

PROPOSED NEWPORT SEWERAGE SCHEME

ENVIRONMENTAL IMPACT ASSESSMENT

**FLORA AND FAUNA
(TERRESTRIAL)**

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1.0 INTRODUCTION

This report describes and evaluates the existing terrestrial flora and fauna within the area of the proposed works. Impacts on habitats, flora and fauna by the proposed development are assessed and, where considered necessary or feasible, mitigation measures are proposed to lessen the impacts by the development.

The project comprises three elements as follows:

1. The site for the wastewater treatment plant at Caulicaun peninsula (as shown in drawing no. B6741-N023-B)
2. The route for the foul effluent pipeline from the treatment plant to the outfall point on the shoreline of the Rosmore peninsula (as shown in drawing no. B8838-N001-A) . A second option for a pipe route extends from the Rosmore peninsula to the islands of Inishdaweel and Muckinish in Clew Bay
3. The routes for the preferred wastewater collection system in the vicinity of Newport and the sites for two proposed pumping stations (as shown in drawing no. B6741-NO16-A)

1.1 Conservation status of area

Clew Bay is an important area of conservation and is a candidate Special Area of Conservation (code 01482), designated under the EU Habitats Directive (Council Directive 92/43/EEC). It is of importance for a suite of habitats listed on Annex I of the Directive (see site synopsis in Appendix 1) – of these, Atlantic salt meadows and perennial vegetation of stony banks are potentially relevant to the present study. It is also of importance for otter and common seal, both species which are listed on Annex II of the Directive,

The boundary of the cSAC extends to the base of the Caulicaun and Rosmore peninsulas. Inishdaweel and Muckinish islands are included in the cSAC in their entireties (see Appendix 2).

2.0 SURVEY METHODS

A field survey of the study area was carried out in September 2004. The survey methodology consisted of a systematic walk-over of the treatment plant site and the route for the outfall pipe on the Rosmore peninsula. Habitats, plant species and vegetation types present were recorded and mapped using a 1:5,000 scale map. Habitat classification is according to the system recommended by The Heritage Council (Fossitt 2000), with reference to the classification system used in the Habitats Directive as necessary.

Inishdaweel and Muckinish Islands were not visited but were viewed using a telescope from Rosmore Point and Ardagh. Also, photographs of the islands taken by the marine survey team were studied.

The approach used for the preferred wastewater collection system in Newport was to drive the various routes with stops where considered necessary (much of route is existing roads or built ground).

Bird species present within the study areas were recorded. Whilst the survey was carried out late in autumn, most of the birds that would have nested in the general area were still present (as shown by family parties and groups of juveniles). Information on wintering wetland birds for the Newport area was acquired from the I-WeBS scheme (courtesy of BirdWatch Ireland, see Appendix 3). The terrestrial habitats would not be expected to support any species of conservation importance (Red-listed etc.) and hence a winter survey of terrestrial birds was not considered necessary.

For mammals, the main emphasis was on search for signs of activity or dwellings. During the survey, particular attention was given to the possible presence of habitats and/or species which are legally protected under Irish or European legislation (especially the Flora Protection Order 1999; Wildlife Act 1976; Wildlife Amendment Act 2000; EU Habitats Directive; EU Birds Directive).

The standard literature was checked for references to the site and locality, as were the listings and maps of sites of conservation importance in County Mayo held by the Department of the Environment, Heritage and Local Government.

3.0 BASELINE ENVIRONMENT

3.1 Habitats, vegetation and flora

3.1.1 Site of treatment works (Caulicaun peninsula)

The Caulicaun peninsula is used largely for grazing cattle, with improved grassland (GA1) the dominant habitat. The field in which the treatment plant would be located is composed of rank, unmanaged grassland (GS2) which has a damp character in places. Scrub is encroaching into this field from a stand of low deciduous woodland which occurs along the northern strip of the peninsula and continues north-eastwards. This woodland is probably best accommodated in the scrub (WS1) category of Fossitt (op.cit.) as it is generally less than 5 m in height and composed of typical scrub species such as willows and hazel. Hedgerows (WL1) provide boundaries to the few fields and also occur along the tracks. A further area of rough grassland occurs in the field to the north of the entrance track from the public road. For the greater part, the peninsula is edged by a low grassy slope which is vegetated with unfertilised grassland and scrub and which can be accommodated in the category dry meadows and grassy verges (GS2). A narrow salt marsh (CM) fringe occurs above the stony shore which skirts the peninsula.

