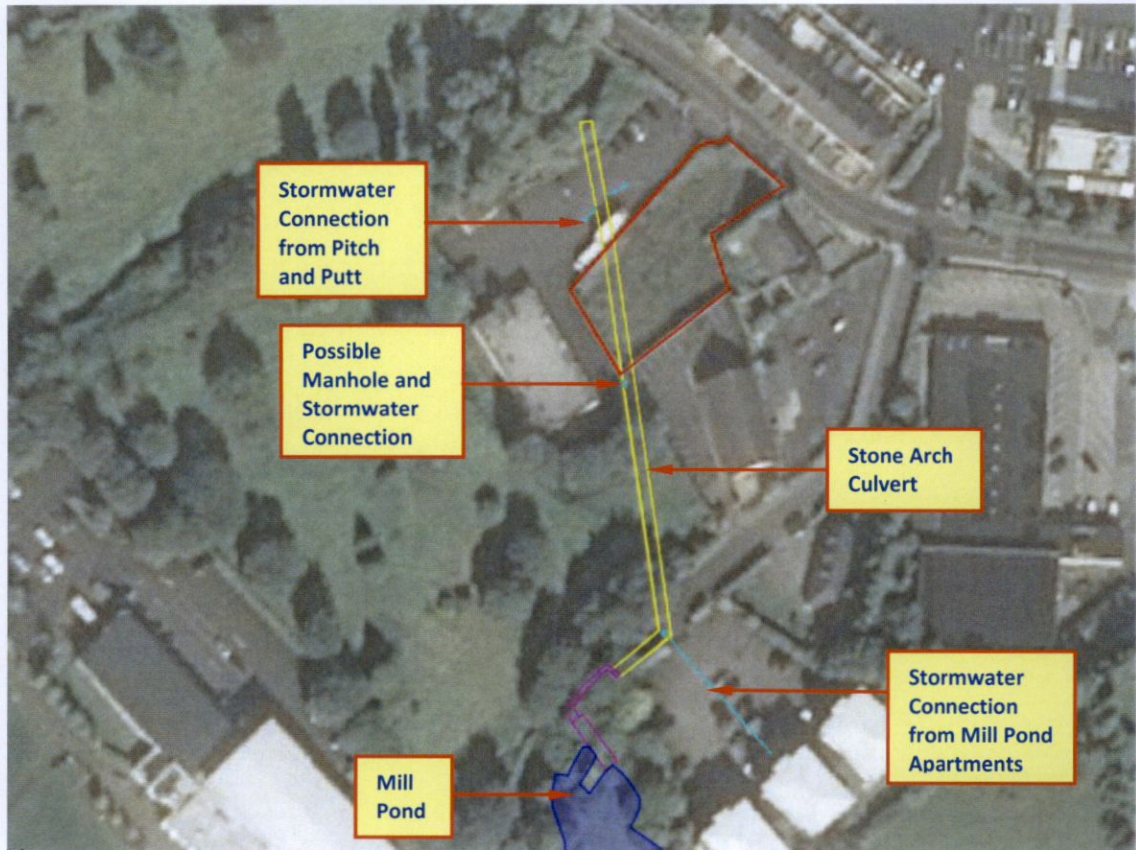


Figure 5 – Potential Stormwater Connections

Hard standing and paved areas have been divided into two categories of surface areas which can drain into the existing stormwater drainage system from the Mill Pond apartments and the Pitch and Putt. The contributing catchment areas from each area are as follows:

Mill Pond Apartments

Roof Area = 801m²

Paved Area = 1180m²

Total Area = 1981m²

Pitch and Putt

Roof Area = 423m²

Paved Area = 1455m²

Total Area = 1878m²

Typical rainfall runoff co-efficients are applied to hard standing areas of 90% for roofs and 85% for roads and paved areas. However, for the purposes of this assessment it is assumed that 100% rainfall runoff drains from these surfaces to the existing stormwater drainage system.

3.3 Peak Flow Discharging into Existing Culvert

In order to determine the combined peak flow discharging into the existing stone arch culvert from the Mill Pond and the existing developments of the Mill Pond apartments and the Pitch and Putt, a stormwater drainage model was developed using Micro Drainage software.

The following assumptions have been made in the drainage model assessment:

- 100% rainfall runoff from paved and roof areas;
- Rainfall return period simulations included 5, 30, and 100 year event for durations ranging from 15 minutes to 6 hours;
- 20% increase in rainfall depths to allow for future climate change;
- 20% factor of safety applied to flow discharging from Mill Pond;
- Existing culvert dimensions are 2.5m wide and 1.5m high arch culvert;
- The culvert is free from obstructions, blockages or collapse;
- The outfall to the Camac River is not restricted or impeded by high river levels.

The peak flow in the stone arch culvert is estimated to be $1.02\text{m}^3/\text{s}$.

Refer to the Micro Drainage output sheets enclosed in *Appendix D* for further details.

