Waterman Moylan
Engineering Consultants

Car Parking Facility at Turnapin Great, Swords Road, Co. Dublin

Engineering Assessment Report

September 2018

Waterman Moylan Consulting Engineers Limited
Block S, East Point Business Park, Alfie Byrne Road, Dublin D03 H3F4
www.waterman-moylan.ie

Waterman Moylan
Engineering Consultants

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This document has been prepared and checked in accordance with
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1	24 Sept 2018	Paddy Waldron	Mark Duignan	Mark Duignan

Comments

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1. Introduction

1.1 Scope

This report has been prepared by Waterman Moylan Consulting Engineers as part of a submission seeking a permanent planning permission for the continuation of use of the 16.9 Ha Quickpark long stay airport car park at Turnapin Great.

1.2 Existing Development

The car park comprising approximately 6,240 parking spaces on approximately 16.9 ha. has been developed in two phases: -

Phase 1	Northern section of the car park consisting of approximately 3,500 parking spaces and ancillary facilities including access junction was constructed in 1999 under planning Reg Ref F02A/1110 and F05A/1164.
Phase 2	Southern section consisting of approximately 2,740 spaces constructed in 2007 under planning Reg Ref F06A/1277.

The car park has been developed on a temporary basis. The surfacing to the car park consists generally of permeable gravel surfacing with blacktop roads forming the carriageway for the entrance and bus route.

The existing development includes road access to the R132 with barriers at the entrance and exit, an office building with welfare and security facilities, and associated features including public lighting bus stops etc.

1.3 Proposal

This proposal is for the continuation of use of the existing long stay at grade car park facility at Turnapin Great, Swords Road, County Dublin, serving Dublin Airport, complete with the associated exit / entry control facilities, roads, drainage and bus shelters.

Permission is also sought for a new entrance building and entrance layout to the car park. The new entrance building will provide for office space and facilities associated with the car park. Total net floor area of the proposed entrance building is c.1,043m^2. A new entrance layout is proposed to facilitate this building which results in a loss of 118 car parking spaces providing for a total of 6,122 spaces. The new entrance layout will facilitate additional SuDS and landscaping features along either side of the entrance layout.

In order to facilitate the new entrance building it is proposed to demolish the existing entrance canopy structure and single storey office, and to relocate the existing maintenance shed.

2. Site Location and Description

2.1 Site Location

The car park is located approximately 1km south of Dublin Airport and is accessed from the R132, Swords Road. The site is located to the north of the M50 Northern Cross Route. The site is easily accessible from the M50 motorway via the Ballymun interchange along Collinstown Road, and also from the M1 motorway via the Airport interchange along the R132 Swords Road.

The site location is indicated in Figure 1 – Site Location Map.

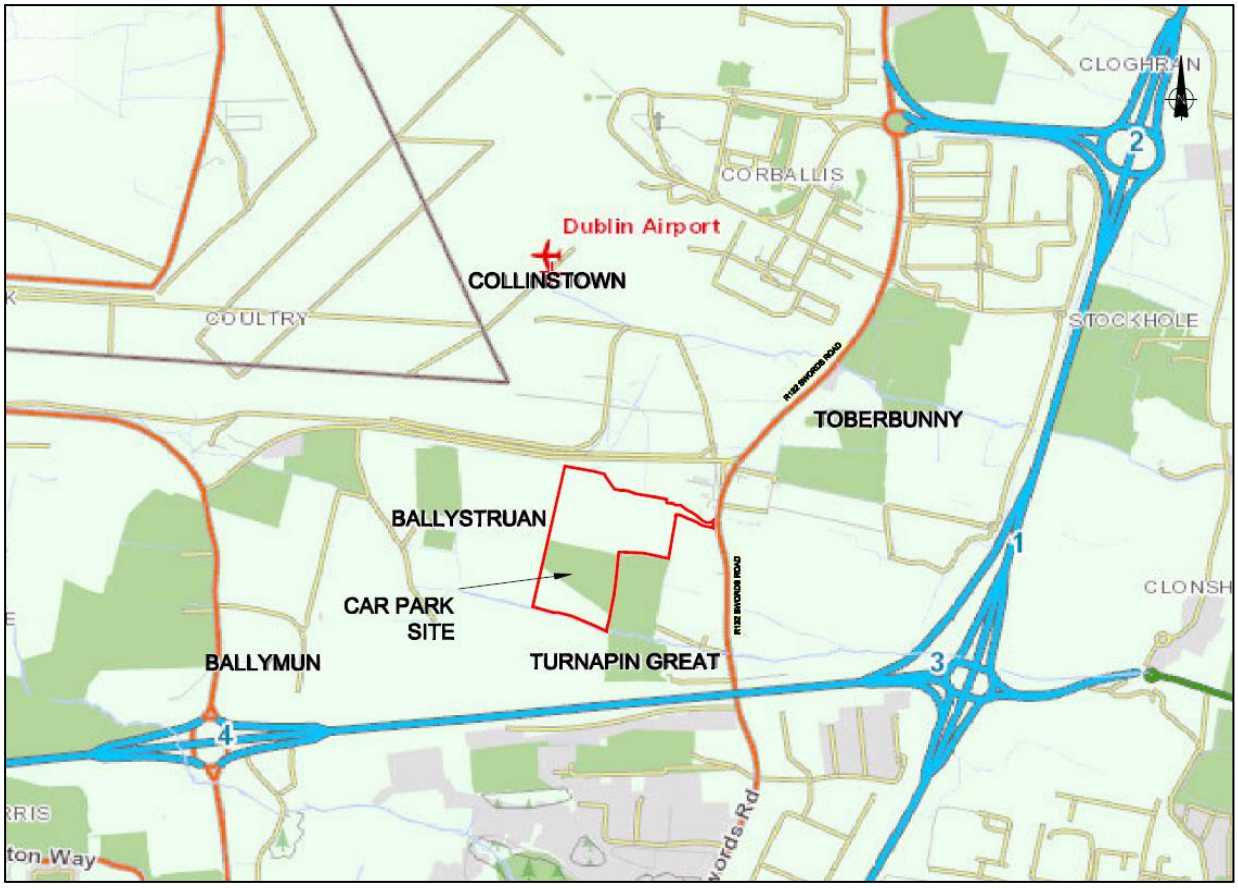


Figure 1 | *Site Location Map*

3. Roads

The site is in close proximity to the airport via the R132 Swords Road. The R132 Swords Road is a regional road that links Dublin City (via Santry) with Dublin Airport, and Swords to the North. The R132 Swords Road is a commuter route which serves local traffic. It is a 4 lane carriageway, including bus lanes either way, approximately 12m wide where it fronts the site.