The habitats in the area of the treatment works are described in the following sections and are mapped in Figure 1.

The field in which the treatment plant will be located comprises unmanaged grassland that can be accommodated in the habitat category **Dry meadows and grassy verges GS2**. The sward is up to 1 m high over much of the field and, as already noted, merges with encroaching scrub and bracken *Pteridium aquilinum* at the margins (see Plates 1-3). Principal species include false-oat grass *Arrhenatherum elatius*, bent grass *Agrostis stolonifera*, Yorkshire fog *Holcus lanatus*, creeping buttercup *Ranunculus repens*, meadow vetchling *Lathyrus pratensis*, common knapweed *Centaurea nigra*, nettles *Urtica dioica* and common sorrel *Rumex acetosa*. The western end is more low-lying than the rest and has a damp character, with rushes *Juncus effusus*, meadowsweet *Filipendula ulmaria*, devil's-bit scabious, tormentil *Potentilla erecta*, marsh thistle *Cirsium palustre* and the occasional spotted orchid *Dactylorhiza maculata*.

The northern part of the field in which the treatment plant will be located is covered by **Scrub WS1** or low **Semi-natural woodland WN** (see Plates 1-3). This extends to the shoreline and is part of a larger stand that continues north-eastwards (see Plate 4). The scrub is dense with a continuous, closed canopy (see Plate 5). Willow (*Salix* spp., inc. *S. aurita* & *S. cinerea*) is the dominant species, with hazel *Corylus avellana* also present and occasional alder *Alnus glutinosa* and holly *Ilex aquifolium*. Ash *Fraxinus excelsior* occurs mainly at the margin of the wood above the shoreline. Brambles *Rubus fruticosus* are common in the understorey, with wild rose *Rosa* spp. and honeysuckle *Lonicera periclymenum* also present. Ivy *Hedera helix* is frequent throughout the wood, both on tree trunks and the ground. The diversity of herbaceous species in the ground layer is relatively low, reflecting the canopy cover. Species present include the following: wood avens *Geum urbanum*, bittersweet *Solanum dulcamara*, wild angelica *Angelica sylvestris*, wood sorrel *Oxalis acetosella*, meadowsweet *Filipendula ulmaria*, opposite-leaved saxifrage *Chrysosplenium oppositifolium* and lady fern *Athyrium filix-femina*.

Improved grassland GA1 occurs in the fields to the west (see Plate 6) and south of the site for the proposed plant. It is a typical, grazed sward that is fertilised and has been reseeded in the past. The sward is dominated by perennial rye grass *Lolium perenne*, and has clovers *Trifolium* spp, dandelion *Taraxacum* spp., ribwort plantain *Plantago lanceolata*, creeping buttercup *Ranunculus repens* and thistles *Cirsium* spp.

Hedgerows WL1 line the track leading from the public road to the site. This track divides, with one branch forming the southern and western boundaries to the field where the treatment plant is proposed and a second veering in a north-west direction to the east of the field. The track is heavily overgrown by hedges on both sides though parts are still used by cattle. Hedgerows also occur in the field to the south of the site for the treatment works and are intermittent around the perimeter of the peninsula – these, however, are low in stature (<5 m approximately) and rather poor in structure. Hawthorn *Crataegus monogyna* is the principal hedge forming species in the area. Ash *Fraxinus excelsior*, sycamore *Acer pseudoplatanus*, blackthorn *Prunus spinosa* and hazel *Corylus avellana* are other main trees

and shrubs. Brambles are frequent within the hedges. The hedge along the western tip of the Caulicaun peninsula has been interplanted with conifers.

