Greater Dublin Drainage

Alternative Sites Assessment and Route Selection Report (Phase 2):
Emerging Preferred Sites and Routes

Volume 1

May 2012

Executive Summary

Fingal County Council on behalf of Meath, Kildare, Dun Laoghaire / Rathdown and South Dublin County Councils and Dublin City Council, has engaged consultants to complete the planning phase of the Greater Dublin Drainage project. The key objectives of the project are to safely deliver through the entire planning process a:

- Regional Wastewater Treatment Plant (WwTP) and associated marine outfall located at a site, to be selected as part of this process, in the northern part of the Greater Dublin Area (GDA), and
- an Orbital Drainage System linking the Regional WwTP to the existing regional sewer network and to provide for future connections for identified developing areas within the catchment

This report details Phase 2 of the Alternative Sites Assessment (ASA) and Route Selection which identifies the emerging preferred sites and routes to be considered in further detail before the final identification of the preferred site and routes. The objectives of the ASA and Route Selection are to identify:

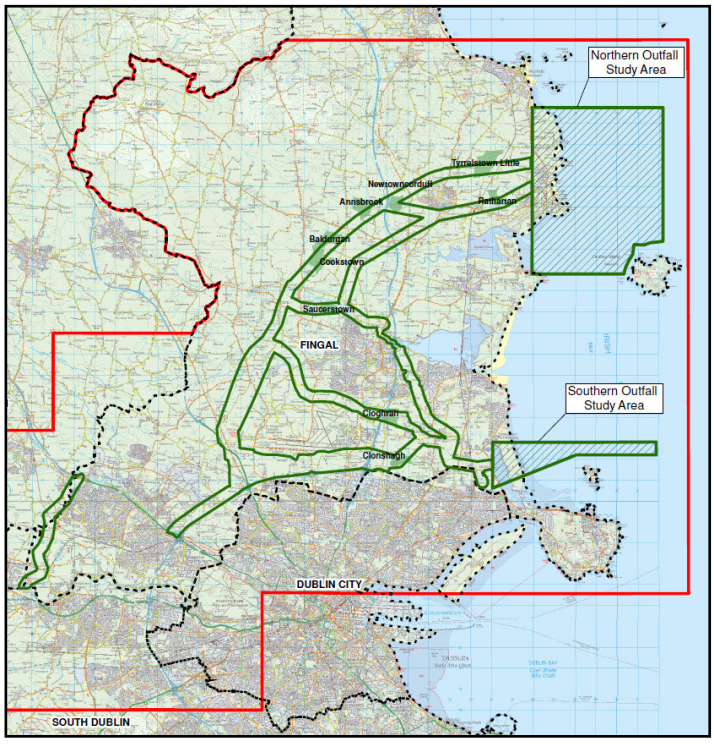
- The best location for the proposed Regional WwTP in North County Dublin;
- The best location for the treated effluent discharge to the Irish Sea including the route of the outfall pipeline connection to the WwTP; and
- The best routes for the Orbital Drainage System connecting existing drainage networks to the proposed Regional WwTP, including trunk/branch sewer connections, and any necessary pumping stations.

The ASA is a four phase qualitative process which has regard to the recommendations of the Strategic Environmental Assessment (SEA) on the Greater Dublin Strategic Drainage Study (GDSDS).

ASA Phase 1

During Phase 1 of the ASA a preliminary screening of the study area was undertaken to identify a short list of potential alternative land parcels of suitable size to accommodate the proposed Regional WWTP and also to identify marine outfall locations and potential transfer pipeline corridors. On completion of Phase 1 nine land parcels with associated pipeline corridors and marine outfall locations (Fig. 1) were shortlisted to be brought forward to Phase 2 of the assessment, as follows:

- Annsbrook
- Baldurgan
- Clonshagh
- Cookstown
- Cloghran
- Newtowncorduff
- Rathartan



- Saucerstown
- Tyrrelstown Little

Full details of Phase 1 of the ASA is available in the ASA Phase One – Preliminary Outcomes Report (October 2011).

ASA Phase 2

In Phase 2 each of the nine shortlisted land parcels and associated pipeline corridors and marine outfall locations (henceforth called land parcel options) identified in Phase 1 were taken through an eight week period of public consultation during which a significant number of submissions were received. The key issues and concerns raised were considered by the environmental and technical specialists during the assessment process.

In parallel with the public consultation each of the land parcel options were assessed by environmental and technical specialists against a range of environmental and technical criteria (Table 1). The assessment process involved eight distinct steps.

Environmental Criteria	Technical Criteria
Ecology	Safety
Cultural Heritage	Planning Policy
Landscape and Visual	Engineering and Design
Hydrology and Hydrogeology	Capital and Operational Costs
Soils and Geology	Sustainability
Traffic	
Air Quality and Odour	
Agronomy and Agriculture	
Noise and Vibration	
People and Communities	

Table 1 – Environmental and technical assessment criteria

Each of the land parcel options were independently assessed by the environmental and technical specialists using desktop studies, visual inspections and consideration of issues raised by the general public. Each specialist identified a number of sub-criteria across each of the land parcel options within their specialisation by which the assessments were undertaken and the level of associated impact identified and recorded in a matrix.

These assessments allowed the determination of the optimum location for the 20Ha site within each of the land parcels, and a refinement of the associated pipeline corridors and marine outfall locations (henceforth called site options). The assessment process then focused on these site options.

The individual specialist matrices were combined into one overall assessment matrix which listed all of the agreed sub-criteria against all of the 9 site options and included the level of impact determined by each of the specialists for each of the sub-criteria.

In a workshop forum the overall assessment matrix was evaluated by the project consultants, with input from the environmental and technical specialists, through an iterative process. This process sought to identify those sub-criteria considered to have the most impact when compared to other sub-criteria within a particular specialisation and then identified which site option had the most impact across that sub-criterion.

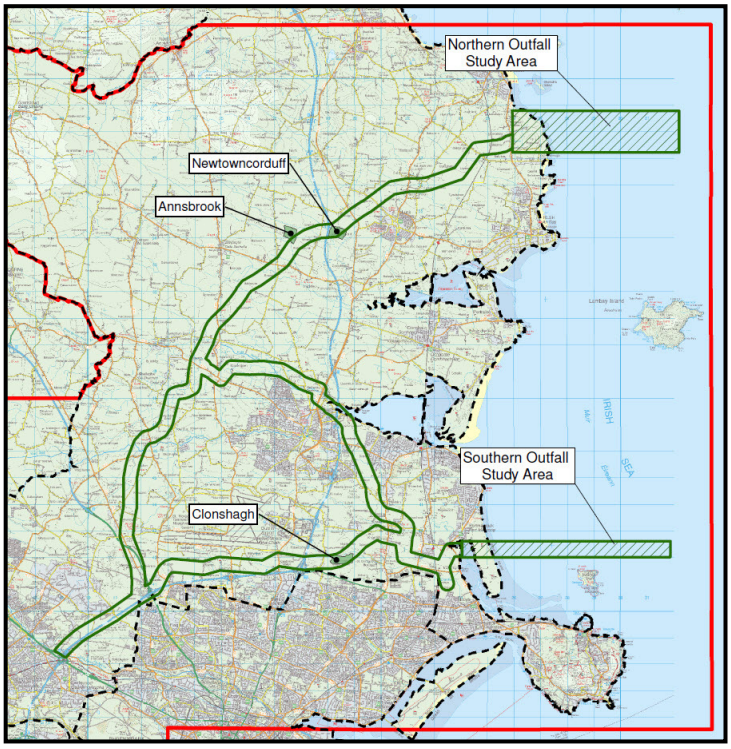
These iterations identified least favourable impacts within the criteria in order of decreasing importance. After each iteration the overall matrix was reviewed to determine whether there were any site options which could be removed, by consensus agreement, from further consideration as a result of the combined impacts associated with it and the range of available choices of other site options with less associated impacts.

In this manner site options, which were deemed by consensus agreement to be less favourable than others, were iteratively removed from further consideration as follows:

Saucerstown was the first site option to be removed from further consideration on the basis of the impacts associated with it which were identified at an early stage in the iterative process.

The *Tyrrellstown Little* site option was removed from further consideration on the next iteration.

The *Rathartan* and *Cloghran* site options were then removed from further consideration on the next iteration.
On the last iteration, it was determined that the least favourable classifications assigned to the *Cookstown* and *Baldurgan* site options result in these options being slightly less favourable then the remaining site options and therefore these should be removed from further consideration.



Therefore, the remaining site options of **Annsbrook, Clonshagh and Newtowncorduff** have been identified from Phase 2 of the Alternative Sites Assessment as the three emerging preferred site options.

ASA Phase 3

Phase 3, public consultation, is scheduled for commencement on 14 May and will run for eight weeks. The aim of this consultation will be to gather public opinion and additional knowledge on the emerging preferred site options.

ASA Phase 4

Following this, Phase 4 will commence and will consist of the following:

- Assessment of submissions received and issues raised as part of the public consultation;
- Further site specific assessment to gain further levels of knowledge on the emerging preferred site options;

- Economic assessment; and
- Consideration of potential mitigation measures on the emerging preferred site options where necessary.

The aim of this phase will be to identify the preferred site option.

Details of Phases 3 and 4 will be provided in the Alternative Sites Assessment and Routes Selection Report (Phases 2, 3 and 4): Preferred Site and Routes Report scheduled for publication in late 2012. Phase 3 involves the public consultation to be undertaken following publication of this report and Phase 4 involves the further assessment of the emerging preferred site options and identification of the preferred site.

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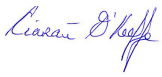
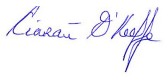
DATE **May 2012**	SIGNATURE 	SIGNATURE 	SIGNATURE 	SIGNATURE 
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List of Acronyms

ABP	An Bord Pleanála
ASA	Alternative Sites Assessment
ASP	Activated Sludge Plant
BAFF	Biological aerated flooded filter
BAP	Biodiversity Action Plan
BIM	Bord Iascaigh Mhara
BOD	Biochemical Oxygen Demand
CAPEX	Capital Expenditure
COD	Chemical Oxygen Demand
DAA	Dublin Airport Authority
DCC	Dublin City Council
DLRCC	Dub Laoghaire Rathdown County Council
DoECLG	Department of the Environment, Community and Local Government
DRA	Dublin Regional Authority
EIS	Environmental Impact Statement
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ERBD	Eastern River Basin District
FCC	Fingal County Council
FEM FRAMS	Fingal East Meath Flood Risk Assessment and Management Study
FSAI	Food Safety Authority of Ireland
GDA	Greater Dublin Area
GDD	Greater Dublin Drainage
GDSDS	Greater Dublin Strategic Drainage Study
GSI	Geological Survey of Ireland
HSL	High Sensitivity Landscape
IAA	Irish Aviation Authority
IFAS	Integrated Fixed film Activated Sludge
IFI	Inland Fisheries Ireland
KCC	Kildare County Council
MBR	Membrane Bioreactor
MCC	Meath County Council
NPWS	National Parks and Wildlife Service
NRA	National Roads Authority

OD	Ordnance Datum
OPEX	Operational Expenditure
OPW	Office of Public Works
PE	Population Equivalent
pNHA	proposed National Heritage Area
RMP	Record of Monuments and Places
RPG	Regional Planning Guidelines
SAC	Special Area of Conservation
SBR	Sequencing Batch Reactors
SDCC	South Dublin County Council
SEA	Strategic Environmental Assessment
SFPA	Sea Fisheries Protection Authority
SPA	Special Protection Area
TSS	Total Suspended Solids
WwTP	Wastewater Treatment Plant

1 Introduction

1.1 Introduction

The official name of the project is *Greater Dublin Drainage – Regional Wastewater Treatment Plant, Marine Outfall & Orbital Drainage System*

1.2 Client

The Client is Fingal County Council (FCC) as the Contracting Authority on behalf of Meath, Kildare, Dun Laoghaire / Rathdown and South Dublin County Councils and Dublin City Council.

1.3 Project Engineering Consultant

Following a competitive tender process Jacobs Engineering Ireland Ltd. supported by TOBIN Consulting Engineers was appointed to act as Project Engineering Consultant on this project with formal signing of Contract on the 14th March 2011.

1.4 Project Communications Consultant

Following a competitive tender process RPS Project Communications was appointed by FCC to act as Project Communications Consultant on this project.

1.5 Project Stages

The Project is divided into a number of stages as follows:

- Sub-stage (a): Project Inception
- Sub-stage (b): Alternative WwTP Site Assessment (ASA) / Pipeline and Marine Outfall Route Selection Report
- Sub-stage (c): Preliminary Report (PR)
- Sub-stage (d): Environmental Impact Statement (EIS)
- Sub-stage (e): Wayleave / Land Acquisition
- Sub-stage (f): Additional Reports
- Sub-stage (g): Planning Process
- Sub-stage (h): Any Other Work

1.6 Objectives

1.6.1 Objectives of overall Scheme

The core requirement of the Greater Dublin Drainage project is to safely deliver through the entire planning process a:

- Regional Wastewater Treatment Plant (WwTP) and associated marine outfall located at a site, to be selected as part of this process, in the northern part of the Greater Dublin Area (GDA), and

- an Orbital Drainage System linking the Regional WwTP to the existing regional sewer network and to provide for future connections for identified developing areas within the catchment.

1.6.2 Objectives of the ASA Stage and ASA Report

The objectives of the Alternative Sites Assessment (ASA), Pipeline & Marine Outfall Route Selection sub-stage are to identify the following:

- The optimum location for the proposed Regional WwTP in North County Dublin;
- The optimum location for the treated effluent discharge to the Irish Sea including the route of the outfall pipeline connection to the WwTP; and
- The optimum routes of the Orbital Drainage System connecting existing drainage networks to the proposed Regional WwTP, including trunk/branch sewer connections, and any necessary pumping stations.

The purpose of this Phase 2 – Alternative Sites Assessment and Route Selection is to assess the short listed potential alternative land parcels, marine outfall locations and transfer pipeline corridors identified in the *ASA Phase One – Preliminary Screening Outcomes Report* against a range of environmental and technical criteria. This process will result in emerging preferred sites, marine outfall locations and transfer pipeline corridors following which additional assessments and studies in addition to public consultation will be undertaken in order to identify the preferred site, transfer pipeline routes and marine outfall location.

1.6.3 ASA Process

The selection of the optimum location and transfer pipeline routes has entailed an assessment of the means to minimise potential adverse environmental impacts and to optimise environmental benefits.

The ASA/Route Selection was undertaken having regard to the recommendations set out in the Strategic Environmental Assessment (SEA) on the GDSDS, which envisaged a process comprising four distinct phases, as outlined in the Methodology Flowchart, Figure 3.1:

Phase 1 - Alternative Sites Identification (Preliminary Screening)

This phase involved the identification of a number of land parcels of suitable size for the regional WwTP site, orbital pipeline corridors and marine outfall study areas. The Phase 1 - Alternative Sites Identification included Public Consultation, desktop studies, mapping of constraints and a screening of the study area. Full details of this phase are provided in the *ASA Phase One – Preliminary Screening Outcomes Report* which was published in October 2011. This report recommended that nine land parcels, associated potential pipeline corridors and marine outfall study areas be brought forward for further consideration against a range of technical and environmental criteria under Phase 2 of the ASA.

Phase 2 - Alternative Sites Assessment

Phase 2 is the basis of this *Alternative Sites Assessment and Route Selection Report (Phase 2)*. It consists of an assessment of the performance of each of the nine alternative land parcels, transfer pipeline routes and marine outfalls shortlisted in Phase 1 against a range of environmental and technical criteria leading to the identification of three emerging preferred sites for the regional WwTP, marine outfall

location and transfer pipeline routes. The Alternative Sites Assessment (ASA) includes Public Consultation on the nine short listed land parcels, pipeline corridors and marine outfall study areas, desk-top studies, windshield surveys, site visits and impact assessments by the project consultants including various engineering and environmental specialists. It also included consideration of issues and concerns identified during the consultation period.

Phase 3: - Consultation stage

Following completion of Phase 2, details of the three emerging preferred sites, orbital pipeline corridors and marine outfall locations will be brought to formal, non-statutory consultation. A primary objective of this phase will be to gather any additional information on the three emerging preferred sites, orbital drainage corridors and marine outfall locations. This consultation period will commence on the 14 May 2012, will run for eight weeks and will include public open days.

Phase 4: - Selection of the Preferred Site, Pipeline Routes and Outfall Location

This phase constitutes the final identification of the preferred site, orbital pipeline routes and marine outfall location and will be based on consideration of the submissions received during the consultation period and findings of additional assessments and studies to be undertaken on the three emerging preferred site options identified in Phase 2.

1.7 Terminology and Descriptions

In order to ensure clarity on the terminology used in this report, the following definitions are provided:

- *Land Parcel* - Suitable area of land within which an approximately 20Ha site for the proposed Regional WwTP could be located.
- *Site* – An approximately 20Ha area of land, within a land parcel, on which the proposed Regional WwTP could be located.
- *Orbital Pipeline Corridors* – Corridors within which the pipelines from the load centres to the Regional WwTP and from the Regional WwTP to the North Dublin coast can be routed.
- *Orbital Pipeline Routes* – Routes of the pipelines, within the orbital pipeline corridors, from the load centres to the Regional WwTP and from the Regional WwTP to the North Dublin coast.
- *Marine Outfall Location* – The specific location within the marine environment where the treated effluent will discharge from the pipeline.
- *Marine Outfall Pipeline* – Pipeline from the North Dublin coast which will transfer the treated effluent to the marine outfall location.

The land parcels, or indeed, their associated sites cannot be considered in isolation from the orbital drainage network or the marine outfall locations, therefore the following terminology is used throughout this report with descriptions as provided:

- *Land Parcel Option* - A specific land parcel, its associated orbital pipeline corridors from the load centres to the WwTP, pipeline corridors from the WwTP to the coast, marine pipeline corridors and marine outfall location.

- *Site Option* - A site of approximately 20 Ha, its associated orbital pipeline corridors from the load centres to the WwTP, pipeline corridors from the WwTP to the coast, marine pipeline corridor and marine outfall location.

1.8 Outline of Report

Chapter 2 of this report provides outline details of the proposed scheme including the WwTP, pipelines and marine outfall. The chapter also includes a brief summary of the work completed to date on the assessment of the required treatment capacity as a result of changes in the economic climate since the completion of the GDSDS and its associated SEA.

Chapter 3 provides an outline of the methodologies used in Phase 1 to identify the short listed land parcel options and in this current Phase 2 which used the outcomes of the individual technical and environmental assessments to identify the emerging preferred sites. Full details of both the methodology used and the outcomes of Phase 1 are provided in the *ASA Phase One – Preliminary Screening Outcomes Report*. In addition, full details of the methodology used in this Phase 2 are provided in the ASA Methodology Report which is provided in Appendix 1 of this report.

Chapter 4 includes outline details of the consultations undertaken with statutory bodies and interested parties to date, which helped inform the ASA. In addition, reference is made to the public consultation period held following publication of the *ASA Phase One – Preliminary Screening Outcomes Report* and the issues raised. Further details of which are provided in the Consultation Response included in Appendix 2 of this report.

Chapter 5 provides details of the identification of the best site for the regional WwTP within each of the land parcels. This determination was based on input from the relevant technical and environmental specialists.

Chapter 6 provides a brief summary of the constraints and potential impacts associated with each site option based on the assessments undertaken by each of the technical and environmental specialists. This chapter is intended to provide a brief outline only. For full details of each of the assessments reference should be made to the individual specialist reports included as Appendices to this report. Furthermore it should be noted that the full outcomes of each of these assessments were used in the ASA process.

Chapter 7 provides full details of the process by which the emerging preferred site options were identified, following the methodology outlined in Chapter 3 and detailed in full in Appendix 1 of this report. Details of how the outcomes of the relevant assessments were used to identify differentiating criteria across the site options, which led to the identification of the emerging preferred site options, are provided.

Finally *Chapter 8* provides an outline of the additional steps required, which include further public consultation and additional assessments, in order to identify the preferred site option.

1.9 Need for the Scheme

The need for additional and alternative wastewater treatment within the Greater Dublin Area has been identified in a number of planning documents published by various bodies including the Local Authorities within the area. However, it was considered prudent, in light of significant changes to the economic landscape within the region in recent years, to review the data used to determine the extent of treatment capacity

required for the region in the future. The need for additional capacity within the region will still be necessary in the relatively near future and as such the objectives and recommendations within such documents still hold true and are outlined below. Details of the treatment capacity review are included in Chapter 2 of this report.

The *Greater Dublin Strategic Drainage Study (GDSDS) (Dublin Drainage Consortium)* was commissioned as a result of the broadening gap between developing effluent load in the GDA and the maximum load, which can be delivered to, and treated at, the existing treatment plants in the catchment, and primarily at Ringsend WwTP. In order to address this, the GDSDS Final Strategy Report, 2005 recommended the construction of a large WwTP (850,000 pe) in North County Dublin and an Orbital Drainage Network to divert either in full or in part some existing foul drainage catchments to this new WwTP.

The subsequent *Strategic Environmental Assessment (SEA) of the GDSDS (Mott MacDonald Pettit Limited in association with ERM Limited; 2008)* endorsed the fundamental concept and scale, but cautioned that site selection needed to take place in a process of rigorous appraisal of alternatives.

The *Forfás Report: Assessment of Water and Waste Water Services for Enterprise*, September 2008, identifies the need for priority investment in future wastewater provision in the key development centres to ensure these locations (and therefore Ireland as a whole) has the capability to meet the future water and waste water capacity needs to ensure future enterprise development. The GDA is identified as one of the key development centres.

The *draft Dublin Region Water Services Strategic Plan 2009* recognises '*that there is a need for a new Wastewater Treatment Plant (WwTP) and outfall to serve the expanding environs of the Dublin Metropolitan area.*' It further states that *'The provision of this new treatment facility, outfall and associated collector network will be essential if new development is to be facilitated in the Dublin Region*'.

The *Water Services Investment Programme 2010 – 2012 (Department of the Environment Community & Local Government)* identifies the need '*for investment in wastewater infrastructure over the coming years' both to facilitate growth and 'to ensure compliance with the Water Framework Directive'*. The programme specifically identified the GDRDP (now GDD): North Dublin Treatment Plant within the list of schemes currently at planning stages

The *Regional Planning Guidelines for the Greater Dublin Area 2010 – 2022 (Regional Planning Guidelines Office; 2010)*, clearly highlight that provision of adequate wastewater treatment capacity is becoming a critical issue within the GDA. The Guidelines identify strategic recommendation PIR17 as the *'Identification and development of a suitable site for the Greater Dublin Regional Drainage Project- Regional Waste Water Treatment Plant, Marine Outfall and Orbital Drainage System……*' Further strategic policy and recommendations reinforcing this recommendation are also included within the guidelines.

The current *Development Plans* for the relevant local authorities (Fingal, Dublin City, South Dublin, Dun Laoghaire Rathdown, Kildare and Meath) all reference the GDSDS. Furthermore, they all identify the need for appropriate and sufficient capacity in the public wastewater treatment plants to facilitate development.

Specifically, the Fingal Development Plan identifies development objectives (WT03) to '*facilitate the implementation of the Greater Dublin Regional Drainage Project*' and

(WT11) to '*provide for the schemes listed in Table WT01 – Foul Drainage and Wastewater Schemes', which includes for the Greater Dublin Regional Drainage Project. T*he Dublin City Development Plan identifies a policy objective '*to support the development of the Greater Dublin Regional Wastewater Treatment Plant, Marine Outfall and Orbital Sewer to be located in the northern part of the Greater Dublin Area to serve the Dublin Region as part of the Greater Dublin Strategic Drainage Strategy*'.

2 Project Description

2.1 Definition of Study Area

The study area has been determined with reference to the Greater Dublin Strategic Drainage Study (GDSDS) and the subsequent Strategic Environmental Assessment (SEA).

A key recommendation of the GDSDS Final Strategy as amended by its SEA was for a single regional wastewater treatment plant (WwTP) to be located in North County Dublin with the treated effluent to be discharged to the marine environment of the Irish Sea.

The GDSDS also made recommendations on the existing foul drainage catchments that should be diverted, either in full or in part, to the proposed regional WwTP.

These recommendations informed the initial selection of the study area, which included North County Dublin, the foul drainage catchments of Blanchardstown, the north city area (Finglas to Howth), the Lucan/Clondalkin foul drainage catchment in South County Dublin, the drainage catchment of Leixlip WwTP, and the County Meath towns of Ashbourne, Ratoath, Kilbride, Dunboyne, and Clonee.

The Study Area was then refined to omit the area north of Balbriggan following consideration of the topography in this area of north County Dublin, the location and extent of the Balbriggan/Skerries Shellfish Waters and the constraints imposed by locating a new marine outfall within these designated waters.

The study area is shown in Figure 1 included in Appendix 17.

2.2 Wastewater Treatment Plant (WwTP)

2.2.1 Capacity of the Regional WwTP

The treatment capacity needs for the GDA identified in the GDSDS were predicated on population projections based on the 2002 Census, with industry and commercial effluent data built up from considerations of sub-catchment planning potential. However in the intervening time since publication in March 2003 of the *GDSDS Population & Landuse Report*, there was a period of significant inward migration post 2004 following the expansion of the EU but in more recent years a shrinking of the national economy with associated reductions in industry and commercial loads together with outward migration.

It was therefore deemed prudent to undertake a review of the load projections by the GDSDS to identify the treatment capacity required to facilitate continued growth within the Greater Dublin Area.

In particular, the release of preliminary results from Census 2011 and the December 2010 update of the Regional Planning Guidelines (RPG) for the GDA, presented an ideal opportunity to confirm existing population and non-domestic loads on the various wastewater treatment plants in the GDA. It also permitted a re-examination of the population and non-domestic growth rates in the GDA, up to and beyond the redefined design year horizon of 2040 for the Greater Dublin Drainage project, with particular emphasis on the catchment contributing to Ringsend WwTP. It should be noted that the

GDSDS originally identified a design year horizon of 2031 for the proposed Regional WwTP; however the design year horizon has been redefined as 2040 based on the current proposals for the GDD project.

The determination of the required treatment capacity for the proposed Regional WwTP is closely linked to the capacity of the existing plant at Ringsend (currently operating on a regional basis) and the requirement to divert load away from this plant when the ceiling on treatment capacity is reached at Ringsend. Therefore, the required treatment capacity at the Regional WwTP has been determined in the context of the firm treatment capacity of 2.1 million PE to be provided at Ringsend WwTP.

Critical drainage catchments in the GDA, which have an influence on the required treatment capacities of both the upgraded Ringsend WwTP and the proposed Regional WwTP, are those which are located in the northern and western environs of the existing catchment of Ringsend WwTP. These catchments are indicated in Figure 4 included in Appendix 17 and comprise;

- The existing catchment of Ringsend WwTP;
- The Blanchardstown (Route 9C Sewer) sub-catchment of Ringsend WwTP (includes the Meath towns & villages of Ashbourne, Ratoath, Kilbride, Dunboyne & Clonee);
- The North Dublin (North Fringe Sewer & NDDS Sewer) sub-catchment of Ringsend WwTP; and
- The South Dublin – Lucan/Clondalkin (Route 9B Sewer) sub-catchment of Ringsend WwTP.

Additional catchments in the GDA, which may also influence future required treatment capacity of the new Regional WwTP, through diversion of flows and load in excess of ultimate treatment capability of the individual wastewater treatment plants in these catchments, are

- Lower Liffey Valley (Leixlip WwTP) Catchment (Includes Leixlip, Celbridge, Maynooth, Kilcock and Straffan);
- Upper Liffey Valley (Osberstown WwTP) Catchment (Includes Naas, Prosperous, Clane, Sallins, Kill, Johnstown, Newbridge, Athgarvan and Kilcullen);
- Swords WwTP Catchment; and
- Malahide WwTP Catchment.

2.2.2 Existing Loadings on Ringsend WwTP

Loading on a wastewater treatment plant arises from residential, commercial, institutional and industrial sources. Census figures are the primary source for residential load estimation. The 2011 population in the Ringsend catchment is estimated at 1,130,760 persons. Commercial and institutional loadings have proven difficult to estimate and it has been assumed that these components of the influent loadings will increase in proportion to the residential loadings. The accuracy of industrial loadings is thought to be very good since these users generally discharge to the public sewer under licence and are therefore metered and their effluent quality is monitored. The measured industrial load on Ringsend WwTP is equivalent to 233,853 PE.

The loadings on the Ringsend WwTP over the past four years have been stable at approximately 1.8 million PE as shown in Table 2.1 below.

Year	Load (millions)
2008	1.79 PE
2009	1.74 PE
2010	1.81 PE
2011	1.74 PE

Table 2.1 Measured Loads to Ringsend WwTP

2.2.3 Projected Loadings on Ringsend WwTP

Three growth scenarios to the design year horizon of 2040 for each element of loading have been considered.

(a) Residential Load Projection

The existing residential population in the study area is provided by the preliminary results of Census 2011, as published on 30 June 2011.

Future residential population in the study area has been examined with reference to target population figures for 2016 and 2022 as set out in the Regional Planning Guidelines (RPG) for the Greater Dublin Area 2010 – 2022 and also to historic population trends over 50 and 100 years within the Greater Dublin Area.

Table 2.2 indicates the relatively close correlation between the RPG target population for 2011 and the preliminary results from the 2011 Census.

Council	2011 (as targeted by RPG)	2011 (from Prelim Census Results)
Dublin City	534,090	525,383
Dun Laoghaire - Rathdown	207,922	206,995
Fingal	262,696	273,051
South Dublin	266,373	265,174
Sub-Total for Dublin Region	**1,271,085**	**1,270,603**
Kildare	209,000	209,955
Meath	178,601	184,034
Wicklow	143,983	136,448
Sub–Total for Mid –East Region	**531,584**	**530,437**
GDA Total	**1,802,669**	**1,801,040**

Table 2.2 – Comparison of Preliminary Census 2011 Results with RPG 2011 Targeted Population

Table 2.3 further shows close correlation between the population estimates at 2011 used in the GDSDS study and the preliminary results from the 2011 Census.

WwTP Catchment	GDSDS Population Estimate @ 2011	2011 Census
Ringsend	1,131,700	1,130,764
Shanganagh	118,353	93,829
Osberstown	64,366	76,001
Leixlip	53,927	58,118
Portrane	24,749	26,751
Malahide	14,454	13,039
Barnageeragh	37,228	31,020
Swords	45,187	48,828
Total	**1,489,964**	**1,478,350**

Table 2.3 – Comparison of Preliminary Census 2011 Results with GDSDS 2011 Population Estimate

Table 2.4 indicates average annual growth rates for Dublin County & County Borough, Counties Kildare, Meath & Wicklow and the GDA based on historic population trends over the period 1911 – 2011 (100 year) and the period 1961 – 2011 (50 year).

Period	Dublin County & Co. Borough	Kildare	Meath	Wicklow	Greater Dublin Area (GDA)
1911 - 2011	0.984	1.154	1.045	0.813	0.994
1961 - 2011	1.147	2.391	2.099	1.709	1.383

Table 2.4 - Average Annual % Growth Rates for the periods 1911 – 2011 & 1961 - 2011

Three growth scenarios for residential population have therefore been considered as follows:

a) Growth Scenario One applies an annual growth rate of 1.4% to year 2040.This growth rate is derived from the Regional Planning Guidelines (RPG) target population figures for the GDA at 2016.

b) Growth Scenario Two applies annual growth rates as derived from the RPG and from the 50 year average annual growth rate for the Dublin Region as set out in Table 2.5 overleaf.

Period	Average Annual Growth Rate	Source
2011 – 2016	1.40%	Derived from RPG target population figures 2006 - 2016
2016 – 2022	1.27%	Derived from RPG target population figures 2016 - 2022
Post 2022	1.15%	50 year average annual growth rate for Dublin Region

Table 2.5 - Average Annual % Growth Rates Applied under Growth Scenario Two

c) Growth Scenario Three applies an annual growth rate of 1.40% to year 2016 and the 100 year average annual growth rate for the Dublin Region thereafter.

(b) Commercial and Institutional Load Projection

As stated previously Commercial and institutional loadings have proven difficult to estimate and it has been assumed that these components of the influent loadings will increase in proportion to the residential loadings under all three growth scenarios.

Therefore the following growth scenarios for commercial and institutional load projection have been assumed:

- Growth Scenario One – 1.40% to year 2040
- Growth Scenario Two – growth rates as per Table 2.5 above
- Growth Scenario Three – 1.40% to year 2016 and 1.00% thereafter.

