DONNACHADH O'BRIEN
& ASSOCIATES CONSULTING ENGINEERS

Kildare Co. Council

Dara Park

Newbridge, Co. Kildare

Preliminary Report on Flooding which occurred on Wednesday 22nd November 2017

23rd November 2017

1 INTRODUCTION

This preliminary report in relation to Dara Park, Newbridge, Co. Kildare relates to a flooding event that occurred on Wednesday 22nd of November 2017. Kildare County Council undertook a Surface Water Improvement Scheme in 2015 to address historic and chronic deficiencies in the existing surface water drainage network in Dara Park.

2 DARA PARK SURFACE WATER DRAINAGE IMPROVEMENT SCHEME

2.1 Kildare County Council commissioned Donnachadh O'Brien and Associates Consulting Engineers (DOBA) to prepare this preliminary report following the recent flooding incident. This followed on form the original investigation of significant defects in the existing main drainage network in Dara Park and the subsequent construction of a Surface Water Improvement Scheme.

The Surface Water Improvement Scheme was constructed from approximately Oct 2015 to summer of 2016 following extensive investigations and surveys of the existing drainage and focused on very specific section of the main drainage network located in the public open spaces adjacent to Dara Park. It is important to note that the area of the works in Fig 1 below is only a small part of a large 23 hectare urban catchment where the most significant drainage issues were identified. No works were carried out on the downstream side of the railway line as highlighted in Fig 1 below.

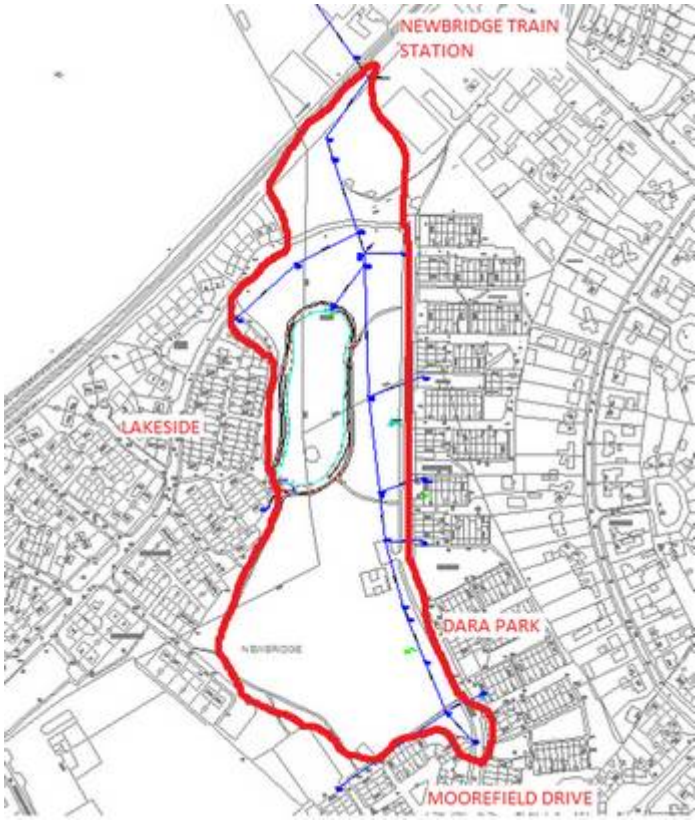

Fig 1: Study Area

2.2 The surface water drainage network in Dara Park dates to the time of the original construction of the housing estates in the area. Due to expansion of housing development in this urban area, adjoining developments were connected to the existing public surface water drainage network in Dara Park and a significant urban catchment of approximately 23 hectares now drains through the surface water network in Dara Park, which discharges via a single culvert located below the railway line to the north of the site. A significant portion of the catchment, including Allen View Heights and Lakeside Park, drains to the lake prior to discharge to the outfall at the railway line.

2.3 Physical, topographical and CCTV surveys of the study area drainage network were undertaken to determine the full catchment area contributing to the network and also to determine significant defects within the existing network. The surveys highlighted numerous deficiencies in the lower reaches of the overall catchment adjacent to the railway culvert in Dara Park including:

- inadequate gradients to pipes
- undersized pipes based on design flows
- large contributing catchment
- blockages due to debris collapsed and damaged pipes
- flow restrictions for the catchment due to the capacity of the existing railway culvert.
- No water storage upstream of the railway culvert

A combination of these factors coupled with increased frequency of severe rainfall events due to climate change resulted in surcharging of the Dara Park surface water network in localised flooding of the low-lying areas of the estate.

2.4 A preliminary design report was prepared on the basis of the survey findings recommending significant improvement to the surface water network in Dara Park. The proposed improvement works were constructed between October 2015 and Summer of 2016 and included the following main elements:

- complete replacement of the existing surface water drainage network, from Moorefield Drive to the point of the railway crossing, with a new network of pipes and manholes.
- introducing a flow control device on the new drainage network to match the downstream restrictions on flow at the railway culvert crossing
- Provision of approximately 7 million litres of storage/ attenuation capacity :

- the existing lake as attenuation to store the excess runoff from severe rainfall events.
- Creation a detention basin in the green area to the south of the existing lake for overflow during extreme rainfall events.