Salt marsh CM fringes much of the Caulicaun peninsula. The strip is narrow, varying from about 4 to 7 metres (see Plate 7). The edge of the marsh is about 20 cm above the stony shore and is edged by a low cliff (see Plate 8). The upper part of the marsh, which is only inundated on the highest of tides, is dominated by common bent *Agrostis stolonifera*. The middle and lower parts have more typical salt marsh plants, with sea rush *Juncus maritimus*, common saltmarsh grass *Puccinellia maritima*, sea plantain *Plantago maritima*, thrift *Armeria maritima*, sea arrowgrass *Triglochin maritima*, and sea aster *Aster tripolium*. Scurvy grass *Cochlearia officinalis* is occasional.

3.1.2 Effluent pipe route, option A : Rosmore peninsula outfall

The Rosmore peninsula comprises almost entirely fields of improved grassland (GA1) that are used for pasture, mostly cattle. A drivable track extends for about three quarters of the peninsula. The pipe route for option A will follow the track for much of the route, though will cross fields at the eastern end (opposite the Caulicaun peninsula) and at the western end leading to the outfall. Hedgerows (WL1) provide the field boundaries over much of the peninsula. A small stand of deciduous woodland (WN) and scrub (WS1) occurs over an archaeological feature at the eastern tip of the peninsula, and a strip of salt marsh (CM) occurs on the shore below this. Clay cliffs, mostly well vegetated, occur for much of the length of the northern shore and parts of the southern shore. Much of the vegetation of the cliffs can be ascribed to the category Dry calcareous and neutral grassland (GS1) of Fossitt (op. cit.).

The habitats in the area of the treatment works are described in the following sections and are mapped in Figure 2.

The **improved grassland GA1** on the Rosmore peninsula is a well-managed, grazed sward that is fertilised and has been reseeded in the past (see Plate 9). In species composition it is similar to that as described for the Caulicaun peninsula, generally being dominated by perennial rye grass *Lolium perenne*. Some fields have wet patches with rushes *Juncus* spp.

The **hedgerows WL1** along the central track and in the fields are mostly of low stature (<4 m) and low species diversity (see Plate 11). Hawthorn is the dominant tree and shrub species, with gorse *Ulex europaeus*, blackthorn *Prunus spinosa*, willow *Salix* spp, and ash also occurring. Brambles and bracken are frequent in the hedgerows. The first section of the track is lined by taller hedgerows which have not been cut (see Plate 12). Ash is frequent here.

The patch of **deciduous woodland WN** at the eastern tip of the peninsula is composed largely of ash and blackthorn (see Plate 13). Sycamore *Acer pseudoplatanus* is also present and brambles are frequent, especially at the margins.

The salt marsh CM which fringes the eastern tip of the Rosmore peninsula (see Plates 13 & 14) is similar in character and species diversity as that described for the Caulicaun peninsula. At most it is 5 m in width and at its outer edge is about 40 cm above the stony shore.