(c) Industrial Load Projections

Given the current economic situation both nationally and internationally, it is likely that the industrial load will decrease, in the short term at least. It is also an objective of Local Authorities within the GDA for new and amended trade licence applications to require that permitted industrial discharges be reduced to domestic strength.

Although the current strategy within the Local Authorities is to reduce the licensed industrial PE load to Ringsend, there is currently significantly more PE licensed than is being used or being delivered to the Ringsend WwTP. It is therefore prudent to look at the actual allocations and consider the total loadings that would arise if licence holders increased their discharges to that permitted in their discharge licences. It is equally prudent to plan for the inclusion of future industrial development in the catchment

For Growth Scenario One it is proposed that allowance should be made for new controlled industrial development in the catchments of Ringsend WwTP and the proposed Regional WwTP and that an allocation significantly higher than that currently measured (i.e., 233,853 PE) should be provided. Allowances for industrial PE loads of 400,000 PE by year 2025 and 500,000 PE by year 2040 have therefore been included in Growth Scenario One. These allocations are significantly higher than that currently measured by the four Local Authorities and represent an annual average growth in this sector of 3.9 % for the period 2011 – 2025 and 1.50% for the period 2026 - 2040.

For Growth Scenario Two it is proposed to maintain the industrial load at the same percentage of total load to year 2040.
For Growth Scenario Three the industrial load is assumed to grow at 0.70% per annum for the period up to 2040.

2.2.4 Total PE Projections on Ringsend WwTP

The 2011 PE figure for the Ringsend WwTP was projected forward to 2040 using the three growth scenarios discussed above.

Under Growth Scenario One the firm treatment capacity of 2.1 million PE would be reached in 2020. Under Growth Scenario Two it would be reached in 2023 and under Growth Scenario Three it would be reached in 2028.

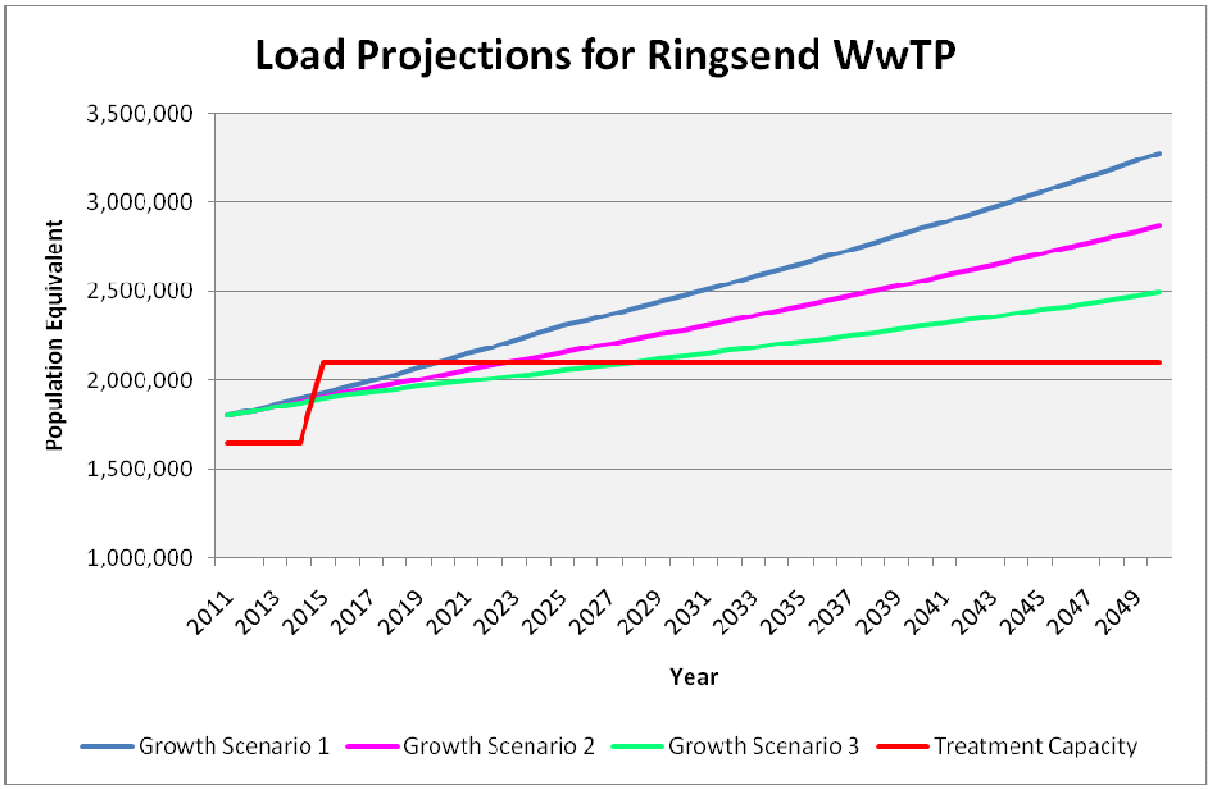


Figure 2.1: Loading Projections for the Ringsend WwTP

Figure 2.1 compares the projected loadings on Ringsend WwTP to the proposed firm treatment capacity.

2.2.5 Projected Loadings on the Regional WwTP

Analysis of the projected loadings to Ringsend WwTP discussed above demonstrates that it will be necessary under all three Growth Scenarios to divert some of the loadings from the Ringsend catchment to the new Regional WwTP in order to maintain the loading on Ringsend WwTP below its firm treatment capacity of 2.1 million PE. In developing the load transfer to the new Regional WwTP for planning purposes Growth Scenario Two, however prudent planning would suggest diverting load from the Ringsend WwTP before its treatment capacity is reached and therefore it is recommended that flow diversions commence as set out hereunder:

- The required load diversions from the Ringsend Catchment would be satisfied at all stages up to year 2040 (the design year horizon) by diverting the total wastewater load generated in the Route 9C (Blanchardstown) Catchment at 2020, and the North Dublin Catchment in two stages at 2020 and 2035 to the proposed Regional WwTP; and
- Post 2041 it may be necessary, depending on actual growth realised, to divert additional wastewater loads from the Ringsend Catchment and this requirement could be satisfied by diverting wastewater load generated in the Route 9B (Lucan/Clondalkin) Catchment of South Dublin to the Regional WwTP.

When the installed or planned treatment capacity at their respective wastewater treatment plants is exceeded diversions would also be required from:

- Lower Liffey Valley (Leixlip WwTP) Catchment in Kildare in 2020;

- Upper Liffey Valley (Osberstown WwTP) Catchment in Kildare post 2030; and
- Swords and Malahide Catchments in Fingal post 2040.

The required treatment capacity of the new Regional WwTP is therefore estimated at approximately 330,000 PE at 2020 rising to approximately 740,000 PE at 2040 as indicated in Table 2.6.

Year	Sub - Catchment	Load Diverted	Cumulative Load on Regional WwTP
2020	Route 9C Sewer	183,700	329,760
	North Fringe Sewer	131,760	
	Leixlip WwTP	14,300	
2035	NDDS Sewer	272,200	677,200
	Osberstown WwTP	4,000	
2040	'-		739,500

Table 2.6 Potential Load Diversions to Regional WwTP

2.2.6 Area of Land Required for Regional WwTP

In order to contain all the necessary unit processes for a treatment plant of the required treatment capacity, it was determined from a study of similar sized plants in the UK, Europe and USA that a site of approximately 20 hectares would be required to accommodate the proposed Regional WwTP. A site of this size ensures:

- flexibility in the final selection of the treatment process to be utilised;
- consideration of the possible integration of Fingal County Council's proposed Sludge Hub Centre with the Regional WwTP;
- sufficient space to adequately construct and screen the site; and
- flexibility regarding purchase of the required land.

2.2.7 Sludge Hub Centre

As noted above, the possibility of co-locating Fingal County Council's proposed Sludge Hub Centre at the site of the proposed Regional WwTP has been raised. This option is currently being considered, in order to determine whether it provides the best solution for the Local Authority. The proposed Fingal Sludge Hub Centre will accept sludges from other WwTP's within the administrative area of Fingal. In addition, the plant will be required to accept sludge from private property owners currently served by septic tank. It is estimated that sludge imports to the proposed Regional WwTP from Fingal would only increase the total sludge arisings at the plant by approximately 20-25%.

Initial assessments indicate that on average, there will be three heavy goods vehicles (HGVs) per day removing treated sludge from the proposed regional wastewater treatment plant (WwTP) when it is at its full operational capacity in 2040. Pending the outcomes of the required review, should the Regional WwTP also become the site of the proposed Fingal Sludge Hub Centre, it is estimated that the number of HGVs could increase to 13 per day, on average.

The ASA process has accounted for, where relevant, impacts associated with the proposed Sludge Hub Centre where these are more onerous than the Regional WwTP alone, which ensures all potential impacts of the project have been addressed.

2.2.8 Waste Water Treatment Plant Technologies

In accordance with current legislation and water quality standards, the new works will be required to achieve, as a minimum, a secondary treatment level with key quality requirements of 25mg/l Biochemical Oxygen Demand (BOD), 125mg/l Chemical Oxygen Demand (COD) and 35mg/l Total Suspended Solids (TSS).

Various treatment processes are currently available which would satisfy these legislative requirements for the proposed Regional WwTP. Assessment is currently ongoing into the range of suitable processes for the proposed plant and include the following secondary treatment processes:

- Conventional Activated Sludge Plant (ASP)
- ASP in Sequencing Batch Reactors (SBR)
- Submerged Attached Growth Processes (e.g. BAFF)
- Integrated fixed film activated sludge processes (e.g. IFAS)
- Membrane bioreactors (MBR)

A conventional secondary treatment WwTP is commonly defined as a combination of Preliminary (or Pre-) treatment processes + Primary treatment processes + Secondary treatment processes.

Preliminary treatment and primary treatment processes will be identified which would best suit the range of secondary treatment processes identified above

In construction of a new WwTP, key opportunities exist for installation of a compact, energy efficient process which overcomes existing issues experienced at other WwTP and takes into account future considerations of population growth, regulatory and sustainability requirements.

Key considerations associated with the identification of the optimum technologies include the following:

- Efficient footprint
- Odour considerations
- Proven processes
- Process staging
- Required scale
- Future proofing
- Sludge impacts and options
- Carbon footprint and greenhouse gas reduction
- Climate Change

Each of the processes will be compared according to their relative advantages and disadvantages, including reference to the above, and whole life costs.

In order to provide a visual reference for the proposed WwTP, an indicative site layout has been generated using a Conventional Activated Sludge Plant (ASP) and is shown on Figure 5 included in Appendix 17. This process would be expected to require the largest footprint and therefore could be considered a worst case scenario.

It should be noted that in terms of the ASA, all site options are essentially similar in relation to WwTP design and therefore no separate sub-criteria related to the design of the WwTP or the process technologies have been included in the ASA. Impacts of the WwTP have all been accounted for under the relevant environmental criteria.

2.3 Orbital Pipelines

The orbital pipelines will transfer untreated effluent from the primary and secondary load centres to the proposed Regional WwTP. Treated effluent will be discharged to the Irish Sea via a pipeline from the WwTP to the marine outfall location.

Routing of the transfer pipelines has considered how to link the main load centres to the outfall locations via the potential WwTP sites while minimising the construction environmental impacts.

It is feasible to route the Orbital sewers from the load centres to each WwTP site and from the WwTP site to the outfall area within the pipeline corridors to generally avoid impacts on designated sites and significant areas of habitat.

The final routing of the transfer pipelines within these corridors will be developed during Phase 3 (consultation) of the Alternative Sites Assessment process and will be finalised at Phase 4 (selection of preferred site, pipeline routes and outfall location).

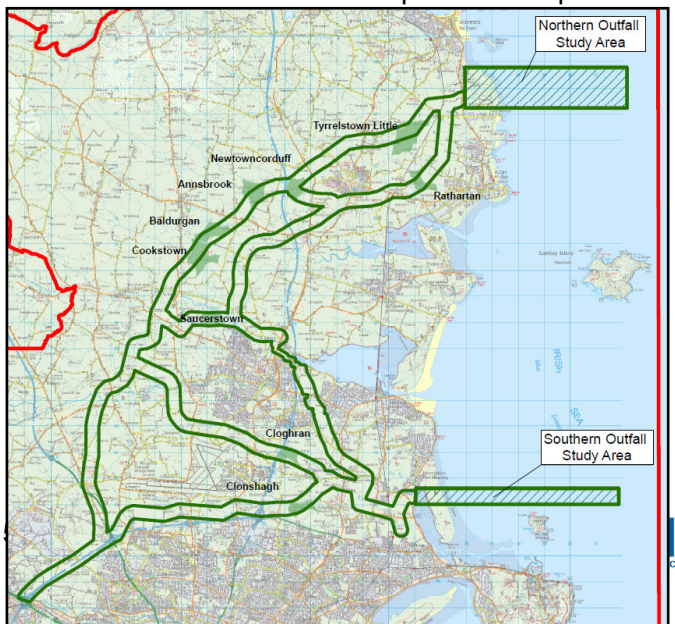
With respect to the ASA, the principal differences between site options under the engineering and design criteria lie in the transfer pipelines to and from the works, specifically the total length of pipeline associated with each site option and the power requirements for all sewage pumping associated with each site option.

In order to facilitate the environmental and technical assessments, the pipeline corridors were split up into a number of sections which allowed the sections associated with each site option to be identified and the associated constraints and potential impacts included in the ASA for that site option. The pipeline sections are shown on Figure 3 included in Appendix 17 and are discussed for each site option in Chapter 6.

2.4 Marine Outfall

As stated previously a key recommendation of the GDSDS Final Strategy as amended by its SEA was for the treated effluent from the regional WwTP to be discharged to the marine environment of the Irish Sea.

Examination of the marine and coastal zone constraint mapping mapped during the Preliminary



Screening stage identified that significant constraints are posed to the location of a new marine outfall off the coast of North County Dublin by designated shellfish waters – the Balbriggan/Skerries Shellfish Area and the Malahide Shellfish Area. These designations are provided for under the Shellfish Waters Directive and are to protect and improve shellfish waters in order to support shellfish life and growth.

The undesignated area between these shellfish waters was identified as a potential area for the location of a new marine outfall (the Northern Outfall Study Area). Similarly the area to the south of the Malahide Shellfish Area was also identified as a potential area for the location of a new marine outfall (the Southern Outfall Study Area).

Other significant constraints to the provision and construction of an outfall pipeline include the Natura 2000 sites at Baldoyle Estuary.

It is acknowledged that the environmental designations around the Baldoyle Estuary provide significant constraints to a southern outfall unless it is feasible to tunnel under these sites to avoid significant adverse impacts. Similarly to avoid impacts at the northern outfall, tunnelling construction methodologies will also have to be employed on a portion of this route. However, this can only be confirmed after further investigation.

As a result, based on the utilisation of such construction methodologies the impacts at the coastline associated with both outfall routes are minimised. This will be subject to further assessment in Phase 3.

ASA Phase 2 studies have indicated the presence of a sub-marine gas pipeline and electrical sub-marine cable (EirGrid Interconnector) in the northern outfall study area. The presence of this gas pipeline and electrical cable constrains the location of an outfall in their immediate vicinity and as such effectively divides the northern outfall area into two distinct sections.

A hydrodynamic and solute transport modelling study has been undertaken to predict the general hydrodynamic circulation patterns of the coastal waters off north County Dublin using a three dimensional numerical model. The modelling study was used to determine the dispersal conditions from a range of possible outfall locations and thereby determine the preferable location(s) off the coast of north County Dublin for a proposed new treated effluent outfall by assessing the relative impact of a range of possible outfalls on the known designations within and adjacent to the marine environment.

The modelling study found that for the northern outfall study area the preferable outfall location(s) lay within a range of 1km – 2km offshore, with preferable location improving slightly in a northerly direction towards Skerries.

The modelling study also found that for the southern outfall study area the preferable outfall location(s) lay approximately 1km off Irelands Eye, to both the north and east of the island.

Both outfall areas have therefore been refined to the areas shown on Figure 3 included in Appendix 17. Further detailed modelling is continuing on these refined study areas in order to assess in more detail the potential impact of the discharged treated effluent.

3 Methodology

3.1 Introduction

This chapter outlines the methodology used to identify the emerging preferred site options, commencing from the preliminary screening assessment to the ASA methodology while also providing generic detail on the environmental and technical specialist assessment methodologies. Further detail can be obtained in the relevant reports which are referenced below and included where relevant in the appendices to this report.

3.2 Preliminary Screening (Phase 1)

The *Alternative Sites Assessment – Phase One Preliminary Screening Outcomes Report* was published in October 2011 and outlined phase 1 of the ASA process which identified suitable land parcels within which the proposed Regional WwTP could be located; corridors for routing of the orbital drainage network and potential marine outfall locations (land parcel options). A brief outline of the methodology used is provided below, full details are included within the published report.

Phase 1 of the ASA process entailed preliminary screening of the study area to identify a short list (minimum of 6 No.) of potential alternative land parcels of suitable size to accommodate the proposed Regional WwTP and also to identify marine outfall locations and potential transfer pipeline corridors.

The land parcel options were identified through a step-by-step process as follows:

Step 1 The approximate required treatment capacity at the design year horizon (2040) of the Regional WwTP and the load centres from which wastewater could be transferred to the WwTP were determined;

Step 2 The approximate area of land required to accommodate the proposed Regional WwTP was determined. The assessment identified a need for a site area of 20Ha;

Step 3 A Constraints Consultation was held with relevant statutory bodies and the general public to assist in the identification of constraints within the Study Area;

Step 4 Known environmentally designated areas (legislative or from the Fingal Development Plan) and sensitive receptors were mapped as potential constraints. Relevant details from submissions received following the Constraints Consultation were also mapped;

Step 5 An appropriate buffer zone of 300m was applied to all identified sensitive receptors (residential and commercial);

Step 6 Residual lands not subject to constraints were examined to identify land parcels of suitable size (20Ha or greater) for the Regional WwTP;

Step 7 The identified land parcels were assessed with respect to Planning Permissions granted but not yet constructed in their vicinity. Any parcels which had such permissions associated with them were removed from further consideration;

Step 8 The constraint mapping was examined to identify areas not subject to constraints for the possible location for a treated effluent marine outfall and to identify potential transfer pipeline corridors;

Step 9 The identified land parcels were assessed in terms of their proximity and accessibility to the identified load centres, feasible outfall locations, and transfer pipeline corridors. Land parcels considered less favourable from these aspects were removed from further consideration at this stage;

Step 10 The remaining land parcels were assessed under high level defined engineering and design constraints. Again land parcels considered less favourable from these aspects were removed from further consideration at this stage; and

Step 11 A shortlist of suitable land parcels and potential transfer pipeline corridors, not subject to the constraints listed above, was compiled.

The purpose of the Phase 1 assessment was to identify a suitable number of favourable land parcel options for progression to the next phase of the assessment, therefore it was necessary to remove a number of land parcels, as outlined above, which did not compare as favourably to the others remaining in consideration. This process resulted in 9 No. land parcel options being identified for assessment under Phase 2 of the ASA as follows:

- Annsbrook
- Baldurgan
- Cloghran
- Clonshagh
- Cookstown
- Newtowncorduff
- Rathartan
- Saucerstown
- Tyrrelstown Little

3.3 ASA Methodology (Phase 2, 3 and 4)

The methodology for identifying the preferred site option from the shortlist of land parcel options identified in Phase 1 and listed above is provided in the flow chart included as Figure 3.1 overleaf and detailed in the *Alternative Sites Assessment (ASA) Methodology Report* included in Appendix 1.

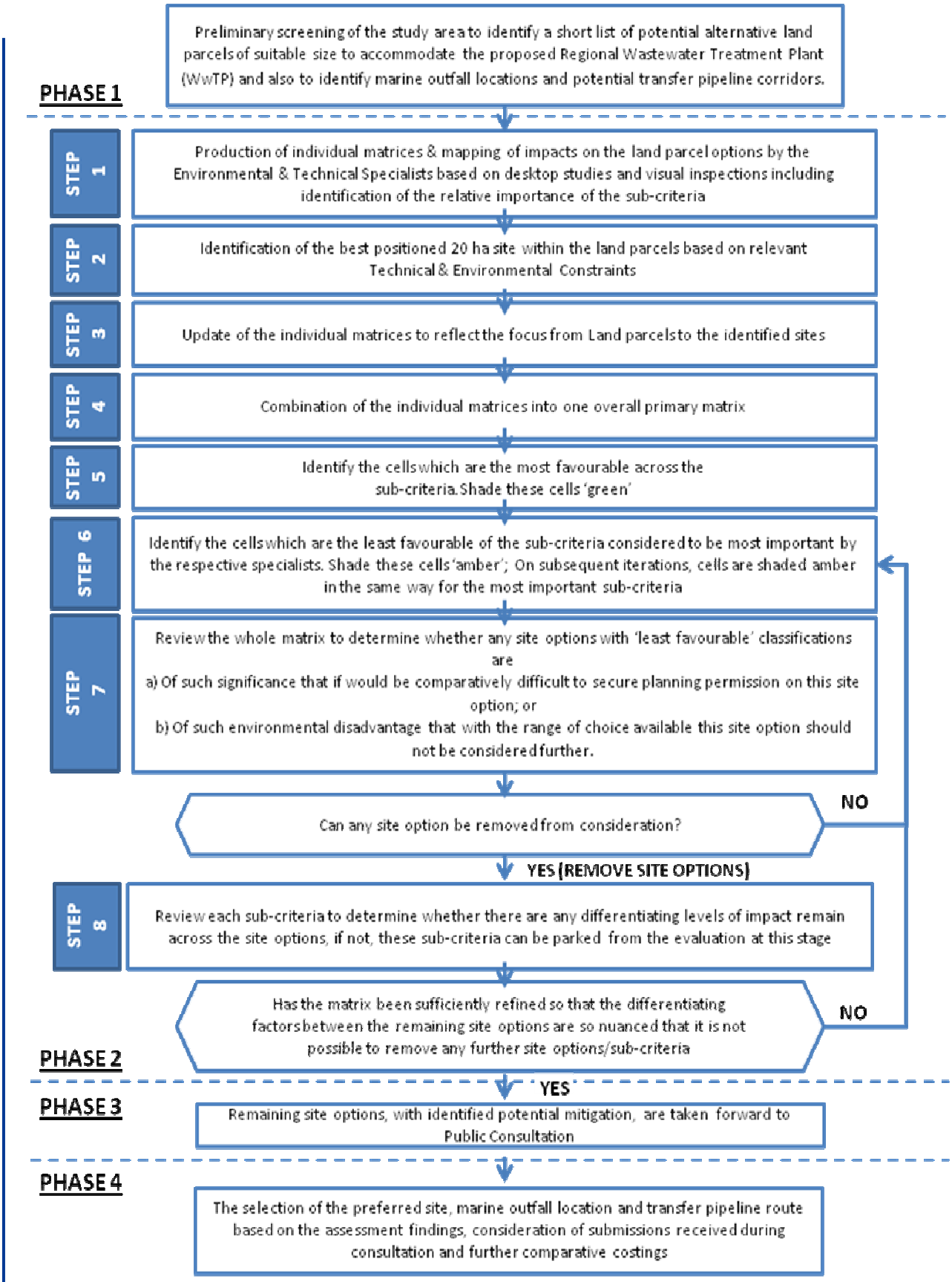


Figure 3.1 Methodology Flowchart

This Phase 2 assessment is based on a qualitative process, in line with the SEA for the GDSDS, which assesses the performance of each of the alternative land parcels, transfer pipelines routes and marine outfall locations against a range of environmental and technical criteria in order to identify a number of emerging preferred site options. Following completion of Phase 3 and 4 of the ASA, the preferred site option will be selected.

The criteria used for the assessment are provided in Table 3.1 below. Each land parcel option was assessed by the relevant technical and environmental specialist under each of these criteria. These assessments were used to identify the differentiating sub-criteria to be used in the identification of the preferred 20 Ha site within each of the land parcels and subsequently the identification of the emerging preferred site option. The full list of agreed sub-criteria for each of the Environmental and Technical criteria are provided in Appendix 3. The outcomes of each of these assessments were combined into an overall assessment matrix detailing all potential constraints associated with each of the site options. Through an assessment of most and least favourable constraints in the matrix, the emerging preferred site options were identified. This process is detailed in full in Chapter 7 of this report.

Environmental Criteria	Technical Criteria
Ecology	Safety
Cultural Heritage	Planning Policy
Landscape and Visual	Engineering and Design
Hydrology and Hydrogeology	Capital and Operational Costs
Soils and Geology	Sustainability
Traffic	
Air Quality and Odour	
Agriculture and Agronomy	
Noise and Vibration	
People and Communities	

Table 3.1 ASA Criteria

3.4 Generic Specialist Methodology

The methodologies used by each of the environmental and technical specialists for their assessments are detailed in full in the relevant reports included in the appendices to this report. A generic outline of the methodology followed is outlined below.

3.4.1 Data Collection

Each specialist undertook a desk-based assessment of the available data collected to date on the scheme. Further data sets, relevant to each specialism were also identified, obtained and reviewed for data relevant to the proposed land parcels, orbital pipeline corridors and marine outfall locations. Where relevant, consultation was undertaken with statutory bodies and interested parties who had not previously been met with by the Project Team. Refer to Chapter 4 for details of consultations undertaken to date for the project.

3.4.2 Site Visits

Windshield surveys of the nine land parcels and pipeline route corridors were undertaken where necessary. Such surveys were generally restricted to publicly accessible lands and roadways. Where required by the relevant specialists, entry onto the land parcels, subject to receipt of landowner permission, was undertaken, generally to verify or clarify constraints identified as part of the desk based assessment.

3.4.3 Specialist Assessment

Based on the assessments undertaken, the land parcels were initially assessed to identify associated constraints which were then used to determine the best placed 20ha site within each of the land parcels. The specialist assessments then focused on the sites, pipeline routes and marine outfall locations (site options). In general for the environmental specialists, five categories were used to categorise impacts identified for the site options, as follows:

- Profound
- Significant
- Moderate
- Slight
- Imperceptible

These categorisations are based on the EPA Guidelines on the information to be contained in Environmental Impact Statements published in 2002 and the National Roads Authority (NRA) Environmental Impact Assessment of National Road Schemes – A Practical Guide.

Technical aspects of the site options were determined in a manner which would allow the most and least favourable option for each sub-criterion to be easily identified.

3.4.4 Generate Matrix

The assessments under each of the identified criteria by the relevant specialists were reported in a matrix format, which scheduled each of the identified sub-criteria against the site options. The level of environmental impact or technical aspect associated with each sub-criterion for each site option was reported across the matrix. Where relevant, additional brief detail was also included which provided basis and justification for the level of impact accorded to each sub-criterion for each site option.

3.4.5 Alternative Sites Assessment

The matrices developed by each of the specialists are included in the relevant reports provided in the Appendices to this report. These matrices were then incorporated into one overall assessment matrix and the full assessment of each of the site options was undertaken. As noted above, full details of the proposed methodology are included in *Alternative Sites Assessment (ASA) Methodology Report* included in Appendix 1 and the full ASA process for the project is detailed in full in Chapter 7 of this report.

4 Consultation

4.1 Introduction

Consultation with key stakeholders, interested parties and the general public is an important aspect of the development of the Greater Dublin Drainage project. At critical points in the development of the project, feedback has been sought from members of the public to assist in shaping the project.

4.2 Statutory Bodies and Interested Parties

Consultation has been sought from statutory bodies and interested parties throughout the project and to date has included the following:

- An Bord Bia
- Bord Iascaigh Mhara (BIM)
- Department of the Environment, Communications and Local Government (DoECLG)
- Department of Agriculture, Food and the Marine (DAFM)
- DoECLG –Planning Section
- DoECLG – Water Quality / Marine Strategy Directive
- Dublin Airport Authority (DAA)
- Dublin City Council (DCC)/CDM – Ringsend WwTP
- Dublin Regional Authority (DRA)
- Eastern River Basin District (ERBD) Project Team
- Environmental Protection Agency (EPA)
- FCC personnel responsible for Sludge Management within the administrative area
- FCC Internal Stakeholder Group which includes senior representatives from divisions within FCC with an interest in the project
- FCC Traffic & Transport
- Food Safety Authority of Ireland (FSAI)
- Geological Survey of Ireland (GSI)
- Growers Representatives
- Inland Fisheries Ireland (IFI)
- Irish Aviation Authority (IAA)
- Kildare County Council (KCC)
- Local Fishermen
- Marine Institute
- Meath County Council (MCC)
- National Parks and Wildlife Service (NPWS)

- Office of Public Works (OPW)
- Project Steering Committee including representatives from FCC, DCC, SDCC, Dun Laoghaire Rathdown County Council (DLRCC), KCC, MCC
- Sea Fisheries Protection Authority (SFPA)
- South Dublin County Council (SDCC)
- Teagasc

Where necessary, throughout the project, further consultation will be arranged with the above bodies and additional parties identified as the project progresses.

4.3 Landowners

Separate and direct engagement has been undertaken by Fingal County Council with each of the landowners affected by the locations of the land parcels, as identified from available land registry data. In addition, where permission was received, these landowners were met by the project Agronomist. Relevant information gathered with reference to farming practices and considerations has been included in the ASA as part of the Agronomy and Agriculture assessment.

4.4 Public Consultation

Public engagement in the project is important in the progression of all stages of the project and to that effect two non-statutory public consultation periods have been held to date, with a third scheduled as part of the ASA to gather public opinion on the emerging preferred sites. Further statutory consultation will commence once the planning application for the project has been submitted to An Bord Pleanála. All public consultation is being managed by the project Communications Consultant with input from the technical team. It should be noted that while the details provided below relate to the formal non-statutory consultation periods, interaction with all stakeholders is ongoing throughout the project by means of the project information service.

Two distinct periods of Public Consultation have been held to date as follows:

- Constraints Consultation (30 May 2011 to 24 June 2011);
- Consultation following identification of and short-listing of potential sites (10 October 2011 to 02 December 2011).

The first consultation period was in relation to identification of all constraints within the study area which should be considered as part of the ASA process. All submissions received were reviewed by the Project Team in order to identify key issues. Full details of the consultation are included in the *Constraints Consultation Report* published in August 2011. Additional details were included, where relevant, by the Technical Team in the *Alternative Sites Assessment – Phase One Preliminary Screening Outcomes Report* published in October 2011.

The second consultation period was in relation to the nine potential land parcels within which the proposed regional Wastewater Treatment Plant (WwTP) could be located. The consultation ran for a total of eight weeks from the 18 November 2011 to the 02 December 2011. Full details of the consultation are included in the *Alternative Sites Assessment (ASA) Consultation Report* published in April 2012. A significant number of submissions were received during this period and the key issues raised were identified

in the consultation report. The issues and concerns identified by stakeholders during the consultation have been considered by the project team as part of the alternative site assessment process to identify the emerging preferred site options. A brief indication of how this has been achieved is provided in Table 4.1 below with further details included in Appendix 2 of this report. It is intended that this table and corresponding appendix be read in conjunction with and as a response to the consultation report.

Stakeholder Issues	Responses
Archaeology and Cultural Heritage	Initially as part of the preliminary screening stage, all recorded Cultural Heritage sites, were mapped and areas of land where they are located were excluded from further consideration as potential sites for the WwTP. As part of this current ASA stage, a Cultural Heritage assessment was undertaken by the relevant specialist, which included indirect impacts which were the subject of some of the concerns raised. Details of this assessment are provided in Chapter 6 with the full specialist report included as Appendix 6 of this report. Where site specific issues were identified in stakeholder submissions, these have been checked by the relevant specialist to ensure they have been included in the assessment.
Climate Change	Energy conservation and minimization of carbon emissions are two of the key considerations for the overall project. Such considerations are and will be considered as part of the preliminary design and development of the WwTP, pipeline routes and marine outfall. An initial outline of energy use and carbon emissions for each of the site options has been summarised in Appendix 16 of this report. Further assessment will be carried out in greater detail for the preferred site option in the next stage of the project.
Community Impact	The potential for the proposed project to impact on both Fingal as a whole and on individual communities within Fingal has been considered under a number of the criteria included in the ASA process, including Landscape and Visual; People and Communities; Noise etc.
Construction	The potential for construction impacts while temporary is still relevant and has been considered under the relevant criteria in the ASA and used, where the sub-criteria provide differentiating factors across the sites in the identification of emerging preferred sites. Detailed assessment of all construction impacts will be undertaken as part of the Environmental Impact Assessment (EIA) on the preferred site once identified.
Ecology and Protected Habitats	Initially as part of the preliminary screening stage, all recorded ecological designations, were mapped and these areas of land were excluded from further consideration as potential sites for the WwTP. As part of this current ASA stage, an ecological assessment was undertaken by the relevant specialist, which included indirect impacts which were the subject of some of the concerns raised. Details of this assessment are provided in Chapter 6 with the full specialist report included as Appendix 5 of this report. Where site specific issues were identified in stakeholder submissions, these have been checked by the relevant specialist to ensure they have been included in the assessment.