4 Conclusions and Recommendations

The above hydraulic assessment shows the estimated peak flow in the existing stone arch culvert is significantly greater than what may currently flow through this culvert. There are a number of obstructions within the culvert at present that would likely impede a flow rate of $1.02\text{m}^3/\text{s}$ from discharging to the Camac River, therefore this flow rate is considered to be conservative. It is recommended that the proposed culvert should be designed in consideration of this flow rate rather than the existing full bore capacity of the stone arch culvert. The existing full bore capacity is no longer required or appropriate as the paper mill is no longer in existence.

APPENDIX A

Visual Inspection Photographs

Photo 1: Mill Pond



Photo 2: Pond Outlet into Concrete Tank



Photo 3: Concrete Tank Outlet



Photo 4: Stone Channel Upstream End



Photo 5: Stone Channel Downstream End



Photo 6: Sump Inlet & Grill



Photo 7: Culvert Outlet to Camac River



APPENDIX B

Culvert Condition Inspection Report & Topographical Survey

Confined Space Inspection Survey Report

Old Nangor Road, Clondalkin, Dublin 22



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CONSULTANTS:
 MURPHY SURVEYS
 KILCULLEN BUSINESS CAMPUS
 KILCULLEN
 CO. KILDARE



1.0 PROJECT DETAILS

Project Name: 35588 Old Nangor Road, Clondalkin

Project Description: Confined Space Survey of Culvert

Project Number: 35588

Project Date: 6/03/2020

Standard: Sewer Rehabilitation Manual, 5th Edition

2.0 PROJECT DESCRIPTION

A confined space inspection was carried out on a surface water culvert connecting a landscaped lake with the River Camac in Clondalkin. The culvert is approximately 110 m in length. The upstream end is accessed via a steel grate while the downstream end is an open-ended culvert discharging into the River Camac. A previous sewer survey carried out by McBreen Environmental in February 2019 commenced at the downstream end and detected a blockage approximately 8 m from the downstream end that could not be passed.

Murphy Surveys accessed the culvert from the upstream end via the steel grate that was opened by representatives from South Dublin County Council.

3.0 CULVERT LOCATION MAP

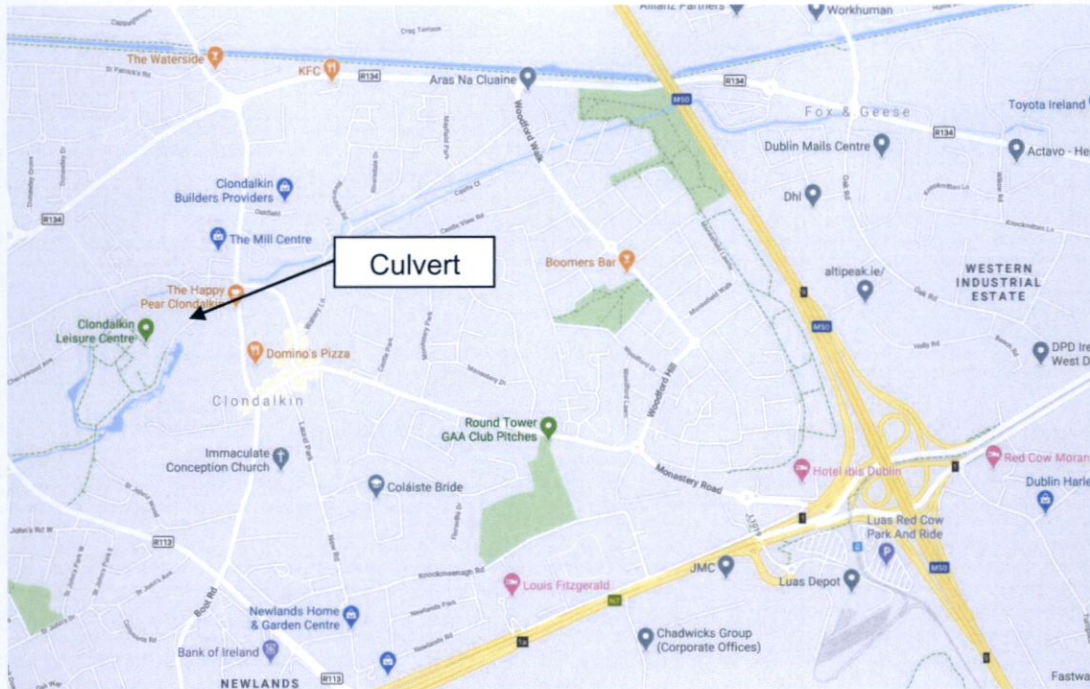


Figure 1: Location Map (Map courtesy of Google Maps)

The culvert is located between a storm attenuation tank and the river Camac. It crosses under the The Mill Pond Road, off the Old Nangor Road in Clondakin, Dublin 22.

