

APPENDIX D – ARCHAEOLOGICAL STUDY

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Preliminary Archaeological Impact Assessment of proposed sewerage collection system at Carrigtohill, Co. Cork

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1. Introduction

This preliminary report assesses the impact of a proposed sewerage scheme collection system on the archaeological landscape of the townlands of Carrigtohill, Killacloyne, Kilcurfin Glebe, Anngrove, Carhoo, Garrancloyne, Gortnamucky, Fahydorgan, Labaun, Springhill, Barryscourt, Tullagreen, Poulaniska, Ballyadam, Gortagousta and Terry's-Land, Carrigtohill, County Cork. The proposed development is centered on Carrigtohill town, in the Barony of Barrymore.

The proposed development has two distinct zones (Fig. 1), the drainage catchment boundary and within this, the approximate development catchment boundary where all the construction work will take place. The chosen route for the sewerage scheme incorporates two known archaeological sites and is within the environs of eleven recorded monuments (Fig 2). The development will involve some ground disturbance during the ground preparation and the construction phases of the proposed sewerage scheme works. The wider drainage catchment boundary for Carrigtohill incorporates a further forty-one recorded archaeological sites (Fig.2) including Barryscourt Castle (RMP¹ CO075-018/01).

2. Study Methodology

A preliminary desktop study of the proposed development area was carried out in order to assess the developments impact on the archaeological potential of Carrigtohill town and the surrounding area. The desktop study included a review of the first and second editions of the six inch scale Ordnance Survey (OS) maps, the Sites and Monuments Record (SMR) and the Record of Monuments and Places (RMP) for County Cork. Archaeological and historical literature for the area was also consulted.

¹ Record of Monuments and Places

3. Archaeological and Historical Background

The proposed sewerage scheme is centered on the town of Carrigtohill in the barony of Barrymore. The proposed development directly incorporates two recorded archaeological sites, a shell midden (RMP CO075-068) and the northern tip of a possible linear earthwork (RMP CO076-002). There are also at least a further fifty known archaeological sites in the environs of the development and its drainage catchment area (Fig. 2).

The town of Carrigtohill is synonymous with the Earls of Barrymore from the thirteenth to the eighteenth centuries but much earlier settlement activity in the area is also evident. There is a flint scatter (RMP CO076-005) recorded from the townland of Clyduff. This may suggest quite early occupation in this part of Cork, with the lithics possibly dating from the Mesolithic right through the Neolithic and Bronze Age (c.7000-500 BC). Flint and similar stone would have been used to manufacture sharp tools, like arrowheads, scrapers and knives. Residual scatters of discarded stone tools and the debris from their manufacture, usually found in ploughed fields, may indicate the location of settlements *in situ* beneath the topsoil. A cave (RMP CO076-003) in the townland of Terry's-Land was explored in 1934 and subsequently excavated to reveal wolf skull and more recent domestic fauna. Despite the modern finds it is possible that the site was used as a refuge for humans and animals from the earliest times. Ten *fulachta fiadh* are also within the study area:

RMP CO075-018/02	Barryscourt
RMP CO075-070	Barryscourt
RMP CO075-071	Barryscourt
RMP CO075-072	Barryscourt
RMP CO064-101	Garranes
RMP CO064-094	Fahydorgan
RMP CO064-089/01	Killacloyne
RMP CO064-100	Longstown
RMP CO064-090	Tibbotstown
RMP CO064-091	Tibbotstown

These archaeological features are most commonly interpreted as ancient cooking-sites, which usually survive as small horseshoe-shaped mounds of charcoal-enriched soil packed with fragments of heat-shattered stones. They are usually located close to a water source, such as these examples, which are adjacent to streams, some of which have been drained and in marshy ground. The cooking would have taken place in a rectangular pit, lined with wooden planks or stone slabs to form a trough. The water in the trough was probably

boiled using hot stones taken from a nearby fire, which resulted in the heat-shattered stones being discarded to one side when the cooking was complete. The majority of available radiocarbon dates place these monuments in the Bronze Age (Power *et al* 1994, 24). It is notable that one (RMP CO075-018/02) close to Barryscourt castle was only uncovered during archaeological monitoring of the excavation of a sewerage trench.

The proposed development incorporates the eastern section of the *zone of constraint* around a shell midden (RMP CO075-068). This site was uncovered in the townland of Carrigtohill during the construction of the new school and although it only produced pottery dated to the thirteenth and early fourteenth centuries it may have been in use for a considerable time. Shell middens can date to as early as the Late Mesolithic but may also be quite recent and their date can only be determined through excavation. This example was also associated with a number of hearths at different levels and various types of habitation refuse. Since this site has been excavated, extensive development has taken place in the vicinity, however, it is possible that further midden activity be detected during the groundworks phase of the development in this area.

There are fourteen ringforts in the environs of the proposed development, with a further six possible examples:

Ringforts:	RMP CO064-082	Ballinbrittig
	RMP CO064-084	Ballinbrittig
	RMP CO064-085	Ballinbrittig
	RMP CO076-006	Ballintubbrid East
	RMP CO064-087	Ballyregan
	RMP CO075-012	Ballyregan
	RMP CO064-102	Garranes
	RMP CO064-103	Garranes
	RMP CO064-104	Garranes
	RMP CO065-054	Lackenbehy
	RMP CO064-092	Tibbotstown
	RMP CO064-093	Tibbotstown
	RMP CO065-059/01	Woodstock
	RMP CO065-060	Woodstock

Possible Ringforts:	RMP CO064-083	Ballinbrittig
	RMP CO076-016	Ballyvodock West
	RMP CO076-071	Clyduff
	RMP CO064-088	Forest-town
	RMP CO064-095	Longstown
	RMP CO065-058	Woodstock

Ringforts are the most widespread archaeological field monument in Ireland. They are usually known by the names *rath* or *lios* and are circular or sub-circular areas enclosed by a single or multiple earthen bank(s) formed of material thrown up from a concentric fosse (ditch) on its outside. Variations on the enclosing element include stone facing or stone banks (*caher*). Archaeological investigation has shown that the majority of ringforts were enclosed farmsteads, built in Early Medieval times. Although comparatively few ringforts have been excavated, it is accepted that they have a long period of use, from about 600-900 AD. Sites may have re-occupied in the medieval and post-medieval period (*ibid*, 77). There are also souterrains associated with at least two of these ringforts. One (RMP CO064-102) is in the townland of Garranes and one (RMP CO065-059/02) is recorded as 'possible souterrain' which implies that although no visible remains were detected the field archaeologist felt the tradition was sufficiently sound to represent a genuine discovery. Souterrains are underground man-made structures composed of a chamber or series of chambers linked by creepways and entered from ground level by a narrow opening. They are often located within ringforts or cashels and like them were built in Early Medieval times. Their exact function is still under debate with suggestions varying from places for domestic storage to temporary habitations to refuges for both people and valuables. Souterrains were constructed by either tunneling into the underlying clay and rock (earth-cut, rock-cut) from a shaft that was later backfilled, or it was built of dry stone in an excavated trench (stone-built), which was then backfilled (*ibid*, 153).

Possibly linked to ringforts are the enigmatic categories of 'enclosures' and 'earthworks'. There are six of these monument types within the environs of the study area, two of the enclosures are unclassified (RMP CO075-014 and CO064-099), two are circular (RMP CO064-097 and CO064-098) and one rectangular (RMP CO064-096). Earthen monuments are often particularly difficult to classify due to poor preservation, deliberate destruction, trampling by livestock etc. Many are therefore only categorised by shape, size and/or degree of preservation (*ibid*, 182). The majority of enclosures may simply be levelled or poorly preserved ringforts, although the possibility is always there that they belong to other classifications such as prehistoric barrows or henges, medieval ringworks or modern landscape features (*ibid*).

A linear earthwork (RMP CO076-002) stretches between the townlands of Clyduff, Carrigtohill and Barryscourt and may form part of the *Claidh Dubh* (Black Ditch). The proposed development incorporates the northern tip of this monument, however the

sewerage pipeline will extend along the existing roadway in this area and the ground may therefore already be disturbed. These types of monuments are generally considered to be defining and/or defending tribal boundaries (*ibid*, 67). The date and function of the *Claidh Dubh* in Cork is however unclear and largely indistinguishable from surrounding field boundaries, except in this particular section where it is clearly visible as a substantial, if eroded, earthwork defence (*ibid*). It is argued that the Clyduff section formed part of the boundary between the Uí Liatháin and the Uí Mac Caille, although the dating evidence is tentative.

Barryscourt castle (RMP CO075-018/01) is located to the south of Carrigtohill town and represents the remains of a medieval tower house and bawn, the seat of the Barry family from the twelfth to the seventeenth centuries. The earliest building at the site was in 1206 by Philip de Barry. The surviving castle is a fine example of a fifteenth century tower house with sixteenth century additions and alterations. The bawn wall with three corner towers is also largely intact.

There are also a number of ecclesiastical sites in the vicinity of the proposed development. A graveyard and church (RMP CO075-017/01 and 02) are located in the north-eastern section of Carrigtohill town. This parish church probably dates to the fifteen or sixteenth century and it was recorded as being in 'repair' by 1615. It was replaced by a new church built in the north-western corner of the graveyard in 1905, which utilized stone from the old church including the chancel-arch. The graveyard contains some early headstones dated to 1767, with early written sources noting headstones dated to 1723 and 1704 that are no longer visible (*ibid*, 245 and 260). A second graveyard and church (RMP CO075-015/01 and 02) are located in Kilcurfin Glebe to the north-west of Carrigtohill town. This church was recorded as being in ruins by 1615 and contains a chest tomb belonging to the Coppingers of Barryscourt. The graveyard is dominated by headstones dating to the 1720s, which are concentrated to the east and south of the church (*ibid*, 250 and 265). A church (RMP CO064-089/02) is located in the townland of Ballinbrittig on the western side of a stream. It is possible that this is an early church site, possibly that of 'Cill na Chuana – Church of the Sequestered Place' (*ibid*, 243-4). To the west of the latter church is a holy well (RMP CO064-086) in the townland of Ballybrittig. The stone faced well is within a grove and was reportedly still in use up to forty years ago. These sites are frequently found close to early ecclesiastical sites and their origins probably date to pre-Christian times.

Four significant post-medieval private dwellings or country houses are also noted in the environs of the study area. Anngrove House (RMP CO075-051) is a late seventeenth century example, the structure in Garrancloyne (RMP CO075-016), known locally as 'Three chimney house', is a ruined early eighteenth century house, 'Union Lodge' in Carhoo (RMP CO075-050) is a late eighteenth or early nineteenth century structure as is 'Barry's Lodge' in Tullagreen (RMP CO075-019). The country house and its demesne were dominant features of the rural Irish landscape throughout the eighteenth and nineteenth centuries, particularly in the areas of richer quality land such as this. Lewis (1837, 87) mentions a number of these residences and cites 'Ann Grove as the elegant residence of F. Wise, Esq., Barry's Lodge of D. Barry, Esq. and Union Lodge of the Rev. W. Gifford'.