Clay cliffs, mostly well-vegetated, occur for much of the length of the northern shore (see Plates 15 & 16). These are substantial in height and occur immediately above the high tide mark. Bare or partly vegetated soil occurs in places due to subsidence. Much of the vegetation of the cliffs can be ascribed to the habitat categories **Dry calcareous and neutral grassland GS1** and **Scrub WS1** of Fossitt (op. cit.). Species present in the grassland areas include red fescue *Festuca rubra*, sweet vernal grass *Anthoxanthum odoratum*, cock's-foot *Dactylis glomerata*, yarrow *Achillea millefolium*, knapweed *Centaurea nigra*, cat's-ear *Hypochoeris radicata*, bird's-foot trefoil *Lotus corniculatus* and, occasionally, wild thyme *Thymus praecox*. Seepage occurs in places and here black bog rush *Schoenus nigricans* occurs, along with such species as devil's-bit scabious *Succisa pratensis* and hard rush *Juncus inflexus*. In a few places, the calcareous glacial till has allowed an incipient tufa habitat to occur but where noted this was poorly developed (see Plate 17). Towards the top of the cliffs, patches of heather *Calluna vulgaris* are present, representing remnants of the former heath vegetation that probably occurred at the cliff tops and above. The main scrub species are willow *Salix* spp., hawthorn, gorse, bramble and bracken. Recently exposed areas as a result of subsidence have a more weedy vegetation, with species such as colts-foot *Tussilago farfara*, ribwort plantain *Plantago lanceolata* and scotch *Elymus repens* – here the vegetation can be ascribed to the **Recolonising bare ground ED3** category of Fossitt. On the stony shoreline at the base of the cliffs some salt-tolerant plants occur, including sea aster *Aster tripolium*, scurvy grass *Cochlearia officinalis*, spear-leaved orache *Atriplex prostrata*, silverweed *Potentilla anserina* and bucks-horn plantain *Plantago coronopus* – these species are typical of shingle and driftline vegetation.

3.1.3 Effluent pipe route, option B : Muckinish Island outfall

Route option B would continue to the tip of the Rosmore peninsula and then to Inishdaweel and Muckinish islands. The final stretch of the Rosmore peninsula does not have a track and the pipe would pass through fields here. The habitats towards the tip of the peninsula are similar to those elsewhere, with improved grassland the principal type. However, at the tip of the peninsula there is a hill with burnet rose *Rosa pimpinellifolia* indicating remnant dry heath (probably the original vegetation type over much of the peninsula).

As already noted, the islands were not visited but appear to be mainly of semi-improved or improved grassland. Bracken *Pteridium aquifolium* occurs on at least Inishdaweel, which is grazed by sheep. Ground photographs indicate that the shoreline is predominantly stony with no significant salt marsh formations or shingle reserves. Some plants typical of shingle and driftline vegetation are present, including sea rocket *Cakile maritima*, sea mayweed *Matricaria maritima* and silverweed *Potentilla anserina*.

3.1.4 Preferred wastewater collection system

The collection system comprises a series of pipe route options and two pumping stations (as shown on drawing no. B6741-N016-A). The majority of the routes would run along existing roads, road verges or other hard core areas. Each is described briefly, along with the sites for the pumping stations.

Option G: this runs from Newport bridge to the proposed pumping station at the tip of the peninsula. G1 to G9 appear to be along the existing road, with G9 to G12 encroaching into a stand of woodland behind a high wall. This is a tall stand of mixed woodland with an open character. Principal species are beech, sycamore, ash, oak and holly, with bramble common in more open areas. There are tracks through the wood. The woodland is considered at most as of Low Local conservation value.

Option F: the portion of this route from F1 to F16 appears to be along existing roads or developed ground, apart from the section F14 to F15 which appears to be within a narrow strip of woodland/scrub alongside the road that is principally of ash and willow. The section from F17 to F20 is at the margin of the stand of mixed woodland already referred to for option G. The pipe would run mostly just inside a stone wall (see Plate 18) where there is a grassy/weedy strip of several metres width. F21 is associated with the site for the proposed pumping station (see below).

Option E: this route appears to run entirely along an existing road. A channel skirts the northern side of the road. There are no areas of conservation interest.

Option C: option C is a short stretch that appears to run entirely along an existing road. There are no areas of conservation interest.

Option D: section D1 to D2 is along an overgrown track, with unmanaged hedgerows both sides (see Plate 19). The track is covered mostly by brambles but there is a range of weed species as well as saplings of ash and sycamore. This track has negligible conservation interest. Section D4 to D5 is along an existing road.

Option A: much of option A runs along an existing road that is lined by treelines and/or mixed woodland (see Plate 20). The road itself obviously has no conservation interest but the adjoining trees/woodland would have some local conservation value. .