4.0 INSPECTION FINDINGS

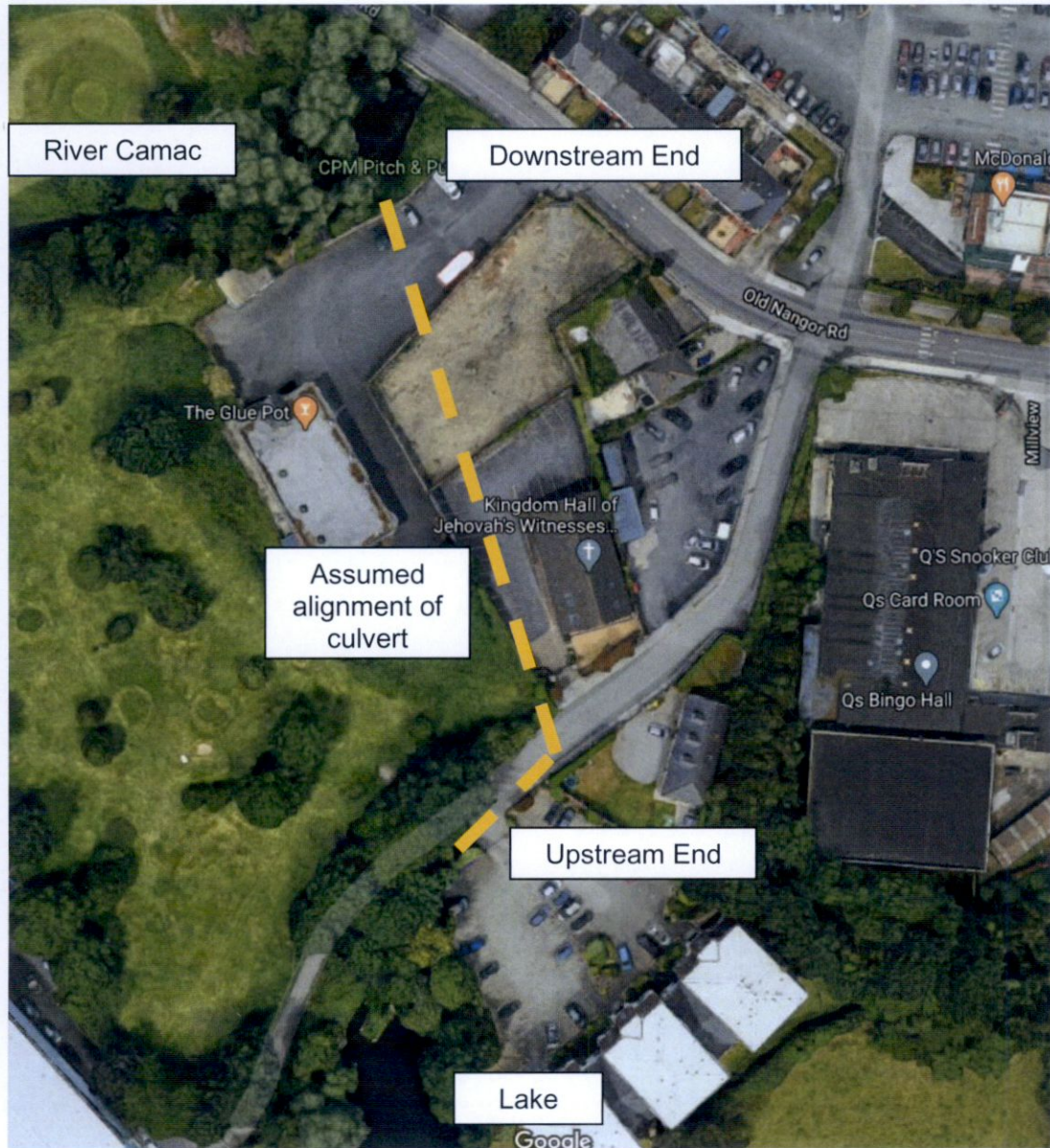


Figure 2: Location Plan

The inspection commenced at the upstream end via a steel grate. Confined space operatives attempted to walk down the culvert but were unable to proceed beyond a blockage in the culvert at the upstream end.

There is a small sized chamber between the steel grate and what appears to be the fascia of an old masonry arch bridge. The water level is up to approximately 300 mm of the arch barrel soffit. A build up of coarse gravel material and debris is present at the old bridge fascia. This blockage, and high-water level prevented progress further downstream. There is a block chamber approximately 8m downstream from the

upstream fascia of the culvert. The chamber can be seen in photograph number three below. South Dublin County Council stated they were going to go back and scan the road, to see if they can find a manhole lid under the road carriageway.

Appendix A: Photographs



Photograph No. 1 Upstream end. Old bridge fascia.



Photograph No. 2 Upstream End @ 2 m. Blockage in Arch Barrel



Photograph No. 3 Upstream End @ 2 m. Arch Barrel



Photograph No. 4 Upstream End @ 2 m. Arch Barrel