Stakeholder Issues	Responses
Flooding	Initially as part of the preliminary screening stage, all available flood data was mapped and these areas of land were excluded from further consideration as potential sites for the WwTP. As part of this current ASA stage, a full hydrology assessment, including flood impact, was undertaken by the relevant specialist, which included indirect impacts which were the subject of some of the concerns raised. Details of this assessment are provided in Chapter 6 with the full specialist report included as Appendix 9 of this report. Where site specific issues were identified in stakeholder submissions, these have been checked by the relevant specialist to ensure they have been included in the assessment.
Geology and Soils	Initially as part of the preliminary screening stage, all recorded Geological Heritage sites were mapped and areas of land where they are located were excluded from further consideration as potential sites for the WwTP. As part of this current ASA stage, a full Soils and Geology assessment was undertaken by the relevant specialist, which included indirect impacts which were the subject of some of the concerns raised. Details of this assessment are provided in Chapter 6 with the full specialist report included as Appendix 8 of this report. Where site specific issues were identified in stakeholder submissions, these have been checked by the relevant specialist to ensure they have been included in the assessment.
Health	Modern day WwTPs are operated with appropriate safeguards to ensure that there are no significant health risks to the general population. Furthermore, a health impact screening assessment (HIA) will be completed as a constituent part of the EIA for the scheme.
Landscape and Amenity	Initially as part of the preliminary screening stage, areas of Highly Sensitive Landscape, as designated in the Fingal County Council Development Plan were mapped and excluded from further consideration as potential sites for the WwTP. As part of this current ASA stage, a Landscape and Visual assessment was undertaken by the relevant specialist, which included indirect impacts which were the subject of some of the concerns raised. Details of this assessment are provided in Chapter 6 with the full specialist report included as Appendix 7 of this report. Where site specific issues were identified in stakeholder submissions, these have been checked by the relevant specialist to ensure they have been included in the assessment.
Livelihood	In order to address issues raised in relation to livelihood, a detailed assessment was undertaken by the project Agronomist as part of the ASA. Details of this assessment, including land quality, crop production figures and values, are provided in Chapter 6 with the full specialist report included as Appendix 11 of this report. In addition, consultation, as noted in section 4.2 above has been ongoing with relevant farming and fisheries bodies including with representatives of the local crop growers and fishermen. Where site specific issues were identified in stakeholder submissions, these have been checked by the relevant specialist to ensure they have been included in the assessment.
Need	As a result of economic changes and the time elapsed since the original assessment, population data have been reviewed from the outset of the project and reviews will continue throughout the lifetime of the project as new data becomes available. This review has accounted for capacity upgrades to existing treatment facilities within the GDA. Furthermore, updated assessment of commercial and industrial loads, to reflect current expectations, have also been completed.

Stakeholder Issues	Responses
Odour	Initially in order to minimise odour impacts, a minimum buffer of 300m from sensitive receptors was selected during the preliminary screening stage to assist in minimizing potential odour impacts on sensitive receptors. Appropriate odour standards will be set at the site boundary. As part of this current ASA stage, a relevant level of odour impact assessment has been undertaken by the project team. Details of the assessment are provided in Chapter 6 with the full report included as Appendix 12 of this report.
Overburdening	The objective of the GDD is to identify the preferred site for a regional WwTP in the northern part of the GDA and is in line with the recommendations of the GDSDS and its accompanying SEA. The preliminary screening methodology was agreed and progressed in a consistent manner with reference to legislative designations only. Known environmentally designated areas and sensitive receptors were mapped as potential constraints. The ASA process further aims to avoid and where this is not possible to mitigate against any associated impacts. A planning application for the project will be submitted to An Bord Pleanála which will make a determination as to whether the project is compliant with sustainable planning for the region.
Planning and Zoning	As part of this current ASA stage, a planning assessment has been undertaken by the relevant specialist in order to address the concerns raised. Details of the assessment are provided in Chapter 6 with the full report included as Appendix 14 of this report. Where site specific issues were identified in stakeholder submissions, these have been checked by the relevant specialist to ensure they have been included in the assessment.
Property and Land Value	The proposed plant is required to facilitate growth in the GDA. The preliminary screening methodology was agreed and progressed in a consistent manner with reference to legislative designations only. Known environmentally designated areas and sensitive receptors with a 300m buffer zone were mapped as potential constraints. Compensation will be provided to those who are directly affected by the purchase of the site, acquiring the land for the road access and acquiring access for the construction and maintenance of the pipelines. The issue of compensation for nearby communities affected by this scheme does not arise at this time.
Proximity to Sensitive Receptors	Initially as part of the preliminary screening stage, a buffer zone of 300m from the centre of sensitive receptors was applied in order to minimise the potential impact on these sensitive receptors. This dimension conservatively exceeds the Development Plan minimum distance requirement from the nearest receptor of 100m and is considered to meet the requirements of the guidance documents referred to in the Preliminary Screening report. Where site specific issues were identified in stakeholder submissions, these have been checked by the relevant specialist to ensure they have been included in the assessment.
Public Consultation	Fingal County Council has endeavoured to achieve an accessible, meaningful and accountable consultation. The consultation process undertaken to date complies with the requirements set out in the Aarhus Convention.
Risk Assessment	Risk analysis has been considered in relation to the Site Options and included in the assessment matrix, where relevant, will be undertaken in further detail as part of the Environmental Impact Assessment undertaken on the preferred site once identified.

Stakeholder Issues	Responses
Road Infrastructure and Traffic	As part of this current ASA stage, an assessment of road infrastructure, site access and traffic impacts have been undertaken by the project team in order to ensure all potential impacts are addressed. Details of the assessment are provided in Chapter 6 with the full report included as Appendix 10 of this report.
Technologies and Treatment Levels	A range of technology options is being considered for use in the regional WwTP and the preferred technology will only be selected after a full comparison of potential solutions. Reference is being made to technologies considered internationally including new and proprietary processes where relevant.
Water Quality	As part of this current ASA stage, a hydrology assessment, which included water quality considerations, was undertaken by the relevant specialist and included indirect impacts which were the subject of some of the concerns raised. Details of this assessment are provided in Chapter 6 with the full specialist report included as Appendix 9 of this report.
Other Issues	*Alternatives* - The preliminary screening methodology was agreed and progressed in a consistent manner with reference to legislative designations only. Known environmentally designated areas and sensitive receptors were mapped as potential constraints.
	ASA Mapping - Where specific constraints were identified in stakeholder submissions, these have been checked by the relevant specialist to ensure they have been included in their assessment.
	The Planning Process - The process used in identification of the preferred site option is in line with current legislation and best practice.

Table 4.1 Stakeholder Issues

5 Identification of Sites

5.1 Introduction

Due to the preliminary screening process undertaken at Phase 1, the land parcels identified at that stage were, in some cases significantly larger, than the site area of approximately 20 Ha required for the Regional WwTP. It was not considered appropriate at the preliminary screening stage to identify the best positioned and best orientated site for the Regional WwTP within each of the land parcels. It was considered more appropriate to wait until the environmental and technical assessments had been completed on the land parcels in order to ensure that the policy of avoidance of impacts was continued through to this phase.

Following completion of their assessments, each of the technical and environmental specialists produced a matrix of sub-criteria which provided differentiating factors across each of the land parcel options. That information was used to determine the most suitable location within each land parcel for the Regional WwTP site and also the most appropriate access route to that site.

The optimum location for a site within a land parcel is as close as possible to the centre of the land parcel, as that provides the greatest possible distance from sensitive receptors.

However, potential impacts identified within each land parcel resulted in a number of other considerations also being taken into account. These included topography, access road routing, avoidance of potential constraints and avoidance of flood plains, land ownership, farm viability, existing field boundaries, land severance and adjacent watercourses.

This process of site identification constitutes step 2 in the ASA methodology, as detailed in the *ASA Methodology Report* included in Appendix 1 of this report.

The following criteria identified potential constraints within each of the land parcels which facilitated the identification of the best site.

Environmental Criteria	Technical Criteria
Ecology	Engineering and Design
Cultural Heritage	Planning Policy
Landscape and Visual	
Hydrology and Hydrogeology	
Soils and Geology	
Traffic	
Agriculture and Agronomy	

Table 5-1 Positioning of Site Area within Land Parcel - Environmental and Technical Criteria

The identified potential constraints were used in a workshop forum with the project consultants, including specialists, to guide the decision making process for the positioning and orienting of the site area within each land parcel. The potential

constraints were presented in individual maps for each location, showing the mapped constraints, the overall land parcel and the site within the land parcel. The detailed location maps for each site are shown on Figures 6a – 6i inclusive included in Appendix 17.

It should be noted that while this exercise has significantly reduced the areas of the identified sites, in some cases the sites are still greater than the 20Ha identified as the process has taken into account land ownership and field boundaries. Further refinement of the site will occur as the agronomy assessments and landowner consultations are progressed and as further indicative site layouts are developed

5.2 Positioning of the Site within each Land Parcel

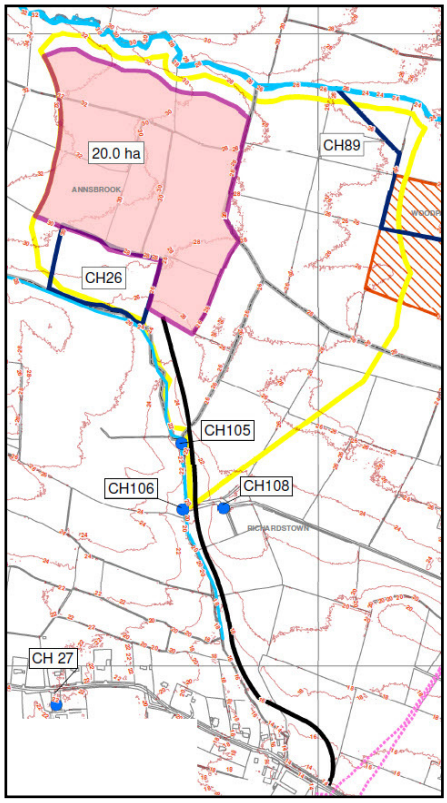
5.2.1 Land Parcel Constraints for Site Orientation

The sections below provide a description of the constraints and potential impacts within each land parcel which affected the location and positioning of the site within that land parcel. The primary constraining features are dependent on specific site attributes and varied from one site to the next. The identification of the primary constraints was undertaken by the environmental and technical specialists based on their expert opinion.

It should be noted that the assessment of comparative constraints of one potential site relative to another is not encompassed in this step. It is confined to the assessment of the potential constraints influencing the positioning and orientation of the site within the land parcel, i.e. those potential constraints which, where possible, can be avoided through appropriate positioning and orientation of the site within the land parcel.

(a) Annsbrook

The land parcel is located primarily in the townland of Annsbrook approximately 2.5km north east of Ballyboughal and has a total area of 62ha. The lands slope in a north-west / south-east direction with a central elevation of approximately 30.2mOD. Figure 6a included in Appendix 17 details the Annsbrook land parcel and site, a schematic of that figure is shown here.



The land parcel lies in open agricultural land, primarily in grassland and tillage. Seven landowners have been identified as owning land within the land parcel.

The sub- criteria which impacted most significantly on the site location within the parcel relate to Cultural Heritage and Agronomy. In addition a 50m buffer was applied to the watercourses which run along the northern and south-western boundaries of the land parcel. Consideration was also given to the topography of the site to ensure, where possible, the most favourable orientation with respect to engineering design of the treatment process was identified.

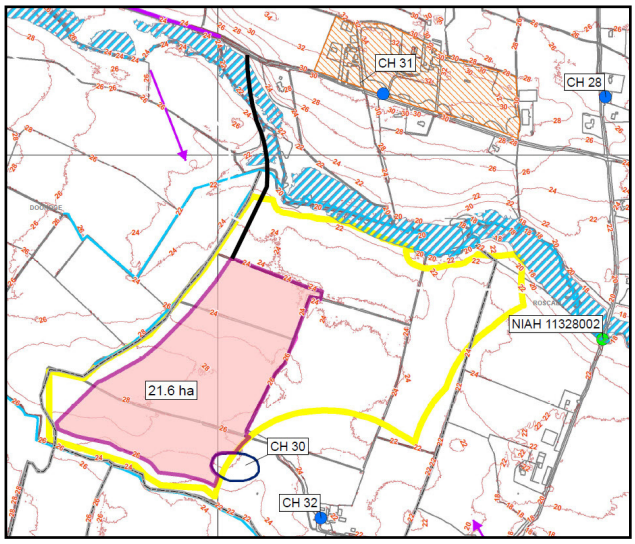
The Cultural Heritage assessment identified the potential for one unrecorded Cultural Heritage site in the southwest corner of the land parcel. The assessment also recorded a demesne to the east of the land parcel. It was therefore recommended and agreed that the site should be set back from these Cultural Heritage features, as an avoidance measure.

The Agronomy assessment recommended that multiple severance of land should be avoided where possible.

Potential access to the site can be achieved, from the R129 to the south, without crossing of watercourses. The proposed access road is 1,230m in length and is routed along existing field boundaries as far as is feasible to avoid splitting land.
The combination of the above resulted in the final positioning of the site within the north westerly corner of the land parcel, primarily on grassland and in one ownership, with a total extent of 20.0ha.

(b) Baldurgan

This land parcel is located primarily in the townland of Baldurgan approximately 1.6km south east of Ballyboughal and has a total area of 57ha. The lands slope generally from south to north with a central elevation of 24.8mOD. Figure 6b included in Appendix 17 details the Baldurgan land parcel and site, a schematic of that figure for Baldurgan is shown here.



The land parcel lies in open agricultural land, primarily used for tillage, vegetable and potato farming. One landowner has been identified as owning land within the land parcel.

The sub-criteria which impacted most significantly on the site location within the parcel relate to Cultural Heritage, Hydrology, topography, Landscape & Visual and Agronomy.

The Cultural Heritage assessment identified a medieval abbey complex to the east of the land parcel, architectural heritage to the east of the land parcel (bridge) and a Holy Well to the south of the land parcel.

The Hydrological assessment indicated that adjacency to a watercourse towards the north of the land parcel would be of concern due to potential flooding and additional set back distance from this watercourse was recommended. However, the route of the potential access to the site area requires crossing of this watercourse to the north.

Consideration was also given to the topography of the site to ensure, where possible, the most favourable orientation with respect to engineering design of the treatment process was identified.

A significant number of scenic views were identified in the vicinity of the land parcel and consideration was given to providing greater distance from these views in selection

of the site. This required the site to be located away from the northern portion of the land parcel.

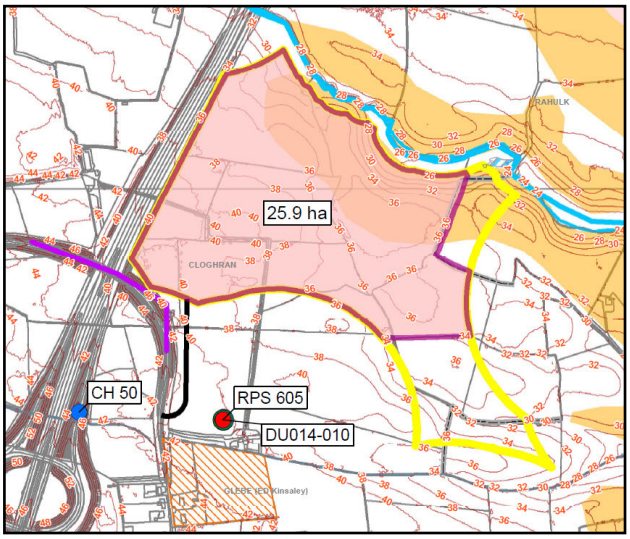
The agronomy assessment considered that while the land is reasonably intensively farmed, it is owned by one landowner and therefore, the orientation of the site should seek to minimise impact on the farm layout.

The proposed road access to the site is from the R129 to the north. It is approximately 580m in length and crosses two watercourses.

The combination of the above resulted in the final positioning of the site within the south - westerly section of the land parcel with a total extent of 21.6ha.

(c) Cloghran

This land parcel is located primarily in the townland of Cloghran, approximately 2.2km east of Dublin Airport and 3.3km south of Swords and has a total area of 32ha. The lands slope generally in a south-west/north-east direction with a central elevation of approximately 35.8mOD. Figure 6c included in Appendix 17 details the Cloghran land parcel and site, a schematic of that figure for Cloghran is shown here.



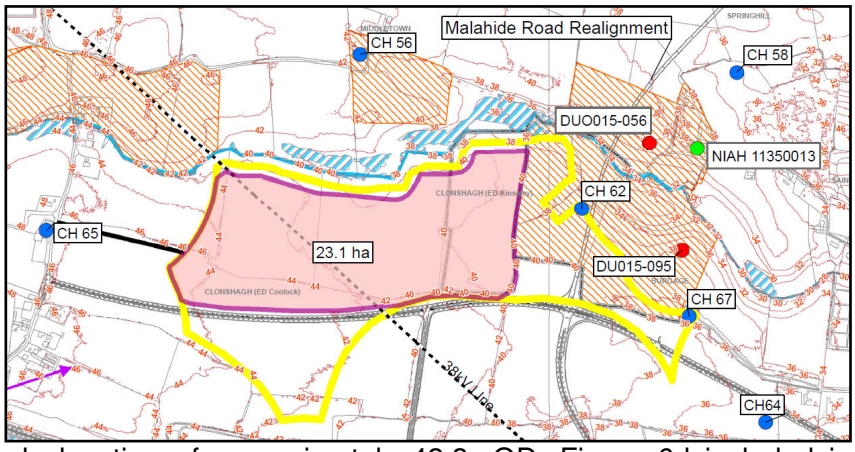
The land parcel is located in agricultural land, primarily in grassland used for beef farming. Five landowners have been identified as owning land within the land parcel.

Due to the overall size of the land parcel at Cloghran, the extent of the site closely matches that of the land parcel. The northern, western and southern boundaries of the site area are exactly contiguous with those boundaries of the land parcel. The exceptions are the exclusions of the areas at the most north easterly and south easterly sections of the land parcel from the site area, in order to minimise impact on field boundaries and facilitate the proposed access to be provided from the south - western side of the site.

The proposed access road to the site is from Stockhole Lane on the south western edge of the site and is 290m in length.

The total extent of the site area is 25.9ha.

(d) Clonshagh



This land parcel is located primarily in the townland of Clonshagh, approximately 2.5km east of Dublin Airport and 1.3km north of Belcamp and Darndale and has a total area of 40ha. The lands slope in a west-east direction with a central elevation of approximately 42.3mOD. Figure 6d included in Appendix 17 details the Clonshagh land parcel and site, a schematic of that figure for Clonshagh is shown here.

The land is located in open agricultural land, primarily in tillage, vegetables and grassland. Five landowners have been identified as owning land within this land parcel.

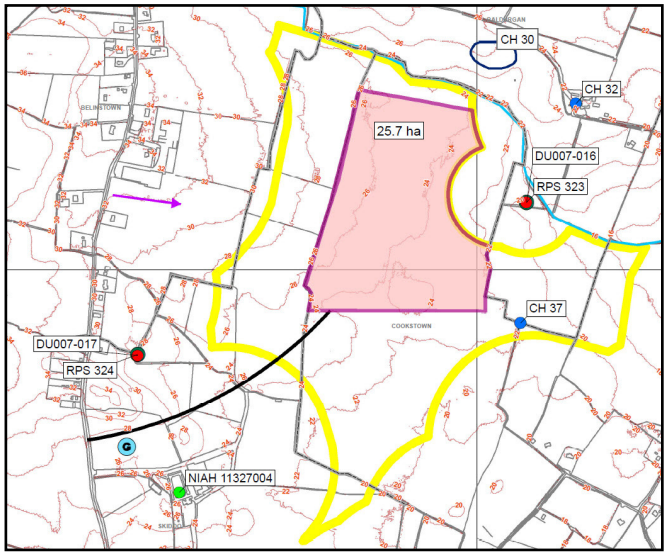
The main constraint associated with the orientation of the site area within the land parcel relates to proposed local authority road infrastructure within the land parcel. In addition, Cultural Heritage sub-criteria and the requirement for set back from adjacent watercourses also impacted on the site location.

Fingal County Council has identified locations within the land parcel for proposed road infrastructure, as shown in Figure 6d included in Appendix 17. The Cultural Heritage assessment noted that a demesne landscape is recorded to the east of the land parcel with one demesne feature or enclosure identified at the eastern boundary of the land parcel. Just outside of the land parcel, a number of other cultural heritage features associated with the demesne landscape are located to the east of the boundary. There are also demesne landscapes beyond the watercourse which runs adjacent to the northern boundary of the land parcel and other demesne landscapes in proximity to the land parcel. In a second watercourse is located to the south of the land parcel, with some recorded flooding.

The proposed access road to the site is from Stockhole Lane to the west of the site and is 320m in length.

Following these considerations, the site area was set back from the demesne landscape to the east of the land parcel and to the north of the proposed local authority road development. The overall positioning of the site is within the northern and the western sections of the land parcel, with a total extent of 23.1ha.

(e) Cookstown



This land parcel is located primarily in the townland of Cookstown, approximately 2.5km south east of Ballyboughal and has a total area of 80ha. The lands slope generally in a westerly to easterly direction with a central elevation of approximately 24.3mOD. Figure 6e included in Appendix 17 details the Cookstown land parcel and site, a schematic of that figure for Cookstown is shown here.

The land is located in open agricultural land. Tillage, vegetable, potato and mixed livestock farming including a beef enterprise are carried out on this land parcel with the majority of the land parcel used for tillage. Five landowners have been identified as owning land within this land parcel.

The sub- criteria which impacted most significantly on the site location within the parcel relate to Cultural Heritage, Hydrology and Agronomy, relating particularly to minimising the number of affected landowners within the land parcel.

The Cultural Heritage assessment identified a Holy Well and a recorded earthworks site in close proximity. At the existing north eastern section of the land parcel, the boundary takes into account adjacent Cultural Heritage features and has already been positioned to include a set back from those features as an avoidance measure. The boundary for the site therefore matches the boundary of the land parcel at the north eastern section of the parcel.

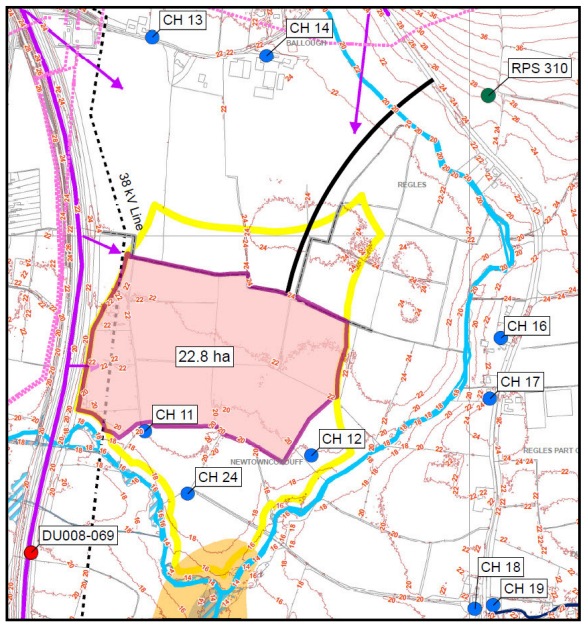
The Hydrology assessment recommended a buffer at the northern section of the land parcel from the northerly watercourse.

The final site orientation was therefore determined following the above considerations while also minimising the number of affected landowners and field boundaries.

The proposed access to the site is from the R108 to the south – west of the site. The proposed access road is 930m in length and crosses one watercourse.

The overall positioning of the site is within the central northern section of the land parcel, in one ownership and with a total extent of 25.7ha.

(f) Newtowncorduff



This land parcel is located primarily in the townland of Newtowncorduff approximately 2.2km west of Lusk and has a total area of 43ha. The lands slope generally in a north / south direction with a central elevation of 20.5mOD. Figure 6f included in Appendix 17 details the Newtowncorduff land parcel and site, a schematic of that figure for Newtowncorduff is shown here.

The land parcel is located in agricultural land, primarily in tillage, vegetables and grassland. Three landowners have been identified as owning land within this land parcel.

The sub-criteria which impacted most significantly on the site location within the parcel relate to Cultural Heritage, Ecology, Hydrology and Landscape & Visual.

The Cultural Heritage assessment identified a number of potential Cultural Heritage sites to the south of the land parcel including a potential ring ditch and mound and an area with potential medieval castle, house & mill. A protected structure was also identified to the north of the land parcel.

There are salmonid watercourses located to the east and south of the land parcel to which appropriate buffers were applied.

The Landscape assessment notes that there are sensitive views from local roads overlooking the site. The Ecology and Landscape assessments note that the land parcel is made up of a significant number of fields, field boundaries and an extensive hedgerow system and therefore avoidance of break-up of the field boundaries and hedgerow system was also a consideration.

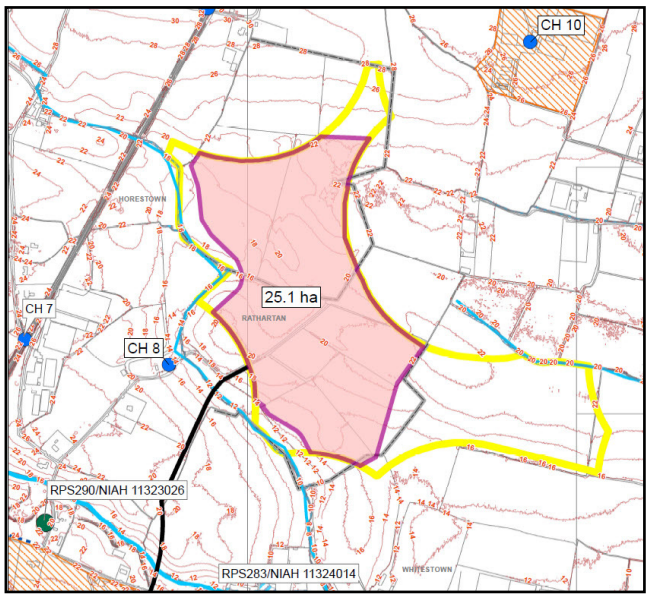
Following these considerations, the site has been set back from the southern section of the land parcel principally as a result of the Cultural Heritage assessment. In addition a greater set back from the watercourses to the southwest and southeast was incorporated, while still maintaining consideration of the number of field boundaries and hedgerows within the overall potential extent of the site.

The proposed access road to the site is from the R132 (formerly the N1) to the north east. It is 640m in length, crosses one watercourse and is routed close to existing field boundaries to minimize severance.

The final positioning of the site is within the centre of the land parcel, with a total extent of 22.8ha.

(g) Rathartan

This land parcel is located primarily in the townland of Rathartan approximately 2.0km west of Rush and approximately 3.0km to the east of Lusk and has a total area of 41ha. The lands slope in a north / south direction with a central elevation of approximately 18.7mOD. Figure 6g included in Appendix 17 details the Rathartan land parcel and site, a schematic of that figure for Rathartan is shown here.



The land parcel is located in agricultural land, used for intensive market gardening. Nine landowners have been identified as owning land within this land parcel.

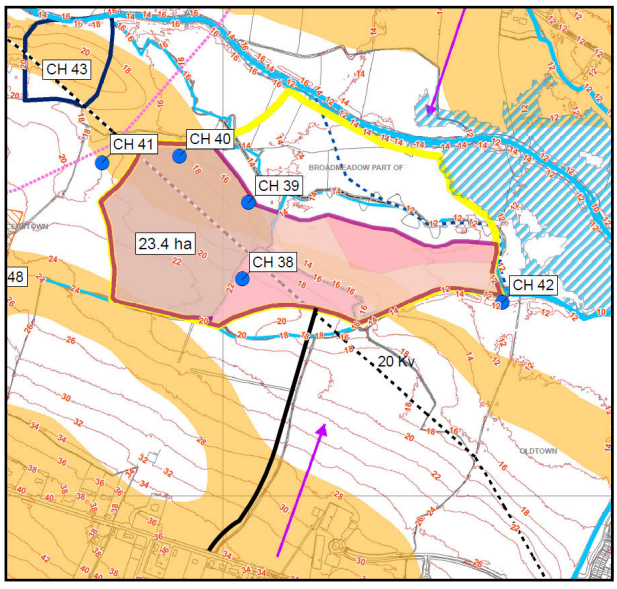
Due to the overall size of the land parcel at Rathartan, the extent of the site within the land parcel closely matches that of the land parcel. The eastern and northern boundaries of the site area are exactly contiguous with those boundaries of the land parcel. The exceptions are the exclusion of the areas at the most north-easterly and south-easterly sections of the land parcel, to minimise impact on field boundaries and facilitate the proposed access to be provided from the south of the site.

The proposed access road to the site is from the R128 to the south. It is 620m in length, crosses two watercourses and is routed in so far as is feasible along field boundaries to minimize severance.

The total extent of the site area is 25.1ha.

(h) Saucerstown

This land parcel is located primarily in the townland of Saucerstown, approximately 3.3km northwest of Swords and has a total area of 36ha. The lands slope in a general south-west / north-east direction with a central elevation of approximately 16.9mOD. Figure 6h included in Appendix 17 details the Saucerstown land parcel and site, a schematic of that figure for Saucerstown is shown here.



The land parcel is located in agricultural land, primarily in tillage, vegetables and grassland. Eight landowners have been identified as owning land within this land parcel.

Due to the overall size of the land parcel at Saucerstown and the presence of a watercourse through the northern section, the extent of the site area, in general, closely matches that of the land parcel. There was little scope for movement of the position of the site within the land parcel, with the exception of set back from the main watercourse to the north of the land parcel and avoidance of a tributary, of this watercourse, running through the site. Therefore, the sub-criteria which impacted most significantly on the site location relate to Hydrology and in particular flooding. Where feasible, the site area was selected to achieve a buffer to the watercourse running through the land parcel.

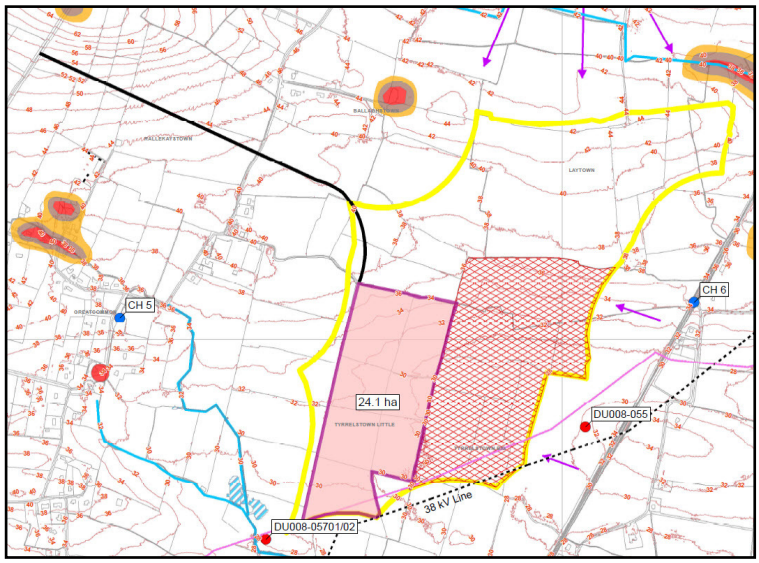
It should be noted that it was not feasible to position the site within the land parcel to avoid additional Cultural Heritage features identified in the Cultural Heritage Assessment. The consequence of this is described, along with the details of other constraints, in Chapter 6 of this report.

The access to the site is proposed from the R125 to the south. The proposed access road is 650m in length, crosses one watercourse and is routed adjacent to field boundaries to minimize severance.

The total extent of the site area is 23.4ha.

(i) Tyrrelstown Little

This land parcel is located primarily in the townland of Tyrrelstown Little, approximately 2.8km north east of Lusk and 3.6km north west of Rush and has a total area of 114ha. The lands slope in a north/south direction with a central elevation of approximately 34mOD. Figure 6i included in Appendix 17 details the Tyrrelstown Little land parcel and site, a schematic of that figure for Tyrrelstown Little is shown here.