Option H: option H is a short stretch that runs along an existing road that is mostly lined by hedgerows. There are no areas of conservation interest.

Option B3: the proposed rising main runs from the Newport bridge to the proposed new pumping station at the site of the recently built apartment block. It runs along the existing road or developed surfaces for all of the route. There are no areas of conservation interest.

Pumping station (rising main): the pumping station linked to the rising main would be built on existing developed land associated with the harbour area and new apartment block (see Plate 21).

Pumping station (Newport peninsula): the site for the proposed pumping station at Newport is at the tip of the woodland stand already referred to for pipe options F and G. Inside the boundary wall there is a strip of several metres of rank grassland and weedy vegetation, with brambles and nettles *Urtica dioica* (see Plate 22). This merges with scrub and low woodland of willows and alders and then taller trees. There are several existing manholes at the site location. Whilst the overall woodland stand is considered to have Low Local conservation value, this part is disturbed and not of conservation value.

3.2 Fauna

3.2.1 Mammals, amphibians and reptiles

The mammal species of most conservation interest which occur in the study area are otter *Lutra lutra* and badger *Meles meles*. A range of common species of the countryside were recorded in the area, including brown rat *Rattus norvegicus*, fox *Vulpes vulpes*, rabbit and hedgehog *Erinaceus europaeus* (one dead animal on shoreline). Other ubiquitous species such as long-tailed field mouse *Apodemus sylvaticus* and pygmy shrew *Sorex minutus* would be expected, as well as less common though widespread species such as the Irish stoat *Mustela erminea*. The survey area does not have any potential bat roosts, by way of buildings or tall trees.

Recent signs of otter (spraints) were recorded on rocks at the top of the shorelines on the north-east part of the Cullichaun peninsula and on the northern shore of the Rosmore peninsula (see Figure 2). This species is widespread in Clew Bay (NPWS data) and is likely to utilise all of the shorelines, as well as the islands.

Badger activity (fresh feeding signs) was noted at the eastern end of the field in which the treatment plant is proposed to be located (see Figure 1). No setts were found in the area though high vegetation and dense scrub made full search very difficult. It is considered that a sett probably exists in the scrub and low woodland on the peninsula.

Clew Bay supports a breeding population of common seal *Phoca vitulina*, with at least 100 animals estimated (Warner 1984, NPWS files). The breeding sites are at Inishcorn, Freaghillaun and Westport Bay. No seals were recorded in the vicinity of Newport during the September field survey though single animals have been seen at the mouth of the Newport River on previous occasions (B. Madden personal observations).

There is little suitable habitat for the common frog *Rana temporaria* in the survey area as there are no ponds or wetland type habitats. The common lizard *Lacerta vivipara* could occur on the clay cliffs of the Rosmore peninsula.

3.2.2 Birds

Terrestrial species:

A good diversity of songbirds was recorded within the hedgerows and areas of woodland and scrub, though all are common species of the countryside. Species present, all of which are considered resident in the area, include robin *Erithacus rubecula*, wren *Troglodytes troglodytes*, blackbird *Turdus merula*, song thrush *Turdus philomelos*, blue tit *Parus caeruleus*, coal tit *Parus ater*, great tit *Parus major*, long-tailed tit *Aegithalos caudatus*, goldcrest *Regulus regulus*, chaffinch *Fringilla coelebs*, greenfinch *Carduelis chloris*, goldfinch *Carduelis carduelis* and bullfinch *Pyrrhula pyrrhula*. Meadow pipit *Anthus pratensis* occurs frequently in the fields, and several skylarks *Alauda arvensis* were present in one of the fields towards Rosmore Point. Stonechats *Saxicola torquata*, including juveniles, were present in the scrub on the cliffs of the Rosmore peninsula.

Small numbers of jackdaws *Corvus monedula* were feeding in the fields on the Rosmore peninsula and a family party of hooded crows *Corvus corone* was present in the area. Ravens *Corvus corax* and a kestrel *Falco tinnuculus* flew over Rosmore during the survey.