The existing car park serves 6,240 long term car parking spaces and is accessed via an existing signal controlled junction complete with a separate right turning lane for southbound traffic. This junction had minor works carried out to improve the turning movements and pedestrian crossing facilities as previously requested by Fingal County Council Roads Department.

A connection between the car park complex and Dublin Airport is provided for by a shuttle bus. The shuttle bus is a regular service, with one bus operating every 5 minutes, with a journey time of 5 minutes in one direction.

The main road within the car park is 6.5m wide and is being used as a one way shuttle bus route serving the car park. The parking aisles around the car park are designed to a width of 6m to allow free movement and good visibility for both car users and pedestrians. A one-way main orbital route is in operation within the complex, allowing for buses to accommodate pedestrians and to create a safer environment. The layout of the parking aisles also separates the pedestrians from traffic on the main road, increasing the safety of these pedestrians.

Refer to drawings 15-194-P010 to P016 for existing and proposed road and car park layout and cross sections.

Sean McGrath of Fingal County Council Transportation Planning Section confirmed on the 22 May 2018 that they have no objection in principle to the proposed permanent continuation of use of the subject car park.

The requirement for the continued use of the subject long term airport car park and its transportation impact if set out in the accompanying Environmental Impact Assessment Report (EIAR) Transportation section.

4. Foul Drainage

The proposal is to connect the new building to the existing 375mm diameter private foul water which connects to an existing 900mm diameter sewer in the R132 Swords Road.

The associated flows are calculated below in Table 1.

Population	Hydraulic Loading / head (l/day)	Number of persons	Total l/day
Staff	60	100	6,000
Customers using facilities	20	10	200
Total			6,200

Table 1 | *Foul Water Outflow*

1 x D.W.F. = 6.2 m^3/day = 0.075 l/s

Peak Flow (6 x D.W.F.) = 0.45 l/s

The existing 900mm diameter pipe running along the Swords Road receives an additional 6.2 m^3/day of untreated effluent with a peak flow of 0.45 l/s (6 DWF) as a result of the development. This additional flow is negligible in terms of the pipes capacity.

The proposed foul water network is shown on drawing 15-194.P021.

5. Storm Water Drainage Design

5.1 Storm Water Management Strategy

The existing storm water management policy implemented on the site has been reviewed in terms of the latest guidelines set out in the Greater Dublin Strategic Drainage Study (GDSDS) and upgrades of the system are proposed as part of the new entrance road and entrance building.

In compliance with the GDSDS, Sustainable Urban Drainage Systems have been incorporated into the drainage scheme to limit the discharge rate to a volume equivalent to a greenfield runoff and to improve the water quality of the surface water runoff.

The strategy is to provide a permeable surface for the car park with a gravel and sand filter to provide surface water treatment and storage in order to clean and to retain the storm water runoff. Pollutant removal occurs within the sub-base material itself and by the filtering action of the reservoir.

In addition, silt trap manholes and petrol interceptors are provided at each outfall to the existing ditch system to contain hydrocarbons and potential spillages.

For storm water management purposes, the site has been divided into seven catchments as indicated in Figure 2 (refer also to accompanying drawing P024). Each catchment has been provided with a hydrobrake manhole limited to the equivalent greenfield runoff and on-site attenuation capable of attenuating for the 1 in 100 year storm and 10% climate change.