The land parcel is located in agricultural land, primarily in tillage, vegetables and grassland. Ten landowners have been identified as owning land within this land parcel

The sub-criteria which impacted most significantly on the site location within the parcel relate to Ecology and Landscape & Visual.

Consideration was also given to the topography of the site to ensure, where possible, the most favourable orientation with respect to engineering design of the treatment process was identified.

The area is a recognised wetland bird area and local knowledge indicated that the south eastern area of the land parcel is currently in use by protected species.

A national monument was identified to the north of the land parcel with significant scenic views from this point over the land parcel. Consideration was therefore given to providing greater distance from these views in selection of the site.

Access to the site is proposed from the R127 to the west of the site. The proposed access road is 1,410m in length, crosses one minor road, which may need to be closed, and while routed along field boundaries in so far as is feasible it has potential to cause severance to a number of fields.

The final positioning of the site is in the south west corner of the land parcel on the lower lying lands, which are currently in grassland used for a beef enterprise and in one ownership. The total extent of the site is 24.1ha.

6 Assessment of Site Options

6.1 Introduction

The nine land parcel options shortlisted in the *Alternative Sites Assessment - Phase One Preliminary Screening Outcomes Report* dated October 2011 have been identified as a result of an onerous process of environmental screening, whereby the risks of impact have been very significantly reduced by a policy of avoidance.

This policy of avoidance has continued through to the identification of the most appropriate site within each land parcel (as outlined in Chapter 5). Each site option can facilitate feasible orbital pipeline routes and marine outfall locations. Each site option already meets the majority of the environmental attributes required in the best site option. Therefore, differences between the site options, in the alternative sites assessment, will be less-than-pronounced, and quite nuanced, as the assessment process proceeds.

Each of the nine site options were assessed in relation to environmental and technical criteria as listed in Section 3.3. These assessments were used to identify the differentiating sub-criteria to be used in the identification of the emerging preferred site options. A full list of the sub-criteria for each specialism is provided in Appendix 3 of this report. The constraints for each site option are detailed in the specialists reports included in Appendix 5 to Appendix 16 of this report. The key environmental and technical differentiating constraints are summarised in the sections below for each site option, with the exception of the outfalls, in turn.

There are only two possible outfall alternatives and therefore in order to maintain clarity in this report, the principal environmental and technical constraints for these two alternative outfalls are described in Section 6.11 of this Chapter. The site options associated with the outfalls are shown in Table 6.1 below:

Northern Outfall	Southern Outfall
Annsbrook	Clonshagh
Baldurgan	Cloghran
Cookstown	
Newtowncorduff	
Rathartan	
Saucerstown	
Tyrrelstown Little	

Table 6.1 Sites associated with outfalls

6.2 Annsbrook

The site location and transfer pipeline corridors are illustrated in Figure 7a included in Appendix 17. The pipeline corridors of relevance to the site are corridors A, D, F and G as illustrated in Figure 2 of Appendix 17. The site utilises the northern outfall, see section 6.11.2 below for further details.

6.2.1 Ecology

In the surrounding environment, arable and cultivated grasslands, abundance of hedgerows and the adjacent watercourses provide good potential for occurrence of protected species, notably badger.

Approximately 2.4km of the site boundary is defined by hedgerow. The site is bound to the north by the Rath Little Stream, which is also part of an ecological corridor identified in the Fingal County Development Plan. The Grallagh Stream (a tributary of the Ballyboghil River) is located adjacent to the southern site boundary. The site is located 4.1km upstream of Rogerstown Estuary SPA and SAC with a clear potential pathway of effect available through the local surface water network.

The following potential negative impacts have been identified for the site:

- Potential Significant Impact on protected species based on length of field boundary defined by hedgerow (2.4km)
- Potential Moderate Impact on Fingal Ecological Networks sites (Rath Little Stream ecological corridor)
- Potential Moderate Impact on salmonid system due to proximity of access road to Ballyboghil River
- Potential Moderate Impact due to loss of winter habitat for Lapwing and Golden Plover and other wader species
- Potential Slight Impact on Natura 2000 wetlands (Rogerstown Estuary SPA/SAC)
- Potential Slight Impact on terrestrial habitats of high ecological value

Ecological constraints located within the transfer pipeline corridors include the following:

- 6 Ecological Buffer Zones and 6 Nature Development Areas identified in the Fingal Development Plan
- 10-11 ecological corridors and approx 36 watercourse crossings, of which 8-9 are salmonid systems
- Watercourse crossings upstream of a number of Natura 2000 and Natural Heritage Areas including South Dublin Bay and River Tolka Estuary, North Dublin Bay, Malahide Estuary, Rogerstown Estuary, and Baldoyle Bay
- Watercourse crossings, including Balcunnin, upstream of Water Framework Directive coastal waters
- Potential to impact on the breeding habitat of Kingfisher (Annex I species) due to a section located along Broadmeadow River (Corridor D & F)
- Areas of importance to wetland birds (IWeBS) adjacent to the Malahide Estuary IWeBS area
- Hedgerow and other BAP habitat

Details of the above designations are provided in the ASA – Phase 2 Ecology Report included in Appendix 5. Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize potential impacts on designated sites and significant areas of habitat. River crossings will primarily be undertaken by tunnelling thereby minimising or eliminating the potential impacts.

6.2.2 Cultural Heritage

There are two sites from the Record of Monuments and Places RMP within 1km of the proposed site. These are located c. 885m and 910m to the east of the proposed site and consist of an excavated pit burial (DU007-034) and an excavated burnt pit (DU007-035). Over 1.2km to the south of the proposed site is the archaeological complex associated with the Augustinian monastery at Gracedieu. In addition, there are five Cultural Heritage sites identified in this assessment within the vicinity of the site (Annsbrook House, the site of a mill r ace, two potential bridge site, and a site of post medieval structures) Given the presence of the post medieval structure likely to formerly belong to the upper classes, the landscape surrounding the development area has the potential to contain post medieval archaeological remains associated with the house and/or a designed landscape..

The following potential negative impacts were identified:

- 4 potential Indirect moderate impacts on Cultural Heritage features (Annsbrook House, two bridge structures and the site of post medieval structures)
- 2 potential Direct Moderate Impacts on townland boundaries
- 1 potential Indirect Slight Impact on a historic designed landscape (Woodpark)
- 1 potential Indirect Imperceptible Impact on an Augustinian monastery complex (Gracedieu DU007-015)

Known Cultural Heritage constraints associated with the transfer pipeline corridors include:

- 32 features from Record of Monuments & Places
- 1 National Monument
- 28 features from Record of Protected Structures & 12 features from National Inventory of Architectural Heritage RPS
- 26 Cultural Heritage features
- 22 historic design landscapes

Pipeline alignments shall be adopted within the corridors which avoid impacts on the above recorded sites.

6.2.3 Landscape and Visual

The Annsbrook site is located on the lower southern slopes of Nags Head with the terrain falling gently to the southeast at this point. It is located within the ‘Low Lying’ landscape character type identified in the Fingal County Development Plan. This landscape type is recognised as having a ‘Modest’ value and a ‘Low’ level of sensitivity. The site lies approximately 1km to the south and 1.3km to the east of an area zoned as ‘Highly Sensitive Landscape’. Designated scenic routes are located 1.3km to the southwest and 2.5km to the north.

The following potential negative impacts were identified:

- Potential Significant impact to disrupt landscape structure (hedgerows)
- Potential Moderate impact on Highly Sensitive Landscape 1.2km north of site with some intervisibility
- Potential Moderate impact on landscape character
- Potential Moderate impacts on views from dwellings and local roads
- Potential Moderate impact on views from major roads (R129)
- Potential Moderate impact on Woodpark Demesne which is 150m to the north east of the site
- Potential Slight impact on views from heritage/tourist/ amenity features
- Potential Slight impact on view from M1 motorway

Potential landscape and visual impacts along the pipeline corridors include:

- Significant potential to disrupt landscape structure along section F which passes almost entirely through fields and hedgerows, with moderate to slight potential along other sections of the corridor
- Potential impact on historic demesne landscapes if Abbeyville Estate is affected (Corridor D)

Landscape and visual impacts associated with the pipeline corridors will be temporary and route alignments will be selected within the corridors to minimise impacts.

6.2.4 Hydrology and Hydrogeology

The surface water from the northern half of the site drains to the Ballough River and the surface water from the southern half of the site drains to the Richardstown River (a tributary of the Ballyboghil River). Both the Ballough and Ballyboghil Rivers discharge into Rogerstown Estuary (a SAC, SPA, pNHA, Ramsar and SNR site), the water quality of which is intermediate (i.e., between unpolluted and potentially eutrophic). The National flood hazard mapping website www.floodmaps.ie does not show any record of historic flooding in the vicinity of the Annsbrook site. The nearest historic flooding location was at Baldrumman, near the M1 crossing of the Ballough River (eastern tributary of the Ballough River). The flood extent maps produced under FEM FRAMS indicates that the Annsbrook site is not flooded by either the Ballough or Ballyboghil Rivers. However, it is noted that the Ballyboghil River has extensive overland flooding approximately 3km further downstream.

The proposed site is underlain by a locally important bedrock aquifer (Lm) to the north of the site which is generally moderately productive and by a locally important bedrock aquifer (Ll) to the south of the site which is moderately productive in local zones only. Groundwater vulnerability mapping shows the area in the vicinity of the site to have a groundwater vulnerability rating of low. No groundwater source wells were found to be within 500m of the site. No karst features were found to be within 2km of the proposed site.

The following potential negative impacts were identified:

- Potential Slight Impact on Ballough River and Ballyboghil Tributary
- Potential Slight Impact on groundwater vulnerability

The pipeline corridors potentially cross 36 watercourses spanning 18 river catchments and some coastal areas.

Pipeline Corridor A and additionally some part of Corridor F and part of Corridor D are mapped as high groundwater vulnerability; the remaining parts of Corridor F have moderate groundwater vulnerability and low groundwater vulnerability.

6.2.5 Soils and Geology

The Annsbrook site is generally used for agriculture and the western part of the site is classified as pasture land. Grey brown podzolics/ brown earths dominate the soil deposits within the site. To the north and south of the site, along the banks of the watercourses, surface water/groundwater gleys and alluvium have been mapped. The superficial deposits covering the majority of the site are limestone till (carboniferous). Alluvium has been mapped along the stream boundaries, but due to the buffers applied to the watercourses, as noted in Chapter 5, these are outside the site boundaries.

The bedrock lithology mapped beneath the site is the Lucan Formation. This lithology is composed of dark grey, well bedded, cherty, graded limestones and calcareous shales. No faults have been mapped within the site boundary, however a fault has been mapped to the north of the site, the extent of which is unknown and may run parallel to the eastern boundary of the site. Potential impacts are imperceptible however the absence of soft ground and the depth to bedrock should be confirmed by ground investigation.

The following potential constraints were identified along the transfer pipeline corridors:

- 1 Geological Heritage Site
- 35 locations where the following activities are or were undertaken - including unregulated sites: operational or historic Industrial activity, extractive sites / quarries, Waste sites or Graveyard sites
- 2 karst features
- High (95%) and medium (45%) chance of encountering shallow bedrock along corridors A and D respectively; low chance for other three sections
- Low potential (10%) to encounter soft ground

Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on the features identified above.

6.2.6 Agronomy and Agriculture

One landowner owns all the land within the proposed site boundary. The majority of the land within the site is currently used for beef enterprises. The land is considered to be of good quality suited to a wide range of farming enterprise, including beef farming, tillage farming, and vegetable production. These enterprises are currently being carried out on lands adjacent to the site. The overall severance impact has been identified by the Agronomist as minor.

6.2.7 Traffic

The Annsbrook land parcel is within lands bounded by the R129 to the south and local roads to the north, east and west. As such proposed access to the site has been located on the R129 and is shown on Figure 6a included in Appendix 17. The new

access road will be approximately 1,230m in length with some local widening required at the new junction, on the R129, to improve visibility.

The R129 is a single carriageway road linking the R122 to the R132 via Ballyboughal. It has a carriageway width of approximately 5-6m. Available accident data currently indicates a low accident frequency on this route.

The pipeline transfer corridors to this site would require two motorway and 11 national/regional road crossings, but which will be constructed by tunnelling methods.

6.2.8 Air Quality and Odour

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site. There should be no significant operational impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate air quality and odour standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for Annsbrook:

- A weighted equivalent of 22 dwellings within 1km of the site at potential risk of air quality impacts during construction
- A weighted equivalent of 22 dwellings within 1km of the site at potential risk of odour nuisance should the odour control system fail
- Sparse population within 500m in direction of prevailing winds; closest population centre in this direction at >2km distance
- Overall construction and operational phase impact ratings are imperceptible

Full details of the weightings applied for Air Quality and Odour are provided in the ASA – Phase 2 Air Quality and Odour Report included in Appendix 12 of this report.

6.2.9 Noise and Vibration

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site. There should be no significant operational noise or vibration impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate daytime and night time noise standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for Annsbrook:

- A weighted equivalent of 70 dwellings PIR (Potential Impact Rating) within 500m of the site
- The existing noise environment at the site is relatively rural in nature, the only significant noise source being the M1 Motorway which is within 1km of the site
- Overall construction phase impact rating is slight
- Overall operational phase impact rating is imperceptible

Full details of the weightings applied for Noise and Vibration are provided in the ASA – Phase 2 Noise and Vibration Report included in Appendix 13 of this report.

6.2.10 People and Communities

The settlement pattern at Annsbrook is linear/ dispersed rural, with a dominant tillage agriculture land use. Housing developments occur within the 1 km boundary to the west (local road), east (local road) and south (R129). A meandering, tree-lined river

runs northwest-southeast, approximately 50 metres north of the site boundary. Field boundaries are well defined with strong hedgerow use. This area maintains a strong rural character with some on-farm residences still remaining. Annsbrook has rural landscapes of high integrity, an active agricultural function and a settlement pattern most in keeping with traditional, rural communities. Along with several other sites, Annsbrook offers the most in terms of the traditional agri-economy. Specific features which can be identified for this site include the following:

- 44 residential and commercial buildings located 300-500m from the site boundary
- 66 residential and commercial buildings within 0.5-1.0km of the site boundary
- Lusk located 2.7km to the north-east, with a population density of 2.08 per hectare. Ballyboughal located 2.2km to the south west
- Ballyboghil Hedgerow Round (Slí na Sceacha) lies approximately 480m to the south west

6.2.11 Planning Policy

The Annsbrook site is zoned as RU (Rural). The site is in agricultural use. There are no known planning constraints associated with the site itself.

6.2.12 Engineering and Design

There are no identified technical constraints to the construction of the WwTP on the Annsbrook site. A WwTP located on this site would outfall to the northern outfall area.

Orbital sewers to this site consist of pumped rising mains and gravity sewers laid in open cut and tunnelled section. The outfall pipe to the northern outfall area would be a gravity sewer laid in open cut and tunnelled section.

The total length of pipeline (orbital sewer, transfer pipeline to coast and marine outfall) required for this site is approximately 47,850m. Total power required to pump flows to this site is in the order of 10,000kW.

It is feasible to route the Orbital sewers from the load centres to the WwTP and from the WwTP to the outfall within the pipeline corridors to generally avoid impacts on designated sites and significant areas of habitat.

An initial carbon footprint assessment was undertaken for the site options, which concentrated primarily on the transfer pipelines as the WwTP will be relatively similar for all sites, details of which are included in Appendix 16 of this report.

Cost data have not been included at this stage in the alternative sites assessment as total pipeline lengths and length to be constructed in open cut and length to be constructed in tunnel provide a surrogate CAPEX comparison, while energy requirements provide a surrogate OPEX comparison, for the nine site options. Costings (CAPEX and OPEX) will be developed for the emerging preferred site options. These will be used in conjunction with the additional data developed from further investigations on the emerging preferred site options and consideration of the issues and concerns raised during Phase 3 consultation to identify the preferred site option.

The following potential negative construction impacts have been identified in relation to Natura 2000 sites for the pipeline corridors:

- Potential Significant impact on the Broadmeadow Estuary SAC from routing of pipeline along corridor D east of Swords and adjacent to the Broadmeadow

Estuary. Potential mitigation of these impacts would be by tunnelling this element of the pipeline.

These potential impacts would be minimized or eliminated by constructing the pipeline in tunnel in this area.

6.3 Baldurgan

The site location and transfer pipeline routes are illustrated in Figure 7a included in Appendix 17. The pipeline corridors of relevance to the site are corridors A, D, F and G as illustrated in Figure 2 included in Appendix 17. The site utilises the northern outfall, see section 6.11.2 below for further details.

6.3.1 Ecology

In the surrounding environment, the mixture of arable grasslands, an abundance of hedgerows and adjacent watercourses provide good potential for occurrence of protected species, notably badger. The site is positioned 180m away from the Ballyboghil River however the proposed access road to the site crosses the river. The Ballyboghil River and tributaries comprise a salmonid system and the site is located approximately 5.3 km upstream of Rogerstown Estuary SPA/SAC and 7.0 km upstream of Malahide Estuary SPA/SAC.

The following potential negative impacts have been identified for the site:

- Potential Slight Impact on Natura 2000 wetlands (Rogerstown Estuary SPA/SAC and Malahide Estuary SPA/SAC/pNHA)
- Potential Moderate Impact on Fingal Ecological Networks sites (Ballyboghil River ecological corridor)
- Potential Slight Impact on protected species based on length of field boundary defined by hedgerow (0.1km)
- Potential Slight Impact on terrestrial habitats of high ecological value
- Potential Moderate Impact on salmonid systems – Site access road crosses the Ballyboghil River (salmonid system). Donabate River is non salmonid system
- Potential Moderate Impact due to loss of winter habitat for Lapwing and Golden Plover and other wader species as the site includes large arable fields and pastures suitable for Lapwing, Golden Plover or other winter waders

Ecological constraints located within the transfer pipeline corridors include the following:

- 6 Ecological Buffer Zones and 4-10 Nature Development Areas identified in the Fingal Development Plan
- 11 ecological corridors and approx 36 watercourse crossings, of which 9 are salmonid systems
- Watercourse crossings upstream of a number of Natura 2000 and Natural Heritage Areas including South Dublin Bay and River Tolka Estuary, North Dublin Bay, Malahide Estuary, Rogerstown Estuary, and Baldoyle Bay
- Watercourse crossings at Balcunnin Stream upstream of Water Framework Directive coastal waters
- Potential to impact on the breeding habitat of Kingfisher (Annex I species) due to a section located along Broadmeadow River (Corridors D & F)
- Areas of importance to wetland birds (IWeBS) adjacent to the Malahide Estuary IWeBS area
- Hedgerow and other BAP habitat

Details of the above designations are provided in the ASA – Phase 2 Ecology Report included in Appendix 5. Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on designated sites and significant areas of habitat. River crossings will primarily be undertaken by tunnelling thereby minimising or eliminating potential impacts.

6.3.2 Cultural Heritage

The Baldurgan site has one RMP site consisting of a holy well (DU007-016), located approximately 425m south-east of the site. The proposed site is located within the townland of Baldurgan. However, the proposed site access crosses a townland boundary, which divides Baldurgan and Grange. One site of archaeological potential has been identified within the vicinity of the proposed site from aerial photographs which consists of three potential circular enclosures (CH 30), located to the immediate east of the site. There is one NIAH structure consisting of a bridge (NIAH 11328002) located 800m east of the proposed site.

The following potential negative impacts were identified:

- 1 potential indirect Imperceptible Impact on feature from Record of Monuments & Places RMP (Holy Well), this feature is also a recorded Protected Structure
- 2 potential Indirect Impacts, one moderate and one slight on two Cultural Heritage features: site of potential circular enclosures and a vernacular farm respectively
- 1 watercourse where there is potential significant impact in relation to finds of further Cultural heritage features
- 1 potential Indirect Slight Impact on the historic designed landscape Newlawn House

Known Cultural heritage constraints located within the transfer pipeline corridors include the following:

- 32 features from Record of Monuments & Places
- 1 National Monument
- 27 recorded Protected Structures and 12 features from National Inventory of Architectural Heritage
- 24 Cultural Heritage features
- 22 historic design landscapes

Pipeline alignments shall be adopted within the pipeline corridors which avoid impacts on the above recorded sites.

6.3.3 Landscape and Visual

The Baldurgan site is located on the lower southern slopes of Nags Head with the terrain falling gently to the southeast. A tributary of the Turvey Stream is located adjacent to the southern boundary and the Ballyboghil River is located a short distance from the northern site boundary. The settlement of Ballyboughal is located just over 1km to the northwest of the site. The site is located within the 'Low Lying' landscape character type identified in the Fingal County Development Plan. This landscape type is recognised as having a 'Modest' value and a 'Low' level of sensitivity. An area of 'Highly Sensitive Landscape' zoning is located 1.5km to the north and designated

scenic routes are identified 0.5km and 5km to the north as well as 0.5km to the southeast of the land parcel.

The following potential negative impacts were identified:

- Potential Significant impacts on scenic routes (0.5km north & 0.5km southeast)
- Potential Moderate impact on areas of highly sensitive landscape (1.5km north)
- Potential Significant impact to the open rural landscape character.
- Potential Moderate impact for effective screening to foreshorten views, conflict with open landscape character and prevailing hedgerow characteristics,
- Potential Moderate impact on views from settlements (Crossroads settlement at Ballyboughal) and a Potential Slight impact from individual dwellings (houses along roads to the west and southeast)
- Potential Significant impacts on views from major roads (R108 and R129)
- Potential Slight impact on landscape structure (large undefined fields)

Potential landscape and visual impacts along the transfer pipeline corridors include:

- Potential significant impact on highly sensitive landscape from a large portion of Corridor A
- Potential significant impact on historic demesne landscapes if Abbeyville Estate is affected (Corridor D)

Landscape and visual impacts associated with the pipeline corridors will be temporary and pipeline alignments will be selected within the corridors to minimise impacts.

6.3.4 Hydrology and Hydrogeology

The 21.6 ha Baldurgan site has been located away from the floodplain of the Ballyboghil River and set back 50m from the Belinstown River tributary. The Ballyboghil River (water quality Q3) outfalls to Rogerstown Estuary (a SAC, SPA, pNHA, Ramsar and SNR site); the Belinstown River discharges into the Malahide Bay (a SAC and pNHA site). No water quality monitoring stations are available on the Belinstown River. If the Baldurgan site is selected for the proposed WWTP, then a water quality monitoring survey may be required to establish the baseline water quality of the Belinstown River.

The National flood hazard mapping website www.floodmaps.ie does not show any record of historic flooding in the vicinity of the Baldurgan site. However, flood extent maps produced by FEM FRAMS show overland flooding in the Ballyboghil River close to the northern boundary of the proposed site and extensive tidal and fluvial flooding in both the Ballyboghil and Belinstown Rivers approximately 2km downstream. As a result it is proposed that that the access to the site will require a new culvert/bridge across the Ballyboghil River.

The proposed site is entirely underlain by a locally important bedrock aquifer (Ll) which is moderately productive in local zones only. The groundwater vulnerability mapping shows the area in the vicinity of the proposed site to have a groundwater vulnerability rating of ‘low’. One groundwater source well (St. Bridget’s Well) was found to be 400m south of the proposed site. No karst features were found to be within 2km of the proposed site. Information received from Fingal County Council suggests the possibility of additional ground water abstraction points and groundwater wells within or in close proximity to the proposed site.

The following potential negative impacts were identified:

- Potential Slight Impact on sensitive surface water receptors due to proximity to Ballyboghil River, Belinstown River and tributary.
- Potential Moderate Impact on Ballyboghil River as a result of reduced conveyance from the culverting requirement.
- Potential Slight Impact in relation to potential flooding in Ballyboughal and Bellinstown
- Potential Slight Impact on designated sites, the Ballyboghil River discharges into Rogerstown Estuary (SPA, pNHA). The Belinstown River discharges to Malahide Bay (SAC, pNHA)
- Potential Slight Impact on groundwater vulnerability
- Potential Slight Impact on 1 identified spring (400m south)

The pipeline corridors potentially cross 36 watercourses spanning 18 river catchments and some coastal areas.

Pipeline Corridor A and additionally some part of Corridor F and part of Corridor D are mapped as high groundwater vulnerability; the remaining parts of Corridor F have moderate groundwater vulnerability and low groundwater vulnerability.

6.3.5 Soils and Geology

The soil types mapped on the site include: grey brown podzolics/ brown earths in the centre, acidic surface water / groundwater gleys in the southwest and basic surface water / groundwater gleys in the north east. The quaternary deposits underlying the site are limestone till of Carboniferous age. No alluvial deposits have been mapped within the site boundaries, however due to the proximity of streams to the northern, southern and western site boundaries it is likely that some soft ground in the form of silts may be encountered.

The site is designated a low groundwater vulnerability. This indicates that the bedrock is greater than 10m below ground level. The GSI Depth to Bedrock indicates that the bedrock may be shallower by classifying the whole site as having a depth to bedrock of 5m to 10m. Potential impacts associated with the site are imperceptible; however the absence of soft ground and the depth to bedrock should be confirmed by ground investigation.

The following potential constraints were identified along the transfer pipeline corridors:

- 1 Geological Heritage Site
- 35 potential contaminated sites Potential impacts associated with the site are imperceptible; however the absence of soft ground and the depth to bedrock should be confirmed by ground investigation.
- 2 karst features
- High (95%) and medium (45%) chance of encountering shallow bedrock along corridor sections A and D respectively; low chance for other two sections
- Low potential (10%) to encounter soft ground

Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on the features identified above.

6.3.6 Agronomy and Agriculture

There is one landowner directly impacted by the proposed site. The land quality is considered to be of good quality. The land use is suited to a wide range of farming enterprises and tillage, vegetable growing and potato farming are currently carried out on the site. There are no farm buildings within the site area though a farm roadway will be impacted. The overall severance impact has been identified by the Agronomist as minor.

6.3.7 Traffic

The Baldurgan site is surrounded by the R129 to the north, the R108 to the west and local roads to the south and east. The R108 has significant development built up alongside it which prevents a suitable access being achieved on this route which results in the proposed access being located on the R129. The proposed access location is shown in Figure 6b included in Appendix 17.

The new access road will be approximately 390m in length and will require one river and one stream crossing. Some widening would also be required of the R129 to improve accessibility.

The pipeline transfer corridors will require three motorway crossings which will be constructed by tunnelling methods.

6.3.8 Air Quality and Odour

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site and there should be no significant operational impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate air quality and odour standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for Baldurgan:

- A weighted equivalent of 10 dwellings within 1km of the site at potential risk of air quality impacts during construction
- A weighted equivalent of 10 dwellings within 1km of the site at potential risk of odour nuisance should the odour control system fail.
- Sparse population within 500 m in direction of prevailing winds; closest population centre in this direction at >5km distance
- Overall construction and operational phase impact ratings are imperceptible

Full details of the weightings applied for Air Quality and Odour are provided in the ASA – Phase 2 Air Quality and Odour Report included in Appendix 12 of this report.

6.3.9 Noise and Vibration

As with all nine short listed sites, there are no sensitive receptors within 300m of the site and there should be no significant operational noise or vibration impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate daytime and night time noise standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for Baldurgan:

- A weighted equivalent of 6 dwellings PIR (Potential Impact Rating) within 500 m of the site

- The existing ambient noise climate is relatively rural farmland area
- Overall construction and operational impact ratings are imperceptible

Full details of the weightings applied for Noise and Vibration are provided in the ASA – Phase 2 Noise and Vibration Report included in Appendix 13 of this report.

6.3.10 People and Communities

Baldurgan has a rural landscape of high integrity, an active agricultural function and a settlement pattern most in keeping with traditional, rural communities. Regarding local character, it is one of six sites as determined to offer the most in terms of the traditional agri-economy. Specific features which can be identified for the site include the following:

- 21 residential and commercial buildings within 300 - 500m of the site boundary
- 82 residential and commercial buildings within 0.5 – 1.0 km of the site boundary
- Major Town of Swords located 0.7km to the north-west, with a population density of 5.14 per hectare.
- Ballyboghil Hedgerow Round (Slí na Sceacha) is located 280m to the east.

6.3.11 Planning Policy

The entire Baldurgan site is zoned rural (RU). There are no significant planning constraints associated with the site.

The Fingal County Development plan mapping indicates that there are two separate views at approximately 1km distance from the site which have been designated for preservation therefore the potential landscape and visual impact of any proposed development will be a consideration in the assessment of this site for the proposed development.

6.3.12 Engineering and Design

There are no identified technical constraints to the construction of the WwTP on the Baldurgan site. A WwTP located on this site will outfall to the northern outfall area.

Orbital sewers to this site consist of pumped rising mains and gravity sewers laid in open cut and tunnelled section. The outfall pipe to the northern outfall area would be a gravity sewer laid in open cut and tunnelled section.

The total length of pipeline (orbital sewer, transfer pipeline to coast and marine outfall) required for this site is approximately 47,850m. Total power required to pump flows to this site is in the order of 9,700kW.

It is feasible to route the Orbital sewers from the load centres to the WwTP and from the WwTP to the outfall within the pipeline corridors to generally avoid impacts on designated sites and significant areas of habitat.

An initial carbon footprint assessment was undertaken for the site options, which concentrated primarily on the transfer pipelines as the WwTP will be relatively similar for all sites, details of which are included in Appendix 16 of this report.

Cost data have not been included at this stage in the alternative sites assessment as total pipeline lengths and length to be constructed in open cut and length to be

constructed in tunnel provide a surrogate CAPEX comparison, while energy requirements provide a surrogate OPEX comparison, for the nine site options. Costings (CAPEX and OPEX) will be developed for the emerging preferred site options. These will be used in conjunction with the additional data developed from further investigations on the emerging preferred site options and consideration of the issues and concerns raised during Phase 3 consultation to identify the preferred site option

The following potential negative construction impacts have been identified in relation to Natura 2000 sites for the pipeline corridors:

- Potential Significant impact on the Broadmeadow Estuary SAC from routing of pipeline along corridor D east of Swords and adjacent to the Broadmeadow Estuary.

These potential impacts would be minimized or eliminated by constructing the pipeline in tunnel in this area.

6.4 Cloghran

The site location and transfer pipeline corridors are illustrated in Figure 7d included in Appendix 17. The pipeline corridors of relevance to the site are corridors A, B, C and G, as illustrated in Figure 2 included in Appendix 17. The site utilises the southern outfall, see section 6.11.1 below for further details.

6.4.1 Ecology

The site contains well established tree hedgerows and is bound by the Sluice River to the north. This watercourse forms part of an ecological corridor given in the Fingal County Development Plan. Grasslands, hedgerows and an adjacent watercourse provide good potential for the occurrence of protected species, notably badger. The site is 4.3 km upstream from Baldoyle Bay SAC and SPA, with a potential pathway of effect via the Sluice River.

The following potential negative impacts have been identified for the site:

- Potential Slight Impact on Natura 2000 wetland sites
- Potential Significant Impact on Sluice River ecological corridor - site abuts river
- Potential Significant Impact on protected species based on length of field boundary defined by hedgerow (2.3km)
- Potential Moderate Impact on habitats of high ecological value
- Potential Moderate Impact on salmonid system (Sluice river and tributaries)
- Potential Moderate Impact on SPA qualifying bird species - site is more than 1km from any SPA boundary

Ecological constraints located within the transfer pipeline corridors include the following:

- Watercourse crossings upstream of a number of SPA, SAC and pNHA sites
- 3 ecological buffer zones (Corridor Section G), 6 nature development areas, 1 nature development area
- Corridors cross 5 ecological corridors and potentially cross 10 rivers or streams and 3 deciduous woodlands
- Corridors cross 4 salmonid systems
- Temporary loss of wet grassland areas that may be suitable wintering habitat for birds

Details of the above designations are provided in the ASA – Phase 2 Ecology Report included in Appendix 5. Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on designated sites and significant areas of habitat. River crossings will primarily be undertaken by tunnelling thereby minimising or eliminating potential impacts.

6.4.2 Cultural Heritage

There are six from the record of Monuments and Places located within 1km of the proposed site, the closest of these being the site of a mound (also listed as a protected structure) and the site of a Holy Well (site of Lady's Well). Two Cultural Heritage features have been identified as part of this assessment within the vicinity of the site

(an excavated Bronze Age burial, the site of Greenwood House). The National Museum of Ireland files have also revealed that a very significant amount of prehistoric and early medieval finds have been made at Feltrim Hill, c. 780m to the north-east.