Wetland species:

Clew Bay supports nationally important wintering populations of barnacle geese *Branta leucopsis*, red-breasted merganser *Mergus serrator* and ringed plover *Charadrius hiaticula* (Crowe & Boland 2004). It is counted annually as part of the I-WeBS scheme and Newport Bay falls into the north-east count sector that extends from Rockfleet Bay to Castleleaffy Strand. Data for this count area are given in Appendix 3 for the 5 year period 1998/99 to 2002/03. Populations are relatively low, with only red-breasted merganser (a species of sea duck) exceeding the threshold for national importance. Barnacle geese were not recorded at all in this sector during the review period and are known to be confined to certain of the outer islands in Clew Bay.

Observations in the study area over 4 days in September 2004 indicated that wader and duck species typically occur at low densities along much of the highly convoluted shoreline. Redshank *Tringa totanus* (ca.40), curlew *Numenius arquata* (14), oystercatchers *Haematopus ostralegus* (ca.20), greenshank *Tringa nebularia* (4) and mallard *Anas platyrhynchos* (12) were the principal species present in the sheltered inlet north of the Cuilcaun peninsula. Black-headed gulls *Larus ridibundus* were in the area for much of the time, with numbers varying from several to over 60 at low tide. Birds feed on the intertidal flats at low tide and roost along the shoreline at high tide. Some birds commute to the islands, though these provide mainly roost sites as feeding potential is limited.

Kingfisher *Atthis alcedo* was recorded in two winters in the review period. This species breeds on the Newport River upstream of the town (B. Madden, personal observations). In autumn and winter birds regularly commute from the river to the estuary and birds may be readily seen from the main bridge in the town.

3.3 Evaluation of conservation importance of study area

Habitats and flora

The site for the proposed treatment works comprises an area that was farmed in the past but is now unmanaged and is being encroached by scrub. Unmanaged grassland is a frequent habitat in the area and is not of any particular conservation importance. The scrub or low woodland on site is part of a larger complex of this habitat – as it is composed almost entirely of native species, it is considered to have local conservation value and is rated as of ‘Moderate Local’ value.

The hedgerows on the Caulicaun and Rosmore peninsulas, whilst providing useful habitat for local wildlife, are not of note as regards structure or species diversity and are rated as of ‘Low Local’ value.

The salt marsh fringe at Caulicaun and at the eastern tip of the Rosmore peninsula is typical of salt marsh in this area of Clew Bay, which corresponds to the habitat ‘Atlantic salt meadow’ of the EU Habitats Directive. While the entire salt marsh habitat in Clew Bay has international importance (as shown by its inclusion in the cSAC), the areas at Caulicaun and Rosmore are only a small part of the complex and similar strips of salt marsh are common along most of the shorelines in the immediate area.

The extensive length of vegetated clay cliff on the northern side of the Rosmore peninsula supports good examples of calcareous type grassland and native scrub and this complex of habitats is considered to have ‘Moderate Local’ conservation value.

The various areas of improved grassland do not have any conservation value. The grassland on Inishdaweel and Muckinish Islands, while within the Clew Bay cSAC, is not likely to have any significant conservation importance as it is used for sheep grazing and appears semi-improved.

Fauna

Otter, which is considered frequent in the area, is a species of high conservation importance as it is listed on Annex II of the EU Habitats Directive. Common Seal, also listed on Annex II of the Directive, breeds in Clew Bay and may occasionally visit the Newport area. Several other mammal species which occur are protected under the Wildlife Acts (1976, 2000) - these species include badger and hedgehog. However, none of these mammal species are considered threatened or vulnerable in a national, regional or county context (see Whilde 1993).

Ornithologically, the terrestrial component of the study area does not support any species of high conservation importance (i.e. listed in Annex I of the Birds Directive or Red-listed by Newton et al. 1999). The occurrence of skylark is of some note as this species is included in the Amber List (i.e. species of medium conservation concern) by Newton et al. (1999) though is still a fairly widespread species.