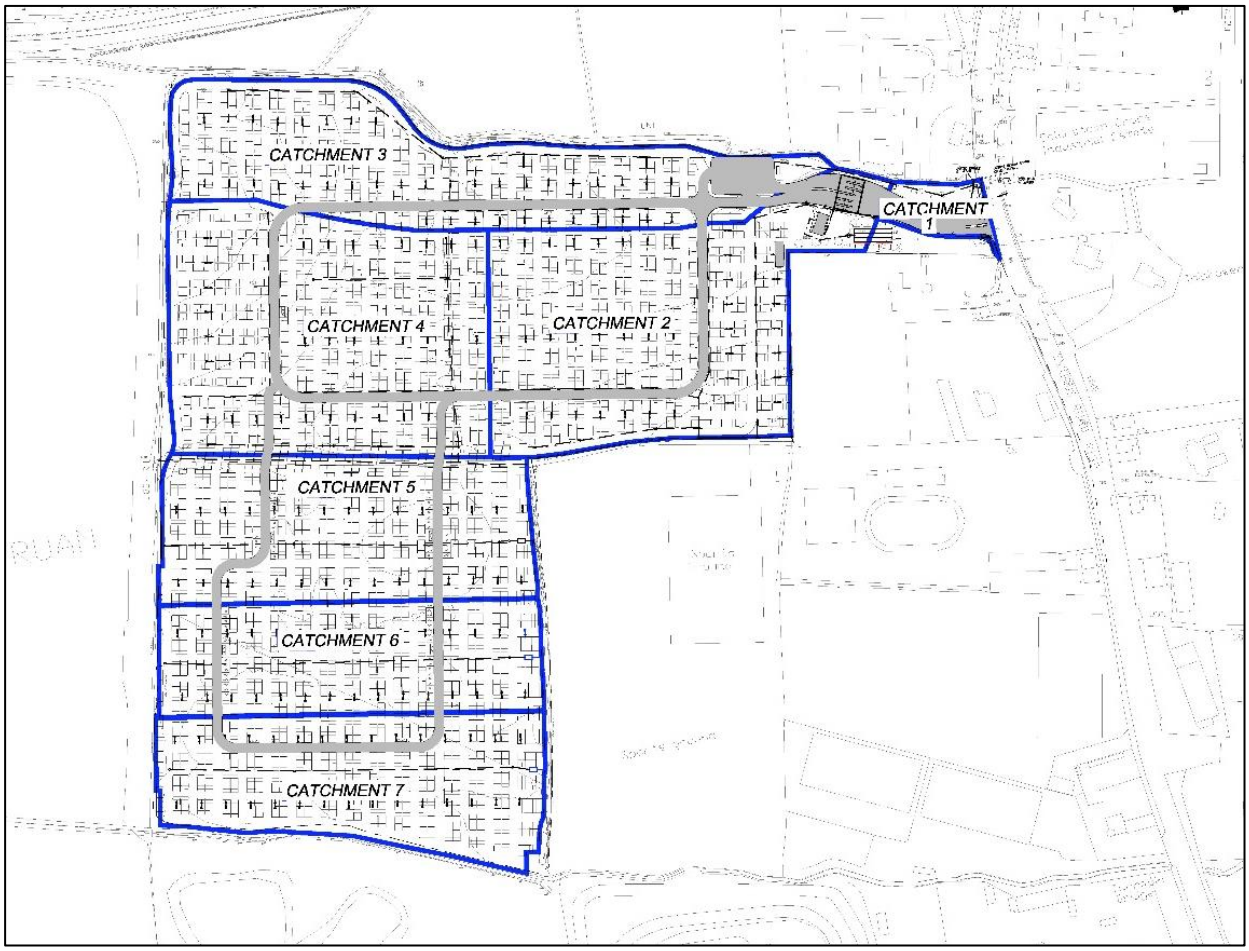


Figure 2 | *Surface Water Catchments*

A new entrance road and building is proposed within Catchment 1. Following a meeting with Fingal County Council Drainage Division on 23 May 2018, it was agreed to provide a swale and filter drain on either side of the entrance road to take surface water runoff from the new entrance road and a filter drain to treat surface water runoff from the down pipes of the new building. The new entrance building will also be provided with a green roof.

Please refer to Proposed Drainage drawing 15-194-P021.

5.2 Sustainable Urban Drainage System

SUDS are implemented to reduce the development runoff down to the equivalent greenfield runoff and to ensure a suitable water quality.

Percolation tests have been carried out by IGSL. The results show that the soils at these lands have low permeability.

To provide quality improvement to storm water before entering the surrounding ditch network a two stage quality improvement system has been employed:-

Stage 1 Permeable surfaces within the car park.

Stage 2 Silt traps and petrol interceptors at each outfall to the receiving waters

The rainwater from the parking area infiltrates through the pavement and is cleaned by the layer of gravel and sand. The sub-base of the car-park is designed with washed 20mm clause 503 gravel which has a storage capacity for the water of at least 30%. The infiltrated water drains via gravity towards the low lying points of the car park where the water is collected by underlying filter drains.

The top layer of gravel causes a slower runoff than sealed surfaces. Also, the runoff from shorter rainfalls or rainfalls with lower intensities will not enter the drainage system as they will fill the voids and will eventually evaporate or infiltrate into the ground. The permeable surface increases the interception capacity of the surface and the evaporation.

Ciria Document, '*Source Control Using Constructed Pervious Surfaces*', (2002) states "*Pervious surfaces and their underlying structures provide mechanisms that encourage filtration, sedimentation, adsorption, chemical/biological treatment and storage.*"

The following table indicate the removal of pollutants through permeable pavings with underlying gravel layers.

	Percentage removal of pollutants of concern					
Techniques	Total Susp. Solid	Hydro-Carbons	Total Phos-phorous	Total Nitrogen	Faecal Coli-forms[5]	Heavy Metals
Pervious Pavements	60-95%	70-90%	50-80%	65-80%	-	60-95%

In addition, silt trap manholes and Class 1 Light Liquid Separators, to European Standard prEN 858, Parts 1 and 2, have been provided at each outfall. This further reduces the percentage of possible pollutants discharging to the surrounding ditch network.

Quickpark have a maintenance regime that requires inspection and cleaning out of silt trap manholes and petrol interceptors every 6 months. The latest inspection was carried out by McBreen Environmental on 5 September 2018. McBreen Environmental confirmed that all petrol interceptors had been cleaned out and are all operating in working order - refer to letter from McBreen Environmental in Appendix A.

5.3 River Quality Protection – Criterion 1 – Interception

According to the guidance provided by the GDSDS, approximately 30 to 40 percent of rainfall events are sufficiently small that there is no measurable runoff taking place from greenfield areas into the receiving waters while from developed hard surfaced areas the runoff is far more rapid with discharges to the receiving waters even in small rainfall events. In addition, the pollutant loadings of this first flush of rainfall is generally higher than the pollutant load of heavy rainfall.

These events are generally considered as the first 5mm of rainfall and the objective is to retain as much as possible of this rainfall within the site without any discharge to the receiving waters.

In the case of the gravel surfacing this will replicate the greenfield conditions and no runoff for small rainfall events would be expected from these areas. The internal roads are drained directly to the gravel areas and similarly there will be no runoff from these areas. The section of road at the new entrance to the site is now proposed to be drained by a swale on the northern side and gullies directly to a filter drain on the southern section.

5.4 River Regime Protection – Criterion 2 – Storm Water Attenuation

The permissible outflow from the site was calculated in accordance with the Greater Dublin Strategic Drainage Study (GDSDS). This document gives guidelines on how to calculate the allowable storm water outflow from new developments. This allowable runoff is to reflect the original greenfield runoff, i.e. the storm water runoff before the site was developed.

The Q_{bar} equation was used in this analysis and the following parameters were used in calculating the greenfield runoff: $Q_{bar} = 0.00108 \times Area^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$

SOIL Type 4 value is used (5.2 l/s/ha) based on a low permeability soil in line with the GDSDS.

In line with the GDSDS and current guidelines, attenuation for a 100 years storm event is required along with 20% climate change factored in.

Catchment	Area (Ha)	Qbar (l/sec/Ha)	Q 100 Year (l/sec/Ha)
1	0.37	5.2	2.0
2	3.32	5.2	17.3
3	2.9	5.2	15.1
4	3.6	5.2	18.7
5	2.46	5.2	12.8
6	2	5.2	10.4
7	2.25	5.2	11.7

Table 2 | *Throttle Rate for the Proposal Development*

The volume of storage required for each of the catchments is calculated in line with the GDSDS and current guidelines. Attenuation for a 100 years storm event is required along with 20% climate change factored in, the results of which are shown below in the Table 3.

This storage volume is provided within each catchment area of the car park by a combination of storage within the gravels and pipe systems and accumulation of surface water on the surface in the vicinity of the outfall which is the lowest section of each catchment.

Catchment	Q 100 Year (l/sec/Ha)	Return Period (Years)	Storage Required (m^3)	Required Storage Inc 20% climate change (m^3)
1	2.0	100	108	**129**
2	17.3	100	1122	**1,346**
3	15.1	100	980	**1,176**
4	18.7	100	1215	**1,458**
5	12.8	100	944	**1,038**
6	10.4	100	830	**996**
7	11.7	100	760	**912**

Table 3 | *Required Attenuation Storage including 20% for Climate Change*

The required storage volume to retain all of the storm water on site is set out in Table 3. This volume assumes that the entire site is totally impermeable, which is very conservative as there will be a significant volume of infiltration across the extensive stoned area of the site which is not taken into account within the attenuation calculations.