The last two recorded archaeological sites within the study area are post-medieval lime kilns. One is in Terry's-Land (RMP CO076-001) and the other in Barryscourt (RMP CO076-007). The burning of lime as an agricultural fertilizer became widespread with the improvements of the eighteenth century, and the 1st edition OS map (1842) shows thousands of lime kilns in County Cork (Power 1994, 312). Lime kilns are an industrial structure dating back to the medieval period and used for burning limestone, chalk and sometimes oyster shell to make quicklime. They generally consist of a circular, square or rectangular pit in which the lime was fired using timber, charcoal or coal as fuel. They were predominantly used for the production of mortar for building purposes and the production of lime for agricultural reasons. Post-medieval lime kilns are generally more structurally sophisticated. When describing Carrigtohill, Lewis (1837, 87) specifically mentions that great quantities of limestone are quarried and burnt into lime for manure.

Many archaeological sites are low visibility monuments and these include ancient (prehistoric) settlements, souterrains, ceremonial and burial sites. Remains of these types of sites may lie buried under the surface. Sites have also been leveled in the past and the sub-surface evidence for these may still remain below the modern surface. Stray finds, dropped or lost in the past can also be recovered when the ground is disturbed. The present inventories of sites and monuments (SMR and RMP) indicates only sites that are now visible above the ground and there remains the possibility that other buried sites exist below the surface.

4. Impact of Proposed Development on the Archaeological Landscape

Visual impact

The proposed development will not have any visual impact on the known archaeological sites in the environs of Carrigtohill town.

Archaeological Impact

The proposed sewerage scheme route directly incorporates two recorded archaeological sites and there are at least a further fifty known archaeological sites in the environs of the development and its drainage catchment area (Fig. 2). The shell midden (RMP CO075-068) has already been excavated with the surrounding area extensively developed since and the pipeline that crosses the northern tip of the linear earthwork (RMP CO076-002) follows the existing roadway and may therefore already be disturbed. It is therefore unlikely that any of the known sites will be directly affected by the development. However, considering the density of sites within the environs of Carrigtohill, especially buried sites such as *fulachta fiadh* and also as the RMP and SMR maps and inventories mainly record sites that were on the original OS surveys (mid nineteenth to early twentieth century), it is possible that formerly unrecorded sites will be uncovered during topsoil stripping, particularly in the previously undeveloped areas:

Much of the proposed development will be along the existing roadways but some will traverse greenfield sites. Buried archaeological sites may range from small-scale sites such as isolated burials to extensive evidence for habitation. These sites will only be detected by archaeological monitoring during ground disturbance. In order to prevent accidental damage to or loss of such features, the removal of topsoil in the development area should be supervised by a suitably qualified archaeologist.

Impact Summary

The impact of the proposed sewerage scheme on the archaeological landscape of the area was preliminary assessed using all of the available documentary and cartographic sources. There are fifty-two recorded monuments surrounding the proposed development area. It is also possible that previously unrecorded monuments may be uncovered during topsoil stripping of the formerly undeveloped areas.

5. Preliminary Mitigation Strategies

The proposed drainage scheme includes two recorded archaeological sites and the proposed development will traverse a number of greenfield sites. In order to prevent any potential loss to the archaeological record a series of preliminary mitigation strategies are recommended.

1. The proposed sewerage pipeline in the vicinity of the shell midden (RMP CO075-068) and the northern tip of the linear earthwork (RMP CO076-002) should be monitored by a suitably qualified archaeologist to record any archaeological deposits and to recover any artefacts. The archaeologist will require a licence for this work and this licence will be issued by the Department of the Environment, Heritage and Local Government. Fifteen working days advance notice is required to apply for and obtain the necessary licence.
2. The greenfield areas incorporated into the development should be field-walked prior to the commencement of the groundworks. This may detect previously unrecorded archaeological sites.
3. All topsoil removal should be monitored by a suitably qualified archaeologist as per the above conditions.
4. The monitoring archaeologist should be empowered to halt the development if buried archaeological features or finds are uncovered. Provision should be made to resolve any newly exposed archaeological sites.
5. Provision, including financial and time should be made at the outset of the project to facilitate any excavation or recording of archaeological material that may be uncovered during the developmental works.

6. Non-Technical Summary

A number of sources were consulted in order to preliminarily assess the archaeological potential of the proposed development area. While the direct impact on the two recorded archaeological monuments within the vicinity of the development may be minimal due to previous development in those areas, as yet unknown archaeological monuments in the development zone may be impacted upon by ground disturbance. A number of mitigating strategies are recommended in order to protect these monuments and to prevent accidental loss or damage to archaeological finds or features that lie below the present surface and have no visible surface remains.

7. Bibliography

Lewis, S. 1837 (reprinted 1998). *A Topographical Dictionary of the Parishes, Towns and Villages of Cork City and County*, The Collins Press, Cork.

Power, D. et al. 1994. *The Archaeological Inventory of County Cork – Vol. II: East & South Cork*. The Stationary Office, Dublin.

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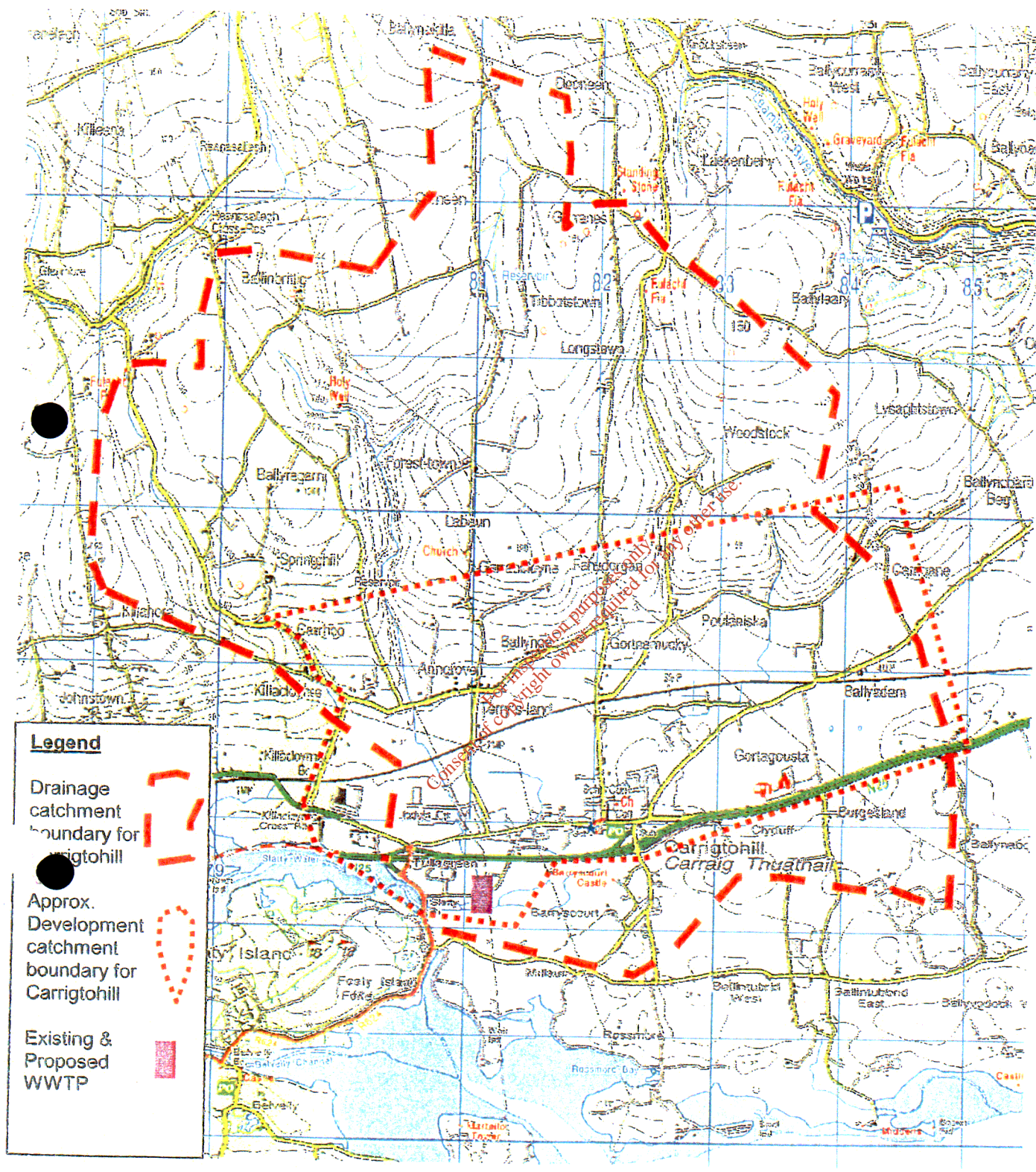