The wintering wetland bird populations associated with the Newport area are relatively low, though are part of the considerably larger Clew Bay complex. Kingfisher, a species of high conservation importance because it is listed on Annex I of the EU Birds Directive, breeds on the Newport River and commutes to the coastal areas in autumn and winter.

4.0 IMPACTS BY THE PROPOSED DEVELOPMENT

The principal impacts which require consideration by this proposed development are loss and disturbance of habitat due to construction activities. Once constructed, there are unlikely to be any further impacts on habitats. Potential impacts on fauna species during both construction and operation phases also require consideration.

4.1 Impacts on habitats, vegetation and flora

4.1.1 Impacts due to construction of treatment works

The development will result in the loss of all the existing habitats at the immediate site for the proposed plant. Habitats would also be lost as a result of construction of a new entrance road to the site. Habitats affected would be unmanaged grassland, scrub and hedgerows.

The loss of unmanaged grassland is not considered an impact of significance as this is a widespread habitat in the area and is not one of particular conservation value.

Much of the scrub in the field is likely to be lost due to direct and indirect construction activities (though with mitigation potential loss can be reduced to a minimum). Whilst the scrub is rated as of Moderate Local conservation value, the part to be affected is only a small part of the total amount of scrub and low woodland in the immediate area. Overall, the loss is rated as an adverse impact of Low to Moderate significance.

The loss of hedgerows due to construction of a new entrance road is considered an adverse impact of Low significance.

4.1.2 Impacts due to laying of effluent pipeline (option A)

The laying of the effluent pipeline will require trench excavations with the consequent temporary removal of habitats. Much of the route is along an established track and here hedgerows along the track are likely to remain intact.

Improved grassland

Disturbance to various areas of improved grassland is not of significance.

Hedgerows

The pipeline leading from the treatment works to the outfall will breach not more than 5 hedgerows assuming that the main length along the track on Rosmore does not require hedgerow removal. With the necessity for wayleaves, the breaches could be in the region of 30 m. However, the hedgerows can be replaced with trees and shrubs of low stature and

hence the impact would be of temporary duration. As the number of hedgerows affected is low, and the removal is likely to be temporary, this impact is rated as of Low significance.

Should the hedgerows along the track on Rosmore require removal, then a considerably greater length of hedgerow would be removed (estimated at ca.2.3 km if removal is required on both sides of track). However, this is still only rated as an impact of Low significance as the hedgerows are not of notable quality and can be reinstated after construction.

Woodland/scrub

The patch of woodland and scrub at the eastern tip of the Rosmore peninsula is likely to be disturbed by the pipeline. However, disturbance will be confined to the margins as the main part of this stand is also an archaeological feature. Disturbance here is rated as of Negligible or at most Low significance.

Salt marsh

The effluent pipe will traverse the salt marsh fringe at two locations (tips of Caulicaun and Rosmore peninsulas), whilst the storm water overflow will cross the salt marsh along the southern shore of the Caulicaun peninsula. At this stage it is not known if the intertidal sections of the pipe will be buried or will lie on the surface and be anchored down.

Should the pipe be buried, then there will be disturbance to a strip of salt marsh of at least several metres width. The marsh could be reinstated with mitigation and good recovery would be expected in the medium term. Such an impact on relatively small areas of salt marsh could only be regarded as of Low significance. Should the pipe remain on the surface, then a section of marsh would be lost at each crossing point. However, this would only be the width of the pipe and, with mitigation, good recovery would be expected in the marginal, disturbed areas. Whilst salt marsh is a habitat of high conservation value, the loss of three relatively small strips could only be considered as an impact of Low significance. Mitigation would be required to prevent further erosion of salt marsh in the disturbed areas.