An assessment of the storage capacity and the level of service that would be provided for each storm water catchment during a 100 year storm event is set out below.

Catchment 1 comprises mainly the new entrance road and associated grass areas at the entrance to the development. The area of road within this catchment is approximately $900m^2$ and storage required for the 100 year storm is $129m^3$.

This storage is provided by approximately 40m of 525mm of oversize pipe plus 4 manholes (storage = $41m^3$). The proposed swale along the new entrance road will facilitate a further attenuation of $31.5m^3$ and the filter drains along the new entrance road and around the new building will facilitate another $28m^3$ of attenuation. Furthermore the new building is designed with a green roof resulting in minimum surface water runoff.

Catchment 2 has a low area comprising approximately $10,000m^2$ below the 56.5 contour in the south east corner of the catchment. Provision for 70% of the storm water migrating to this area during a storm event would result in a depth of water approximately 93mm deep during a 100 year storm event. Based on a 30% void storage within the stone build-up, storage volume within the 300 mm gravel layers only local surface flooding would occur during a 100 year storm.

Catchment 3 has a low area comprising approximately $4,500m^2$ below the 57.5m contour in the east side of the catchment. Provision for 70% of the storm water migrating to this area would result in a depth of storage required of 178mm. Based on 30% void storage volume within the 300 mm gravel layer surface flooding of up to 90mm may be expected. However in practice, in the event that surface flooding occurs in this area it would flow across in to Catchment 2 which is at the 56.5m contour and surface flooding would be expected to occur in the south east corner of Catchment 2.

Catchment 4 contains a low area at the 57.0m contour with a surface area of approximately $7,200m^2$. Again based on a 70% flow of storm water the depth of storage required would be approximately 142mm. With 30% void storage available within the 300mm gravel layer this would result in surface flooding of approximately 48mm. In the event that surface flooding occurs in this area it is expected that some of the flooding would flow into Catchment 2 resulting in possible surface flooding in the low point within Catchment 2.

Catchment 5 has a low area comprising approximately 8,000m^2 at approximately the 57.0m contour. Based on a 70% flow of storm water to this area a storage depth of approximately 92mm would be expected in this area. This depth of water will result in only local surface flooding.

Catchment 6 includes a low area approximately 12,000m^2. Based on a 70% flow of storm water to this area a depth of storage of approximately 48mm is required. This depth of water will be retained within the 300mm gravel surfacing layer and only limited local surface flooding would be expected in this area.

Catchment 7 includes a flat area of approximately 9,000m^2 at the south east side of the catchment. Based on a 70% flow of storm water to this area a depth of storage of approximately 73mm would be required. This depth of water will be retained within the 300mm gravel surfacing layer and only local surface flooding would be expected in this area. It is noted that the general gradient of the lands falls towards the south east corner of catchment 7 and any flows across the boundary of upstream catchments will increase the storage demands in this area leading to potential surface flooding during a 100 year storm event.

It is noted that the above calculations are based on zero permeability. The actual surface of the car park however consists of permeable gravel surfacing which will result in very little change for the greenfield conditions.

5.5 Hydrology

The subject lands consist of approximately 16.9 hectares and are currently in use as a long stay car park serving Dublin Airport.

The lands are relatively flat with a level of approximately 56m to 59m OD Malin Head. The natural fall of the lands is quite gentle, and falls from the west to south east. The lands are in the catchment of the Mayne River as illustrated in Figure 3.

The Mayne River catchment has two sub-catchments, namely the Mayne Stream and the Cuckoo Stream sub-catchments. The site drains naturally to the Mayne Stream via storm water field drainage ditches, which form the boundary of the site. The Mayne Stream and the Cuckoo Stream merge at Balgriffin to form the Mayne River water course.

Figure 3 | *Mayne River Catchment Area and Surrounding Catchments*

The main ditches are those on the northern and southern boundaries of the site and both of these ditches extend eastwards from the subject lands and discharge into the Mayne River water course which flows east along the boundary between Fingal County Council and Dublin City Council to discharge to the Irish Sea at Baldoyle.

Fingal County Council Drainage Division previously requested that an old local ditch which was culverted with a 1050mm pipe during the construction of the carpark be reopened. This was most recently discussed with Fingal County Council on 23 May 2018 and the following was noted:

1. The previous ditch served only as a local ditch and did not convey surface water from upstream ditches or lands. The only land it drained was the northern half of the car park (Phase 1 of the car park).
2. The main ditches which conveyed water along the car park bordered the north of the car park and the south of the car park as shown in Figure 3 and drawing 15-194-P020.
3. There are 3 no. road crossing points over the length of the culvert and as such the entire length of the culvert could not be reopened, it would have to re-open in 4 no. short sections and as such would not be practical or beneficial.
4. Reopening of the culvert with a 10m riparian corridor ether side would remove approximately 335 car spaces.

Further to the above, in May 2018 Fergus Finch of Fingal County Council Drainage Division confirmed he had no objection to the culvert remaining in place.

5.6 Hydrogeology

Subsoil conditions consist of firm light-brown sandy gravelly boulder clay which is typical of this area of north Dublin.

Percolation tests have been carried out by Irish Geotechnical Services Ltd. on these lands and the results of these tests indicate that the subsoil is a very low permeability.

The National Draft Aquifer Bedrock Map prepared by the Geological Survey of Ireland was consulted and it was established that the majority of the site is within the designation Pi which represents a poor aquifer which is generally unproductive while the south east corner of Phase 2 is within the designation Li which represents locally important moderately productive aquifer.

5.7 Existing on Site Surface Water Drainage System

The existing car park in these subject lands was originally constructed in 2 phases, with Phase 1 on the northern section of the existing car park having been in operation for approximately 17 years and Phase 2 on the southern part of the site having been in operation for almost 12 years.

The entire car park site has been designed to retain storm water during storm events with an impermeable berm having been constructed on the perimeter of the site. This controls the storm water runoff from the site to specific discharge points where flow controls and petrol interceptors are used to control the flow and quality of the storm water discharges.

The excess storm water is stored on site for the duration of the storm and is discharged to the existing watercourses over an extended period of time at a controlled rate. The required flow restriction is achieved by means of Hydrobrakes installed at the outfall manholes.

Figure 4 | *Extract of National Draft Aquifer Bedrock Map (GSI)*

The car park was constructed using permeable gravel surfacing on a layer of geotextile in order to replicate the original greenfield conditions. The permeable gravel surfacing also provides storage capacity for the retained surface water in storm conditions and acts as a filter to improve the quality of water being discharged to the existing ditches.