Figure 1. Site location

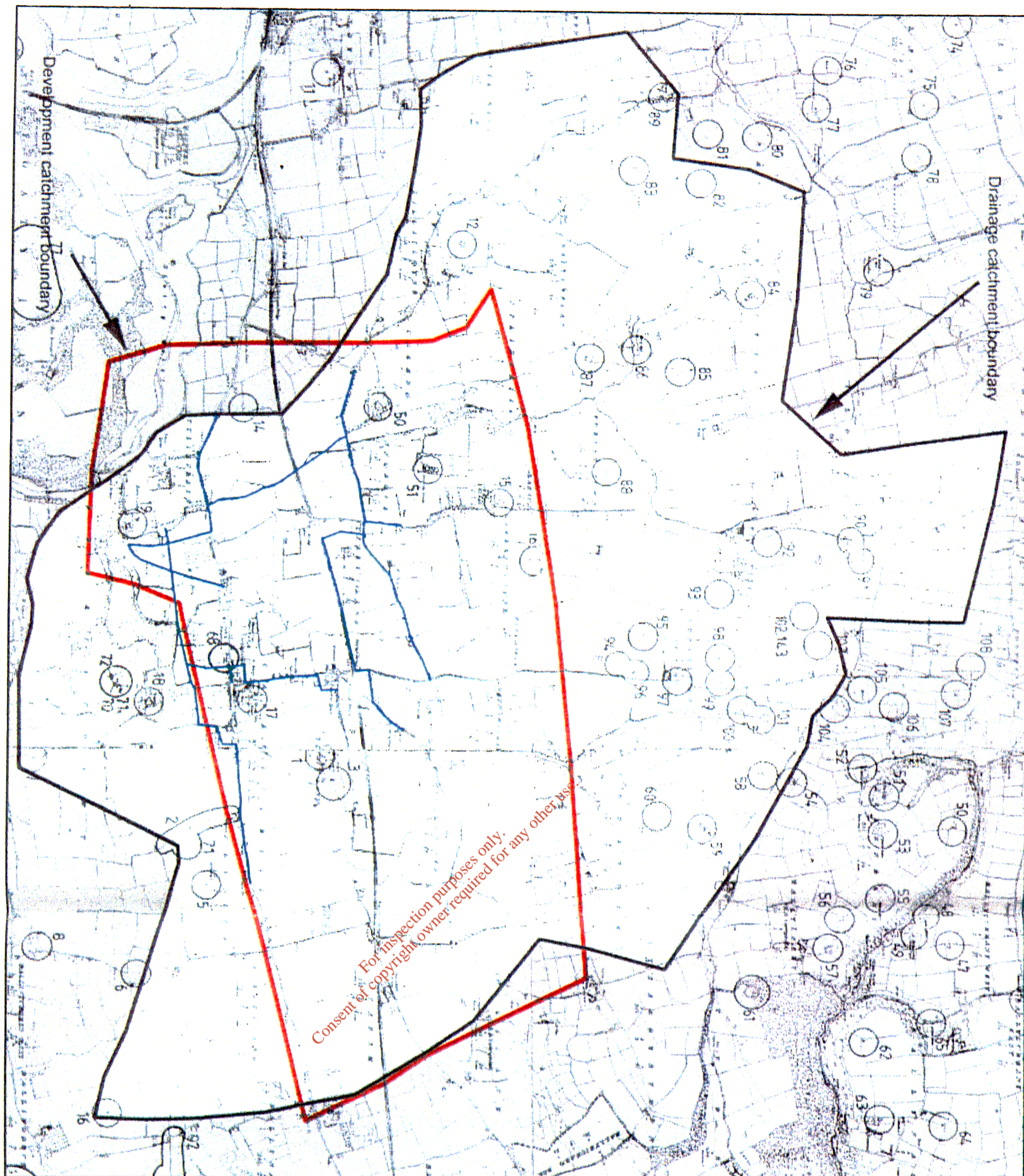


Figure 2: Extracts from SMR maps CO64, CO65, CO75 and CO76 showing drainage catchment boundary for Carrigtohill (in black), approximate development catchment boundary for Carrigtohill (in red) and proposed piperoute (in blue)

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Appendix 1 – Extracts from the Archaeological Inventory of County Cork – Vol. 11: East and South Cork

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1. Introduction

This report assesses the impact of a proposed waste water treatment plant outfall pipeline on the archaeological and historical landscape of the townland of Tullagreen, Carrigtohill, County Cork. The proposed development area is south-west of Carrigtohill town (Fig. 1), extending for a length of *c.* 800m, along the northern edge of Slatty Water, west and south of Tullagreen House. The chosen route for the outfall pipeline does not directly incorporate any known archaeological sites but is within the environs of three recorded monuments (Fig 2; Appendix 1). The development will involve disturbance of the mud-flats during the site preparation works and the construction phases of the proposed outfall pipeline.

2. Study Methodology

A desktop study of the proposed development area was carried out in order to assess the developments impact on the archaeological potential of Tullagreen townland, Carrigtohill, Co. Cork and the surrounding area. The desktop study included a review of the first and second editions of the six inch scale Ordnance Survey (OS) maps, the Sites and Monuments Record (SMR) and the Record of Monuments and Places (RMP) for County Cork. All of the available archaeological and historical literature for the area was also consulted. All local historical and archaeological journals were checked to establish if any new information on the area was published in the recent past.

3. The Receiving Environment

The proposed outfall pipeline route is located *c.* 1 mile south-west of Carrigtohill town, in the barony of Barrymore and is directly west of Barryscourt Castle. The pipeline is located within Slatty Water, part of the estuary of the River Lee and directly north-east of Lough Mahon. Cork Harbour is one of the largest natural harbours in the world and several towns and suburbs of Cork City are located around its shores. Cork harbour also houses a large number of islands, notably Foaty Island to the south of the development area and Brown Island and Harpers Island to the west. The Youghal Branch of the Great Southern and Western Railway is to the north.

4. Development Proposal

This project consists of the construction of an outfall pipeline for a sewerage scheme. The pipeline will extend along the northern edge of Slatty Water, west and south of Tullagreen House and the outfall point is located at the western end (Fig. 3).

5. Archaeological and Historical Background

The proposed outfall pipeline is centered on the townland of Tullagreen, c.1 mile southwest of Carrigtohill in the barony of Barrymore. The proposed development does not incorporate any recorded archaeological sites but there are at least three known sites in the environs (Fig. 2; Appendix 1).

The town of Carrigtohill is reportedly named from the Irish *Thuahill*, meaning left handed or North. It is so called because, whereas most of the rocks in that part of the country run east-west, the rocks at Carrigtohill run north-south. The town itself is synonymous with the Earls of Barrymore from the thirteenth to the eighteenth centuries but much earlier settlement activity in the area is also evident. A flint scatter, for example, is recorded from the townland of Clyduff to the east. This may suggest quite early occupation in this part of Cork, with the lithics possibly dating from the Mesolithic right through the Neolithic and Bronze Age (c.7000-500 BC). Flint and similar stone would have been used to manufacture sharp tools, like arrowheads, scrapers and knives. Residual scatters of discarded stone tools and the debris from their manufacture, usually found in ploughed fields, may indicate the location of settlements *in situ* beneath the topsoil. A cave in the townland of Terry's-Land to the north-east was explored in 1934 and subsequently excavated to reveal wolf skull and more recent domestic fauna. Despite the modern finds it is possible that the site was used as a refuge for humans and animals from the earliest times.

Many *fulachta fiadh* are also within the environs of Carrigtohill. These archaeological features are most commonly interpreted as ancient cooking-sites, which usually survive as small horseshoe-shaped mounds of charcoal-enriched soil packed with fragments of heat-shattered stones. They are usually located close to a water source, such as these examples,

which are adjacent to streams, some of which have been drained and in marshy ground. The cooking would have taken place in a rectangular pit, lined with wooden planks or stone slabs to form a trough. The water in the trough was probably boiled using hot stones taken from a nearby fire, which resulted in the heat-shattered stones being discarded to one side when the cooking was complete. The majority of available radiocarbon dates place these monuments in the Bronze Age (Power *et al.* 1994, 24).

Of particular interest is the prehistoric occupation site (RMP¹ CO075-077) uncovered during the development of the Fota Golf Course. This site is located directly south of the proposed development area, focused on Fuchsia Hill on Foaty Island. Several areas of archaeological potential were excavated, ranging from prehistoric to post-medieval in date. Of note was a Bronze Age structure with an external hearth, 50m north-east of this was a spread of fire-shattered stones and 10m from the settlement evidence was a large clay-lined pit, three fire-pits with shallow 'flues', a pit containing Late Neolithic or Early Bronze Age pottery and another pit with a similar dated mortuary vessel and flint blade probably represented a re-interred cremation burial (Power *et al.* 1994, 365; Rutter and O'Connell 1992). On the lower slopes of the hill were another three fire-pits, while early post-medieval activity was represented by a late medieval jug in a pit, field enclosures, drains and numerous pits/post-holes (*ibid.*). It is notable that only 5% of the total area under development was properly investigated, suggesting that this location, within Cork harbour was extensively occupied from the prehistoric period onwards.

North of the proposed development area, in the townland of Kilacloyne, is the site of an enclosure (RMP CO075-014). This is an enigmatic category as earthen monuments are often particularly difficult to classify due to poor preservation, deliberate destruction, trampling by livestock, etc. Many are therefore only categorised by shape, size and/or degree of preservation (Power *et al.* 1994, 182). The majority of enclosures may simply be levelled or poorly preserved ringforts, although the possibility is always there that they belong to other classifications such as prehistoric barrows or henges, medieval ringworks or modern landscape features (*ibid.*). This particular example is shown on the 1st edition (1842) and 2nd edition (1904) O.S. maps as a sub-rectangular enclosure cut across by an east-west field fence (Fig. 4). The site was subsequently levelled and no visible surface trace remains today (*ibid.*, 185).

¹ Record of Monuments and Places

Barryscourt castle (RMP CO075-018/01) is located c. 0.5 miles to the east of the proposed development area and represents the remains of a medieval tower house and bawn, the seat of the Barry family from the twelfth to the seventeenth centuries. The earliest building at the site was in 1206 by Philip de Barry. The surviving castle is a fine example of a fifteenth century tower house with sixteenth century additions and alterations. The bawn wall with three corner towers is also largely intact. Related to this demesne and located directly east of the proposed development area in the townland of Tullagreen is a significant post-medieval private dwelling or country house (RMP CO075-019). This structure is known as 'Barry's Lodge' and is late eighteenth or early nineteenth century in date. The country house and its demesne were dominant features of the rural Irish landscape throughout the eighteenth and nineteenth centuries, particularly in the areas of richer quality land such as this. Lewis (1837, 87) mentions this residence, stating that it was the elegant residence of D. Barry, Esq. This house was originally a two-storey L-shaped building with a hipped roof but was demolished in the early 1990s. According to local information farm buildings to SSE are the remains of a larger complex that included a mill from which two millstones survive (Power *et al.* 1994, 329).

Fota House and associated gardens to the south are also evidence for important post-medieval activity in the area. The house dates to the eighteenth century and was altered in various stages until the end of the nineteenth century. The Fota gardens contain many rare and exotic shrubs and trees, including an extensive rose garden.

It is notable that many archaeological sites are low visibility monuments, which include ancient (prehistoric) settlements, souterrains, ceremonial and burial sites. Remains of these types of sites may lie buried under the surface. Sites have also been leveled in the past and the sub-surface evidence for these may still remain below the modern surface. Stray finds, dropped or lost in the past can also be recovered when the ground is disturbed. The present inventories of sites and monuments (SMR and RMP) indicates only sites that are now visible above the ground and there remains the possibility that other buried sites exist below the surface.

6. Impact of Proposed Development on the Archaeological Landscape

Visual impact

The proposed development will not have any visual impact on the known archaeological sites in the environs of the townland of Tullagreen, Carrigtohill, Co. Cork.

Archaeological Impact

The proposed outfall pipeline route is not located within the zone any recorded archaeological sites, however there are three known sites in the environs, including evidence for prehistoric settlement (Fig 2; Appendix 1). The proposed outfall pipeline runs along the northern side of the Slatty Water estuary. This waterway is tidal with substantial mud-flats exposed at low tide. It is possible, therefore that formerly unrecorded sites could be uncovered during disturbance of the environs of the pipeline. Buried archaeological sites may range from small-scale sites such as isolated burials to extensive evidence for habitation. These sites will only be detected by an archaeological walkover at low tide. This area will be subject to metal detection survey.