Potential negative impacts for the site are:

- 1 potential Indirect Slight Impact on feature from Record of Monuments & Places (Holy Well – the site of Lady's Well, no longer in evidence)
- 1 potential Indirect Slight Impact on a site from Record of Protected Structures (the site of a mound which is also in the record of Monuments & Places)
- 1 watercourse where there is potential significant impact in relation to finds of further Cultural heritage features
- 1 Potential Direct Moderate Impact on townland boundaries

Known Cultural Heritage constraints located within the transfer pipeline corridors include the following:

- 28 features from Record of Monuments & Places
- 22 Recorded Protected Structures
- 9 features from National Inventory of Architectural Heritage
- 13 Cultural heritage features
- 18 historic design landscapes
- 1 partial Architectural Conservation Area

Pipeline alignments shall be adopted within the pipeline corridors which avoid impacts on the above recorded sites.

6.4.3 Landscape and Visual

The site at Cloghran is on flat ground immediately to the east of the M1 motorway and bordered by a small watercourse to the north. Predominant land use is pastoral agricultural with an intricate field system of mature broadleaf hedgerows. The site is located in the 'Low Lying' area, as designated in Fingal County Development Plan. This landscape type is recognised as having a 'modest' value and low level of sensitivity. An area of 'High Sensitive Landscape' zoning occurs approximately 0.8km to the east of the site.

The following potential negative impacts were identified:

- Potential Slight Impact on an elevated Highly Sensitive Landscape (HSL) zone 1km to the east with limited intervisibility
- Potential Moderate Impact on the character of the landscape – there is already major transport infrastructure to the west and a quarry and driving range to the east
- Potential Moderate Impact on views from Ballymacartle 1km southeast
- Potential Moderate Impact on views from a local roads and housing clusters – 500m south at Glebe and 500m to the east at Greenwood
- Potential Moderate Impact on views from the motorway – clear views from overpasses

- Potential Moderate Impact on landscape structure – strongly defined hedgerow system within site boundary

Potential landscape and visual impacts along the transfer pipeline corridors include:

- Potential Significant Impact to disrupt landscape structure along Corridor C
- Potential Significant Impact to impact on woodland along Tolka river (Corridor A)
- Potential Significant Impact on Tolka river (Corridor A) Mayne river (Corridor G)

Landscape and visual impacts associated with the pipeline corridors will be temporary and pipeline alignments will be selected within the corridors to minimise impacts.

6.4.4 Hydrology and Hydrogeology

The site has been set back 50m from the Sluice River to the north. Site access is from the south and does not require a culvert. The outfall of the river is to Baldoyle Estuary. The national flood hazard mapping website www.floodmaps.ie shows records of historic flooding upstream and downstream but not on the site itself.

The proposed site is entirely underlain by a poor bedrock aquifer which is generally unproductive, except locally (Pl). The area around the site has a predominantly low groundwater vulnerability rating. There are no groundwater wells within 500m of the site but there is 1 karst feature 2km southeast of the site.

The following potential negative impacts were identified:

- Potential moderate Impact due to proximity to water body in terms of flooding – Sluice river is adjacent to site boundary (buffer has been set in place)
- Vulnerability to groundwater contamination – potential moderate impact as mapped groundwater vulnerability includes both area of low vulnerability and high vulnerability

The pipeline corridors potentially cross 11 watercourses spanning 9 river catchments and some coastal areas.

Pipeline Corridor A and additionally some part of Corridor C are mapped as high groundwater vulnerability; the remaining parts of Corridor C along with Corridor G and Corridor B have either moderate groundwater vulnerability or low groundwater vulnerability.

6.4.5 Soils and Geology

The site is generally flat and gently slopes west to east with a topographic range of 40 – 30 mOD approx. A variety of soil types occur here – grey brown podzolics/brown earths, basic groundwater gleys and renzinas. Limestone till underlies the majority of the soil in the site with some gravel to the north near the river. There are no alluvium deposits within the site. The GSI Depth to Bedrock mapping indicates bedrock of 5-10m for the majority of the site. Potential impacts associated with the site are imperceptible; however the absence of soft ground and the depth to bedrock should be confirmed by ground investigation.

The following potential constraints were identified along the transfer pipeline corridors:

- 2 mineral resources at risk of sterilisation

- High (95%, 65%) potential to encounter shallow rock in section A and C respectively
- Low potential (10%) to encounter soft ground
- 32 locations where the following activities are or were undertaken - including unregulated sites: operational or historic Industrial activity, extractive sites / quarries, Graveyard sites

Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on the features identified above.

6.4.6 Agronomy and Agriculture

There are 4 landowners within the Cloghran site itself. The land is all good quality, suitable for a wide range of farming enterprises. The ground cover is grassland, mainly for beef production. There are no farm buildings or roadways within the site area. There are mature trees and hedgerows with the site. The overall severance impact has been identified by the Agronomist as minor.

6.4.7 Traffic

The site is bounded by the M1 motorway to the west, which is not suitable for access. The local road, Stockhole Lane, provides the only appropriate access location. Despite being a local road, Stockhole Lane is reasonably wide with a carriageway width of approximately 7m. The accident data for this road indicates infrequent minor accidents; however there are high accident rates on the adjacent N32 and R107 routes to which Stockhole Lane connects. Local works will be required at the junction location to Stockhole Lane to achieve adequate accessibility.

6.4.8 Air Quality and Odour

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site and there should be no significant operational impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate air quality and odour standards at all times. For differentiation purposes, the following can be said of the Cloghran site:

- A weighted equivalent of 87 dwellings within 1km of site boundary at risk of air quality impacts during both construction and operational phases
- A weighted equivalent of 87 dwellings within 1km of site boundary at risk of odour impacts at operational phase (No risk of odour at construction phase).

Full details of the weightings applied for Air Quality and Odour are provided in the ASA – Phase 2 Air Quality and Odour Report included in Appendix 12 of this report.

6.4.9 Noise and Vibration

As with all nine short-listed sites, there are no sensitive receptors within 300m of the site and there should be no significant operational noise or vibration impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate daytime and night time noise standards at all times. For differentiation purposes, the following can be said of the Cloghran site:

- A weighted equivalent of 15 dwellings Potential Impact rating (PIR) within 500m of the site

- The existing noise environment includes the M1 motorway and the area is under the projected flight path of the proposed parallel runway at Dublin Airport.
- Overall construction and operational phase impact ratings are slight

Full details of the weightings applied for Noise and Vibration are provided in the ASA – Phase 2 Noise and Vibration Report included in Appendix 13 of this report.

6.4.10 People and Communities

The settlement pattern at Cloghran is dispersed-rural as well as clustered-suburban to the north of the site (Swords housing estates). Land use has intensified in an orbital pattern around the site and includes a large quarry, the National Show Centre, housing development, Dublin airport and associated business park (the latter being within 1km). The land in and around the site is agricultural and forms part of the South Fingal Fringe. This is an area of converging functionality with few remaining traditional rural characteristics. Specific features of the site include:

- 116 residential and commercial buildings located within 300-500m of the site
- 629 residential and commercial buildings located within 500-1km of the site
- Significant residential areas are Swords 1.5km to the north, Ballymacartle housing estate 600m to the southeast. Cloghran ED density is 7.69 per hectare.
- Amenities include a playground c. 800m to the north and the National Show Centre c. 580m to the west.

6.4.11 Planning Policy

Cloghran shares many of the same planning policy objectives as Clonshagh due to their Greenbelt designations and location in the South Fingal Fringe. The Greenbelt zoning provides one of the biggest planning challenges. Proximity to the airport and the protection of the safety zones in the Fingal CDP could be an issue. Also local objectives in the CDP propose the development of a nursing home and the creation of a new tourism centre at Abbeyville House.

6.4.12 Engineering and Design

There are no identified technical constraints to the construction of the WwTP on the Cloghran site. A WwTP located on this site would outfall to the southern outfall area.

Orbital sewers to this site consist of pumped rising mains and gravity sewers laid in open cut and tunnelled section. The outfall pipe to the southern outfall area will be a gravity sewer laid in open cut and tunnelled section.

The total length of pipeline (orbital sewer, transfer pipeline to coast and marine outfall) required for the site is approximately 34,300m. Total power required to pump flows to this site is in the order of 8,550kW.

It is feasible to route the Orbital sewers from the load centres to the WwTP and from the WwTP to the outfall within the pipeline corridors to generally avoid impacts on designated sites and significant areas of habitat.

An initial carbon footprint assessment was undertaken for the site options, which concentrated primarily on the transfer pipelines as the WwTP will be relatively similar for all sites, details of which are included in Appendix 16 of this report. Cloghran

performed reasonably well in the assessment under both 'total embodied carbon' and 'total lifetime operational carbon' sub-criteria.

Cost data have not been included at this stage in the alternative sites assessment as total pipeline lengths and length to be constructed in open cut and length to be constructed in tunnel provide a surrogate CAPEX comparison, while energy requirements provide a surrogate OPEX comparison, for the nine site options. Costings (CAPEX and OPEX) will be developed for the emerging preferred site options. These will be used in conjunction with the additional data developed from further investigations on the emerging preferred site options and consideration of the issues and concerns raised during Phase 3 consultation to identify the preferred site option

The following potential negative construction impacts have been identified in relation to Natura 2000 sites for the pipeline corridors:

- Significant impact on the Baldoyle Estuary SAC from routing of outfall pipe to southern outfall area.

These potential impacts would be minimized or eliminated by constructing the pipeline in tunnel in this area.

6.5 Clonshagh

The site location and transfer pipeline corridors are illustrated in Figure 7c included in Appendix 17. The pipeline corridors of relevance to the site are corridors A, B and G as illustrated in Figure 2 included in Appendix 17. The site utilises the southern outfall, see section 6.11.1 below for further details.

6.5.1 Ecology

The Clonshagh site comprises tilled earth, a hedgerow network and adjacent watercourses, which provide good potential for occurrence of protected species, notably badger. The northern boundary of the Clonshagh site is bounded by the Cuckoo Stream, which is a tributary of the Mayne River, while the main channel of the Mayne River lies adjacent to the southern boundary of the site.

The site is located 4.6km upstream of Baldoyle Bay Special Protection Area (SPA) and Special Area of Conservation (SAC) with a potential pathway of effect available via the Mayne River. The Mayne River constitutes a non-salmonid system.

The following potential negative impacts have been identified for the site:

- Potential Slight Impact on Natura 2000 wetland Baldoyle Bay (SPA/SAC/pNHA)
- Potential Significant Impact on Fingal Ecological Network sites (Mayne River ecological corridor)
- Potential Moderate Impact on protected species based on length of field boundary defined by hedgerow (1.4km)
- Potential Moderate Impact on terrestrial habitats of high ecological value
- Potential Moderate Impact on birds which are the qualifying interest for the SPA
- Potential Moderate Impact for loss of winter habitat for Lapwing, Golden Plover and other wader species due to large pasture fields within the site being suitable for these birds

Ecological constraints located within the transfer pipeline corridors include the following:

- Potential Impact on 3 Ecological Buffer Zones and 6 Nature Development Areas
- 3 crossings of ecological corridors and approximately 5 watercourse crossings, of which 2 are salmonid systems.
- Watercourse crossings upstream of a number of Natura 2000 and Natural Heritage Areas including south Dublin Bay and River Tolka Estuary, North Dublin Bay, North Bull Island and Baldoyle Bay.
- Hedgerows and other BAP habitat

Details of the above designations are provided in the ASA – Phase 2 Ecology Report included in Appendix 5. Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on designated sites and significant areas of habitat. River crossing will primarily be undertaken by tunnelling thereby minimising or eliminating potential impacts.

6.5.2 Cultural Heritage

The Clonshagh site is located within the two townlands both of which are known as Clonshagh and the boundary that separates the two crosses the proposed site. There are seven features from the Record of Monuments and Places, three recorded Protected Structures and five structures from the National Inventory of Architectural Heritage located within 1km of the Clonshagh site.

The following potential negative impacts were identified:

- 3 Potential Indirect Imperceptible Impacts on features from the Record of Monuments and Places (two enclosures and a ringfort) and one recorded Protected Structure (house)
- 3 Potential Indirect Imperceptible Impacts on Cultural Heritage sites (enclosure, vernacular house and house and farm)
- 3 Potential Indirect Slight Impacts on historic designed landscapes of Spring Hill, Lower Middletown and Upper Middletown.

Known Cultural Heritage constraints located within the transfer pipeline corridors include the following:

- 20 features from Record of Monuments & Places
- 15 recorded Protected Structures and 6 features from National Inventory of Architectural Heritage
- 10 Cultural Heritage features
- 14 historic design landscapes

Pipeline alignments shall be adopted within the pipeline corridors which avoid impacts on the above recorded sites.

6.5.3 Landscape and Visual

The Clonshagh site is located just beyond the northern fringe of Dublin City with Bewleys Airport Hotel located approximately 500m to the southwest of the site, and the Hilton Airport Hotel less than 1km to the southeast of the site.

This site is located within the 'Low Lying' landscape character type identified in the Fingal County Development Plan. This landscape type is recognised as having a 'Modest' value and a 'Low' level of sensitivity. An area of 'Highly Sensitive Landscape' zoning occurs approximately 1km to the northeast of the site. The advantages of this site are the low integrity of the surrounding urban fringe landscape and the relatively low degree of visibility from surrounding roads and residences. This could change, however, if the planned Malahide Road realignment takes place as this would run along the southern boundary of the site. The sensitivities of the site include being in close proximity to several demesne landscapes, potential elevated views from the Bewley's and Hilton airports hotels and its location on the flight path for aircraft about to land or having just taken off from Dublin Airport.

The following potential negative impacts were identified:

- Potential Moderate Impacts on landscape character and potential to disrupt landscape character
- Potential Moderate Impact on Clonshagh historic designed landscape
- Potential Moderate Impact on views from rural dwellings

- Potential Moderate Impact on views from rural dwellings
- Potential Moderate Impact on views from heritage/tourist/amenity features (Bewleys Hotel, Hilton Airport Hotel and GAA grounds)
- Potential Slight Impacts on "Highly Sensitive Landscape" 1.3km north east
- Potential Slight Impact on views from settlements (Darndale <1km South, no clear views afforded toward the site)
- Potential Slight Impact on major roads (N32 and R107)
- Potential Significant Impact on views from aerial approach to Dublin Airport

Potential landscape and visual impacts along the transfer pipeline corridors include:

- Significant potential to impact on area zoned as highly sensitive landscape along the western half of Corridor A
- Significant potential to impact on areas of highly sensitive landscape in areas of Corridor B.
- Significant potential to impact on areas of highly sensitive landscape zoning as it approaches the Baldoyle Estuary (Corridor G)

Landscape and visual impacts associated with the pipeline corridors will be temporary and pipeline alignments will be selected within the corridors to minimise impacts.

6.5.4 Hydrology and Hydrogeology

The Clonshagh site has been set back 50m from the Cuckoo Stream (a tributary of the Mayne River). The access to the site is from the west and does not require culverting of any river or stream. The Mayne River (water quality Q3) outfalls to Baldoyle Estuary (a SPA, SAC and pNHA site). The national flood hazard mapping website www.floodmaps.ie shows no records of historic flooding of the site. Flood maps produced by FEM FRAMS do not show any overland flooding in the vicinity of the site, but do show extensive overland flooding approximately 2km downstream.

The proposed site is partially underlain by a locally important bedrock aquifer (LI) to the west (which is moderately productive in local zones only) and predominantly underlain by a poor bedrock aquifer (PI) to the east. The groundwater vulnerability mapping shows the area in the vicinity of the proposed site to have a groundwater vulnerability rating of 'low'. No groundwater source wells were found to be within 500m of the proposed site however one karst feature (St. Doolagh's Well) was found to be 1.3km to the east of the proposed site. Fingal County Council has no groundwater borehole records for the site.

The following potential negative impacts were identified:

- Slight impact on sensitive surface watercourse due to proximity to Cuckoo River and Mayne River, 50m and 370m respectively
- Moderate impacts on locally important bedrock aquifer and slight impact on groundwater vulnerability
- Slight impact on hydrogeological features, St Doolaghs well 1.2km east of site.

The pipeline corridors potentially cross 6 watercourses spanning 5 river catchments and some coastal areas.

Pipeline Corridor A is mapped as high groundwater vulnerability, while Corridor G and Corridor B have either moderate groundwater vulnerability or low groundwater vulnerability.

6.5.5 Soils and Geology

Limestone till deposits of Carboniferous age underlie the soils over the majority of the site however, gravels derived from limestone have been mapped in the north western corner. No alluvium deposits have been mapped within the site boundaries, however due to the proximity of streams to the northern site boundary, it is likely that some soft ground in the form of silts may be encountered.

The Tober Colleen Formation is the bedrock lithology which underlies the majority of the site. This lithology is described as a calcareous shale and limestone conglomerate. The Lucan Formation, a dark grey, well bedded, cherty, graded limestone and calcareous shale has been mapped at the western extent of the site.

The majority of the site has been classified as having a low groundwater vulnerability indicating that bedrock is generally greater than 10 m deep. The GSI DTB mapping indicates the bedrock is 5-10 m deep across the whole site which is shallower than the groundwater vulnerability mapping. Site specific ground conditions will be confirmed, as required, through site investigations.

There are two historic unregulated landfills located close to the site. Belcamp Lane Landfill (approximately 400m from the site boundary) has been assigned as a moderate risk site in terms of potential risk from contaminants; Doolaghs Quarry Landfill (approximately 850m from the site boundary) has been assigned as a low risk site in terms of potential risk from contaminants

Potential impacts associated with the site are imperceptible; however the absence of soft ground and the depth to bedrock should be confirmed by ground investigation.

The following potential constraints were identified along the transfer pipeline corridors:

- 24 potential contaminated sites
- High (95%) potential of encountering shallow bedrock along corridor section A
- Low Potential to encounter soft ground (1% - 10%)
- 35 locations where the following activities are or were undertaken - including unregulated sites: operational or historic Industrial activity, extractive sites / quarries, Graveyard sites.

Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on the features identified above.

6.5.6 Agronomy and Agriculture

There are three landowners within the Clonshagh site. Tillage and vegetable farming are carried out on the site with the majority of the site used for vegetable growing. There are no farm buildings impacted within the site area however there will be an impact on an existing farm roadway. There is a small amount of trees and hedgerows within the site area also. The overall severance impact has been identified by the Agronomist as minor.

6.5.7 Traffic

The Clonshagh site is situated near the N32 and the Clonshagh Road, the former being to the south and the latter to the west of the site. The N32 is a National Secondary Route of dual carriageway type. Current NRA policy restricts access to national routes where possible and as such access onto the N32 is unlikely. The proposed access is onto the Clonshagh Road as shown on Figure 6d included in Appendix 17. The Clonshagh Road is a section of the same local road as Stockhole Lane and so shares the same accident history infrequent minor accidents), however, the carriageway width is narrower, being approximately 5-6m, relative to a width of 7m on Stockhole Lane.

The pipeline transfer corridors to this site require two motorway crossings, which could be constructed by tunnelling.

6.5.8 Air Quality and Odour

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site and there should be no significant operational impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate air quality and odour standards at all times. For the purposes of differentiating between the sites the following can be identified;

- A weighted equivalent of 15 dwellings within 1km of the site at potential risk of air quality impacts during construction
- A weighted equivalent of 15 dwellings within 1km of the site at potential risk of odour nuisance should the odour control system fail
- Sparse population within 500 m in direction of prevailing winds; closest population centre in this direction at >5km distance
- Overall construction and operational phase impact ratings are imperceptible

Full details of the weightings applied for Air Quality and Odour are provided in the ASA – Phase 2 Air Quality and Odour Report included in Appendix 12 of this report.

6.5.9 Noise and Vibration

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site and there should be no significant operational noise or vibration impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate daytime and night time noise standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for Cookstown:

- A weighted equivalent of 37 dwellings PIR (Potential Impact Rating) within 500 m of the site
- The existing ambient noise climate is close to M50 and M1 Motorways and under the runway flight path for Dublin Airport.
- Overall construction and operational impact ratings are slight

Full details of the weightings applied for Noise and Vibration are provided in the ASA – Phase 2 Noise and Vibration Report included in Appendix 13 of this report.

6.5.10 People and Communities

The Clonshagh site is one of the weaker of the nine sites in terms of the determination of local character - the site is located in a zone of transition, i.e. a convergence of the urban and rural function, leading to a more fractured 'sense of place'. Although the site location is still moderately rural, the cumulative effect of industry, infrastructure and increasing residential density damage the rural character and identity of the area. Specific features that can be identified for this site include the following:

- 83 residential and commercial buildings within 300m – 500m of the site boundary
- 1443 residential and commercial buildings within 0.5 – 1.0 km of the site boundary
- 4 significant amenities; football grounds 700m to the north-west, Darndale and Belcamp Parks 800m to the south west and south east respectively and Innisfail GAA club 500m to the south.
- Town of Balgriffin located approximately 0.8km to the south, population density of 1.61 per ha

6.5.11 Planning Policy

The majority of the Clonshagh site is zoned Greenbelt. The south-western section of the site is zoned HT (High Technology) with a requirement to prepare a masterplan and flood risk assessment. The entire site is situated in the Dublin Airport Outer Public Safety Zone, and is just south of the Inner Public Safety Zone. The site is located within the Dublin Airport Outer Airport Noise Zone and the northern section of the site is situated in the Dublin Airport Inner Airport Noise Zone. The Fingal County Development Plan specifies road objectives for the area surrounding the site, which should be considered in relation to potential further development. An area zoned new residential is situated 300m southeast of the site.

6.5.12 Engineering and Design

There are no identified technical constraints to the construction of the WwTP on the Clonshagh site. A WwTP located on this site would outfall to the southern outfall area.

Orbital sewers to this site consist of pumped rising mains and gravity sewers laid in open cut and tunnelled section. The outfall pipe to the northern outfall area would be a gravity sewer laid in open cut and tunnelled section.

The total length of pipeline (orbital sewer, transfer pipeline to coast and marine outfall) required for this site is approximately 30,600m.Total power required to pump flows to this site is in the order of 7,850kW.

It is feasible to route the Orbital sewers from the load centres to the WwTP and from the WwTP to the outfall within the pipeline corridors to generally avoid impacts on designated sites and significant areas of habitat.

An initial carbon footprint assessment was undertaken for the site options, which concentrated primarily on the transfer pipelines as the WwTP will be relatively similar for all sites, details of which are included in Appendix 16 of this report. Clonshagh performed reasonably well in the assessment under both 'total embodied carbon' and 'total lifetime operational carbon' sub-criteria.

Cost data have not been included at this stage in the alternative sites assessment as total pipeline lengths and length to be constructed in open cut and length to be constructed in tunnel provide a surrogate CAPEX comparison, while energy requirements provide a surrogate OPEX comparison, for the nine site options. Costings (CAPEX and OPEX) will be developed for the emerging preferred site options. These will be used in conjunction with the additional data developed from further investigations on the emerging preferred site options and consideration of the issues and concerns raised during Phase 3 consultation to identify the preferred site option

The following potential negative construction impacts have been identified in relation to Natura 2000 sites for the pipeline corridors:

- Significant impact on the Baldoyle Bay SPA/SAC/pNHA from routing of outfall pipe to southern outfall area.

These potential impacts would be minimized or eliminated by constructing the pipeline in tunnel in this area.

6.6 Cookstown

The site location and transfer pipeline corridors are illustrated in Figure 7a included in Appendix 17. The pipeline corridors of relevance to the site are corridors A, D, F and G as illustrated in Figure 2 included in Appendix 17. The site utilises the northern outfall, see Section 6.11.2 below for further details.

6.6.1 Ecology

The site comprises arable grasslands, scrub, a hedgerow network and adjacent watercourses which provide good potential for occurrence of protected species, notably badger. The site is located 800m from the Ballyboghil River ecological corridor and is located 7.0km upstream of Malahide Estuary SPA and SAC with a potential pathway of effect available through the local surface water network. The Donabate River forms the northern boundary of this site and this river constitutes a non-salmonid system.

The following potential negative impacts have been identified for the site;

- Potential Slight Impact on Natura 2000 wetland sites (Malahide Estuary SPA/SAC/pNHA)
- Potential Slight Impact on Fingal Ecological Network Sites (Ballyboghil River Ecological corridor)
- Potential Slight Impact on protected species associated with field boundaries due to removal of 0.9km of hedgerow
- Potential Slight Impact on habitats of high ecological value
- Potential Slight Impact on breeding habitat for Annex 1 species Kingfisher.
- Potential Moderate Impact to result in loss of winter habitat for Lapwing and Golden Plover and other wader species as the site includes large arable fields and pastures suitable for Lapwing, Golden Plover or other winter waders

Ecological constraints located within the transfer pipeline corridors include the following:

- 6 Ecological Buffer Zones and 4-10 Nature Development Areas identified in the Fingal Development Plan
- 11 ecological corridors and approx 36 watercourse crossings, of which 9 are salmonid systems
- Watercourse crossings upstream of a number of Natura 2000 and Natural Heritage Areas including South Dublin Bay and River Tolka Estuary, North Dublin Bay, Malahide Estuary, Rogerstown Estuary, and Baldoyle Bay
- Watercourse crossings at Balcunnin Stream upstream of Water Framework Directive coastal waters
- Potential to impact on the breeding habitat of Kingfisher (Annex I species) due to a section of route located along Broadmeadow River (Corridor Section D & F)
- Areas of importance to wetland birds (IWeBS) adjacent to the Malahide Estuary IWeBS area
- Hedgerows and other BAP habitat

Details of the above designations are provided in the ASA – Phase 2 Ecology Report included in Appendix 5. Pipeline alignments within the pipeline corridors will be adopted

which aim to avoid or minimize impacts on designated sites and significant areas of habitat. River crossings will primarily be undertaken by tunnelling thereby minimising or eliminating potential impacts.

6.6.2 Cultural Heritage

There are two sites from the Record of Monuments and Places located within 1km of the Cookstown site. These consist of a holy well, located c. 195m east of the site and the site of a mound located c. 515m to the south-west. The proposed site is located within the townland of Cookstown, although part of the east and west boundaries are formed by townland boundaries. The proposed site access crosses a townland boundary, dividing Cookstown from Skidoo. This site access will also cross a small watercourse to the southeast of the boundary. Three sites of archaeological potential have been identified within the vicinity of the proposed site. These consist of the site of three potential circular enclosures, the site of a post medieval farmstead and the possible site of Cookstown House.

The following potential negative impacts were identified;

- 1 potential Indirect Slight Impact on a feature from Record of Monuments & places (Holy Well) also a recorded Protected Structure.
- 2 potential Slight Impacts on two Cultural Heritage features (circular enclosures and a vernacular farm) and a potential Indirect Imperceptible Impact on Cookstown House
- 3 watercourses where there is potential significant impact in relation to finds of further Cultural Heritage features
- Indirect slight negative on the historic designed landscape Skidoo House
- Two moderate impacts on townland boundaries crossed by the access road

Known Cultural heritage constraints located within the transfer pipeline corridors include the following:

- 32 features from Record of Monuments & Places
- 27 recorded Protected Structures and 12 features from National Inventory of Architectural Heritage
- 1 National monument
- 24 Cultural Heritage features
- 22 historic design landscapes

Pipeline alignments shall be adopted within the pipeline corridors which avoid impacts on the above recorded sites.

6.6.3 Landscape and Visual

This Cookstown site lies on the boundary between the ‘Low Lying’ and ‘Rolling Hills’ landscape character types identified in the Fingal County Development Plan. These landscape types are both recognised as having a ‘Modest’ value, however, the ‘Low Lying’ landscape type is deemed to have a ‘Low’ level of sensitivity, whilst the ‘Rolling Hills’ landscape type is assigned a ‘Medium’ level of sensitivity. An area of ‘Highly Sensitive Landscape’ zoning occurs 1.6km to the north of the site. Designated scenic routes occur 0.3km to the east and 1km to the north as well as 5km to the north. There is a strong potential to adversely affect the open character and integrity of this rural

landscape and effective screen planting of the proposal is likely to conflict with the surrounding landscape structure.

The following potential negative impacts were identified;

- Significant impacts on views from scenic routes to the East (0.5km) and also distant elevated views from scenic routes >5km North
- Slight potential to impact on areas of Highly Sensitive Landscape (HSL) located 1.6km North
- Significant impact on the open rural landscape character of high integrity
- Moderate potential for effective screening to foreshorten views and conflict with the open landscape character with particular regard to the elevated scenic route and HSL designation to the north
- Moderate impact on views from the Crossroads settlement, Ballyboughal 1.7km north-west and southward stretch of dwellings located 1km along the R108.
- Slight potential to impact on dwellings along the regional road (R108) 0.3km west.
- Potential Significant Impact on views from regional road R108, 0.3km west.
- Slight potential to disrupt landscape structure
- Potential Moderate Impact on historic designed landscape of Skidoo house surrounded to the north and east by the site (0.3km setback)

Potential landscape and visual impacts along transfer pipeline corridors include:

- Potential significant impact on highly sensitive landscape which contains a large portion of Corridor A
- Potential significant impact on demesne landscapes if Abbeyville Estate is affected (Corridor D)

Landscape and visual impacts associated with the pipeline corridors will be temporary and route alignments will be selected within corridors to minimise impacts.

6.6.4 Hydrology and Hydrogeology

The Cookstown site is located in the Belinstown River catchment and has been set back 50m from the Belinstown River. Access to the site is from the south-west and will require a new culvert on the tributary of the Broadmeadow River. The Belinstown River flows adjacent to the northern boundary of the site and outfalls to Malahide Bay (a SAC and PNHA site). Water Quality data are not currently available. There are no records of historic flooding from the Belinstown River in the vicinity of the site. Flood maps produced by FEM FRAMS do not show any overland flooding in the vicinity of the site, but extensive overland flooding is shown approximately 3km downstream.

The proposed site is entirely underlain by a locally important bedrock aquifer (Ll) which is moderately productive in local zones only. The groundwater vulnerability mapping shows the area in the vicinity of the proposed site to have a groundwater vulnerability rating of low. One groundwater source well (St. Bridget's Well) was found to be 210m south east of the proposed site however no karst features were found to be within 2km of the proposed site. Information received from Fingal County Council suggests the possibility of additional ground water abstraction points and groundwater wells within or in close proximity of the proposed site.

The following potential negative impacts were identified:

- Potential Moderate impact on sensitive surface water interceptors due to proximity of Belinstown River (10m north) and Broadmeadow Tributary (1km south)
- Potential Moderate impact on locally important bedrock and slight impact on groundwater vulnerability
- Potential for a slight impact on groundwater supplies and a spring (St. Bridget's Well) located 210m south east.

The pipeline corridors potentially cross 36 watercourses spanning 18 river catchments and some coastal areas.

Pipeline Corridor A and additionally some part of Corridor F and part of Corridor D are mapped as high groundwater vulnerability; the remaining parts of Corridor F have moderate groundwater vulnerability and low groundwater vulnerability.

6.6.5 Soils and Geology

The quaternary deposits underlying the Cookstown site are limestone till of Carboniferous age. No alluvial deposits have been mapped within the site boundaries, however due to the proximity of streams to the northern site boundary; it is likely that some soft ground in the form of silts may be encountered. The Lucan Formation, a dark grey, well bedded, cherty, graded limestone and calcareous shale has been mapped as the bedrock lithology underlying the whole site. There are no bedrock faults mapped within the site.

The site has been classified as having a low groundwater vulnerability indicating that bedrock is generally greater than 10 m deep. The GSI Depth to Bedrock mapping indicates the bedrock is 5-10 m deep across the majority of the site, with small areas of bedrock depth of 3-5m. This mapping indicates rock is shallower than the groundwater vulnerability mapping does. There is no site investigation data available to confirm which of these data sources is correct.

There is an historic sand and gravel pit located approximately 650m outside the boundary to the southwest of the site. Potential impacts associated with the site are imperceptible; however the absence of soft ground and the depth to bedrock should be confirmed by ground investigation.

The following potential constraints were identified along the transfer pipeline corridors;

- 1 Geological Heritage Site
- 2 karst features
- High (95%) and medium (45%) chance of encountering shallow bedrock along corridor sections A and D respectively; low chance for other two sections
- Low potential (10%) to encounter soft ground
- 35 locations where the following activities are or were undertaken - including unregulated sites: operational or historic Industrial activity, extractive sites / quarries, Graveyard sites

Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on the features identified above.