In addition, silt traps and Class 1 light liquid separators were provided at each outfall as part of the site development works.

The car park which was developed was designed in compliance with the Greater Dublin Strategic Drainage Study (GDSDS); Sustainable Urban Drainage Systems (SUDS) were implemented into this drainage scheme to improve the water quality of the surface water runoff and to limit the discharge rate to a volume equivalent to its greenfield runoff.

The existing surface water drainage network is shown on drawings 15-194-P021 to P024, included as part of this application.

5.8 Existing Car Park Construction Details

The car-parking areas and access roads are generally formed at-grade. The parking areas consist of permeable crushed stone in compliance with Clause 505 of the Department of the Environment Specification for Road Works, acting as a soakaway, with a blinding layer.

The bus route is surfaced with dense bitumen macadam and surface water from the bus route will drain from this road to the adjoining gravel surfacing percolating through the gravels.

5.9 Water Quality Testing

The car park drainage system has the potential to impact the quality of ground water and watercourses as a result of petrol, oil and other pollutant runoff from vehicles. This could have a detrimental effect on local ecology. As such, it is important to periodically investigate the quality of surface runoff, to ensure that the Sustainable Urban Drainage Systems in place are adequately treating surface water entering the surrounding watercourses.

There are 6 no. outfalls from the car park that discharge to the surrounding ditch network. Each outfall has been provided with a silt-trap manhole, petrol interceptor and hydrobrake manhole to minimise the runoff of hydrocarbons and limit the discharge rate to its natural Greenfield runoff rate.

Test samples were taken on the 24th of April 2018 and analysed for total petroleum hydrocarbons (TPH) – refer to Figure 5, below, which indicates the test sample locations.

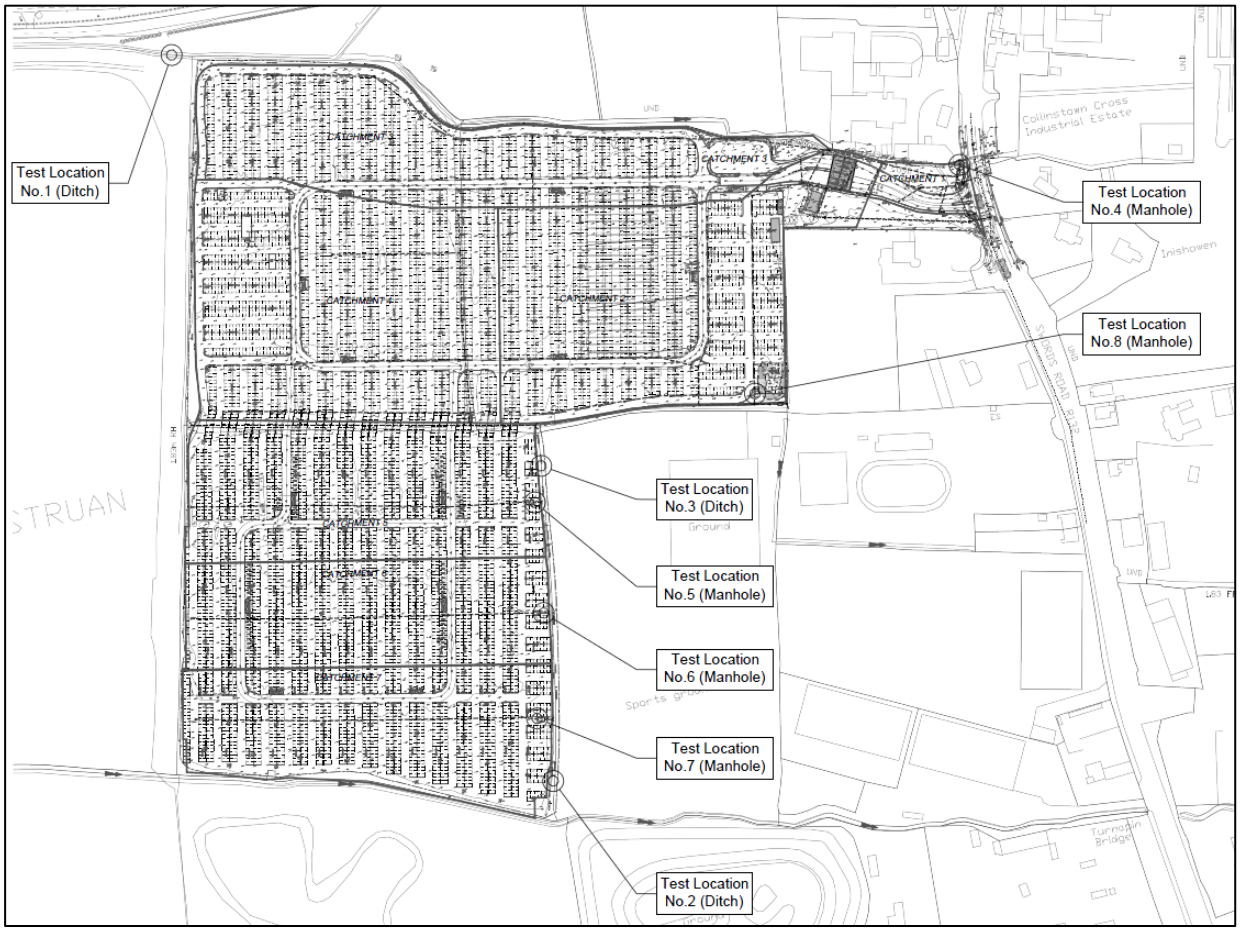


Figure 5 | *Test Sample Locations*

Hydrocarbon fuels are generally complex mixtures of compounds, including alkanes, alkenes and a range of aromatic compounds. Analysis of water samples for TPH measures the total concentration of all petroleum related hydrocarbons, expressing the results in terms of the concentration of hydrocarbon compounds within various carbon ranges. TPH are common site contaminants, but they are not generally regulated as hazardous wastes. Nonetheless, petroleum products must not form a visible film on the surface

of the water or form coatings on the beds of watercourses and lakes, and must not impart a detectable 'hydrocarbon' taste to fish or produce harmful effects in fish.

A limit value of 200µg/l is given in *S.I. No. 294/1989 - European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989* for dissolved or emulsified hydrocarbons (after extraction by petroleum ether). The World Health Organisation has set out a limit value for drinking water of 15,000µg/l for C6-C8 TPH and 300µg/l for C8-C16 TPH.