Impact Summary

The impact of the proposed outfall pipeline on the archaeological landscape of the area was assessed using all of the available documentary and cartographic sources. There are three recorded monuments surrounding the proposed development area. It is also possible that previously unrecorded monuments may be uncovered during disturbance of the mud-flats and construction of the outfall pipe. This area is therefore subject to an archaeological walkover and metal detection survey at low tide.

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7. Mitigation Strategies

In order to prevent any potential loss to the archaeological record a series of mitigation strategies are recommended.

1. The Slatty Water estuary is tidal with substantial mud-flats exposed at low tide, these may be walked across at low tide and a non-intrusive inspection should be carried out of the inter-tidal zone and riverbed affected by the proposed development.
2. A metal detection survey of the area must be undertaken. It will record the location of all ferrous and non-ferrous materials on and beneath the inter-tidal zone and riverbed. Each contact will be plotted, facilitating the development of a metal detector contact distribution pattern.
3. The archaeologist will require a licence for this work and this licence will be issued by the Department of the Environment, Heritage and Local Government. Fifteen working days advance notice is required to apply for and obtain the necessary licence.
4. The archaeologist should be empowered to halt the development if buried archaeological features or finds are uncovered.
5. Provision, including financial and time should be made at the outset of the project to facilitate any excavation or recording of archaeological material that may be uncovered during the developmental works.

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8. Non-Technical Summary

A number of sources were consulted in order to assess the archaeological and historical potential of the proposed development area. While there is no direct impact on the recorded archaeological monuments within the vicinity of the development area as yet unknown archaeological monuments in the development zone may be impacted upon. A number of mitigating strategies are recommended in order to protect these monuments and to prevent accidental loss or damage to archaeological finds or features that lie below the present surface and have no visible surface remains.

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9. Bibliography

Lewis, S. 1837 (reprinted 1998). *A Topographical Dictionary of the Parishes, Towns and Villages of Cork City and County*, The Collins Press, Cork.

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Rutter, E. and O'Connell, P. 1992. Fota, Co. Cork. In S. Cherry (ed.) *Digging up Cork: Archaeological Excavations in Cork 1992*. Cork Corporation/Cork Public Museum, 11-13.

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Appendix 1

Extracts from the *Archaeological Inventory of County Cork, Vol. 2: East and South*
(Power *et al* 1994).

Killacloyne RMP CO075-014

Enclosure Indicated on 1842 OS map as sub-rectangular enclosure (L c.40m N-S; c.20m E-W) cut across by E-W field fence. Levelled; no visible surface trace.

Tullagreen RMP CO075-019

Country house Late 18th/early 19th-century 2-storey L-shaped house; recently demolished. Hipped roof, gabled at rear. Entrance front (E) of 5 bays, central door. Brick-larched windows; brick cornice. Central 2-storey hipped projection to rear. According to local information farm buildings to SSE are remains of larger complex which included mill from which two millstones survive.

Foaty RMP CO075-077

Occupation site On Fota Island, in former parkland. Extensive area of archaeological remains partially excavated (1992) under salvage conditions in advance of golf-course development. Around 5% of total area properly investigated, centred on Fuchsia Hill; analysis of finds, C14 samples, in progress.

Area 1: c.100m W of power station. Ovoid structure (8m E-W; 5.5m N-S), with 1 central post-hole; entrance to E, with probable porch. Hearth (L c.1m) just NE of structure. Comparable to Bronze Age mortuary house at Ballyveelish (Doody 1987, 8-21).

Area 2: c. 50m NE of (1): enigmatic spread of lightly fire cracked stones, 80 m sq, in slight hollow.

Area 3: On lower W slopes Fuchsia Hill, 3 small firepits: two pits c.3m apart; one, re-cut, 25m to NE. Unable to investigate surrounding area.

Area 4: 90m to W of power station. Large pit (L 6.4m; W 3.75m; D 0.86m) with 2 successive clay linings. Just to NE were 3 small firepits (diam. c. 1.25m; D c. 0.4m) with shallow 'flues' radial to large pit to SW, containing late Neolithic/early Bronze Age (LNEBA) pottery. Three shallow pits SW of larger pit, one containing LNEBA mortuary vessel, flint blade; possibly re-interred cremation. Four small pits in square c. 6m S of large pit, each containing 1 water-rolled quartz pebble.

Area 5: c. 110m S of (4), c. 60m S of (1), under destroyed bank, hearth and 3 post-holes; land between (1) and (5) now listed by OPW.

Area 9: 150m W of (6), early post Medieval pit containing late Medieval fag, cutting possible butt end shallow ditch; medieval wall remnant 32m to NE terminates at re-cut post-hole, presumably for gate; these and other features suggest presence field enclosures pre-emparkment for Fota House. Complex to N includes shallow linear cut feature, underlying post-holes belonging to an area 6m x 6m to NE, comprising 40 stake-holes and 20 pits/post-holes, some re-cut; one contained prehistoric pottery. Overlain by drystone revetted bank (Wth c.2.5m) on approx. same line as early cut feature; two post medieval drains then cut to either side of bank. Bank subsequently leveled; material pushed over top of side ditches contains prehistoric pottery (Rutter and O'Connell, 1992).

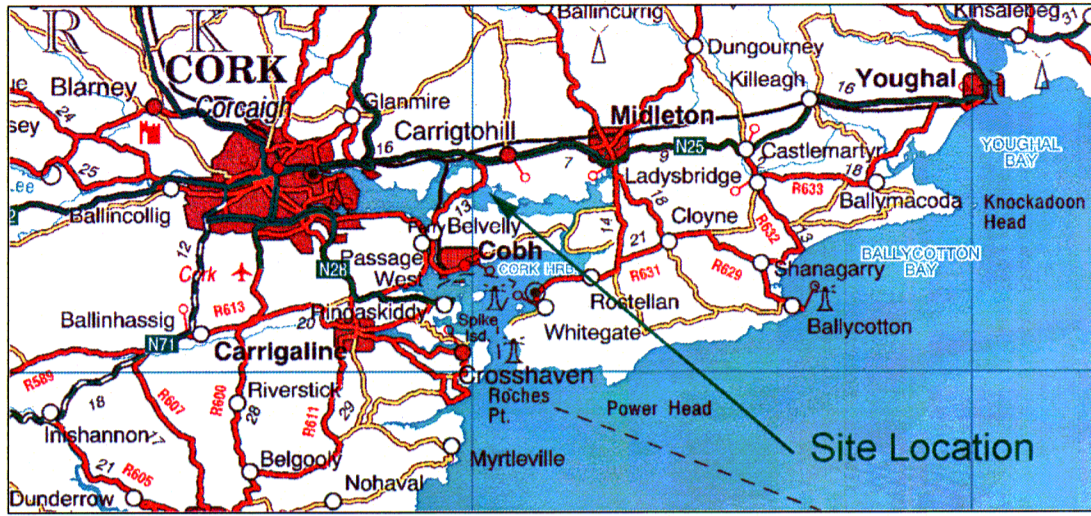


Figure 1: Site location.

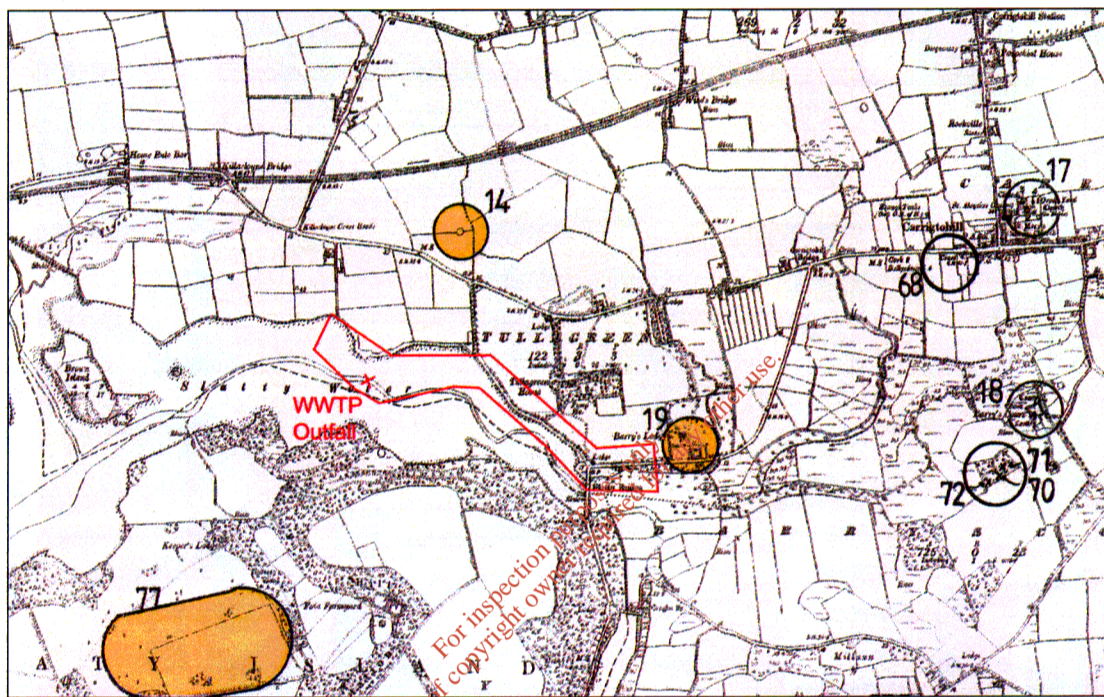


Figure 2: Extract from RMP CO075 showing proposed development area and known archaeology in the environs.