- Repair and upgrade of the outfall manhole adjacent to the railway tracks to the north of Dara Park including cleaning out the existing culvert.

3 STORM EVENT OF 22ND NOVEMBER 2017

3.1 The storm event of 22nd November 2017 was a severe weather event. Based on Met Eireann Information, approximately 45-50mm of rain fell in a 24 hour period and the vast majority of this fell in a 6 hour period from approximately 3am.

3.2 Flooding of some road areas occurred in Dara Park from this storm Event. Donnachadh O'Brien & Associates attended site on the morning of the 22nd November, and the images below illustrate the flooding of low lying roads experienced.

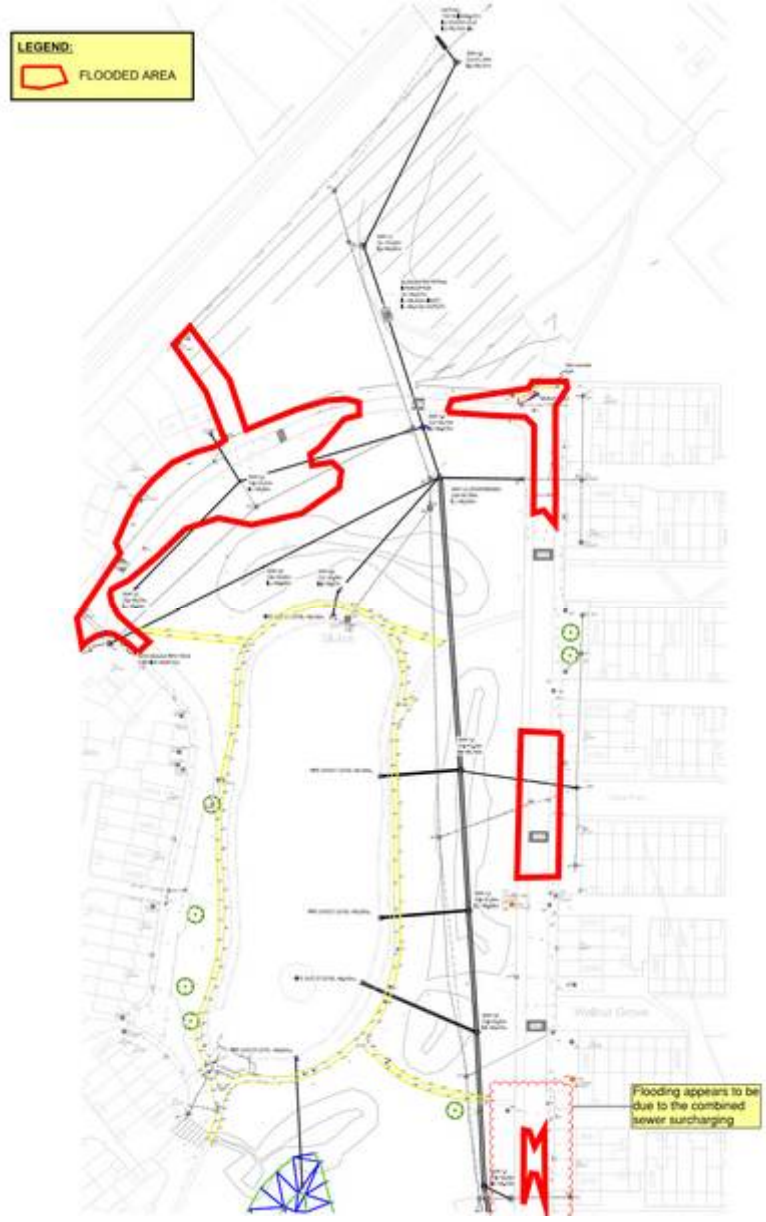

Fig 2: Extent of Flooding Observed

3.3 From our inspections, in areas where flooding of roads was evident, no houses were flooded and the worst affected area were the bungalow houses in Lakeview Crescent where some of the driveways had lying water evident for 50% of the driveway. This area is the lowest part of the site and has always experience the worst historic flooding.

Figure 3 : Worst Affected Property from Surface Water Flooding – Lakeside Crescent

3.4 Following inspection, it became apparent that the reason for the surcharging of the surface water network and flooding was a partially blocked trash screen in the adjacent Irish Rail Property at the entrance to the culvert. This was blocked with debris and was preventing the full flow of water from entering the culvert (see figure 4 above showing the water level above the trash screen). This image was a taken at the time of maximum surcharge at approx. 12pm.

The nature of the debris included, leaf's and twigs and other vegetative matter but also plastic, some general rubbish including a disused fire extinguisher that appears to have been disposed of in the culvert. Had this large object not been trapped by the trash screen, it is likely to have caused a

severe blockage of the culvert below the railway like in an inaccessible area and therefore the trash screen was performing its function effectively.

Figure 4 : raised water level at culvert entrance due to debris blocking the trash screen at the entrance to the culvert located in Irish Rail Property

3.5 Trash screens, by their very nature require regular maintenance to remove caught debris and to ensure a through passage of the design flows. In this case the flow was restricted by debris to approximately 25% of the culvert capacity. This was verified by Kildare County Council who opened up manhole chambers on the downstream side of the Railway Culvert.