The test results are tabulated in Table 4, below, and are illustrated in Figure 6.

	>C6-C8 Total	**>C8-C10 Total**	**>C10-C12 Total**	**>C12-C16 Total**	**>C16-C21 Total**	**>C21-C40 Total**	**>C10-C40 Total EPH**	**C5-C10 Total GRO**
	µg/l	*µg/l*	*µg/l*	*µg/l*	*µg/l*	*µg/l*	*µg/l*	*µg/l*
Test Sample 1	<10	<5	<5	<10	<20	<20	<20	<5
Test Sample 2	<10	<5	<5	<10	<20	<20	<20	<5
Test Sample 3	<10	<5	<5	<10	<20	<20	<20	<5
Test Sample 4	<10	7	7	16	32	76	138	7
Test Sample 5	<10	<5	<5	<10	<20	<20	<20	<5
Test Sample 6	<10	<5	<5	49	153	32	234	<5
Test Sample 7	<10	<5	<5	<10	<20	<20	<20	<5
Test Sample 8	<10	<5	<5	18	44	98	160	<5

Table 4 *| 6 Split Total Petroleum Hydrocarbons Test Results*

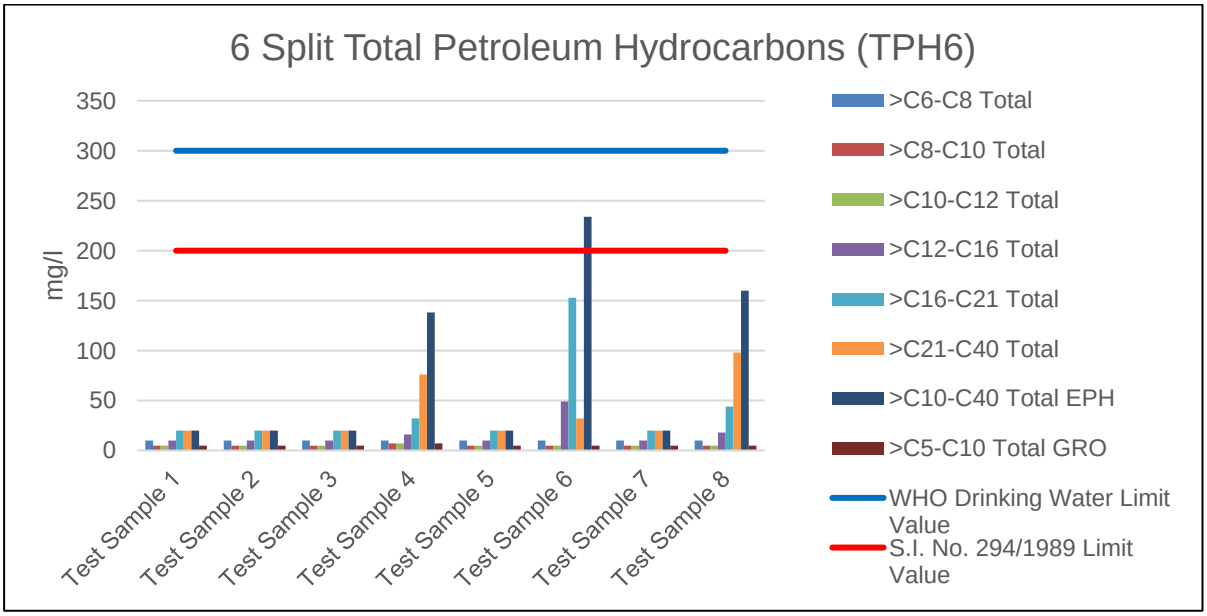


Figure 6 *| 6 Split Total Petroleum Hydrocarbons Test Results*

All of the samples fell below the drinking water limit values, with one sample from testing location 6 exceeding 200µg/l for C10-C40 Total EPH, as set out in the European Communities Regulations. Despite this slightly high result, there is no adverse effect to the surrounding water bodies as the downstream ditch was not affected. This is confirmed by the test results from test location 2, taken from the ditch immediately downstream of testing location 6. Results from within the ditch at test location 2 indicate that the TPHs are below the drinking water threshold limit. This indicates that the vegetation and dilution provided within the local ditch is further treating and breaking down hydrocarbons to below the drinking water threshold limit before discharging to the local watercourse (tributary of Mayne Stream).

Since the water samples were taken, the silt-trap manholes and petrol interceptors were cleaned out – refer to Appendix A. Petrol interceptors are to be inspected every six months as part of the Quickpark maintenance regime and a log should be maintained detailing the depth of oil found, any oil volume removed and any silt removal or cleaning carried out.

A full report on the water quality testing and results is included as an appendix to the water chapter of the Engineering Impact Assessment Report, which accompanies this report.

6. Flood Risk Assessment

6.1 Methodology

In order to assess the flood risks associated with this development a risk assessment based on the DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management published in November 2009, has been carried out.

The components to be considered in the identification and assessment of flood risk are as per Table A1 of the above guidelines.

- Tidal
- Fluvial
- Surface Water
- Ground Water
- Human/mechanical error

Each component will be investigated from a Source, Pathway and Receptor point of view, followed by an assessment of the likelihood of a flood occurring, and the possible consequences. From the consideration of the likelihoods and the possible consequences a risk is evaluated. Should the presence of such a risk exist, mitigation measures will be explored and a residual risk presented. Each of the above flood risk components are addressed below.

6.2 Tidal – Irish Sea

The Irish Sea is approximately 7 kilometres east of the subject site, which is at a level of between 56 and 59m OD Malin. The Dublin Coastal Protection Project indicated that the 2002 high tide event was a 5.46m tide (Chart Datum). When converted to OD Malin (-2,51m) this corresponds with a level of 2.95m OD Malin. The subject site is therefore located in excess of 50m above the highest tide recorded in the Dublin Coastal area and there is no risk of tidal flooding in this area.

6.3 Fluvial

The water courses in the area are indicated in Figure 3 of this report and on accompanying drawing 15-194-C020.

To the north of the subject lands there is a watercourse which drains the south airport lands and which is a tributary of the Mayne River. This water course is the subject of flash flooding at this location during periods of extreme weather conditions, and flooding along the north boundary of the site was recorded in August 2008 during an extreme storm event as a result of storm water runoff from the environs of Dublin Airport. Subsequent to this storm event it is understood that Fingal County Council have cleaned the culvert which accommodates this water course under the R132, Swords Road.