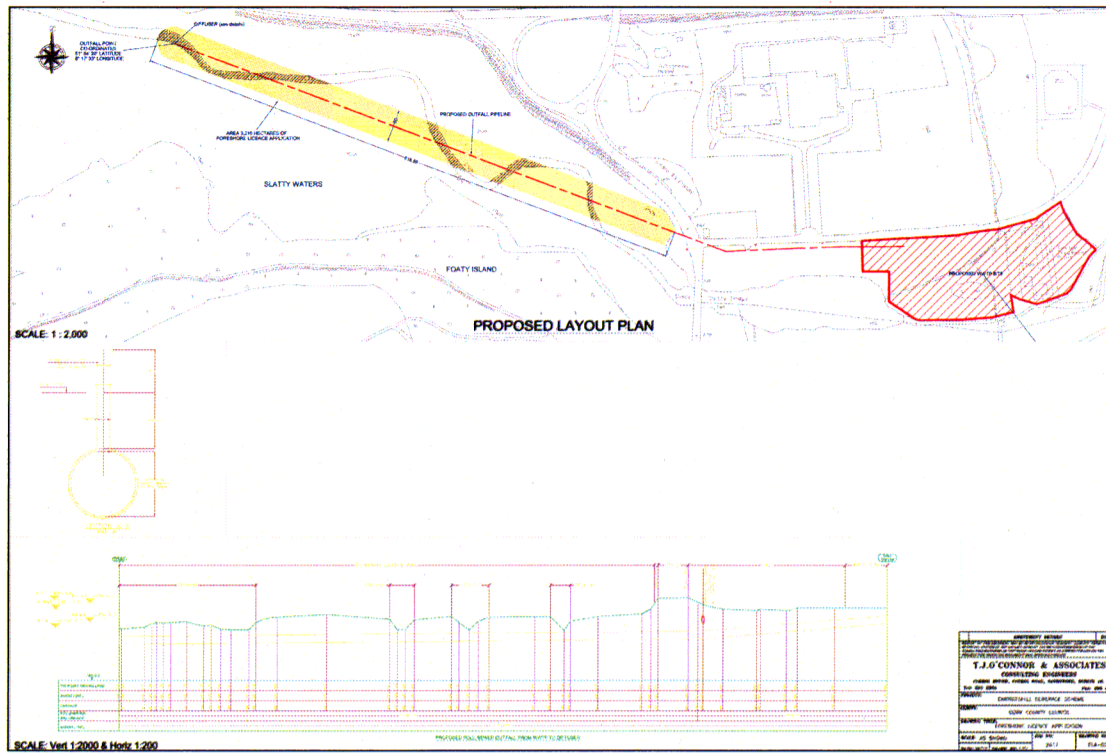


Figure 3: Proposed development area of outfall pipeline.

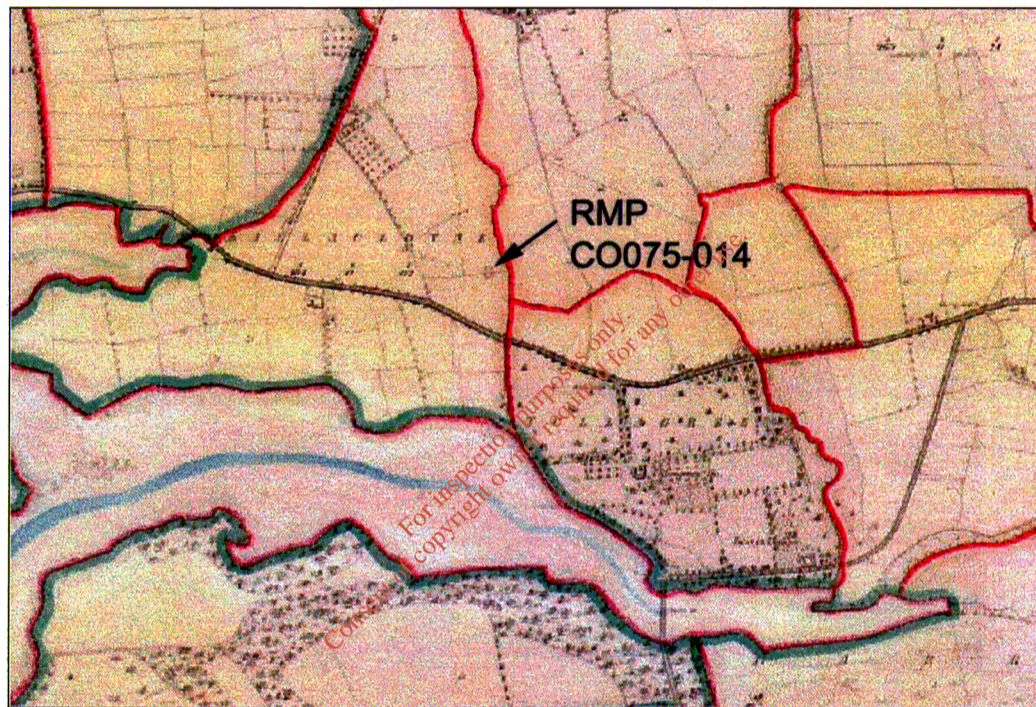


Figure 4: Sub-rectangular enclosure (RMP CO075-014) marked on 1st edition 6" O.S. Map.

APPENDIX E – HARBOUR MODELLING

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Carrigrohilly EIS Appendix E

Harbour Model

	Phosphorus										Harbour Model
	Existing	North Point	Harpers	Fota Br.	Mid Channel	C.grenin Out	L. Mahon1	L. Mahon2	L. Mahon3	Belvelly	
Neap Tide	16:40	0.02	0.051	0.00	0.01	0.04	0.09	0.06	0.01	0.00	0.00
	17:40	0.01	0.053	0.00	0.01	0.02	0.06	0.05	0.01	0.00	0.00
	18:40	0.01	0.063	0.00	0.00	0.00	0.06	0.05	0.00	0.00	0.00
Flow Rate 10125	19:40	0.00	0.088	0.01	0.00	0.00	0.06	0.03	0.00	0.00	0.00
F Coli 10000	20:40	0.00	0.088	0.04	0.00	0.00	0.05	0.01	0.00	0.00	0.00
T Coli 100000	21:40	0.00	0.080	0.07	0.02	0.00	0.03	0.00	0.00	0.00	0.00
BOD 25	22:40	0.00	0.081	0.08	0.04	0.01	0.04	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	0.129	0.08	0.02	0.01	0.10	0.00	0.00	0.00	0.00
DO 1	00:40	0.00	0.104	0.07	0.00	0.01	0.08	0.00	0.00	0.00	0.00
Ammonia 3	01:40	0.00	0.093	0.02	0.00	0.00	0.07	0.01	0.00	0.00	0.00
Nitrate 15	02:40	0.00	0.081	0.00	0.00	0.00	0.07	0.04	0.00	0.00	0.00
Phos. 1	03:40	0.01	0.059	0.00	0.00	0.02	0.05	0.06	0.00	0.00	0.00
Input : North Point	04:40	0.01	0.044	0.00	0.01	0.04	0.06	0.06	0.01	0.00	0.00
			0.078	0.029							
Neap Tide	16:40	0.01	0.051	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carrigrenan excluded	17:40	0.01	0.054	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	18:40	0.00	0.063	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flow Rate 10125	19:40	0.00	0.083	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F Coli 10000	20:40	0.00	0.079	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T Coli 100000	21:40	0.00	0.067	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00
BOD 25	22:40	0.00	0.067	0.07	0.04	0.01	0.00	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	0.118	0.07	0.02	0.01	0.00	0.00	0.00	0.00	0.00
DO 1	00:40	0.00	0.092	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ammonia 3	01:40	0.00	0.083	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nitrate 15	02:40	0.00	0.079	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phos. 1	03:40	0.00	0.060	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Input : North Point	04:40	0.01	0.046	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			0.072								
Spring Tide	16:40	0.01	0.024	0.00	0.00	0.01	0.03	0.01	0.02	0.00	0.00
	17:40	0.01	0.021	0.00	0.00	0.00	0.02	0.01	0.02	0.00	0.00
	18:40	0.00	0.011	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.00
Flow Rate 10125	19:40	0.00	0.010	0.00	0.00	0.00	0.02	0.02	0.02	0.00	0.00
F Coli 10000	20:40	0.00	0.016	0.01	0.00	0.00	0.02	0.02	0.00	0.00	0.00
T Coli 100000	21:40	0.00	0.024	0.01	0.01	0.00	0.02	0.02	0.00	0.00	0.00
BOD 25	22:40	0.00	0.039	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	0.061	0.02	0.01	0.00	0.09	0.00	0.00	0.00	0.00
DO 1	00:40	0.00	0.125	0.02	0.00	0.00	0.06	0.00	0.00	0.00	0.00
Ammonia 3	01:40	0.00	0.034	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
Nitrate 15	02:40	0.01	0.008	0.00	0.01	0.03	0.02	0.02	0.02	0.00	0.00
Phos. 1	03:40	0.03	0.006	0.01	0.01	0.01	0.01	0.02	0.02	0.00	0.00
Input : North Point	04:40	0.02	0.017	0.01	0.00	0.01	0.02	0.01	0.02	0.00	0.00
			0.031								

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Carrigrohilly EIS Appendix E

	Existing	North Point	Harpers	Fota Br.	BOD	Mid Channe C.grenin Ou L	L. Mahon1	L. Mahon2	L. Mahon3	Belvelly	Harbour Model Weir Is
Neap Tide	16:40	0.30	1.12	0.01	0.04	0.10	0.16	0.14	0.03	0.00	0.00
	17:40	0.22	1.12	0.01	0.03	0.06	0.14	0.14	0.03	0.00	0.00
	18:40	0.11	1.18	0.02	0.01	0.01	0.06	0.13	0.01	0.00	0.00
Flow Rate 10125	19:40	0.05	1.58	0.21	0.01	0.01	0.04	0.09	0.00	0.00	0.00
F Coli 10000	20:40	0.02	1.62	0.75	0.08	0.01	0.03	0.02	0.00	0.00	0.00
T Coli 100000	21:40	0.01	1.55	1.20	0.42	0.08	0.01	0.00	0.00	0.00	0.00
BOD 25	22:40	0.00	1.70	1.33	0.70	0.17	0.01	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	2.89	1.31	0.37	0.14	0.01	0.00	0.00	0.00	0.00
DO 1	00:40	0.01	2.14	1.12	0.08	0.05	0.02	0.00	0.00	0.00	0.00
Ammonia 3	01:40	0.01	1.72	0.40	0.01	0.01	0.03	0.01	0.00	0.00	0.00
Nitrate 15	02:40	0.05	1.44	0.05	0.00	0.01	0.12	0.10	0.00	0.00	0.00
Phos. 1	03:40	0.14	1.11	0.01	0.01	0.06	0.17	0.14	0.01	0.00	0.00
Input : North Point	04:40	0.26	0.91	0.01	0.04	0.11	0.16	0.14	0.03	0.00	0.00
			1.55								
Neap Tide	16:40	0.18	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carrigrenan excluded	17:40	0.14	1.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	18:40	0.07	1.21	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flow Rate 10125	19:40	0.03	1.54	0.24	0.01	0.00	0.00	0.00	0.00	0.00	0.00
F Coli 10000	20:40	0.01	1.51	0.78	0.09	0.01	0.00	0.00	0.00	0.00	0.00
T Coli 100000	21:40	0.00	1.37	1.17	0.45	0.08	0.00	0.00	0.00	0.00	0.00
BOD 25	22:40	0.00	1.49	1.25	0.73	0.19	0.00	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	2.77	1.23	0.40	0.15	0.00	0.00	0.00	0.00	0.00
DO 1	00:40	0.00	1.98	1.11	0.09	0.05	0.00	0.00	0.00	0.00	0.00
Ammonia 3	01:40	0.00	1.60	0.43	0.02	0.01	0.00	0.00	0.00	0.00	0.00
Nitrate 15	02:40	0.02	1.44	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phos. 1	03:40	0.08	1.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Input : North Point	04:40	0.19	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			1.48								
Spring Tide	16:40	0.33	0.45	0.01	0.01	0.02	0.03	0.03	0.06	0.00	0.00
	17:40	0.20	0.39	0.01	0.01	0.01	0.04	0.04	0.06	0.00	0.00
	18:40	0.09	0.23	0.01	0.01	0.01	0.07	0.03	0.06	0.00	0.00
Flow Rate 10125	19:40	0.03	0.25	0.08	0.05	0.02	0.05	0.05	0.05	0.00	0.00
F Coli 10000	20:40	0.01	0.40	0.13	0.07	0.03	0.03	0.05	0.00	0.00	0.00
T Coli 100000	21:40	0.00	0.59	0.25	0.15	0.06	0.03	0.05	0.00	0.00	0.00
BOD 25	22:40	0.00	0.99	0.37	0.25	0.09	0.02	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	1.54	0.47	0.25	0.09	0.06	0.00	0.00	0.00	0.00
DO 1	00:40	0.00	3.13	0.49	0.05	0.06	0.02	0.01	0.00	0.00	0.00
Ammonia 3	01:40	0.00	0.86	0.07	0.02	0.02	0.06	0.09	0.00	0.00	0.00
Nitrate 15	02:40	0.31	0.21	0.01	0.04	0.08	0.08	0.07	0.00	0.00	0.00
Phos. 1	03:40	0.62	0.12	0.03	0.02	0.03	0.04	0.04	0.07	0.00	0.00
Input : North Point	04:40	0.42	0.27	0.01	0.01	0.02	0.04	0.04	0.07	0.00	0.00
			0.73								