3.6 This debris blocking the trash screen caused a severe surcharging of the piped network within Dara Park. When this occurred the water levels in the pipe network rose and, in accordance with the Surface Water Improvement Scheme Design, the lake level rose with the retention of the storm water. The water level continued to rise such that the overflow detention basin was also. Utilised. The design capacity of the storm water attenuation was approximately 7 million litres of water and this was fully utilised during the storm event.

3.7 Due to the restriction of flow at the railway culvert the water continued to rise marginally above the design levels in the lake and detention basin and road gullies started to surcharge causing

some flooding of the roads and low-lying open space area adjacent to Lakeside Crescent and in 2 areas within Dara Park.

3.8 Kildare County Council acted swiftly and immediately and arranged access for maintenance staff to the Irish Rail property and removed debris from the trash screen to restore design flow through the railway culvert. Immediately, by approximately 1pm there was a significant reduction in the water level by 500mm to 600mm at the outfall, as figure 5 below illustrates, when compared to figure 4. (The trash screen is now clearly visible in figure 5)

Figure 5 : reduced water level at culvert by approx. 500mm following removal of blockage to the trash screen

3.8 Once the blockage was removed the water gradually commenced to discharge at a significantly higher flow rate and the surcharge of the piped network in Dara Park started to abate. By approximately 2.45pm the water from the lake and detention basin was clearly and visibly flowing toward the lake outfall and began slowly to drop in level.

3.9 Further inspection at approximately 5pm showed that the water levels had reduced and there was a very significant reduction in the flooding to the roads within Dara Park and Lakeside crescent. On further inspection this morning (23rd November 2017) at 9am, the lake had returned to normal water levels and it was apparent that the attenuated water volumes had been discharged, with the culvert outfall operating in a normal manner.

Figure 5 : Normal water level restored in the lake at 9am on Thursday 23rd November. (see the high water mark on the bank)

3.9 With reference to Fig. 1, in one area of Dara Park there was a separate and unrelated drainage issue where a foul sewer adjacent to houses became surcharged and overtopped the manhole resulting in a sewage discharge and localised flooding. This manhole is part of a foul drainage system that is not connected to any of the piped network associated with the Dara Park Drainage Improvement Works. We understand that this drainage problem relates to poor capacity and falls within the foul network combined with surface water surcharge from overflows during severe rainfall events, as occurred yesterday.

4.0 SUMMARY

4.1 Flooding of the lower portions of the road infrastructure at Dara Park and Lakeside Crescent occurred on the morning of the 23rd November 2017 following a severe rainfall event with 45-50mm of rainfall, most of which fell over a 6 hour period.

4.2 The flooding was caused by debris blockages at a trash screen located in the immediately adjacent Irish Rail Property to the north of the site. This trash screen protected a culvert traversing below the railway line where the entire 23-hectare urban catchment discharges. Dara Park is located in the lower reaches of this catchment. This culvert was reduced to approximately 25% of its normal capacity.

4.3 The blockage caused surcharging of the storm water piped drainage network in Dara Park & Lakeside Crescent. Once identified, Kildare County Council, in consultation with Irish Rail, arranged for the unblocking of the trash screen and there was an immediate increase in flows to the culvert which immediately lowered the water level at the culvert by 500mm approximately.

4.4 The Surface Water Improvement Works implemented in 2015 / 2016 provided significant volumetric storage of surcharged and attenuated storm water in the lake and overflow detention basin. This storage was fully utilised and retained approximately 7 million litres of water which otherwise would have caused significant flooding of the surrounding area, putting many houses at risk of flooding.

4.5 Due to the debris blockages and flow restrictions at the outfall, some additional surcharging of gullies occurred and sections of localised low-lying roads in Dara Park and Lakeside Crescent were temporally flooded. From our inspection there was no flooding of houses and the worst-case flooding witnessed resulted in approximately 50% of one driveway in Lakeside Crescent having some standing water. In very extreme rainfall conditions (events approaching or exceeding 1 in 100-year rainfall intensity) it is acceptable for roads between kerbs to be utilised for some temporary flood storage.

4.6 It is clearly evident from our inspections yesterday during the worst period of the storm event, that the Dara Park Surface Water Improvement Works are operating as designed and that if

the culvert was free from debris and blockages, it is our opinion that no road flooding would have occurred within Dara Park and Lakeside Crescent.

4.7 It is imperative that an ongoing maintenance regime is put in place in relation to the installed Surface Water Improvement Scheme to mitigate against any similar occurrences in the future.

4.8 A separate and unrelated drainage flooding issue also occurred in Dara Park where a foul sewer adjacent to houses became surcharged and overtopped the manhole resulting in a sewage discharge and localised flooding. This foul drainage system is not connected to any of the piped surface water network associated with the Dara Park Drainage Improvement Works. We understand that this drainage problem relates to poor capacity and falls within the existing foul drainage network, exacerbated by surface water surcharge from upstream combined drainage overflows which become triggered during severe rainfall events as occurred on the 22nd November.