6.6.6 Agronomy and Agriculture

There is one landowner within the site. The land is all considered of good quality suited to a wide range of farming enterprises. Crop rotation is practised on the lands and vegetables and potatoes are part of the rotation. There are no farm buildings or farm roadways located within the site area. The overall severance impact for the site has been identified by the Agronomist as moderate.

6.6.7 Traffic

The proximity of the Cookstown site to the R108, has determined the R108 as the most achievable access route. The proposed access location is shown on Figure 6e included in Appendix 17. The new access road will be approximately 930m in length and will require 1 ditch/stream crossing. Significant improvement works would be required to provide a safe access off the R108, requiring significant landtake. The R108 runs in a North South direction linking Naul to Roganstown. The road has a carriageway width of approximately 5-6m. Accidents on the R108 are not frequent and none have been recorded in the vicinity of the proposed entrance.

The pipeline transfer corridors will require three motorway crossings which will be constructed by tunnelling methods.

6.6.8 Air Quality and Odour

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site and there should be no significant operational impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate air quality and odour standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for Cookstown:

- A weighted equivalent of 10 dwellings within 1km of the site at potential risk of air quality impacts during construction
- A weighted equivalent of 10 dwellings within 1km of the site at potential risk of odour nuisance should the odour control system fail.
- Sparse population within 500 m in direction of prevailing winds; closest population centre in this direction at >5km distance
- Overall construction and operational phase impact ratings are imperceptible

Full details of the weightings applied for Air Quality and Odour are provided in the ASA – Phase 2 Air Quality and Odour Report included in Appendix 12 of this report.

6.6.9 Noise and Vibration

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site and there should be no significant operational noise or vibration impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate daytime and night time noise standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for Cookstown:

- A weighted equivalent of 7 dwellings PIR (Potential Impact Rating) within 500 m of the site
- The existing ambient noise climate is relatively rural farmland area
- Overall construction and operational impact ratings are imperceptible

Full details of the weightings applied for Noise and Vibration are provided in the ASA – Phase 2 Noise and Vibration Report included in Appendix 13 of this report.

6.6.10 People and Communities

Cookstown has a rural landscape of high integrity, an active agricultural function and a settlement pattern most in keeping with traditional, rural communities. Regarding local character, it is one of six sites which has been determined to offer the most in terms of the traditional agri-economy.

- 53 residential and commercial buildings within 300 – 500m of the site boundary
- 59 residential and commercial buildings within 500m – 1.0 km of the site boundary
- 2 significant amenities in close proximity to the site, the Swords Roganstown golf club located 990m to the south and Ballyboghil Hedgerow Round located 980m to the north east.
- Dwellings are located at Ballyboughal approximately 0.9km to the north east.

6.6.11 Planning Policy

The Cookstown site is zoned RU (Rural). The Development Plan has designated a 'preserved view' to the east of the site boundary, and while these seem to be at some remove from the site, the potential landscape and visual impact of any proposed development will be a consideration in the suitability of this site for any new development. The proposed site is not located in any of the designated airport safety or noise zones.

6.6.12 Engineering and Design

There are no identified technical constraints to the construction of the WwTP on the Cookstown site. A WwTP located on this site would outfall to the northern outfall area.

Orbital sewers to this site consist of pumped rising mains and gravity sewers laid in open cut and tunnelled section. The outfall pipe to the northern outfall area would be a gravity sewer laid in open cut and tunnelled section.

The total length of pipeline (orbital sewer, transfer pipeline to coast and marine outfall) required for this site is approximately 47,900m.Total power required to pump flows to this site is in the order of 10,000kW.

It is feasible to route the Orbital sewers from the load centres to the WwTP and from the WwTP to the outfall within the pipeline corridors to generally avoid impacts on designated sites and significant areas of habitat.

An initial carbon footprint assessment was undertaken for the site options, which concentrated primarily on the transfer pipelines as the WwTP will be relatively similar for all sites, details of which are included in Appendix 16 of this report.

Cost data have not been included at this stage in the alternative sites assessment as total pipeline lengths and length to be constructed in open cut and length to be constructed in tunnel provide a surrogate CAPEX comparison, while energy requirements provide a surrogate OPEX comparison, for the nine site options. Costings (CAPEX and OPEX) will be developed for the emerging preferred site options. These will be used in conjunction with the additional data developed from further

investigations on the emerging preferred site options and consideration of the issues and concerns raised during Phase 3 consultation to identify the preferred site option.

The following potential negative construction impacts have been identified in relation to Natura 2000 sites for the pipeline corridors:

- Potential Significant impact on the Malahide Estuary SPA/SAC/pNHA from routing of pipeline along corridor D east of Swords and adjacent to the Malahide Estuary.

These potential impacts would be minimized or eliminated by constructing the pipeline in tunnel in this area.

6.7 Newtowncorduff

The site location and transfer pipeline corridors are illustrated in Figure 7a included in Appendix 17. The pipeline corridors of relevance to the site are corridors A, D, F and G as illustrated in Figure 2 included in Appendix 17. The site utilises the northern outfall, see section 6.11.2 below for further details.

6.7.1 Ecology

The site lies in what has been noted as 'High Lying Agricultural' land. The mixture of arable and tillage grasslands, proliferation of hedgerows and adjacent watercourses provide good potential for occurrence of protected species, notably badger. The site is located 2.9 km upstream of Rogerstown Estuary SPA and SAC with a clear potential pathway of effect available through the local surface water network. Two converging watercourses (Rath Little stream and Ballough river) form part of an ecological corridor identified in the County Development Plan.

The following potential negative impacts have been identified for the site:

- Potential Moderate Impact on Natura 2000 wetland sites (Rogerstown SPA/SAC)
- Significant impact on Fingal Ecological Network Sites (Rath Little and Ballough rivers)
- Potential Significant Impact on protected hedgerow-based species
- Potential Significant Impact on habitats of high ecological value
- Potential Moderate Impact on salmonid system (Ballough river)
- Potential Moderate Impact on SPA qualifying bird species - the site is more than 1 km from any SPA boundary.

Ecological constraints located within the transfer pipeline corridors include the following:

- Watercourse crossings upstream of a number of SPA, SAC and pNHA sites
- 6 ecological buffer zones and 4-10 nature development areas
- 10 ecological corridors and potentially crosses 36 rivers or streams
- Corridors cross 8-9 salmonid systems
- Potential to impact on the breeding habitat of Kingfisher (Annex I species) due to a section of route located along Broadmeadow River (Corridor Section D & F)
- Portions of the route have good mature hedgerow, scrub and grassland suitable for the breeding habitat of the Yellowhammer, Tree Sparrow, Spotted Flycatcher and Kingfisher
- Areas of importance to wetland birds (IWeBS) adjacent to the Malahide Estuary IWeBS area
- Hedgerows and other BAP habitat

Details of the above designations are provided in the ASA – Phase 2 Ecology Report included in Appendix 5. Pipeline alignments within the route corridors will be adopted which aim to avoid or minimize impacts on designated sites and significant areas of

habitat. River crossings will primarily be undertaken by tunnelling thereby minimising or eliminating potential impacts.

6.7.2 Cultural Heritage

There are six sites from the record of Monuments and Places RMP sites located within 1km of the proposed site, the closest of these being a *fulacht fiadh* and moated site which is a protected structure. Four Cultural Heritage sites were identified in this assessment within the vicinity of the proposed site (the site of two mounds, a possible ring ditch site, a possible medieval village site and a possible castle and mill site, of possible medieval date). The proliferation of medieval and potential medieval sites indicates that the proposed site may be located within a landscape that has a higher potential for medieval archaeological remains.

The following potential negative impacts were identified:

- 3 potential Indirect Slight Impacts on Cultural heritage features identified in this assessment (*fulacht fiadh*, moated site, potential medieval site) and 4 potential Indirect Imperceptible Impacts
- 1 watercourse where there is potential significant impact in relation to finds of further Cultural heritage features

Known Cultural Heritage constraints located within the transfer pipeline corridors include the following:

- 32 features from Record of Monuments & Places
- 28 recorded Protected Structures and 12 features from National Inventory of Architectural Heritage
- 1 National monument
- 26 Cultural Heritage features
- 22 historic design landscapes
- 1 partial Architectural Conservation Area

Pipeline alignments shall be adopted within the pipeline corridors which avoid impacts on the above recorded sites.

6.7.3 Landscape and visual

The site is on relatively flat ground with a land cover of tillage and pasture within a dense geometric field system, bounded by mature broadleaf hedgerows. It is located in the 'Low Lying' landscape character type identified in the Fingal County Development Plan. It is of modest value and has 'low sensitivity'. The town of Lusk is 1.5 km to the east while the R132 road and M1 motorway lie to the east and west of the site respectively.

The following potential negative impacts were identified:

- Potential Significant impact on views to the north (0.5km) and northwest (0.7km)
- Potential Slight impact on an elevated Highly Sensitive Landscape (HSL) zone 0.7km to the northwest
- Potential Moderate impact on views from a pub overlooking the site, 0.5km to the northeast

- Potential Moderate impact on the character of the landscape – there is already major transport infrastructure
- Potential Slight impact on views from Dunganstown (1km southeast)
- Potential Moderate impact on views from a local road (0.5km north) and the R132 (0.5km east)
- Potential Significant impact on views from the motorway – there will be filtered views from site screening
- Potential Significant impact on views from the R132 – it is slightly raised and affords occasional views of site
- Potential Significant impact on landscape structure – strongly defined hedgerow system within site boundary

Potential landscape and visual impacts along the transfer pipeline corridors include:

- Potential significant impact on highly sensitive landscape which contains a large portion of Corridor A
- Potential significant impact on demesne landscapes if Abbeyville Estate is affected (Corridor D)

Landscape and visual impacts associated with the pipeline corridors will be temporary and route alignments will be selected within corridors to minimise impacts.

6.7.4 Hydrology and Hydrogeology

The Newtowncorduff site is located in the Ballough river catchment. The river merges with its tributary and forms a confluence flowing just south of the site boundary. The river outfalls to Rogerstown Estuary (SPA/SAC/pNHA). The access to the site is from the northeast and would require a culvert on the tributary. The national flood hazard mapping website www.floodmaps.ie shows records of historic flooding around the site itself.

The proposed site is jointly underlain by locally important bedrock – aquifer (Lm) to the north and aquifer (Ll) to the south. Groundwater vulnerability rating is 'low'. There is 1 bored groundwater well 510m to the north for agricultural and domestic use and 4 karst features were found within 1.8km of the site. There is evidence of further potential groundwater wells in and around the site.

The pipeline corridors potentially cross 36 watercourses spanning 18 river catchments and some coastal areas.

Pipeline Corridor A and additionally some part of Corridor F and part of Corridor D are mapped as high groundwater vulnerability; the remaining parts of Corridor F have moderate groundwater vulnerability and low groundwater vulnerability.

6.7.5 Soils and Geology

The site is generally flat with a gentle slope to the south and a topographic range of 15-25m OD. The site use is agricultural with the southern section specifically designated as pasture. The soils are grey brown podzolics/brown earths in the centre and groundwater gleys around the edges. Limestone tills of Irish Sea basin origin lie beneath these. There are no alluvium deposits within the site.

The GSI Depth to Bedrock mapping indicates that bedrock is 5-10m deep across most of the site with some areas in the south 3-5m. Potential impacts associated with the site are imperceptible; however the absence of soft ground and the depth to bedrock should be confirmed by ground investigation.

The following potential constraints were identified along the transfer pipeline corridors:

- 1 Geological Heritage Site
- 3 mineral resources potentially sterilised
- High potential of encountering shallow bedrock in corridor A (95%) and medium potential for corridor D (45%)
- Low chance of encountering soft ground (10%)
- 35 locations where the following activities are or were undertaken - including unregulated sites: operational or historic Industrial activity, extractive sites / quarries, Graveyard sites

Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on the features identified above.

6.7.6 Agronomy and Agriculture

There is one landowner within the Newtowncorduff site. Land is considered to be of good quality and subject to a wide range of farming enterprises. On the site itself, beef is produced and grass and rapeseed are grown, while the surrounding lands are used for a number of farming enterprises including growing of wheat, cauliflower, grass and rapeseed. There are mature tree hedgerows but no farm buildings in the site. A large agri-business, 'Whites Agri', is located adjacent to the site. The overall severance impact has been identified by the Agronomist as minor.

6.7.7 Traffic

The Newtowncorduff site borders the M1 Motorway, which is unsuitable for access. The nearest roads with potential for an access are the R132 to the east of the site and a local road to the north. The local road is of lower standard than the R132 and not suitable for access, therefore it is proposed to provide an access onto the R132. The proposed access location is shown on Figure 6f included in Appendix 17. The R132 was formerly part of the N1/M1 National Route linking Dublin to Belfast and is a well maintained single carriageway road. The section between Blake's Cross and the Five Roads where the proposed access has been located has a running carriageway of approximately 7m in width and 2.5m hard shoulders. There have been several accidents along this section of the R132 with 1 recorded as being serious.

6.7.8 Air Quality and Odour

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site. There should be no significant operational impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate air quality and odour standards at all times. For differentiation purposes, the following can be said of the Newtowncorduff site:

- A weighted equivalent of 19 dwellings within 1km of site boundary at risk of air quality impacts during both construction and operational phases

- A weighted equivalent of 19 dwellings within 1km of site boundary at risk of odour impacts at operational phase (No risk of odour at construction phase).

Full details of the weightings applied for Air Quality and Odour are provided in the ASA – Phase 2 Air Quality and Odour Report included in Appendix 12 of this report.

6.7.9 Noise and Vibration

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site. There should be no significant operational noise or vibration impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate daytime and night time noise standards at all times. For differentiation purposes, the following can be said of the Newtowncorduff site:

- A weighted equivalent of 40 dwellings within 500m of the site at risk of noise impacts during construction phase
- The M1 and N1 provide the existing noise climate
- Overall construction and operation phase impact ratings are 'slight'.

Full details of the weightings applied for Noise and Vibration are provided in the ASA – Phase 2 Noise and Vibration Report included in Appendix 13 of this report.

6.7.10 People and Communities

Newtowncorduff has a dispersed-rural settlement pattern. The site has both agricultural and infrastructural (motorway) activities associated nearby. Housing is both rural and urban generated. The area around the site is rural in character but its integrity is lessened somewhat by the prominence of the motorway and associated fly-over. The site is also located within the wider rural hinterland of Lusk, which is popular with walkers and outdoor enthusiasts. There are no known leisure/tourism amenities within 1 km of the site. Specific features of this site include:

- 33 residential and commercial buildings within 300m - 500m of the site boundary
- 205 residential and commercial buildings within 500m – 1km of the site boundary
- Lusk is 1.3km to the east with a population density of 2.08 per hectare

6.7.11 Planning Policy

The entire site is zoned RU (rural) but the development boundary of the town of Lusk is located within 1km of the site boundary and has been specified as suitable for housing development. There are no significant planning policy challenges associated with Newtowncorduff.

6.7.12 Engineering and Design

There are no identified technical constraints to the construction of the WwTP on the Newtowncorduff site. A WwTP located on this site would outfall to the northern outfall area.

Orbital sewers to this site consist of pumped rising mains and gravity sewers laid in open cut and tunnelled section. The outfall pipe to the northern outfall area would be a gravity sewer laid in open cut and tunnelled section.

The total length of pipeline (orbital sewer, transfer pipeline to coast and marine outfall) required for this site is approximately 47,850m.Total power required to pump flows to this site is in the order of 9,300kW.

It is feasible to route the Orbital sewers from the load centres to the WwTP and from the WwTP to the outfall within the pipeline corridors to generally avoid impacts on designated sites and significant areas of habitat.

An initial carbon footprint assessment was undertaken for the site options, which concentrated primarily on the transfer pipelines as the WwTP will be relatively similar for all sites, details of which are included in Appendix 16 of this report.

Cost data have not been included at this stage in the alternative sites assessment as total pipeline lengths and length to be constructed in open cut and length to be constructed in tunnel provide a surrogate CAPEX comparison, while energy requirements provide a surrogate OPEX comparison, for the nine site options. Costings (CAPEX and OPEX) will be developed for the emerging preferred site options. These will be used in conjunction with the additional data developed from further investigations on the emerging preferred site options and consideration of the issues and concerns raised during Phase 3 consultation to identify the preferred site option

The following potential negative construction impacts have been identified in relation to Natura 2000 sites for the pipeline corridors:

- Potential Significant impact on the Malahide Estuary SPA/SAC/pNHA from routing of pipeline along corridor D east of Swords and adjacent to the Malahide Estuary.

These potential impacts would be minimized or eliminated by constructing the pipeline in tunnel in this area.

6.8 Rathartan

The site location and transfer pipeline corridors are illustrated in Figure 7b included in Appendix 17. The pipeline corridors of relevance to the site are corridors A, D, E, F and G as illustrated in Figure 2 included in Appendix 17. The site utilises the northern outfall, see section 6.11.2 for further details.

6.8.1 Ecology

The environment surrounding the site comprises of a mixture of cultivated and tillage grasslands, hedgerows and watercourses, which provide good potential for occurrence of protected species, notably badger.

The site is located 1km upstream of the Rogerstown Estuary SPA and SAC with a clear potential pathway of effect available through the local surface water network. This site is set back from the Lusk River corridor to the west but the proposed access road crosses this river.

The following potential negative impacts have been identified for the site:

- Potential Significant Impact on Natura 2000 wetland site Rogerstown Estuary SPA/SAC/pNHA (1km north)
- Potential Significant Impact on protected species based on length of field boundary defined by hedgerow (2.5km)
- Potential Slight Impact on salmonid systems (Lusk river is non salmonid)
- Potential Moderate Impact on birds which are the qualifying interest of the SPA – moderate as the site is more than 1km from the boundary of a SPA
- Potential Moderate Impact on greylag goose feeding area, as the site lies within the normal geographic range of the north Co. Dublin winter greylag goose flock
- Potential Moderate Impact due to loss of winter habitat for Lapwing and Golden Plover and other wader species, particularly as relatively close proximity to Rogerstown Estuary increases likelihood of site being used by waders

Ecological constraints located within the transfer pipeline corridors include the following:

- 6 Ecological Buffer Zones and 4-10 Nature Development Areas identified in the Fingal Development Plan
- 12-13 ecological corridors and approx 45 watercourse crossings, of which 11-12 are salmonid systems
- Watercourse crossings upstream of a number of Natura 2000 and Natural Heritage Areas including South Dublin Bay and River Tolka Estuary, North Dublin Bay, Malahide Estuary, Rogerstown Estuary, and Baldoyle Bay
- Watercourse crossings, including Balcunnin Stream and Rush Stream, upstream of Water Framework Directive coastal waters
- Potential to impact on the breeding habitat of Kingfisher (Annex I species) due to a section of route located along Broadmeadow River (Corridor Section D & F)
- Areas of importance to wetland birds (IWeBS) adjacent to the Malahide Estuary IWeBS area and the Skerries Grasslands IWeBS area
- Hedgerow and other BAP habitat

Details of the above designations are provided in the ASA – Phase 2 Ecology Report included in Appendix 5. Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on designated sites and significant areas of habitat. River crossings will primarily be undertaken by tunnelling thereby minimising or eliminating potential impacts.

6.8.2 Cultural Heritage

There are seven features from the Record of Monuments and places located within 1km of the Rathartan site. There are also eleven recorded Protected Structures located within 1km of the proposed site in addition to five structures of architectural merit. These structures of architectural merit are not subject to statutory protection.

The proposed site is located within the townlands of Rathartan and Horestown. The townland boundary that divides the two runs across the centre of the proposed development area. The proposed access route will cross the townland boundary, which is also a watercourse, which divides Rathartan from Whitestown and another watercourse which separates the townland of Whitestown and Beau.

The following potential negative impacts were identified:

- 1 Potential Indirect Moderate Impact on recorded Protected Structure (Holy Well) and 1 Potential Indirect Imperceptible Impact on recorded Protected Structure, Whitestown house.
- 3 potential Indirect Imperceptible Impacts on Cultural Heritage features (2 railway bridges and Haystone House) and 1 Potential Slight Impact on a Cultural Heritage site, a derelict single storey house
- 1 watercourse where there is potential significant impact in relation to finds of further Cultural heritage features
- 2 potential Direct Moderate Impacts on townland boundaries which cross the site.

Known Cultural heritage constraints located within the transfer pipeline corridors include the following:

- 34 features from Record of Monuments & Places
- 38 recorded Protected Structures and 20 features from National Inventory of Architectural Heritage
- 1 National monument
- 28 Cultural Heritage features
- 25 historic design landscapes

Pipeline alignments shall be adopted within the pipeline corridors which avoid impacts on the above recorded sites.

6.8.3 Landscape and Visual

The Rathartan site is located in an area with small watercourses running along its south western and eastern boundaries. This site is located within the ‘Coastal’ landscape character type identified in the Fingal County Development Plan. This landscape type is recognised as being of ‘Exceptional’ value and a ‘High’ level of sensitivity. An area of ‘Highly Sensitive Landscape’ (HSL) zoning and a designated scenic route both occur 0.5km to the south of the site.

The constraints relating to the Rathartan site include its relatively close proximity to the significant sized coastal settlement of Rush and the potential for close views from the Dublin/Belfast railway line, which lies just to the west. The surrounding landscape has an open rural character of high integrity. It is also quite distinctive as it is used for intensive market gardening.

The following potential negative impacts were identified:

- Moderate impact on views from scenic route located to the south (0.5km)
- Slight potential to impact on areas of Highly Sensitive Landscape
- Moderate impact on views from heritage/tourist/amenity features (Baldongan Church 2.5km north)
- Moderate impact to rural landscape character but located near the urban fringe of Rush
- Moderate potential for effective screening to foreshorten views, conflict with open landscape character and prevailing hedgerow characteristics (elevated views from castle and scenic route to north and scenic route to south)
- Significant impacts on views from settlements (coastal settlement of Rush 0.8km east)
- Moderate impact on views from local dwellings (clusters of houses at Kingtown 0.5km west, Haytown 0.5km north and Whitestown 0.5km south)
- Significant impact on views from Dublin – Belfast rail line which lies directly west
- Significant impacts on views from major regional road R128
- Moderate impact on landscape structure
- Slight impact on Haystown demesne historic designated landscape

Potential landscape and visual impacts along transfer pipeline corridors include:

- Significant potential to disrupt landscape structure along Section E which passes almost entirely through fields and hedgerows, with moderate to slight potential along other sections of the corridor
- Potential significant impact on demesne landscapes if Abbeyville Estate is affected (Section D)

Landscape and visual impacts associated with the pipeline corridors will be temporary and route alignments will be selected within the corridors to minimise impacts.

6.8.4 Hydrology and Hydrogeology

The Rathartan site is located in the Collinstown Stream catchment and has been set back 50m from the watercourse. The access to the site is from the south west and will require a new culvert on the Collinstown Stream. The Collinstown Stream flows adjacent to the western boundary of the site and outfalls to the Rogerstown Estuary (a SAC, SPA, pNHA, Ramsar and SNR site) less than 1km downstream. As water quality data for the Collinstown Stream are currently unavailable a water quality monitoring survey of this stream will be required. Three recreational bathing sites, namely, Rush South Beach, Brook Beach and Loughshinny Beach are located within approximately 3km of the site. There are some known records of historic flooding approximately 500m downstream of the site but none in the vicinity of the site. The flood maps produced by FEM FRAMS do not show any overland flooding in the vicinity of the site.

The proposed site is entirely underlain by a locally important bedrock aquifer (Lm) which is generally moderately productive. The groundwater vulnerability mapping shows the area in the vicinity of the proposed site to have a groundwater vulnerability rating of 'low'. The GSI mapping does not show any groundwater source well within 500m of the proposed site however one karst feature a Bog Well was found to be 1.7km northwest of the proposed site. Further information provided by FCC suggests the possibility of additional ground water abstraction points and groundwater wells within or in close proximity to the proposed site.

The following potential negative impacts were identified:

- Potential Slight impact on sensitive surface watercourse due to proximity to Collinstown Stream (30m west) and Palmerstown Stream (120m southeast)
- Potential Slight impact on flood-prone watercourses due to crossing at Collinstown Stream
- Potential Moderate impact on ecologically important and designated sites as the Collinstown stream discharges into Rogerstown Estuary (SAC, SPA, pNHA, Ramsar and SNR) approx. 1km downstream
- Potential Moderate impact on locally important bedrock aquifer
- Potential Slight impact on groundwater vulnerability
- Potential Slight impact on hydrogeological features: 1 spring (Bog Well 1.7km north west of the site)

The pipeline corridors potentially cross 45 watercourses spanning 28 river catchments and some coastal areas.

Pipeline Corridor A and additionally some part of Corridor F and part of Corridor D are mapped as high groundwater vulnerability; the remaining parts of Corridor F have moderate groundwater vulnerability and low groundwater vulnerability.

6.8.5 Soils and Geology

Irish Sea till underlies the soils over the majority of the site. No alluvial deposits have been mapped within the site boundaries, however due to the proximity of streams to the south-western site boundary; it is likely that some soft ground in the form of silts may be encountered. The Lucan Formation, a dark grey, well bedded, cherty, graded limestone and calcareous shale underlie the majority of the site.

The groundwater vulnerability has been classified as low across the whole site indicating bedrock is greater than 10 m deep. The GSI Depth to Bedrock mapping shows the majority of the site to have an overburden thickness of 5 – 10 m with a small area on the western boundary of 3 – 5 m. No site investigation data are available for the site; however GSI boreholes close to the site boundary indicate depth to bedrock to be up to 35 m below ground level.

The main Dublin-Belfast railway line (T1) is situated close to the western boundary of the site and is identified as a potential source of contamination. Potential impacts associated with the site are imperceptible; however the absence of soft ground and the depth to bedrock should be confirmed by ground investigation.

The following potential constraints were identified along the transfer pipeline corridors:

- 1 Geological Heritage Site
- 2 karst features

- High (95%) and Medium (45%) chance of encountering shallow bedrock along corridor sections A and D respectively; low chance for other three sections
- Low potential (10%) to encounter soft ground
- 38 locations where the following activities are or were undertaken - including unregulated sites: operational or historic Industrial activity, extractive sites / quarries, Graveyard sites

Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on the features identified above.

6.8.6 Agronomy and Agriculture

The land at the Rathartan site is all considered to be of good quality suited to a wide range of farming enterprises. The lands in this site are currently used for tillage and vegetable growing, including cauliflower, parsnips, spinach and cabbage. A large proportion of the proposed site area is used for intensive vegetable production. There are no farm buildings located within the site area. A farm laneway giving access to a number of landowners is located within the site area. The overall severance impact has been identified by the Agronomist as moderate in the case of the Rathartan site.

6.8.7 Traffic

Potential access points to the Rathartan land parcel are limited due to the presence of the Dublin to Belfast Railway line to the west of the site. As a result the only viable road for providing an access to the site is the R128. The proposed access location is shown on Figure 6g included in Appendix 17. The new access road will be approximately 620m in length. The R128 is a regional road linking Lusk to Rush and Skerries. Some local widening will be required on the R128 to improve visibility and therefore some additional landtake is probable. The carriageway width of the R128 is approximately 6m and the accident history shows several minor accidents along the section the access will be located.

The pipeline transfer corridors to this site will require three motorway and two national/regional road crossings, which will be constructed by tunnelling methods.

6.8.8 Air Quality and Odour

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site. There should be no significant operational impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate air quality and odour standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for Rathartan:

- A weighted equivalent of 29 dwellings within 1km of the site at potential risk of air quality impacts during construction
- A weighted equivalent of 29 dwellings within 1km of the site at potential risk of odour nuisance should the odour control system fail.
- Sparse population within 500 m in direction of prevailing winds; closest population centre in this direction at >5km distance
- Overall construction and operational phase impact ratings are imperceptible

Full details of the weightings applied for Air Quality and Odour are provided in the ASA – Phase 2 Air Quality and Odour Report included in Appendix 12 of this report.

6.8.9 Noise and Vibration

As with all of the nine short-listed sites, there are no sensitive receptors within 300m of the site. There should be no significant operational noise or vibration impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate daytime and night time noise standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for Rathartan:

- A weighted equivalent of 22 dwellings PIR (Potential Impact Rating) within 500 m of the site
- The existing ambient noise climate borders the DART rail line
- Overall construction and operational impact ratings are slight

Full details of the weightings applied for Noise and Vibration are provided in the ASA – Phase 2 Noise and Vibration Report included in Appendix 13 of this report.

6.8.10 People and Communities

The Rathartan site is in an area which maintains a strong rural character with farm residences mixing with urban-generated housing. It has a rural landscape of high integrity, an active agricultural function, a settlement pattern most in keeping with traditional, rural communities and is among the sites that offer the most in terms of the traditional agri-economy. Specific features that can be identified for this site include the following;

- 131 residential and commercial buildings within 300 – 500m of the site boundary
- 728 residential and commercial buildings within 500m – 1.0 km of the site boundary
- 1 significant amenity in close proximity to the site, a 7-a-side football pitch located circa. 920m to the east.
- Major towns of Lusk and Rush located approximately 2.4km east and 2km west respectively.

6.8.11 Planning Policy

The Rathartan site is zoned Rural (RU). There does not seem to be any significant planning constraints associated with the site itself. Consideration must be given to the site's location in the rural area between the towns of Lusk and Rush and its position adjacent to the main approach route to Rush as well as horticultural businesses.

With regard to its location between Lusk and Rush, it should be noted within the County Development Plan, that the development Strategy for Lusk states that "*existing and future development will be consolidated within well defined town boundaries and the distinct physical separation of Rush and Lusk will be maintained*". On the following page, the Plan states that "*the consolidation of Rush and the distinct physical separation of Rush and Lusk as separate towns is a fundamental principle of the development strategy*". These objectives as well as those relating to the need to protect existing horticultural uses in the area must be addressed if the proposal is to be considered in the fertile agricultural area which separates the two towns.

The location of the site directly to the north of the R148 road on the outskirts of Rush must be considered in terms of the quality of design and screening in light of the local

objective to prepare a "Gateway Strategy" for the western approach to the town and to preserve views along this stretch of the road.

6.8.12 Engineering and Design

There are no identified technical constraints to the construction of the WwTP on the Rathartan site. A WwTP located on this site would outfall to the northern outfall area.

Orbital sewers to this site consist of pumped rising mains and gravity sewers laid in open cut and tunnelled section. The outfall pipe to the northern outfall area would be a gravity sewer laid in open cut and tunnelled section.

The total length of pipeline (orbital sewer, transfer pipeline to coast and marine outfall) required for this site is approximately 46,900m. Total power required to pump flows to this site is in the order of 9,800kW.

It is feasible to route the Orbital sewers from the load centres to the WwTP and from the WwTP to the outfall within the pipeline corridors to generally avoid impacts on designated sites and significant areas of habitat.

An initial carbon footprint assessment was undertaken for the site options, which concentrated primarily on the transfer pipelines as the WwTP will be relatively similar for all sites, details of which are included in Appendix 16 of this report.

Cost data have not been included at this stage in the alternative sites assessment as total pipeline lengths and length to be constructed in open cut and length to be constructed in tunnel provide a surrogate CAPEX comparison, while energy requirements provide a surrogate OPEX comparison, for the nine site options. Costings (CAPEX and OPEX) will be developed for the emerging preferred site options. These will be used in conjunction with the additional data developed from further investigations on the emerging preferred site options and consideration of the issues and concerns raised during Phase 3 consultation to identify the preferred site option

The following potential negative construction impacts have been identified in relation to Natura 2000 sites for the pipeline corridors:

- Potential Significant impact on the Malahide Estuary SPA/SAC/pNHA from routing of pipeline along corridor D east of Swords and adjacent to the Malahide Estuary.

These potential impacts would be minimized or eliminated by constructing the pipeline in tunnel in this area.

6.9 Saucerstown

The site location and transfer pipeline corridors are illustrated in Figure 7b included in Appendix 17. The pipeline corridors of relevance to the site are corridors A, D, E, F and G as illustrated in Figure 2 included in Appendix 17. The site utilises the northern outfall, see section 6.11.2 below for further details.

6.9.1 Ecology

The site comprises agricultural and arable grasslands, a small portion of scrub, a hedgerow network and an adjacent watercourse, providing good potential for occurrence of protected species, notably badger. The site has been positioned 250m away from the Broadmeadow River corridor to the north and a buffer is in place to the Saucerstown Stream, which is adjacent to the north of the site. To the south, the site abuts a tributary of the stream and the proposed access road crosses this stream. The Broadmeadow River and tributaries comprise a salmonid system, and the site is located approx 3km upstream of Malahide Estuary SPA and SAC.