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Carrigrohilly EIS Appendix E

Harbour Model

	Existing	North Point	Harpers	Fota Br.	Mid Channel	C.grenin Out	L. Mahon1	L. Mahon2	L. Mahon3	Belvelly	Weir Island
Neap Tide	16:40	0.21	0.72	0.01	0.05	0.12	0.19	0.17	0.04	0.00	0.00
	17:40	0.15	0.73	0.01	0.04	0.07	0.16	0.16	0.03	0.00	0.00
	18:40	0.08	0.80	0.01	0.01	0.02	0.16	0.15	0.01	0.00	0.00
Flow Rate 10125	19:40	0.03	1.09	0.15	0.01	0.01	0.18	0.10	0.00	0.00	0.00
F Coli 10000	20:40	0.01	1.11	0.52	0.06	0.01	0.14	0.02	0.00	0.00	0.00
T Coli 100000	21:40	0.01	1.03	0.84	0.29	0.05	0.10	0.00	0.00	0.00	0.00
BOD 25	22:40	0.00	1.10	0.94	0.49	0.12	0.11	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	1.82	0.93	0.26	0.10	0.30	0.00	0.00	0.00	0.00
DO 1	00:40	0.01	1.40	0.80	0.06	0.03	0.25	0.01	0.00	0.00	0.00
Ammonia 3	01:40	0.01	1.17	0.29	0.01	0.01	0.21	0.02	0.00	0.00	0.00
Nitrate 15	02:40	0.04	1.00	0.04	0.00	0.01	0.19	0.11	0.00	0.00	0.00
Phos. 1	03:40	0.10	0.76	0.01	0.02	0.07	0.16	0.17	0.01	0.00	0.00
Input : North Point	04:40	0.18	0.60	0.01	0.04	0.12	0.19	0.17	0.03	0.00	0.00

Neap Tide
Carrigrenan excluded

	16:40	0.12	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	17:40	0.09	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	18:40	0.05	0.82	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flow Rate 10125	19:40	0.02	1.05	0.16	0.01	0.00	0.00	0.00	0.00	0.00	0.00
F Coli 10000	20:40	0.01	1.02	0.53	0.07	0.01	0.00	0.00	0.00	0.00	0.00
T Coli 100000	21:40	0.00	0.90	0.82	0.31	0.06	0.00	0.00	0.00	0.00	0.00
BOD 25	22:40	0.00	0.95	0.87	0.51	0.13	0.00	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	1.71	0.86	0.28	0.11	0.00	0.00	0.00	0.00	0.00
DO 1	00:40	0.00	1.27	0.79	0.06	0.04	0.00	0.00	0.00	0.00	0.00
Ammonia 3	01:40	0.00	1.08	0.30	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Nitrate 15	02:40	0.01	0.99	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phos. 1	03:40	0.06	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Input : North Point	04:40	0.13	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Spring Tide

	16:40	0.21	0.28	0.01	0.01	0.02	0.11	0.04	0.07	0.00	0.00
	17:40	0.13	0.24	0.02	0.01	0.01	0.06	0.04	0.06	0.00	0.00
	18:40	0.06	0.14	0.01	0.01	0.01	0.04	0.03	0.07	0.00	0.00
Flow Rate 10125	19:40	0.02	0.16	0.05	0.03	0.01	0.06	0.06	0.05	0.00	0.00
F Coli 10000	20:40	0.00	0.25	0.08	0.05	0.02	0.07	0.05	0.00	0.00	0.00
T Coli 100000	21:40	0.00	0.36	0.16	0.10	0.04	0.06	0.01	0.00	0.00	0.00
BOD 25	22:40	0.00	0.60	0.23	0.16	0.06	0.07	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	0.93	0.29	0.16	0.06	0.28	0.01	0.00	0.00	0.00
DO 1	00:40	0.00	1.88	0.30	0.03	0.04	0.17	0.01	0.00	0.00	0.00
Ammonia 3	01:40	0.00	0.53	0.05	0.01	0.01	0.10	0.09	0.01	0.00	0.00
Nitrate 15	02:40	0.19	0.13	0.01	0.04	0.09	0.06	0.07	0.08	0.00	0.00
Phos. 1	03:40	0.39	0.08	0.03	0.02	0.04	0.04	0.04	0.08	0.00	0.00
Input : North Point	04:40	0.26	0.17	0.02	0.01	0.02	0.06	0.04	0.07	0.00	0.00

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Carrigrohilly EIS Appendix E

Harbour Model

	Existing	North Point	Harpers	Fota Br.	Mid Channel	C.grenin Out	L. Mahon1	L. Mahon2	L. Mahon3	Belvelly	Weir Island
Neap Tide	16:40	0.05	0.15	0.00	0.01	0.02	0.04	0.04	0.01	0.00	0.00
	17:40	0.03	0.16	0.00	0.01	0.01	0.03	0.04	0.01	0.00	0.00
	18:40	0.02	0.18	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00
Flow Rate 10125	19:40	0.01	0.25	0.03	0.00	0.00	0.01	0.02	0.00	0.00	0.00
F Coli 10000	20:40	0.00	0.26	0.12	0.01	0.00	0.01	0.00	0.00	0.00	0.00
T Coli 100000	21:40	0.00	0.23	0.20	0.06	0.01	0.00	0.00	0.00	0.00	0.00
BOD 25	22:40	0.00	0.24	0.22	0.11	0.03	0.00	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	0.38	0.22	0.06	0.02	0.00	0.00	0.00	0.00	0.00
DO 1	00:40	0.00	0.31	0.19	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Ammonia 3	01:40	0.00	0.27	0.07	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Nitrate 15	02:40	0.01	0.23	0.01	0.00	0.00	0.03	0.02	0.00	0.00	0.00
Phos. 1	03:40	0.02	0.17	0.00	0.00	0.01	0.04	0.04	0.00	0.00	0.00
Input : North Point	04:40	0.04	0.13	0.00	0.01	0.03	0.04	0.04	0.01	0.00	0.00

Neap Tide
Carrigrenan excluded

	16:40	0.03	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	17:40	0.02	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	18:40	0.01	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flow Rate 10125	19:40	0.00	0.24	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F Coli 10000	20:40	0.00	0.23	0.12	0.01	0.00	0.00	0.00	0.00	0.00	0.00
T Coli 100000	21:40	0.00	0.20	0.19	0.07	0.01	0.00	0.00	0.00	0.00	0.00
BOD 25	22:40	0.00	0.20	0.20	0.11	0.03	0.00	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	0.35	0.20	0.06	0.02	0.00	0.00	0.00	0.00	0.00
DO 1	00:40	0.00	0.27	0.18	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Ammonia 3	01:40	0.00	0.24	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nitrate 15	02:40	0.00	0.23	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phos. 1	03:40	0.01	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Input : North Point	04:40	0.03	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Spring Tide

	16:40	0.04	0.06	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00
	17:40	0.02	0.05	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00
	18:40	0.01	0.03	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00
Flow Rate 10125	19:40	0.00	0.03	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00
F Coli 10000	20:40	0.00	0.05	0.02	0.01	0.00	0.01	0.01	0.00	0.00	0.00
T Coli 100000	21:40	0.00	0.07	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00
BOD 25	22:40	0.00	0.12	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	0.18	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00
DO 1	00:40	0.00	0.37	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Ammonia 3	01:40	0.00	0.10	0.01	0.00	0.00	0.01	0.02	0.00	0.00	0.00
Nitrate 15	02:40	0.04	0.02	0.00	0.01	0.02	0.01	0.02	0.02	0.00	0.00
Phos. 1	03:40	0.08	0.01	0.01	0.00	0.01	0.01	0.01	0.02	0.00	0.00
Input : North Point	04:40	0.05	0.03	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.00

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Carrigrohilly EIS Appendix E

	DO										Harbour Model	
	Existing	North Point	Harpers	Fota Br.	Mid Channel	C.grenin Out	L. Mahon1	L. Mahon2	L. Mahon3	Belvelly		Weir Island
Neap Tide	16:40	10.0	9.6	10.0	10.0	9.9	9.9	9.9	10.0	10.0	10.0	10.0
	17:40	10.0	9.6	10.0	10.0	10.0	9.9	9.9	10.0	10.0	10.0	10.0
	18:40	10.0	9.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Flow Rate 10125	19:40	10.0	9.3	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
F Coli 10000	20:40	10.0	9.2	9.6	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
T Coli 100000	21:40	10.0	9.3	9.4	9.8	9.9	9.9	10.0	10.0	10.0	10.0	10.0
BOD 25	22:40	10.0	9.3	9.3	9.6	9.9	9.9	10.0	10.0	10.0	10.0	10.0
SS 35	23:40	10.0	8.8	9.3	9.8	9.9	9.9	10.0	10.0	10.0	10.0	10.0
DO 1	00:40	9.9	9.0	9.3	9.9	9.9	9.9	10.0	10.0	10.0	10.0	10.0
Ammonia 3	01:40	9.9	9.1	9.7	10.0	9.9	9.9	10.0	10.0	10.0	10.0	10.0
Nitrate 15	02:40	9.9	9.2	9.9	10.0	9.9	9.9	10.0	10.0	10.0	10.0	10.0
Phos. 1	03:40	9.8	9.4	9.9	10.0	9.9	9.9	10.0	10.0	10.0	10.0	10.0
Input : North Point	04:40	9.8	9.5	9.9	9.9	9.9	9.8	9.9	9.9	9.9	10.0	9.9