There is also a water course to the south of the site which drains agricultural lands to the west of the subject lands this ditch is a field ditch which is a tributary of the Mayne River.

The Office of Public Works (OPW) records for predictive and historic flood maps and benefiting maps have been consulted with regards to any recorded flood events in the vicinity of these lands. This review confirmed that the only history of flooding in the vicinity of these lands was at the Swords Road as noted above.

The Fingal East Meath Flood Risk Assessment and Management Study (FEM FRAM) for the Mayne River has been consulted and no flooding even in extreme conditions (1/1000 year event) is forecast within the

site boundary. This is likewise in the most recent flood maps from Fingal Development Plan, Strategic Flood Risk Assessment Maps, as provided in Appendix B.

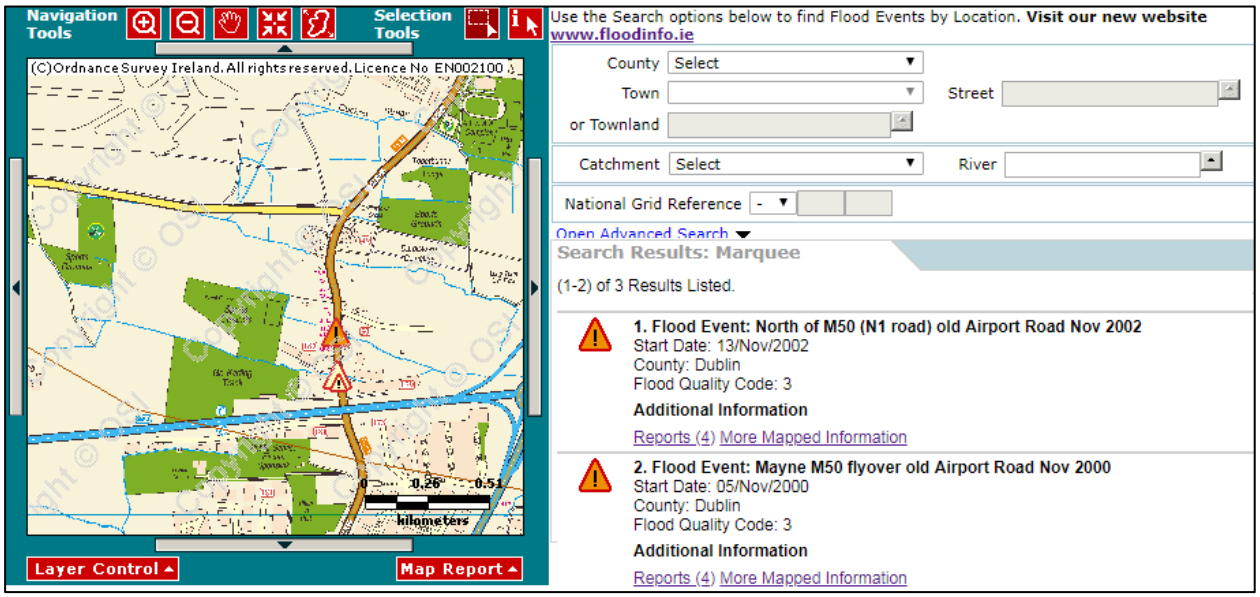


***Figure 7** | Extract of OPW Flood Records Map*

There is a residual risk of some potential flooding from the watercourse to the north of the development lands due to excessive run off from the airport environs during extreme conditions. However this risk is low and flood water can be accommodate.

6.4 Surface Water

The development lands generally fall from the north down to the south east (towards the ditches noted above).

Storm water falling on the subject lands are retained within the lands by perimeter berms for rainfall events up to the 1 in 100 year return and discharged to the existing ditch system via flow restriction devices which control the runoff to greenfield levels.

Due to the restricted runoff from the subject lands there is a risk that surface water accumulating within the site will result in minor local surface flooding within the low points of the site during extreme storm events. Please see also Section 5.0 of this report where storage of surface water is reviewed.

6.5 Ground Water

The subject lands are located on higher ground at a level of between 56m and 59m OD Malin. The lands fall away towards the south east. Trial holes were excavated throughout the site to establish the level of the ground waters in the area. These trial holes confirmed that the ground water is generally at least 1.6m below original ground level (please refer to the site investigation carried out by Moylan on 23 and 28 March 2011).

There is no known history of springs in the area.

The likelihood of ground water flooding for the subject lands is very remote.

6.6 Human/Mechanical Errors

The subject site will be drained to existing ditches via petrol interceptors and hydrobrake flow controls. There is a risk of these flow controls becoming blocked resulting in a restriction of the discharges from the site during a major storm event. Maintenance of these manholes every 6 months minimises the risk of blockages and flooding.

In the event of the outfalls from the site blocking due to lack of maintenance surcharge water will be stored on site during the storm event increasing the depth of the retained waters on the site.

7. Watermain

The proposed infrastructure includes the existing water supply network that serves the control building and adjacent fire hydrants.

It is proposed to install a section of 100mm diameter watermain to the existing 100mm main that runs adjacent to the entrance road, connecting to the existing 150mm trunk watermain running along the R132 Swords Road.

The existing and proposed water network and car park layout is shown on drawing 15-194-P030.

Appendix A: Letter from McBreen Environmental

To whom it may concern.

I can confirm that McBreen Environmental serviced 6 no interceptor @ Quickpark Dublin on the 05/09/2018.

The interceptors were in good condition and had only very small traces of oil which was skimmed off all 6 interceptors and all interceptors are in good working order. The outfall line was washed and the waste was removed to licensed disposal facility for destruction.

Please see below pictures and job report.

Lismagratty, Cootehill Road, Cavan, Co Cavan
Lo-Call: 1890 66 33 33 | **Fax:** 049 438 00 39
Email: info@mcbreenenvironmental.ie
Web: www.mcbreenenvironmental.ie
Company Reg. No. 432184 | **VAT Reg. No.** IE9643687H

Lismagratty, Cootehill Road, Cavan, Co Cavan
Lo-Call: 1890 66 33 33 | **Fax:** 049 438 00 39
Email: info@mcbreenenvironmental.ie
Web: www.mcbreenenvironmental.ie
Company Reg. No. 432184 | **VAT Reg. No.** IE9643687H