The following potential negative impacts have been identified for the site:

- Potential Moderate Impact on Natura 2000 wetlands (Malahide Estuary SPA/SAC)
- Potential Significant Impact on salmonid system of Broadmeadow River
- Potential Moderate Impact on Fingal Ecological Networks sites (Broadmeadow River ecological corridor)
- Potential Moderate Impact on protected species based on length of field boundary defined by hedgerow (1.4km)
- Potential Significant Impact on the breeding habitat for Annex I species Kingfisher - suitable breeding habitat and high quality feeding habitat for Kingfisher is present on the Broad Meadow River
- Potential Significant Impact due to loss of winter habitat for Lapwing and Golden Plover and other wader species as the site includes large arable fields and pastures suitable for Lapwing, Golden Plover or other winter waders

Ecological constraints located within the transfer pipeline corridors include the following:

- 6 Ecological Buffer Zones and 4-10 Nature Development Areas identified in the Fingal Development Plan
- 12-13 ecological corridors and approx 45 watercourse crossings, of which 11-12 are salmonid systems
- Watercourse crossings upstream of a number of Natura 2000 and Natural Heritage Areas including South Dublin Bay and River Tolka Estuary, North Dublin Bay, Malahide Estuary, Rogerstown Estuary, and Baldoyle Bay
- Watercourse crossings, including Balcunnin Stream and Rush Stream, upstream of Water Framework Directive coastal waters
- Potential to impact on the breeding habitat of Kingfisher (Annex I species) due to a section of route located along Broadmeadow River (Corridor Section D & F)
- Areas of importance to wetland birds (IWeBS) adjacent to the Malahide Estuary IWeBS area and the Skerries Grasslands IWeBS area

- Potential for the loss of hedgerow habitat

Details of the above designations are provided in the ASA – Phase 2 Ecology Report included in Appendix 5. Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on designated sites and significant areas of habitat. River crossings will primarily be undertaken by tunnelling thereby minimising or eliminating potential impacts.

6.9.2 Cultural Heritage

The Saucerstown site has a relatively high archaeological potential and a field inspection was therefore carried out.
The following potential negative impacts were identified:

- 3 Potential Direct Profound Impacts on Cultural Heritage features (a ring ditch and two ringforts)
- 2 Potential Indirect Impacts (two moderate; one slight) to three Cultural heritage features identified in this assessment
- 2 Potential Direct moderate Impacts on townland boundaries which cross the centre of the site
- 2 watercourses where there is potential significant impact in relation to finds of further Cultural heritage features
- 1 Potential Indirect Slight Impact on a historic designed landscape

Due to the large amount of previously unrecorded archaeological sites located within the proposed development area, the area also has high potential for prehistoric and early medieval archaeological remains. It may be noted from above, that this site has the significance of having three potential direct profound impacts on Cultural Heritage features identified in the site visit for this assessment, as those features are located within the site boundary (a ring ditch and two ringforts)

Known Cultural heritage constraints located within the transfer pipeline corridors include the following:

- 34 features from Record of Monuments & Places
- 38 recorded Protected Structures and 20 features from National Inventory of Architectural Heritage
- 1 National monument
- 28 Cultural Heritage features
- 25 historic design landscapes

Pipeline alignments shall be adopted within the pipeline corridors which avoid impacts on the above recorded sites.

6.9.3 Landscape and Visual

The Saucerstown site is located in the base of the shallow Broadmeadow River valley. It is located within the ‘Rolling Hills’ landscape character type identified in the Fingal Development Plan. This is recognised as having a ‘Modest’ value and ‘Medium’ level of sensitivity. An area of ‘Highly Sensitive Landscape’ zoning is found approx 2.5km to the east, while designated scenic routes occur 0.5km to the south and 0.8km to the west. A key constraint relating to the Saucerstown site is its relatively close proximity to the

western fringe of Swords. Two Bed and Breakfast operations were identified on a lane a short distance to the north, while Swords Golf Club lies adjacent to the northwest of the site.

The following potential negative impacts were identified:

- Significant impacts on scenic routes to south (0.5km) and west (0.8km)
- Significant impacts on views from heritage/tourist/amenity features (Swords Golf Course, Broadmeadow River and Linear Park, two B&B operations)
- Moderate impacts to landscape character and potential to disrupt landscape structure (hedgerows)
- Significant impacts on views from settlements (Swords, including extensive new housing development on outskirts) and individual dwellings (houses along roads to north and south)
- Moderate impacts on views from major roads (R108 and R125)
- Moderate impact on Saucerstown demesne historic designated landscape
- Slight impacts on views from aerial approach to Dublin airport

Potential landscape and visual impacts along transfer pipeline corridors include:

- Significant potential to disrupt landscape structure along Section E which passes almost entirely through fields and hedgerows, with moderate to slight potential along other sections of the corridor
- Potential significant impact on demesne landscapes if Abbeyville Estate is affected (Section D)

Landscape and visual impacts would be temporary and pipeline alignments would be selected within the corridors to minimise impacts.

6.9.4 Hydrology and Hydrogeology

The Saucerstown site is located in the Broadmeadow River catchment. Two tributaries of the Broadmeadow River flow adjacent to the northern, southern and eastern boundaries of the site. The access to the site is from the south and will require a new culvert on one of the Broadmeadow tributaries. The Broadmeadow River (Q3 – poor water quality status) discharges into the Broadmeadow Estuary (a SPA, SAC and pNHA site), the water quality of which is eutrophic. The national flood hazard mapping website www.floodmaps.ie shows records of a major flooding approximately 1km downstream and recurrence flooding approximately 1.5km downstream of the site. Flood maps produced by FEM FRAMS show extensive overland flooding extent (0.1% AEP) adjacent to the northern boundary of the site and also in the vicinity of the site at both upstream and downstream locations.

The proposed site is partially underlain by a locally important bedrock aquifer (LI) to the south which is moderately productive in local zones only and by a poor bedrock aquifer (PI) to the north. The groundwater vulnerability mapping shows the area in the vicinity of the proposed site to have a groundwater vulnerability rating of low to high but predominately moderate. No groundwater source wells or karst features were found to be within 500m or 2km respectively of the proposed site. Fingal County Council has no groundwater borehole records for this site.

The following potential negative impacts were identified:

- Significant impact on sensitive surface watercourse due to proximity of Broadmeadow tributaries (within 10m)
- Moderate impacts in relation to potential flooding from Broadmeadow River system
- Moderate impacts on locally important bedrock aquifer and groundwater vulnerability

The pipeline corridors potentially cross 45 watercourses spanning 28 river catchments and some coastal areas.

Pipeline Corridor A and additionally some part of Corridor F and part of Corridor D are mapped as high groundwater vulnerability; the remaining parts of Corridor F have moderate groundwater vulnerability and low groundwater vulnerability.

6.9.5 Soils and Geology

The northern part of the site is dominated by alluvial deposits associated with the Broadmeadow River. In the centre of the site, quaternary deposits are composed of limestone gravels while in the south they are limestone tills. The GSI Depth to Bedrock mapping indicates that the bedrock is approximately 5-10m deep over the majority of the site. Potential impacts are imperceptible; however the absence of soft ground and the depth to bedrock should be confirmed by ground investigation.

The following potential constraints were identified along the transfer pipeline corridors:

- 1 Geological Heritage Site
- 2 karst features
- High (95%) and Medium (45%) chance of encountering shallow bedrock along corridor sections A and D respectively; low chance for other three sections
- Low potential (10%) to encounter soft ground
- 38 locations where the following activities are or were undertaken - including unregulated sites: operational or historic Industrial activity, extractive sites / quarries, Graveyard sites

Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on the features identified above

6.9.6 Agronomy and Agriculture

There are three landowners within the Saucerstown site. The site is all considered good quality land suited to a wide range of farming enterprises and is currently used for tillage, grassland and vegetable production including parsnips, potatoes and cauliflower. There are no farm buildings located within the site. The overall severance impact has been identified by the Agronomist as minor.

6.9.7 Traffic

The Saucerstown site is located to the west of Swords. Due to the presence of a golf course to the west, the Broadmeadow River to the north and housing to the east, the only option for a new access into the site is from the R125. The proposed access location is shown on Figure 6h included in Appendix 17. The new access road will be approximately 650m in length and will require a crossing of the Saucerstown Stream.

Some local widening would also be required at the new junction on the R125 to improve visibility.

The R125 links Swords to the R135 near Archerstown and is approximately 6m wide. The accident history along this road reveals several minor incidents near the proposed access location, however, in the more built up areas to the east as the road enters Swords, a significant number of accidents has been recorded including several fatalities.

The pipeline transfer routes to this site would require three motorway and two national/regional road crossings, which will be constructed by tunnelling methods.

6.9.8 Air Quality and Odour

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site. There should be no significant operational impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate air quality and odour standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for Saucerstown:

- A weighted equivalent of 142 dwellings within 1km of the site at potential risk of air quality impacts during construction
- A weighted equivalent of 142 dwellings within 1km of the site at potential risk of odour nuisance should the odour control system fail
- Sparse population within 500m in direction of prevailing winds; closest population centre in this direction at >5km distance
- Overall construction and operational phase impact ratings are slight

Full details of the weightings applied for Air Quality and Odour are provided in the ASA – Phase 2 Air Quality and Odour Report included in Appendix 12 of this report.

6.9.9 Noise and Vibration

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site. There should be no significant operational noise or vibration impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate daytime and night time noise standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for Saucerstown:

- A weighted equivalent of 57 dwellings PIR (Potential Impact Rating) within 500m of the site
- The existing noise environment at the site is one of a rural area with no significant noise sources
- Overall construction and operational phase impact ratings are slight

Full details of the weightings applied for Noise and Vibration are provided in the ASA – Phase 2 Noise and Vibration Report included in Appendix 13 of this report.

6.9.10 People and Communities

The features of the Saucerstown site and surrounding area, as described in preceding sections of this report, illustrate that it has a strong local character with a rural landscape of high integrity, an active agricultural function and a settlement pattern in

keeping with traditional, rural communities. Along with some of the other sites, Saucerstown offers the most in terms of the traditional agri-economy and the 'rural idyll.' Specific features that can be identified for this site include the following:

- 66 residential and commercial buildings located 300-500m from the site boundary
- 948 residential and commercial buildings within 0.5-1.0km of the site boundary
- Major town of Swords located 1.2km to the south-east, with a population density of 5.14 per hectare
- 4 significant amenities in close proximity to the site: a school (400m to south), Broadmeadow linear park (320m to east), demesne parkland (620m to south-west) and Swords & Rogerstown Golf Club (290m to north-west)

6.9.11 Planning Policy

The site is bisected by the Swords Town Development boundary with GB (Greenbelt) zoned lands to the west and OS (Open Space) zoned lands to the east. There are a number of planning policy challenges associated with the Saucerstown site not only due to its restrictive GB and OS land use zoning but also due to its location along the route of a proposed new Swords Bypass Road (Fingal Development Plan Objective 'Swords 13') and to the local objectives which specify that a large area of the site is intended to provide a new regional park (Policy GIM 8 of the Swords Town Development Plan). Furthermore there is zoning adjacent to the site for new residential development.

6.9.12 Engineering and Design

There are no identified technical constraints to the construction of the WwTP on the Saucerstown site. A WwTP located on this site would outfall to the northern outfall area.

Orbital sewers to this site consist of pumped rising mains and gravity sewers laid in open cut and tunnelled section. The outfall pipe to the northern outfall area will consist of a gravity sewer laid in open cut and tunnelled section.

The total length of pipeline (orbital sewer, transfer pipeline to coast and marine outfall) required for this site is approximately 47,850m. Total power required to pump flows to this site is in the order of 7,100kW.

It is feasible to route the Orbital sewers from the load centres to the WwTP and from the WwTP to the outfall within the pipeline corridors to generally avoid impacts on designated sites and significant areas of habitat.

An initial carbon footprint assessment was undertaken for the site options, which concentrated primarily on the transfer pipelines as the WwTP will be relatively similar for all sites, details of which are included in Appendix 16 of this report. Saucerstown performed reasonably well in the assessment under the 'total lifetime operational carbon' sub-criteria.

Cost data have not been included at this stage in the alternative sites assessment as total pipeline lengths and length to be constructed in open cut and length to be constructed in tunnel provide a surrogate CAPEX comparison, while energy requirements provide a surrogate OPEX comparison, for the nine site options. Costings (CAPEX and OPEX) will be developed for the emerging preferred site options. These will be used in conjunction with the additional data developed from further

investigations on the emerging preferred site options and consideration of the issues and concerns raised during Phase 3 consultation to identify the preferred site option

The following potential negative construction impacts have been identified in relation to Natura 2000 sites for the pipeline corridors:

- Potential Significant impact on the Malahide Estuary SPA/SAC/pNHA from routing of pipeline along corridor D east of Swords and adjacent to the Malahide Estuary.

These potential impacts would be minimized or eliminated by constructing the pipeline in tunnel in this area.

6.10 Tyrrelstown Little

The site location and transfer pipeline corridors are illustrated in Figure 7a included in Appendix 17. The pipeline corridors of relevance to the site are corridors A, D, F and G as illustrated in Figure 2 in Appendix 17. The site utilises the northern outfall, see section 6.11.2 below for further details.

6.10.1 Ecology

The Tyrrelstown Little site comprises cultivated agricultural grassland. The site is not bounded by any watercourses and there are no watercourses running through the site. The nearest adjacent watercourses are the Rush Stream, which rises a short distance east of the site and the Lusk River (also known as Collinstown Stream), which passes near to the southwest corner of the site. In the environment surrounding the Tyrrelstown Little site, the mixture of cultivated and tillage grasslands, an abundance of hedgerows and adjacent watercourses provide good potential for occurrence of protected species, notably badger.

There is no ecological status available in relation to the Rush Stream. The current ecological status of the Lusk River is identified as Good (Water Maps, Eastern River Basin District). The EPA does not monitor the biological status of the Lusk River. The Lusk River constitutes a non-salmonid system because of the presence of an impassable barrier to fish movement at the lower end of the system. It discharges to Rogerstown Estuary Special Protection Area (SPA) and Special Area of Conservation (SAC) approximately 2.2km downstream.

The following potential negative impacts have been identified for the site:

- Potential Moderate Impact on Natura 2000 wetland sites (Rogerstown Estuary SPA/SAC/pNHA)
- Potential Significant Impact on protected species based on length of field boundary defined by hedgerow (3.8km)
- Potential Moderate Impact on birds which are Qualifying Features of an SPA; the impact potential is moderate as the site is more than 1km from the boundary of any SPA and any negative effects are considered unlikely to be significant in terms of the Conservation Objectives of the SPA
- Potential Significant Impact due to loss of winter Greylag Goose Feeding Areas based in IWeBS Data as the site is within 'Skerries Grasslands' IWEBS area, and likely to be a feeding site for the north Co Dublin winter Greylag Goose flock
- Potential Significant Impact to result in loss of winter habitat for Lapwing and Golden Plover and other wader species as the site includes large arable fields and pastures suitable for Lapwing, Golden Plover or other winter waders

Ecological constraints located within the transfer pipeline corridors include the following:

- Watercourse crossings upstream of a number of Natura 2000 and proposed Natural Heritage Areas including South Dublin Bay and River Tolka Estuary, North Dublin Bay, Malahide Estuary, Rogerstown Estuary, and Baldoyle Bay
- Crossings of river ecological corridors including Tolka River ecological corridor, Broadmeadow Ward and Sluice River ecological corridors, Ballyboghil, Rath Little and Ballough stream ecological corridors and Mayne River ecological corridor

- 6 Ecological Buffer Zones and 7 Nature Development Areas identified in the Fingal Development Plan
- Crossings by corridor sections of Salmonid river systems including Tolka River System, Ward River System, Broadmeadow River System, Sluice River System, Ballough River system and Ballyboghil River system
- Potential to impact on the breeding habitat of Kingfisher (Annex I species) due to a section located along Broadmeadow River (Corridor Section D & F)
- Areas of importance to wetland birds (IWeBS) adjacent to the Malahide Estuary IWeBS area and the Skerries Grasslands IWeBS area
- Hedgerow and other BAP habitat

Details of the above designations are provided in the ASA – Phase 2 Ecology Report included in Appendix 5. It should be feasible to adopt pipeline alignments within the corridors which avoid impacts on designated sites and significant areas of habitat. River crossings will primarily be undertaken by tunnelling thereby minimising or eliminating potential impacts.

6.10.2 Cultural Heritage

There are three sites from the Record of Monuments and Places RMP located within 1km of the proposed site, the closest being an excavated site, located c. 130m south-west. The proposed site is located c. 1.47km south of Baldongan Church (DU005-037), due to the topographical position of the church on a rise in the landscape, the development will be very visible from the church. The church is a National Monument and a protected structure.
The following potential negative impacts were identified:

- 2 potential Indirect Moderate Impacts at Baldongan, one on the National Monument of Baldongan Castle and the second on the recorded Protected Structure / National Inventory of Architectural Heritage site / National Monument of Baldongan Church
- 2 potential Indirect Imperceptible Impacts on *fulacht fiadh* to the southwest of the site and east of the site
- 2 potential Indirect Impacts on Cultural Heritage sites identified as part of this assessment; one Indirect Slight Impact, on Tyrrelstown House located 350m south of the site boundary and one Indirect Imperceptible Impact, on the railway bridge located 515m southeast of the site boundary.
- 1 potential Slight Impact on historic designed landscape at Tyrrelstown House located 350m south of the site boundary
- 2 potential Direct Moderate Impacts on townland boundaries at the site

Known Cultural Heritage constraints located within the transfer pipeline corridors include the following:

- 32 features from Record of Monuments & Places
- 1 National Monument within associated corridor sections (from Corridor F)
- 27 features from Record of Protected Structures & 20 features from National Inventory of Architectural Heritage
- 27 Cultural Heritage features

- 22 demesne or historic design landscapes identified by the specialist

Pipeline alignments will be adopted within the pipeline corridors which avoid impacts on the above recorded sites.

6.10.3 Landscape and Visual

The Tyrrelstown Little site is located at the confluence of the Low Lying, High Lying and Coastal landscape character types identified in the Fingal County Development Plan. The 'Low Lying' landscape type is recognised as having a 'Modest' value and a 'Low' level of sensitivity. The 'High Lying' character type is defined as being of 'High' value and the 'Coastal' character type as being of 'Exceptional' value. Both are considered to be of 'High' sensitivity.

The elevation of the lands at the Tyrrelstown Little site slope in a north to south direction with a central elevation of approximately 30 mOD. An area of 'Highly Sensitive Landscape' zoning occurs approximately 0.5 km to the north of the site and approximately 2 km to the east of the site. Baldongan Castle (National Monument) and Baldongan Church (recorded Protected Structure / National Inventory of Architectural Heritage site / National Monument) are located approximately 1.5 km to the north of the site boundary at an elevated topographical location, approximately 64m OD.

The following potential negative impacts were identified in relation to the site:

- Potential Significant Impact on views from scenic routes designated in Fingal County Development Plan - One scenic route with clear views over the site, 1.6 km to the north of the site, two scenic views with fleeting views over the site, 2 km to the northwest and 1.7 km to the south of the site
- Potential Significant Impact on areas of 'Highly Sensitive Landscape' designation in Fingal County Development Plan – Extensive Area on higher ground 0.5 km north of the site with strong intervisibility and similar character
- Potential Significant Impact on views from heritage/tourist/amenity features Significant - Baldongan Castle on hill 1.7km N with extensive scenic views in the direction of the site
- Potential Significant Impact on the character of the landscape - Open rural landscape character of high integrity for the site and its surrounds
- Potential Significant Impact on views from settlements (Swords, including extensive new housing development on outskirts) and individual dwellings (houses along roads to north and south)
- Potential Moderate Impact that landscape screening will be ineffective or contribute to landscape and visual impacts – there is potential for effective screening to foreshorten views, conflict with open landscape character and the prevailing hedgerow characteristics - particular attention needs to be paid to elevated views from castle and scenic route to north of the site
- Potential Significant Impact on views from Dublin - rail line is 0.6 km east
- Potential Moderate Impact on views from other major roads (other than scenic routes) – Moderate Impact as clear views towards the site not readily available from either R127 regional road on elevated ground 1.3 km west of the site or R128 regional road 1.7 km south of the site
- Potential Moderate Impact to disrupt landscape structure (hedgerows / field pattern) – impact due to combination of large cropping fields to the north of the site and smaller geometric pastoral fields with low hedgerows adjacent to the site

Potential landscape and visual impacts along the transfer pipeline corridors include:

- Significant potential to disrupt landscape structure along Section E which passes almost entirely through fields and hedgerows, with moderate to slight potential along other sections of the corridor
- Potential significant impact on demesne landscapes if Abbeyville estate is affected (Corridor D)

Landscape and visual impacts will be temporary and route alignments would be selected within the corridors to minimise impacts.

6.10.4 Hydrology and Hydrogeology

The prominent hydrological features in the vicinity of the Tyrrelstown Little site are the Collinstown Stream (also called the Lusk) to the southwest of the site, the Rush Stream which rises to the southeast of the site and drains the land and the Balcunnin Stream which is located a short distance to the north of the site. The proposed access to the site is from the northwest corner of the site and does not require crossing of watercourses.

The National flood hazard mapping website www.floodmaps.ie does not show any record of historic flooding in the vicinity of the Tyrrelstown Little site. The flood extent maps produced under FEM FRAMS show that for each of the Collinstown and the Rush Town streams neither have extensive flooding scenarios (for either the 1% or the 0.1% AEPs.

According to the GSI bedrock aquifer mapping, the site is entirely underlain by a locally important bedrock aquifer which is generally moderately productive (Lm). The GSI groundwater vulnerability mapping shows the site to have low groundwater vulnerability. No groundwater wells were found to be within 500m of the proposed site however one karst feature a Bog Well was found to be 0.7km west of the proposed site. Further information available from Fingal County Council suggests the possibility of additional groundwater abstraction points and groundwater wells within or in close proximity of the proposed site.

The following potential negative impacts were identified:

- Groundwater Vulnerability (potential for groundwater contamination) – Potential Slight Impact; permanent impact on a significant proportion of attribute, which is Low Groundwater Vulnerability, Low potential for groundwater contamination

The pipeline corridors potentially cross 36 watercourses spanning 18 river catchments and some coastal areas.

Pipeline Corridor A and additionally some part of Corridor F and part of Corridor D are mapped as high groundwater vulnerability; the remaining parts of Corridor F have moderate groundwater vulnerability and low groundwater vulnerability.

6.10.5 Soils and Geology

The soils on the site have been mapped as grey/brown podzolics/ brown earths and surface water and groundwater gleys. The Quaternary subsoils have been mapped as sandstone and shale till. No alluvial deposits have been mapped on the site. The site is underlain by the Lucan bedrock formation. GSI mapping identifies a number of parallel faults, trending north to south, the southern extent of which are located approximately 1 km to the north of the site boundary. The depth to bedrock on the site is likely to be

greater than 10 m across the site. The absence of soft ground and the depth to bedrock would be confirmed by ground investigation.

The following potential constraints were identified along the transfer pipeline corridors:

- 1 Geological Heritage Site (Feltrim Hill Quarry, Corridor Section D)
- 2 karst features (features within Corridor Section F; Bog Well, Harlakes Well)
- Potential to encounter shallow bedrock during construction within the corridor sections A, D, F and G – Section A (95% Shallow Bedrock), Section D (45% Shallow Bedrock), Section F (25% Shallow Bedrock), Section G (5% Shallow Bedrock)
- Potential to encounter soft ground within the Corridors A, D, F and G – Alluvium deposits < 10%

Pipeline alignments within the pipeline corridors will be adopted which aim to avoid or minimize impacts on the features identified above.

6.10.6 Agronomy and Agriculture

There is one landowner at the site at Tyrrelstown Little. The land at the site is considered to be good quality land suited to a wide range of farming enterprises. The land within the site itself is currently used for beef production although it is located within the overall surroundings of the intensive market gardening area with the area surrounding the site used for horticultural farming enterprises. There are no farm buildings or roadways located within the site. The overall severance impact has been identified by the Agronomist as Not Significant.

6.10.7 Traffic

The Tyrrelstown Little site is situated west of the Dublin Belfast Railway Line and north east of Lusk. The nearest roads to the site are narrow local roads which are not considered suitable for providing access to the development.

The proposed access is located on the R127 as shown on Figure 6i included in Appendix 17. The R127 links the R132 at Blakes Cross to Balbriggan via Lusk and Skerries. The section of road upon which the access is located has a carriageway width of approximately 6m. There are few recorded accidents along this section of the R127, however, they occur with greater frequency and severity further south. An access road of approximately 1,410 m in length is required and requires one watercourse crossing.

The transfer pipeline corridors to the Tyrrelstown Little site require three motorway and two national/regional road crossings which will be constructed by tunnelling methods.

6.10.8 Air Quality and Odour

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site. There should be no significant operational impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate air quality and odour standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for the Tyrrelstown Little site:

- A weighted equivalent of 10 dwellings within 1km of the site at potential risk of air quality impacts during construction

- A weighted equivalent of 10 dwellings within 1km of the site at potential risk of odour nuisance should the odour control system fail
- Sparse population within 500m in direction of prevailing winds; closest population centre in this direction at 1 km distance, Rush
- Overall construction and operational phase impact rating - imperceptible

Full details of the weightings applied for Air Quality and Odour are provided in the ASA – Phase 2 Air Quality and Odour Report included in Appendix 12 of this report.

6.10.9 Noise and Vibration

As with all the nine short-listed sites, there are no sensitive receptors within 300m of the site. There should be no significant operational noise or vibration impacts associated with the proposed Regional WwTP as there will be a requirement to adhere to appropriate daytime and night time noise standards at all times. For the purposes of differentiating between sites at the ASA stage, the following can be identified for the Tyrrelstown Little site:

- A weighted equivalent of 8 dwellings PIR (Potential Impact Rating) within 500m of the site
- The existing noise environment at the site is one of a rural area, the site is adjacent to the DART rail line
- Overall construction and operational phase impact rating - imperceptible

Full details of the weightings applied for Noise and Vibration are provided in the ASA – Phase 2 Noise and Vibration Report included in Appendix 13 of this report.

6.10.10 People and Communities

The features of the Tyrrelstown Little site and surrounding area, as described in preceding sections of this report, illustrate that it has a strong local character with a rural landscape of high integrity, an active agricultural function and a settlement pattern in keeping with traditional, rural communities. Along with some of the other sites, Tyrrelstown is part of a significant intensive market gardening / horticultural, agri-economy. Specific features that can be identified for this site include the following:

- 50 residential and commercial buildings located 300-500 m of the site boundary
- 74 residential and commercial buildings within 0.5-1.0 km of the site boundary
- Lusk is approx 1.5km to southwest, with a population density of 2.08 per ha and Rush is approx 1.9km to the southeast.

6.10.11 Planning Policy

The Tyrrelstown Little site is an agricultural site and is zoned RU (Rural).

A Local Objective within 1 km of the site (Local Objective GIM7) is to undertake 'Historic Landscape Characterisation (HLC) for the Rush, Lusk, Loughshinny and Skerries area to include all lands east of the M1 motorway between the areas covered by the HLC studies in Balbriggan and Donabate/Portrane'. An objective listed as 'Other objective' within 1.5km of the site is for the preservation of a number of views along the Baldongan Road to the north of the site.

There does not seem to be any significant planning constraints associated with this site. With regard to the green infrastructure objective GIM7 it is worth noting that this objective relates to a much wider area beyond the site and it is not necessarily restrictive in terms of the development potential of the site.

6.10.12 Engineering and Design

There are no identified technical constraints to the construction of the WwTP on the Tyrrelstown Little site. A WwTP located on this site would outfall to the northern outfall area.

Orbital sewers to this site consist of pumped rising mains and gravity sewers laid in open cut and tunnelled section. The outfall pipe to the northern outfall area would be a gravity sewer laid in open cut and tunnelled section.

The total length of pipeline (orbital sewer, transfer pipeline to coast and marine outfall) required for this site is approximately 47,900m. Total power required to pump flows to this site is in the order of 10,500kW.

It is feasible to route the Orbital sewers from the load centres to the WwTP and from the WwTP to the outfall within the pipeline corridors to generally avoid impacts on designated sites and significant areas of habitat.

An initial carbon footprint assessment was undertaken for the site options, which concentrated primarily on the transfer pipelines as the WwTP will be relatively similar for all sites, details of which are included in Appendix 16 of this report.

Cost data have not been included at this stage in the alternative sites assessment as total pipeline lengths and length to be constructed in open cut and length to be constructed in tunnel provide a surrogate CAPEX comparison, while energy requirements provide a surrogate OPEX comparison, for the nine site options. Costings (CAPEX and OPEX) will be developed for the emerging preferred site options. These will be used in conjunction with the additional data developed from further investigations on the emerging preferred site options and consideration of the issues and concerns raised during Phase 3 consultation to identify the preferred site option.

The following potential negative construction impacts have been identified in relation to Natura 2000 sites for the pipeline corridors:

- Potential Significant impact on the Malahide Estuary SPA/SAC/pNHA from routing of pipeline along corridor D east of Swords and adjacent to the Malahide Estuary.

These potential impacts would be minimized or eliminated by constructing the pipeline in tunnel in this area.

6.11 Marine Outfalls

The Marine Outfall Study Areas are shown in Figure 3 of Appendix 17. As noted in section 6.1 above, there are only two potential outfall locations, northern and southern, with all the site options associated with either the northern or southern outfall location. The potential impacts associated with the outfalls, discussed in the following sections, are incorporated into the assessment, as detailed in Chapter 7, for the relevant site option.

Environmental constraints identified within the vicinity of the two outfall routes, are summarised below, with further details provided in the specialist reports at Appendix 5 to Appendix 16. This section focuses on those criteria which are considered to be the important differentiators between the two outfall locations, namely:

- Ecology
- Cultural heritage
- Landscape and visual
- Hydrology and hydrogeology
- Soils and geology

6.11.1 Southern Outfall

(a) Ecology

The more restricted corridor of the southern outfall (compared to the northern outfall) passes directly under the Baldoyle SAC/SPA/Ramsar/pNHA site. The qualifying interests of the site are that of an estuary for resident and over-wintering birds. The outfall route also passes under the Baldoyle Coast Ecological Buffer Zone and Portmarnock Golf Course Nature Development Area (see figures included in the ASA – Phase 2 Ecology Report included in Appendix 5 for the locations of these designated sites in relation to the Natura 2000 designated area). Initial habitats assessments have revealed the possible presence of Annex I habitats in the form of saltmarsh and Zostera beds in the estuary. Further details on the intertidal habitats and offshore ecology are provided at Appendix 5. A southern outfall pipeline will be constructed in tunnel to avoid any direct impingement on the designated Natura 2000 areas, and therefore significant loss of habitats along this marine outfall route is not expected.

The outfall route is immediately south of the designated shellfish area of Malahide. However there is significant inshore fishing activity outside this designated area, targeting razor clams, crab and lobster which must also be considered.

Marine mammals found in the vicinity of the outfall location include whales, dolphins, porpoises and seals, with seal and harbour porpoise being the most commonly recorded. Construction activity, including noise and vibration, has the potential to impact on marine mammals.

(b) Cultural Heritage

The following have been recorded within the vicinity of the southern outfall area:

- 1 Cultural Heritage site

- 27 recorded shipwreck sites in and within the vicinity of the proposed outfall; any coastal area should be considered to be of high archaeological potential.

Further details of the above are provided in the ASA – Phase 2 Cultural Heritage Report included in Appendix 6 of this report. A pipeline alignment will be adopted which avoids any known cultural heritage sites.

(c) Landscape and Visual

The entire coastal area of County Fingal is subject to High Sensitivity zoning. The potential exists to impact on one significant length of scenic route and one coastal walk. Impacts from settlements and dwellings would include Portmarnock just to the north and scattered houses close to the outfall location. Landscape and visual impacts associated with the marine outfall would be temporary and construction methods which minimise impacts will be employed.

(d) Hydrology and Hydrogeology

The nearest recreational bathing site (Portmarnock Beach) is located 2km to the north, and this recorded 'Good' water quality in 2010. National Flood Hazard Mapping records exist of two historic flooding areas, one at Mayne Bridge, the other a recurring coastal flooding at Baldoyle. FEM FRAMS coastal flood maps show extensive flooding near the north-western and south-western parts of the study area.

The outfall is underlain by a poor bedrock aquifer which is generally unproductive, except locally. The groundwater vulnerability rating ranges from low to high but is predominantly high. Source Protected Areas and Zones of Contribution are not located within close proximity to the outfall, and no wells were identified.