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Neap Tide	16:40	10.0	9.6	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Carrigrenan excluded	17:40	10.0	9.6	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	18:40	10.0	9.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Flow Rate 10125	19:40	10.0	9.3	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
F Coli 10000	20:40	10.0	9.3	9.6	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0
T Coli 100000	21:40	10.0	9.4	9.4	9.8	9.9	10.0	10.0	10.0	10.0	10.0	10.0
BOD 25	22:40	10.0	9.4	9.4	9.6	9.9	10.0	10.0	10.0	10.0	10.0	10.0
SS 35	23:40	10.0	8.9	9.3	9.8	9.9	10.0	10.0	10.0	10.0	10.0	10.0
DO 1	00:40	9.9	9.1	9.4	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0
Ammonia 3	01:40	9.9	9.2	9.7	10.0	9.9	10.0	10.0	10.0	10.0	10.0	10.0
Nitrate 15	02:40	9.9	9.2	9.9	10.0	9.9	10.0	10.0	10.0	10.0	10.0	10.0
Phos. 1	03:40	9.9	9.4	9.9	10.0	9.9	10.0	10.0	10.0	10.0	10.0	10.0
Input : North Point	04:40	9.8	9.5	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

Spring Tide	16:40	10.0	9.8	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	17:40	10.0	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	18:40	10.0	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Flow Rate 10125	19:40	10.0	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
F Coli 10000	20:40	10.0	9.8	9.9	9.9	9.9	9.9	10.0	10.0	10.0	10.0	10.0
T Coli 100000	21:40	10.0	9.7	9.8	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0
BOD 25	22:40	10.0	9.6	9.8	9.8	9.9	10.0	10.0	10.0	10.0	10.0	10.0
SS 35	23:40	10.0	9.3	9.7	9.8	9.9	10.0	10.0	10.0	10.0	10.0	10.0
DO 1	00:40	9.9	8.7	9.6	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0
Ammonia 3	01:40	9.9	9.5	9.9	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0
Nitrate 15	02:40	9.7	9.8	9.9	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0
Phos. 1	03:40	9.6	9.9	9.9	10.0	9.9	10.0	10.0	10.0	10.0	10.0	10.0
Input : North Point	04:40	9.7	9.8	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

Carrigrohilla EIS Appendix E

DO

Harbour Model

Neap Tide	16:40	10.0	9.4	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Flow Rate 13950	17:40	10.0	9.4	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
F Coli 10000	18:40	10.0	9.3	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
T Coli 100000	19:40	10.0	9.0	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
BOD 20	20:40	10.0	9.1	9.5	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
SS 35	21:40	10.0	9.2	9.2	9.2	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
DO 1	22:40	10.0	9.2	9.2	9.2	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
Ammonia 3	23:40	10.0	8.5	9.1	9.1	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
Nitrate 10	00:40	9.9	8.8	9.2	9.2	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Phos. 1	01:40	9.9	8.9	9.6	9.6	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Input : North Point	02:40	9.9	9.0	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	03:40	9.8	9.2	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	04:40	9.8	9.3	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Neap Tide	16:40	9.9	9.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Wind 6.5m/s 250deg	17:40	9.9	9.6	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Carrigrenan Excluded	18:40	9.9	9.5	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Flow Rate 10125	19:40	9.9	9.4	9.8	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
F Coli 10000	20:40	9.9	9.4	9.6	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
T Coli 100000	21:40	9.9	9.4	9.4	9.4	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
BOD 20	22:40	9.9	9.4	9.4	9.4	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
SS 35	23:40	9.9	9.3	9.4	9.4	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
DO 1	00:40	9.9	8.8	9.4	9.4	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Ammonia 3	01:40	9.9	9.1	9.7	9.7	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Nitrate 10	02:40	9.8	9.2	9.8	9.8	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Phos. 1	03:40	9.8	9.3	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Input : North Point	04:40	9.7	9.4	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Neap Tide	16:40	9.9	9.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Wind 6.5m/s 250deg	17:40	9.9	9.6	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Flow Rate 10125	18:40	9.9	9.5	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
F Coli 10000	19:40	9.9	9.4	9.8	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
T Coli 100000	20:40	9.9	9.4	9.6	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
BOD 20	21:40	9.9	9.4	9.4	9.4	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
SS 35	22:40	9.9	9.3	9.4	9.4	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
DO 1	23:40	9.9	8.8	9.4	9.4	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
Ammonia 3	00:40	9.9	9.1	9.7	9.7	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Nitrate 10	01:40	9.9	9.2	9.8	9.8	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Phos. 1	02:40	9.8	9.2	9.8	9.8	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Input : North Point	03:40	9.8	9.3	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
	04:40	9.7	9.4	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Neap Tide	16:40	9.9	9.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Wind 6.5m/s 250deg	17:40	9.9	9.6	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Flow Rate 10125	18:40	9.9	9.5	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
F Coli 10000	19:40	9.9	9.4	9.8	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
T Coli 100000	20:40	9.9	9.4	9.6	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
BOD 20	21:40	9.9	9.4	9.4	9.4	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
SS 35	22:40	9.9	9.3	9.4	9.4	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
DO 1	23:40	9.9	8.8	9.4	9.4	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
Ammonia 3	00:40	9.9	9.1	9.7	9.7	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Nitrate 10	01:40	9.9	9.2	9.8	9.8	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Phos. 1	02:40	9.8	9.2	9.8	9.8	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Input : North Point	03:40	9.8	9.3	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
	04:40	9.7	9.4	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9

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Carrigrohilly EIS Appendix E

	Existing	North Point	Harpers	Suspended Solids			Harbour				
				Fota Br.	Mid Chann	O L. Mahon	L. Mahon1	L. Mahon2	L. Mahon3	Belvelly	Weir Island
Neap Tide	16:40	0.44	1.62	0.01	0.14	0.32	0.22	0.20	0.05	0.00	0.00
	17:40	0.32	1.63	0.01	0.09	0.23	0.19	0.19	0.04	0.00	0.00
	18:40	0.17	1.75	0.03	0.02	0.20	0.08	0.18	0.01	0.00	0.00
Flow Rate 10125	19:40	0.07	2.34	0.32	0.01	0.21	0.06	0.12	0.00	0.00	0.00
F Coli 10000	20:40	0.03	2.38	1.12	0.02	0.17	0.05	0.02	0.00	0.00	0.00
T Coli 100000	21:40	0.01	2.24	1.80	0.12	0.12	0.02	0.00	0.00	0.00	0.00
BOD 25	22:40	0.01	2.44	2.00	0.26	0.14	0.02	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	4.10	1.97	0.22	0.36	0.02	0.00	0.00	0.00	0.00
DO 1	00:40	0.01	3.08	1.71	0.07	0.30	0.03	0.01	0.00	0.00	0.00
Ammonia 3	01:40	0.02	2.55	0.61	0.02	0.25	0.05	0.02	0.00	0.00	0.00
Nitrate 15	02:40	0.08	2.17	0.08	0.02	0.23	0.16	0.14	0.00	0.00	0.00
Phos. 1	03:40	0.20	1.66	0.01	0.08	0.19	0.23	0.20	0.01	0.00	0.00
Input : North Point	04:40	0.38	1.33	0.01	0.14	0.22	0.22	0.20	0.04	0.00	0.00
Neap Tide	16:40	0.26	1.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carrigrenan excluded	17:40	0.20	1.66	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	18:40	0.10	1.78	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flow Rate 10125	19:40	0.04	2.27	0.36	0.01	0.00	0.00	0.00	0.00	0.00	0.00
F Coli 10000	20:40	0.01	2.20	1.17	0.14	0.00	0.00	0.00	0.00	0.00	0.00
T Coli 100000	21:40	0.01	1.98	1.76	0.68	0.00	0.00	0.00	0.00	0.00	0.00
BOD 25	22:40	0.00	2.13	1.86	1.10	0.00	0.00	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	3.91	1.84	0.60	0.00	0.00	0.00	0.00	0.00	0.00
DO 1	00:40	0.00	2.83	1.68	0.14	0.00	0.00	0.00	0.00	0.00	0.00
Ammonia 3	01:40	0.01	2.36	0.65	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Nitrate 15	02:40	0.03	2.16	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phos. 1	03:40	0.12	1.69	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Input : North Point	04:40	0.27	1.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spring Tide	16:40	0.48	0.63	0.02	0.02	0.13	0.04	0.04	0.08	0.00	0.00
	17:40	0.29	0.54	0.02	0.01	0.07	0.05	0.05	0.08	0.00	0.00
	18:40	0.14	0.33	0.02	0.02	0.05	0.10	0.04	0.08	0.00	0.00
Flow Rate 10125	19:40	0.05	0.36	0.11	0.07	0.07	0.06	0.08	0.06	0.00	0.00
F Coli 10000	20:40	0.01	0.57	0.19	0.11	0.09	0.05	0.06	0.00	0.00	0.00
T Coli 100000	21:40	0.00	0.84	0.37	0.22	0.08	0.03	0.01	0.00	0.00	0.00
BOD 25	22:40	0.00	1.39	0.53	0.37	0.13	0.08	0.00	0.00	0.00	0.00
SS 35	23:40	0.00	2.16	0.68	0.37	0.13	0.34	0.01	0.00	0.00	0.00
DO 1	00:40	0.00	4.38	0.70	0.07	0.09	0.03	0.01	0.00	0.00	0.00
Ammonia 3	01:40	0.00	1.22	0.10	0.02	0.03	0.12	0.11	0.01	0.00	0.00
Nitrate 15	02:40	0.44	0.30	0.02	0.05	0.11	0.07	0.09	0.10	0.00	0.00
Phos. 1	03:40	0.89	0.17	0.04	0.02	0.04	0.05	0.05	0.10	0.00	0.00
Input : North Point	04:40	0.61	0.37	0.02	0.01	0.02	0.04	0.04	0.09	0.00	0.00

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Carrigrohilly EIS Appendix E