McBreen Environmental

Drain Jetting Job Report

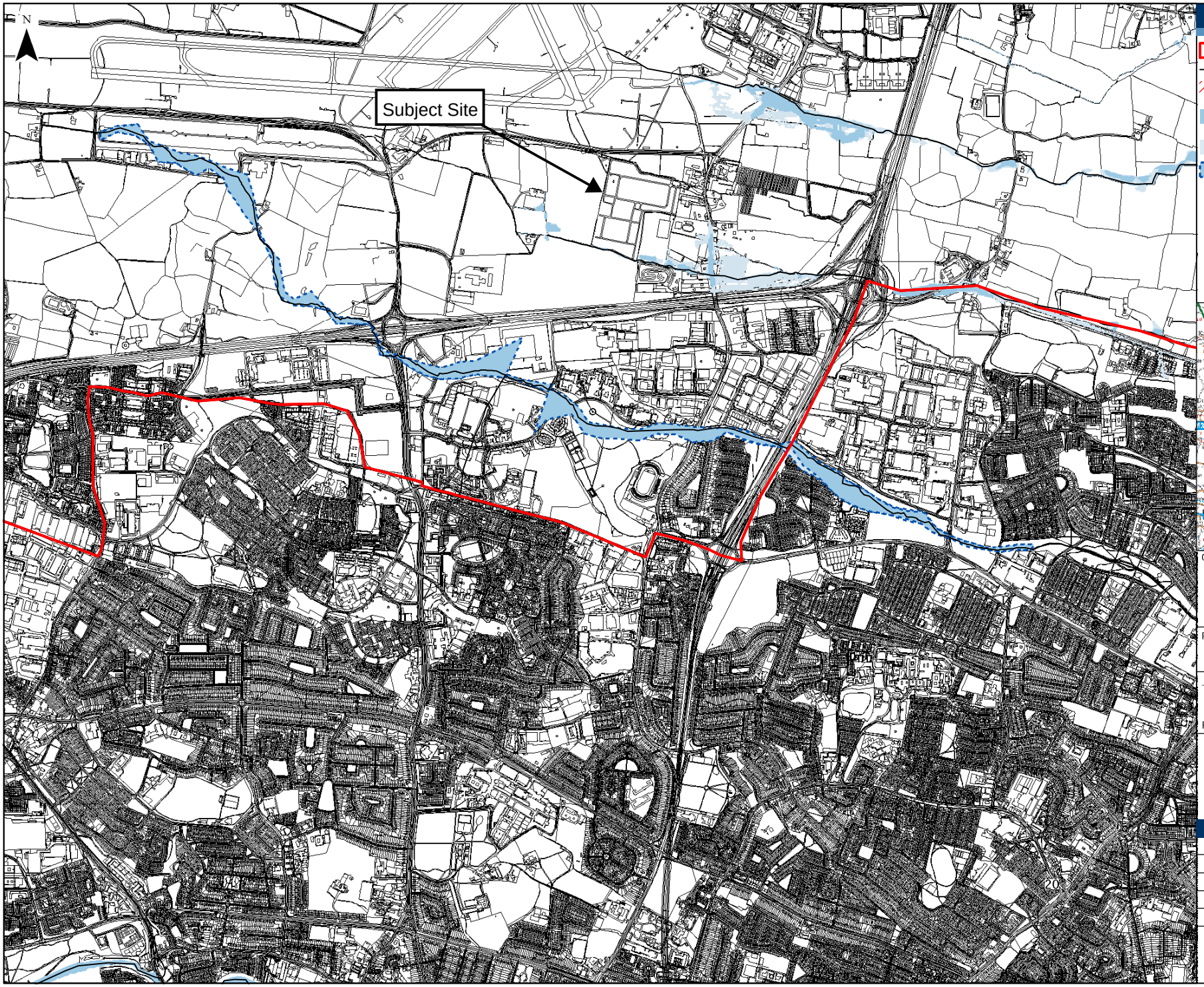
McBreen Environmental Drain Services Ltd
Lismagratty, Cootehill Road, Co Cavan
Tel: 1890 66 33 33
Email: info@mcbreenenvironmental.ie
VAT No. IE9643687H
Permit No. NWCPO-14-11283-01

Customer Details	
Company Name: Liffey Developments	Site Contact & Phone No. Pete Waters - 086 8386979
Company Address:	Site Address: Dublin AirportLong term Parking
Job Details	
Job Name: 6 Interceptors to be skimmed Quickpark DAA	McBreen Environmental employees on site: Stephen Fannin, Pete Waters
Job ID: 122-41076	
Description of work carried out: skimmed of 6 interceptor in long term car park, Removed waste to enva Dublin for disposal,All interceptors are in good condition and only had very small traces of oil. jetting outlet to drain	McBreen Environmental Vehicles on site: 171CN999
Job Start Time 2018-09-05 11:08:42	Job End Time 2018-09-05 13:53:42
Work fully complete this visit?	Recommendation to Client:
If not reason work incomplete:	
Have all covers/lids been safely put back in place?	Yes
Details	
Waste Quantity Removed/Tankered?	Metres Washed:
EWC Code:	Oil from oil/water interceptors (13.05.06*)
Waste Destination:	Enva Dublin (W0196-01)

Customer Signature :

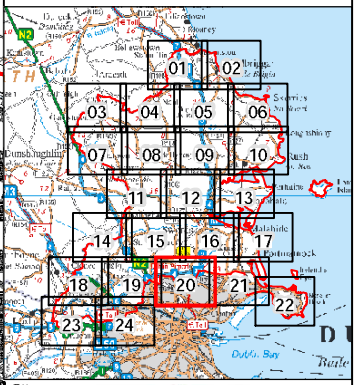
Driver Signature:

Appendix B: Fingal Development Plan, Strategic Flood Risk Assessment Maps



Legend

- Fingal County Boundary
- Watercourse Centreline
- Defended Area
- Flood Zone A - 1% AEP Flood Extent (1 in 100 chance in any given year)
- Flood Zone B - 1% AEP Flood Extent (1 in 1000 chance in any given year)
- Indicative Flood Extents



Client

Comhairle Contae Fhine Gall
Fingal County Council

Project
Strategic Flood Risk Assessment

Title
Fluvial Flood Zone Mapping

Figure
Map 20 of 24

RPS
West Pier Business Campus,
Dun Laoghaire,
Co Dublin,
Ireland.

Tel: +353 (0) 1 4882900
Fax: +353 (0) 1 2835676
Email: ireland@rpsgroup.com
Web Page: rpsgroup.com/ireland

Issue Details

Drawn By: HF	Project No. MDW0716
Checked By: BT	File Ref: MDW0716arc0001D02
Approved By: SK	
Scale: 1:20,000 @ A3	Drawing No. Rev:
Date: 02/12/2015	Arc0001 D01

UK and Ireland Office Locations