(e) Soils and Geology

The following constraints and features were identified in relation to the southern outfall route:

- 1 high risk unregulated historic landfill at Baldoyle close to where Section G joins the outfall study area
- Depth to bedrock mapping shows the bedrock to be in the range 3-10m deep and this is to be confirmed with further site investigation

6.11.2 Northern Outfall

(a) Ecology

There are no marine related designated sites within the northern outfall area, with the exception of Rogerstown SAC/SPA/Ramsar/pNHA in the south-western corner. However the outfall is likely to be located to the north of the area shown and therefore away from this designated site. Lambay Island SPA/SAC/pNHA lies just outside the outfall search area, and again is located towards the south and therefore some distance from the outfall location. Skerries Islands SPA/pNHA lies just to the north of the outfall location. The coastline of the northern outfall area includes part of the IWeBS area 'Skerries Coastline' identified as being of national importance.

Initial habitats assessments have revealed the possible presence of Annex I habitats in the form of biogenic reefs in the general vicinity of the outfall. Further details on the intertidal habitats and offshore ecology are provided in the ASA – Phase 2 Ecology

Report included in Appendix 5. There is not expected to be any significant loss of habitats along the marine outfall route.

The outfall route is immediately south of the designated shellfish area of Balbriggan/Sherries. However there is significant inshore fishing activity outside this designated area, targeting razor clams, crab and lobster which must be considered, and there are a small number of local boats that target shellfish within the proposed northern outfall location.

Marine mammals found in the vicinity of the marine outfall location include whales, dolphins, porpoises and seals, with seal and harbour porpoise being the most commonly recorded. Construction activity, including noise and vibration, has the potential to impact on marine mammals.

(b) Cultural Heritage

The following have been recorded within the vicinity of the northern outfall area:

- 11 RMPs, all but two of which are also listed as protected structures
- 29 features recorded as Protected Structures or in the National Inventory of Architectural Heritage
- 12 features identified as Cultural Heritage sites (Appendix 6)
- 40 recorded shipwreck sites in and within the vicinity of Lambay Island to the immediate south-east of the proposed outfall; any coastal area should be considered to be of high archaeological potential.

Further details of the above are provided in the ASA - Phase 2 Cultural Heritage Report included in Appendix 6. A pipeline alignment will be adopted which avoids any known cultural heritage sites.

(c) Landscape and Visual

The entire coastal area of County Fingal is subject to High Sensitivity zoning and High Amenity zoning. The potential exists to impact on numerous designated scenic routes and four coastal walks. A designated bathing beach is located within the outfall study area and there are numerous houses along the coastal roads in the vicinity of the outfall to the north of Rush. Landscape and visual impacts associated with the marine outfall will be temporary and construction methods which minimise impacts will be employed.

(d) Hydrology and Hydrogeology

The coastal water quality in the vicinity of the northern outfall is unpolluted and there are two bathing beaches (Loughshinny and Rush South Beach) which both have ‘Good’ water quality (in 2010). Some localised coastal flooding has been recorded. The outfall is partially underlain by poor bedrock aquifer and a locally important bedrock aquifer which is moderately productive in local zones only. The groundwater vulnerability is predominantly low. Source Protected Areas and Zones of Contribution are not located within close proximity to the outfall, and no wells were identified.

(e) Soils and Geology

The following constraints and features were identified in relation to the northern outfall route:

- Skerries to Rush Geological Heritage Area (GHA) which extends along the coast and therefore crosses the outfall alignment
- Portrane Shore GHA located further to the south and unlikely to be impacted by the outfall construction
- 9 potentially contaminated land sites including Rush Graveyard and Brooks End historical unregulated landfill to the north of Rush
- 3 karst features
- Depth to bedrock mapping shows the bedrock to be in the range 1-5m deep and this is to be confirmed with further site investigation

A northern outfall pipeline will be constructed in tunnel to avoid any direct impingement on the Geological Heritage Areas.

7 ASA Outputs

7.1 Introduction

Completion of steps 1 to 4 of the Alternative Sites Assessment (ASA) Methodology as discussed in Chapters 5 and 6 of this report has resulted in the identification of nine site options from the nine short listed land parcel options and the combination of the individual matrices as developed by the environmental and technical specialists into one overall primary assessment matrix. A full list of the sub-criteria for each specialism is provided in Appendix 3 of this report. This matrix was cross referenced, unambiguous wording clarified and refined to remove sub-criteria which were determined as non-differentiating across all nine site options. Details of the sub-criteria which were removed on the basis that they provide no differentiation across the site options are also included in Appendix 3.

This Chapter provides detail on the application of the Alternative Sites Assessment (ASA) Methodology, specifically steps 5 to 8 of the methodology, to the refined primary assessment matrix. This entails an assessment of the relative significance of each of the constraints / impacts across each sub-criteria followed by a comparative assessment of each site option based on their associated impacts. Relative significance is a combination of the importance of the sub-criteria and the level of impact on each site, pipeline or marine outfall.

The process was undertaken over a series of workshops by the project consultants with input from all environmental and technical specialists.

7.2 First Iteration on Matrix

The first iteration on the matrix involved the application of step 5 (identification of 'most favourable' cells – assignment of green colour) of the ASA Methodology to the primary assessment matrix.

The sub-criteria for the site options were reviewed to determine which cells could be identified as 'most favourable'. Environmental sub-criteria which had no impact or where relevant, an imperceptible impact were highlighted green. Similarly the 'most favourable' cells across each of the technical sub-criteria were also coloured green.

A schedule of sub-criteria cells which were assigned a green colour is presented in Appendix 4.

7.3 Second Iteration on Matrix

The second iteration on the matrix involved the application of the following steps from the ASA Methodology to the primary assessment matrix.

Step 6 - Each environmental and technical specialist identified their worst or 'least favourable' cell and these cells were assigned an amber colour. A schedule of sub-criteria cells which were assigned an amber colour during this iteration on the matrix is presented in Appendix 4.

Step 7 – The matrix was reviewed to determine whether any site option with 'least favourable' classifications could be removed. It was determined that the 'least favourable' classifications assigned to the Saucerstown site option were of such

significance that it would be comparatively difficult to secure planning permission on this site. The Saucerstown site option was therefore removed from the matrix and from further consideration.

The sub-criteria which were deemed to be 'least favourable' for the Saucerstown site option are summarized in Table 7.1 below

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Cultural Heritage (Site)	1.1.4	Potential to impact (direct/indirect) on CH sites (previously unrecorded sites)	**Direct:** Three profound negative (CH 38, 39, 40) **Indirect:** Two moderate negative (CH 41, 42), one slight negative (CH 43), one imperceptible negative (CH 48)
Landscape & Visual (Site)	2.1.1	Potential to impact on views from scenic routes (designation in Fingal CDP)	**Significant** - One 0.5km S with occasional open and elevated views over site and another 0.8km W with no clear views
Ecology(Site)	3.1.5	Potential to impact on a salmonid system	**Significant -** The Broadmeadow River (main channel and tributaries) constitutes a salmonid system and the access road crosses a tributary and site abuts a tributary.
Hydrology (Site)	4.1.1	Proximity to water bodies in terms of flooding and as an indicator of sensitive surface water receptors	**Significant:** Broadmeadow tributaries (water quality Q3) are within 10m of the site; the site is surrounded by tributaries almost throughout its perimeter, High importance. Will have permanent impact on small proportion of attribute. Will have permanent impact on a significant proportion of attribute.
Hydrogeology (Site)	5.1.3	GSI Groundwater Protection Response matrix	R2
Planning	12.2	Site Zoning	OS (Open Space) GB (Green Belt)
Planning	12.7	Zoning present within 300m of site boundary	OS (Open Space) GB (Green Belt) RU (Rural) RA (New Residential)

Table 7.1 – 'Least Favourable' Sub-Criteria for Saucerstown

Step 8 – Following the removal of the Saucerstown site option each sub-criteria was again reviewed to determine whether any differentiating levels of impact remained. Where no differentiating level of impact was determined then these sub-criteria were

withdrawn from evaluation at this stage (i.e. removed from matrix). The sub-criteria removed at this stage are summarised in Table 7.2 below:

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Ecology (Site)	3.1.8	Potential to result in loss of breeding habitat for Annex I species Kingfisher	**Slight**
Soils & Geology (Site)	6.1.6	Potential to encounter soft ground	**Imperceptible**

Table 7.2: Non – differentiating sub-criteria removed (Second Iteration)

7.4 Third Iteration on Matrix

The third iteration on the matrix involved the application of the following steps from the ASA Methodology to the refined assessment matrix remaining on completion of the second iteration.

Step 6 - Each environmental and technical specialist identified their next worst or next 'least favourable' cell and these cells were assigned an amber colour. A schedule of sub-criteria cells which were assigned an amber colour during this iteration on the matrix is presented in Appendix 4.

Step 7 – The matrix was reviewed to determine whether any site option with 'least favourable' classifications could be removed. It was determined that the 'least favourable' classifications assigned to the Tyrrelstown Little site option were of such environmental disadvantage that with the range of choice available this site option should not be considered further. The Tyrrelstown Little site option was therefore removed from the matrix and from further consideration.

The sub-criteria which were deemed to be 'least favourable' for the Tyrrelstown Little site option are summarized in Table 7.3 below:

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Cultural Heritage (Site)	1.1.1	Potential to impact (direct/indirect) on National Monuments (designated sites)	**Direct:** None **Indirect:** One moderate negative (DU005-038)
Cultural Heritage (Site)	1.1.3	Potential to impact (direct/indirect) on RPS/NIAH (designated sites)	**Direct:** None **Indirect:** One moderate negative (RPS 245)
Landscape & Visual (Site)	2.1.1	Potential to impact on views from scenic routes (designation in Fingal CDP)	**Significant** - One 1.6km N with clear views over site - two 2km NW and one 1.7km S with fleeting views over site
Landscape & Visual (Site)	2.1.2	Potential to impact on areas of 'Highly Sensitive Landscape' (designation in Fingal CDP)	**Significant** - an extensive one on higher ground 0.5km N of site with strong intervisibility and similar character

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Landscape & Visual (Site)	2.1.3	Potential to impact on views from heritage/ tourist/ amenity features	**Significant** - Baldongan Castle on hill 1.7km N with extensive scenic views in the direction of the site
Ecology (Site)	3.1.1	Potential to impact on Natura 2000 sites and National Heritage Areas	**Moderate**: 2.2km upstream of Natura 2000 wetland sites (Rogerstown Estuary SPA/SAC)
Ecology (Site)	3.1.7	Potential to result in the loss of winter Greylag Goose Feeding Areas based on IWeBS Data.	**Significant** - Within 'Skerries Grasslands' IWeBS area, likely to be a feeding site for the north Co Dublin winter Greylag Goose flock
Ecology (Site)	3.1.9	Potential to result in significant loss of winter habitat for Lapwing and Golden Plover and other wader species outside of designated areas (I.e. relatively large, flat open fields of ploughed or fallow arable land or pasture)	**Significant** - site includes large arable fields and pastures suitable for Lapwing, Golden Plover or other winter waders
Traffic	11.1	Length of access road required	1410m access road required
Traffic	11.2	Number of crossings required for access road	1 road crossing
Traffic	11.3	Potential Impact on landowners	Access road impacts on 8 fields. Could potentially require demolition of barn
Traffic	11.7	Frequency of accidents on surrounding network (indication of general road safety issues)	Probable use of R127 south of Lusk with high accident rate. If this road wasn't to be used then slight to moderate rating
Engineering & Design	13.1.6	Total Pipeline Lengths	47,900 m
Engineering & Design	13.2	Total Power Requirements	10,500 kW
Engineering & Design	13.3	Total Carbon (tonnes CO2)	547,849

Table 7.3: 'Least Favourable' Sub-Criteria for Tyrrelstown Little

Step 8 – Following the removal of the Tyrrelstown Little site option each sub-criteria was again reviewed to determine whether any differentiating levels of impact remained. Where no differentiating level of impact was determined then these sub-criteria were withdrawn from evaluation at this stage (i.e. removed from matrix). The sub-criteria removed at this stage are summarised in Table 7.4 overleaf:

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Cultural Heritage	1.1.1	Potential to impact (direct/indirect) on National Monuments (designated sites)	**Direct:** None **Indirect:** None

Table 7.4: Non – differentiating sub-criteria removed (Third Iteration)

7.5 Fourth Iteration on Matrix

The fourth iteration on the matrix involved the application of the following steps from the ASA Methodology to the refined assessment matrix remaining on completion of the third iteration.

Step 6 - Each environmental and technical specialist identified their next worst or next 'least favourable' cell and these cells were assigned an amber colour. A schedule of sub-criteria cells which were assigned an amber colour during this iteration on the matrix is presented in Appendix 4.

Step 7 – The matrix was reviewed to determine whether any site option with 'least favourable' classifications could be removed. It was determined that the 'least favourable' classifications assigned to the Rathartan and Cloghran site options were of such environmental disadvantage that with the range of choice available these site options should not be considered further. The Rathartan and Cloghran site options were therefore removed from the matrix and from further consideration.

The sub-criteria which were deemed to be 'least favourable' for the Rathartan site option are summarized in Table 7.5 below:

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Cultural Heritage (Site)	1.1.3	Potential to impact (direct/indirect) on RPS/NIAH (designated sites)	**Direct:** None **Indirect:** One moderate negative (RPS 246), one imperceptible negative (RPS 283)
Landscape & Visual (Site)	2.1.1	Potential to impact on views from scenic routes (designation in Fingal CDP)	**Moderate** - one located 0.5km S and although likely to be associated with coastal views it does afford an elevated but brief glimpse of the site in the opposite direction
Landscape & Visual (Site)	2.1.3	Potential to impact on views from heritage/ tourist/ amenity features	**Moderate** - Baldungan Church on hill 2.5km N with extensive scenic views in the direction of the site
Ecology (Site)	3.1.1	Potential to impact on Natura 2000 Sites and Natural Heritage Areas	**Significant**: 1.0km upstream of Natura 2000 wetland sites Rogerstown Estuary SPA/SAC)

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Ecology (Site)	3.1.3	Potential to impact protected species based on length of field boundary defined by hedgerow, which incorporates mature trees, within site, e.g. Badgers, Bats, Yellowhammer, Tree sparrow, Stock dove	**Significant**: 2.5km of hedges within the site
Ecology (Site)	3.1.7	Potential to result in the loss of winter Greylag Goose Feeding Areas based in IWeBS Data.	**Moderate** - Within the normal geographical range of the north Co Dublin winter Greylag Goose flock. Location is in an area considered likely to be used by the north Co Dublin winter Greylag Goose flock on occasion
Hydrology (Site)	4.1.4	Potential Impact on ecologically important and designated sites.	**Moderate:** The Collinstown stream discharges into Rogerstown Estuary (SAC, SPA, pNHA, Ramsar and SNR) approx. 1km downstream, High importance. Will have permanent impact on small proportion of attribute.
Agronomy & Agriculture	7.1	Approximate% Reduction in overall farm holding	30%, 16.75%, 100%,9.3%, 34% 98%, 19%
Agronomy & Agriculture	7.2	Farming Enterprise	Horticulture & Tillage, (intensive market gardening area)
Agronomy & Agriculture	7.3	Number of landowners impacted within site boundary	7 to 9
Agronomy & Agriculture	7.4	Severance based on site location within overall land holdings	Moderate
Agronomy & Agriculture	7.8	Overall Impact	Major Negative Impact
People & Communities (Site)	10.1	Number of residential & commercial buildings 300-500m from site boundary	131
People & Communities (Site)	10.4	Potential to impact on areas of Significant Population Densities	Rush is c. 0.7km to the east and Lusk (settlement at Lough Common) is c. 1.8km to the west.
Traffic	11.2	Number of crossings required for access road	2 stream/river crossings
Traffic	11.4	Works required to provide safe access entrance	Some local widening likely. Boundary treatments required for visibility so some additional landtake probable
Traffic	11.5	Potential impact on surrounding local road network	Access onto R128 and probable use of R127. Both Roads are not particularly suitable for HGVs
Traffic	11.6	Frequency of accidents near entrance	1 accident (minor) approx. 200m from entrance

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Traffic	11.7	Frequency of accidents on surrounding network (indication of general road safety issues)	Probable use of R127 south of Lusk with high accident rate. If this road wasn't to be used then slight to moderate rating
Engineering & Design	13.1.6	Total Pipeline Length	46,900 m
Engineering & Design	13.2	Total Power Requirements	9,800 kW
Engineering & Design	13.3	Total Carbon (tonnes CO2)	508,325

Table 7.5 'Least Favourable' Sub-Criteria for Rathartan

The sub-criteria which were deemed to be 'least favourable' for the Cloghran site option are summarized in Table 7.6 below:

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Cultural Heritage (Site)	1.1.2	Potential to impact (direct/indirect) on RMPs (designated sites)	**Direct:** None **Indirect:** One slight negative (DU014-010)
Cultural Heritage (Site)	1.1.3	Potential to impact (direct/indirect) on RPS/NIAH (designated sites)	**Direct:** None **Indirect:** One slight negative (RPS 605)
Ecology (Site)	3.1.2	Potential to impact on Fingal Ecological Network Sites	**Significant**: Site abuts Sluice River ecological corridor
Ecology (Site)	3.1.3	Potential to impact protected species based on length of field boundary defined by hedgerow, which incorporates mature trees, within site, e.g. Badgers, Bats, Yellowhammer, Tree sparrow, Stock dove	**Significant**: 2.3km of hedges within the site
Ecology (Site)	3.1.5	Potential to impact on a salmonid system	**Moderate** - The Sluice River (main channel and tributaries) constitutes a salmonid system.
Ecology (Marine Outfall)	3.3.1	Potential to impact on Natura 2000 Sites within survey area footprint	**Significant** (passes through Baldoyle SAC)

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Ecology (Marine Outfall)	3.3.2	Potential to impact on Fingal Ecological Network Sites	**Significant** Transfer pipeline must pass through Baldoyle Coast Ecological Buffer Zone and Portmarnock Golf Course Nature Development Area. These sites are protected in the County Plan and serve to further protect the Baldoyle Bay SPA/SAC/pNHA.
Ecology (Marine Outfall)	3.3.3	Potential to impact on other potential annex 1 habitats (under the Habitats Directive) within the survey area footprint	**Significant** (saltmarsh and Zostera beds in Baldoyle Estuary)
Ecology (Marine Outfall)	3.3.5	Potential to impact on intertidal habitats	**Moderate** (sensitive habitats in Estuary and on Velvet Strand)
Hydrology (Site)	4.1.1	Proximity to water bodies in terms of flooding and as an indicator of sensitive surface water receptors	***Moderate:*** Sluice River (10m north) and Sluice tributary (290m south) of the site, High importance. Will have permanent impact on small proportion of attribute.
Hydrogeology (Site)	5.1.3	GSI Groundwater Protection Response matrix	R2
Agronomy & Agriculture	7.3	Number of landowners impacted within site boundary	4 to 6
People & Communities (Site)	10.1	Number of residential & commercial buildings 300-500m from site boundary	116
Traffic	11.4	Works required to provide safe access entrance	Road on embankment so would need to raise access road on approach to junction
Traffic	11.7	Frequency of accidents on surrounding network (indication of general road safety issues)	High accident rate on N32 & R107 (including deaths)
Planning	12.2	Site Zoning	GB (Green Belt)
Planning	12.3	Airport Public Safety & Noise Zones on Site	Inner PSZ Outer PSZ Inner Noise Zone Outer Noise Zone
Planning	12.7	Zoning present within 300m of site boundary	GB (Green Belt) GE (Enterprise)

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Planning	12.8	Airport Public Safety and Noise Zones within 300m of site boundary	Inner PSZ Outer PSZ Inner Noise Zone Outer Noise Zone

Table 7.6 'Least Favourable' Sub-Criteria for Cloghran

Step 8 – Following the removal of the Rathartan & Cloghran site options each sub-criteria was again reviewed to determine whether any differentiating levels of impact remained. Where no differentiating level of impact was determined then these sub-criteria were withdrawn from evaluation at this stage (i.e. removed from matrix). The sub-criteria removed at this stage are summarised in Table 7.7 below:

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Landscape & Visual (Site)	2.1.9	Potential to impact on views from Dublin - Belfast rail line	**Imperceptible**
Ecology (Site)	3.1.7	Potential to result in the loss of winter Greylag Goose Feeding Areas based in IWeBS Data.	**Imperceptible**
Hydrogeology (Site)	5.1.1	Aquifer Classification - importance of the groundwater resource to a given area	**Moderate**
Hydrogeology (Site)	5.1.2	Vulnerability Classification - potential for groundwater contamination	**Slight**
Hydrogeology (Site)	5.1.3	GSI Groundwater Protection Response matrix	**R1**
Soils & Geology (Site)	6.1.4	Potential to encounter shallow bedrock during construction (interactions with other disciplines during construction - noise, dust etc)	**Imperceptible**
Agronomy & Agriculture	7.7	Crop Rotation Practiced	Yes
Agronomy & Agriculture	7.8	Overall Impact	Moderate negative impact
Air & Odour	9.9	Construction Phase Impact rating	Imperceptible
Air & Odour	9.10	Operational Phase Impact rating	Imperceptible

Table 7.7 Non-differentiating sub-criteria removed (Fourth Iteration)

7.6 Fifth Iteration on Matrix

The fifth iteration on the matrix involved the application of the following steps from the ASA Methodology to the refined assessment matrix remaining on completion of the fourth iteration.

Step 6 - Each environmental and technical specialist identified their next worst or next 'least favourable' cell and these cells were assigned an amber colour. A schedule of sub-criteria cells which were assigned an amber colour during this iteration on the matrix is presented in Appendix 4.

Step 7 – The matrix was reviewed to determine whether any site option with 'least favourable' classifications could be removed. It was determined that the least favourable classifications assigned to the Cookstown and Baldurgan site options put these site options on a slightly less favourable footing than the remaining three site options of Annsbrook, Clonshagh and Newtowncorduff. As a result the Cookstown and Baldurgan site options have not been brought forward to Phase 3. However, as they remain viable alternative (albeit at present not preferred) locations for the Regional WwTP, it is considered prudent to reserve these site options pending completion of the ASA assessment for the three site options now proposed to be brought forward for public consultation and further studies.

The sub-criteria which were deemed to be 'least favourable' for the Cookstown site option are summarized in Table 7.8 below:

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Cultural Heritage (Site)	1.1.2	Potential to impact (direct/indirect) on RMPs (designated sites)	**Direct:** None **Indirect:** One slight negative (DU007-016)
Cultural Heritage (Site)	1.1.3	Potential to impact (direct/indirect) on RPS/NIAH (designated sites)	**Direct:** None **Indirect:** One slight negative (RPS 323)
Cultural Heritage (Site)	1.1.4	Potential to impact (direct/indirect) on CH sites (previously unrecorded sites)	**Direct:** None **Indirect:** Two slight negative (CH 30, CH 32)
Cultural Heritage (Site)	1.1.5	Potential to impact (direct) on water courses and environs (areas of archaeological potential)	Three (potentially significant)
Landscape & Visual (Site)	2.1.1	Potential to impact on views from scenic routes (designation in Fingal CDP	**Significant** - one 0.5km E with relatively clear views towards the site afforded from here - also distant elevated views from scenic routes >5km N
Landscape & Visual (Site)	2.1.4	Potential to impact on the character of the landscape character	**Significant** - open rural landscape character of high integrity within and around the site

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Landscape & Visual (Site)	2.1.5	Potential that landscape screening will be ineffective or contribute to landscape and visual impacts	**Moderate** - potential for effective screening to foreshorten views, conflict with open landscape character and prevailing hedgerow characteristics - particular attention needs to be paid to elevated scenic route and HSL designations to the north
Ecology (Site)	3.1.9	Potential to result in significant loss of winter habitat for Lapwing and Golden Plover and other wader species outside of designated areas (I.e. relatively large, flat open fields of ploughed or fallow arable land or pasture)	**Moderate** - site includes large arable fields suitable for Lapwing, Golden Plover or other winter waders
Hydrology (Site)	4.1.1	Proximity to water bodies in terms of flooding and as an indicator of sensitive surface water receptors	**Moderate:** Belinstown River (10m north) and Broadmeadow tributary (1km south) (water quality Q3) of the site, High Importance. Will have permanent impact on small proportion of attribute.
Agronomy & Agriculture	7.2	Farming Enterprise	Tillage, Horticulture, & Potatoes
Agronomy & Agriculture	7.5	Severance based on site location within overall land holdings	Moderate
People & Communities	10.1	Number of residential & commercial buildings 300-500m from site boundary	53
Traffic	11.1	Length of access road required	930m access road required
Traffic	11.2	Number of crossings required for access road	1 ditch/stream crossing
Traffic	11.3	Potential Impact on landowners	Access road impacts on 5 fields
Traffic	11.4	Works required to provide safe access entrance	Road would likely require widening. To achieve visibility would require significant landtake.
Traffic	11.5	Potential impact on surrounding local road network	Access onto R108. Road not particularly suitable for HGVs. Travel distance to better road moderate
Traffic	11.8	Road link impacted upon by all construction traffic (excluding major routes i.e. R132/N32)	Two options but both long (R108 & R129 7.8km, R108 & R125 6.9km)
Engineering & Design	13.1.6	Total Pipeline Length	47,900 m

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Engineering & Design	13.2	Total Power Requirements	9,600 kW

Table 7.8 'Least Favourable' Sub – Criteria for Cookstown

The sub-criteria which were deemed to be 'least favourable' for the Baldurgan site option are summarized in Table 7.9 below:

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Cultural Heritage (Site)	1.1.4	Potential to impact (direct/indirect) on CH sites (previously unrecorded sites)	**Direct:** None **Indirect:** Two, one moderate negative (CH 30), one slight negative (CH 32)
Landscape & Visual (Site)	2.1.1	Potential to impact on views from scenic routes (designation in Fingal CDP)	**Significant** - one 0.5km N with clear views and one 0.5km SE also with clear views - also distant elevated views from scenic routes >5km N
Landscape & Visual (Site)	2.1.2	Potential to impact on areas of 'Highly Sensitive Landscape' (designation in Fingal CDP)	**Moderate** - HSL located 1.5km N with some intervisibility from higher ground within the HSL
Landscape & Visual (Site)	2.1.4	Potential to impact on the character of the landscape character	**Significant** - open rural landscape character of high integrity within and around the site
Landscape & Visual (Site)	2.1.5	Potential that landscape screening will be ineffective or contribute to landscape and visual impacts	**Moderate** - potential for effective screening to foreshorten views, conflict with open landscape character and prevailing hedgerow characteristics - particular attention needs to be paid to elevated scenic route and HSL designations to the N
Ecology (Site)	3.1.2	Potential to impact on Fingal Ecological Network Sites	**Moderate**: Site located 180m from Ballyboghil Stream ecological corridor, but access road crosses it.
Ecology (Site)	3.1.5	Potential to impact on a salmonid system	**Moderate -** The Ballyboghil River (main channel and tributaries) constitutes a salmonid system and the access road crosses it. However, the Donabate River constitutes a non-salmonid system.

Specialist	Sub - Criteria		Description of Potential Impact
	Ref. No	Description	
Ecology (Site)	3.1.9	Potential to result in significant loss of winter habitat for Lapwing and Golden Plover and other wader species outside of designated areas (I.e. relatively large, flat open fields of ploughed or fallow arable land or pasture)	**Moderate** - site includes large arable fields suitable for Lapwing, Golden Plover or other winter waders
Hydrology (Site)	4.1.2	Culverting requirement - used to indicate impact on flood-prone watercourses due to reduced conveyance.	**Moderate:** Crossing Ballyboghil River, High importance. Will have permanent impact on small proportion of attribute.
Agronomy & Agriculture	7.2	Farming Enterprise	Tillage, Potatoes & Horticulture
People & Communities	10.4	Potential to impact on areas of Significant Population Densities	Ballyboughal (houses at Dooroge) is c. 0.7km to the NW.
Traffic	11.2	Number of crossings required for access road	2 river/stream crossings
Traffic	11.3	Potential Impact on landowners	Access road impacts on 3 fields splitting one
Traffic	11.4	Works required to provide safe access entrance	Some local widening likely. Visibility acceptable.
Traffic	11.5	Potential impact on surrounding local road network	Can access R132 after approx. 2km of travel on R129.
Traffic	11.8	Road link impacted upon by all construction traffic (excluding major routes i.e. R132/N32)	4km (R129)
Engineering & Design	13.1.6	Total Pipeline Length	47,850 m
Engineering & Design	13.2	Total Power Requirements	9,700 kW
Engineering & Design	13.3	Total Carbon (tonnes CO2)	488,427
Engineering & Design	13.9	Public Utilities within the Site	2 number: ESB (MV) Overhead (10-20kv)

Table 7.9 'Least Favourable' Sub – Criteria for Baldurgan

7.7 Summary of Iterative Process

The assignment of 'least favourable' classifications to sub-criteria cells in the primary assessment matrix and the subsequent review of the matrix in an iterative process has enabled the project team to determine whether site options with 'least favourable' classifications are:

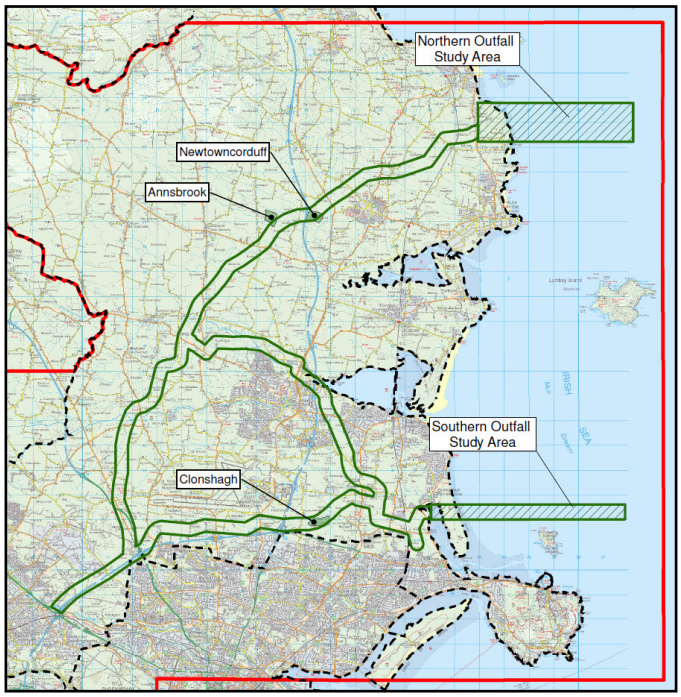
a) Of such significance that it would be comparatively difficult to secure planning permission on that site option; or

b) Of such environmental disadvantage that with the range of choice available the site option should not be considered further

Through this process the six site options as listed hereunder have been removed from further consideration at this time

- Saucerstown (removed following the second iteration)
- Tyrrelstown Little (removed following the third iteration)
- Rathartan (removed following the fourth iteration)
- Cloghran (removed following the fourth iteration)
- Cookstown (removed following the fifth iteration)
- Baldurgan (removed following the fifth iteration)

The three site options of Annsbrook, Clonshagh and Newtowncorduff have emerged from the nine short listed site options as the preferred site options to be taken forward for further consideration.



8 Alternative Sites Assessment – Phase 3 & 4

Phases 3 and 4 of the ASA will consist of the following steps in order to identify which of the emerging preferred site options, Annsbrook, Clonshagh and Newtowncorduff is preferred:

- Public consultation to gather public opinion and additional knowledge on the emerging preferred site options;
- Additional assessments including archaeological geophysical testing and ground investigation to gain further levels of knowledge on the emerging preferred site options;
- Any additional assessments required as a result of issues raised at the public consultation;
- Economic Assessment; and
- Implementation of mitigation measures for identified impacts on the emerging site options, where necessary.

In relation to the implementation of mitigation measures, it should be noted that such measures have not previously been considered as the preference always has been to avoid impact rather than mitigate. However, at this stage it is considered appropriate to consider mitigation measures for impacts to the three emerging preferred site options. Such measures are being incorporated into the assessment at this stage as differentiating factors across the site options are likely to be nuanced and the consideration of mitigation measures may in such instances be cost effective. Any additional costs will then be considered as outlined above and will be included in the '*Capital and Operational Costs*' criteria of the matrix.

Following completion of the above, an *Alternative Sites Assessment and Route Selection Report (Phases 2, 3 & 4): Preferred Site and Routes* will be prepared and published providing details of the process followed.