	Existing	North Point	Harpers	Total Coliforms			L. Mahon1	L. Mahon2	L. Mahon3	Belvelly	Harbour Model Weir	
				Fota Br.	Mid Chann.	C.grenin O						
Neap Tide	16:40	625	3729	152	962	2405	8749	3849	2862	627	1	0
	17:40	445	3444	68	739	1473	5358	3451	2690	466	1	0
	18:40	221	3008	32	177	294	3142	1223	2350	131	0	0
Flow Rate 10125	19:40	89	3712	495	34	43	3293	657	1668	8	0	0
F Coli 10000	20:40	31	3883	1750	159	27	2715	547	239	0	0	0
T Coli 100000	21:40	15	4174	2433	954	161	2240	223	12	0	0	0
BOD 25	22:40	6	5319	2679	1470	376	3421	159	3	0	0	0
SS 35	23:40	5	9993	2526	751	291	10815	209	11	0	0	0
DO 1	00:40	11	6398	2042	164	91	8118	338	57	0	0	0
Ammonia 3	01:40	20	4234	739	25	25	4977	480	203	2	0	0
Nitrate 15	02:40	77	3286	93	27	137	4118	3391	2715	22	0	0
Phos. 1	03:40	233	2827	21	279	1509	3875	4637	3398	115	0	0
Input : North Point	04:40	519	2768	95	974	2548	5503	3902	2988	448	1	0
Neap Tide	16:40	390	3686	1	0	0	0	0	0	0	0	0
Carrigrenan excluded	17:40	293	3466	6	0	0	0	0	0	0	0	0
	18:40	139	3080	28	4	1	0	0	0	0	0	0
Flow Rate 10125	19:40	52	3720	542	14	4	0	0	0	0	0	0
F Coli 10000	20:40	16	3784	1803	178	23	0	0	0	0	0	0
T Coli 100000	21:40	6	3919	2454	1009	176	0	0	0	0	0	0
BOD 25	22:40	2	4924	2629	1528	401	0	0	0	0	0	0
SS 35	23:40	6	9923	2490	802	315	0	0	0	0	0	0
DO 1	00:40	7	6230	2080	174	99	0	0	0	0	0	0
Ammonia 3	01:40	7	4133	787	27	14	0	0	0	0	0	0
Nitrate 15	02:40	31	3385	105	2	2	0	0	0	0	0	0
Phos. 1	03:40	156	2869	9	0	0	0	0	0	0	0	0
Input : North Point	04:40	416	2950	2	0	0	0	0	0	0	0	0
Spring Tide	16:40	1016	2266	280	176	407	4130	890	783	1379	14	0
	17:40	592	1897	293	214	235	1947	962	848	1249	32	0
	18:40	269	999	269	229	196	1228	1681	635	1257	36	0
Flow Rate 10125	19:40	89	930	381	333	220	1421	959	1131	989	19	1
F Coli 10000	20:40	20	1412	455	305	181	1591	699	956	28	9	1
T Coli 100000	21:40	5	2195	818	496	201	1518	420	83	2	9	2
BOD 25	22:40	1	3829	1219	781	279	2173	38	38	0	9	2
SS 35	23:40	0	6070	1626	767	269	10715	150	150	0	8	2
DO 1	00:40	0	12371	1628	137	177	5858	412	142	6	7	2
Ammonia 3	01:40	1	3054	204	54	95	2623	1764	2753	78	6	1
Nitrate 15	02:40	1095	774	118	1106	2461	1678	2104	1667	2078	3	0
Phos. 1	03:40	2073	589	707	389	743	1471	1128	952	1825	57	0
Input : North Point	04:40	1310	1588	315	227	440	2089	924	789	1533	25	0

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Neap Tide	16:40	17:40	18:40	19:40	20:40	21:40	22:40	23:40	00:40	01:40	02:40	03:40	04:40	Total Coliforms	Harbour Model
Flow Rate	13950													0	0
F Coli	10000	623	424	204	75	23	9	3	4	9	45	214	483	0	0
T Coli	100000	521	4735	4181	5081	5121	5324	6705	8661	5733	4579	3983	4017	0	0
BOD	20													0	0
SS	35													0	0
DO	1													0	0
Ammonia	3													0	0
Nitrate	10													0	0
Phos.	1													0	0
Input : North Point														0	0

Neap Tide

Wind 6.5m/s 250deg	16:40	17:40	18:40	19:40	20:40	21:40	22:40	23:40	00:40	01:40	02:40	03:40	04:40	Total Coliforms	Harbour Model
Carrigrenan Excluded														0	0
Flow Rate	10125	435	449	279	113	38	15	5	5	11	41	127	387	0	0
F Coli	10000	4030	2808	2891	3348	3418	3612	4689	6204	4109	3343	2923	3228	0	0
T Coli	100000													0	0
BOD	20													0	0
SS	35													0	0
DO	1													0	0
Ammonia	3													0	0
Nitrate	10													0	0
Phos.	1													0	0
Input : North Point														0	0

Neap Tide

Wind 6.5m/s 250deg	16:40	17:40	18:40	19:40	20:40	21:40	22:40	23:40	00:40	01:40	02:40	03:40	04:40	Total Coliforms	Harbour Model
Flow Rate	10125	396	433	260	105	36	14	5	3	6	13	39	133	404	0
F Coli	10000	4050	2809	2872	3324	3394	3578	4664	6133	4061	3363	2893	3065	0	0
T Coli	100000													0	0
BOD	20													0	0
SS	35													0	0
DO	1													0	0
Ammonia	3													0	0
Nitrate	10													0	0
Phos.	1													0	0
Input : North Point														0	0

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	Existing	North Point	Faecal Coliform				Harbour Model Weir Island					
			Fota Br.	Mid Chann	C.grenin O	L. Mahon3						
Neap Tide	16:40	62	373	30	192	481	1750	770	572	125	0	0
	17:40	44	344	13	148	295	1072	690	538	93	0	0
	18:40	22	301	4	35	59	628	245	470	26	0	0
Flow Rate 10125	19:40	9	371	50	6	8	659	131	334	2	0	0
F Coli 10000	20:40	3	388	175	16	3	543	109	48	0	0	0
T Coli 100000	21:40	1	417	243	95	16	448	45	2	0	0	0
BOD 25	22:40	1	532	268	147	38	684	32	1	0	0	0
SS 35	23:40	0	999	253	75	29	2163	42	2	0	0	0
DO 1	00:40	1	640	204	16	9	1624	68	11	0	0	0
Ammonia 3	01:40	2	423	74	3	4	995	96	41	0	0	0
Nitrate 15	02:40	8	329	9	5	27	824	678	543	4	0	0
Phos. 1	03:40	23	283	3	56	302	775	927	680	23	0	0
Input : North Point	04:40	52	277	19	195	510	1101	780	598	90	0	0
Neap Tide	16:40	39	369	0	0	0	0	0	0	0	0	0
Carrigrenan excluded	17:40	29	347	1	0	0	0	0	0	0	0	0
	18:40	14	308	3	0	0	0	0	0	0	0	0
Flow Rate 10125	19:40	5	372	54	1	0	0	0	0	0	0	0
F Coli 10000	20:40	2	378	180	18	2	0	0	0	0	0	0
T Coli 100000	21:40	1	392	245	101	18	0	0	0	0	0	0
BOD 25	22:40	0	492	263	153	40	0	0	0	0	0	0
SS 35	23:40	0	992	249	80	32	0	0	0	0	0	0
DO 1	00:40	0	623	208	17	10	0	0	0	0	0	0
Ammonia 3	01:40	1	413	79	3	1	0	0	0	0	0	0
Nitrate 15	02:40	3	339	10	0	0	0	0	0	0	0	0
Phos. 1	03:40	16	287	1	0	0	0	0	0	0	0	0
Input : North Point	04:40	42	295	0	0	0	0	0	0	0	0	0
Spring Tide	16:40	102	283	56	35	81	826	178	157	276	3	0
	17:40	59	234	59	43	47	389	192	170	250	6	0
	18:40	27	114	53	46	39	246	336	127	251	7	0
Flow Rate 10125	19:40	9	95	51	53	41	284	192	226	198	4	0
F Coli 10000	20:40	2	142	48	38	28	318	140	191	6	2	0
T Coli 100000	21:40	1	220	83	51	23	303	84	17	0	2	0
BOD 25	22:40	0	383	122	79	29	435	8	8	0	2	0
SS 35	23:40	0	607	163	77	28	2143	30	30	0	2	0
DO 1	00:40	0	1237	163	14	20	1171	82	28	1	1	0
Ammonia 3	01:40	0	306	21	7	14	524	352	550	16	1	0
Nitrate 15	02:40	109	78	21	221	492	336	421	333	415	1	0
Phos. 1	03:40	207	73	141	78	149	294	225	190	365	11	0
Input : North Point	04:40	131	221	63	45	88	418	185	158	306	5	0

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Parameter	Time	521	62	405	23	108	335	1593	427	521	604	1	Harbour Model
Neap Tide	16:40	521	62	405	23	108	335	1593	427	521	604	1	0
	17:40	473	42	281	13	64	156	1309	253	438	391	1	0
	18:40	418	20	287	6	21	35	635	373	364	462	1	0
Flow Rate	13950	508	8	332	65	8	9	543	400	365	216	1	0
F Coli	10000	512	2	339	166	26	6	525	248	362	18	1	0
T Coli	100000	532	1	358	224	96	20	559	200	162	0	1	0
BOD	20	671	0	466	234	141	40	1212	150	47	0	1	0
SS	35	1360	0	1058	222	65	33	2268	100	68	0	1	0
DO	1	866	0	613	189	20	13	1681	69	174	1	0	0
Ammonia	3	573	1	406	72	5	7	956	102	286	22	0	0
Nitrate	10	458	5	336	12	9	43	775	195	777	150	0	0
Phos.	1	398	21	289	6	37	128	749	548	663	382	0	0
Input : North Point	04:40	402	48	307	20	95	321	1057	556	562	608	1	0
Neap Tide	16:40	403	44	405	40	108	335	1593	427	521	604	1	0
Wind 6.5m/s 250deg	17:40	281	45	281	13	64	156	1309	253	438	391	1	0
Carrigrenan Excluded	18:40	289	28	287	6	21	35	635	373	364	462	1	0
Flow Rate	10125	335	11	332	65	8	9	543	400	365	216	1	0
F Coli	10000	342	4	339	166	26	6	525	248	362	18	1	0
T Coli	100000	361	1	358	224	96	20	559	200	162	0	1	0
BOD	20	469	0	466	234	141	40	1212	150	47	0	1	0
SS	35	1063	0	1058	222	65	33	2268	100	68	0	1	0
DO	1	620	0	613	189	20	13	1681	69	174	1	0	0
Ammonia	3	411	1	406	72	5	7	956	102	286	22	0	0
Nitrate	10	334	4	336	12	9	43	775	195	777	150	0	0
Phos.	1	292	13	289	6	37	128	749	548	663	382	0	0
Input : North Point	04:40	323	39	307	20	95	321	1057	556	562	608	1	0

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