Vegetated clay cliffs

The final section of pipeline from the fields to the outfall location on the shoreline will traverse the clay cliffs on the north side of the Rosmore peninsula. Details are not available on the amount of cliff that will be disturbed but it is likely that the pipeline will be graded with the cliff and buried. The construction is likely to cause substantial disturbance to a section of cliff vegetation – this impact is rated as at least of Low significance, though with mitigation, the long-term impact can be reduced.

4.1.3 Impacts due to laying of effluent pipeline (option B)

All of the impacts described for option A would also largely apply to option B, with disturbance to improved grassland, hedgerows, woodland/scrub, salt marsh and clay cliff vegetation. The impacts on these habitats are rated similarly.

In addition, option B would involve disturbance to sections of shoreline on Inishdaweel and Muckinish islands. Available information indicates that there are no significant formations of salt marsh or shingle vegetation on these islands but merely some driftline vegetation at the top of the stony shoreline. Disturbance to the driftline vegetation could only be rated as of Low significance.

4.1.4 Impacts associated with preferred wastewater collection system

The majority of the route options are along existing roads and there would be no adverse ecological impacts by their construction. Parts of options G and F would pass along the margins of a stand of mixed woodland and may require some tree or shrub removal – this, however, is not considered significant and would not affect the overall value of the wood. One of the pumping stations would be at the western point of this wood but on ground that is mainly rank grass, weedy vegetation and low scrub – the development of a pumping station here would not have any significant ecological impacts. Much of route option D is along a vegetated track – clearance of the track of vegetation would not be of significance. The location for the other pumping station at the harbour area is a site that is already a concrete surface and hence there would be no ecological impacts here.

4.2 Impacts on fauna

There are unlikely to be any significant impacts on the various fauna species associated with the area.

Otter

During construction, otters may be reluctant to use the shoreline at Caulicaun during working hours. However, as the disruption would be temporary in duration and as similar habitat is frequent in the area, this is not considered a significant impact. It is noted that no otter holt was recorded at the shoreline sections that would be directly affected by pipe laying. Once in operation, otters are unlikely to be affected by disturbance due to the presence of the treatment plant and associated personnel and vehicles, and especially if a fringe of trees is retained along the margin of the peninsula. Otters regularly travel up the Newport river and readily pass through the town and thus are well-used to background noise etc.

A study of otters at Westport (Murphy & Fairley 1985) showed that otters feed mainly on fish (especially eel, rockling, gobies, wrasses, butterfly), with various crustacea also taken. The food supply of otter would not be expected to be adversely affected by the proposed scheme unless there was a serious pollution incident.

Badger

A badger group could be adversely affected should a sett occur in the scrub in the field where construction will occur. Measures would need then to be taken to remove the animals (see recommendations and mitigation measures). However, even if a sett had to be

removed, badgers are still likely to remain in the area as there is ample suitable habitat for the animals.

Common Seal

The development would not be expected to have any impacts on the common seals which breed in Clew Bay as the breeding sites are not in the Newport vicinity.

Other mammals

For other mammal species, it is unlikely that the proposed development would have any adverse significant impacts and all should remain in the immediate area.

Terrestrial birds

The main impact on terrestrial bird species will be the permanent loss of some nesting and feeding habitat by way of scrub removal on the Caulicaun peninsula. However, similar habitat is frequent in the general area and the diversity of species in the area would not be adversely affected. Furthermore, none of the species that would be affected is of particular conservation importance. Hedgerow removal for pipe laying will similarly affect a range of small bird species that use the hedgerows for nesting and/or feeding. This impact is not considered significant as the number of hedgerows that will be affected is relatively low and these will be replaced after construction. Note, however, that scrub and hedgerow removal should not occur during the bird-nesting season so as to prevent destruction of active bird's nests.

Waterbirds

The wintering waterfowl in the Newport area will not lose any feeding or roosting habitat by this development.

Some intertidal feeding habitat may be affected during pipe laying activities in the intertidal zone (by smothering of invertebrates with suspended solids) but this would be a temporary impact and is not considered significant.

Construction activities would also cause some disturbance to birds in the area but this would be temporary and is not considered significant.

Once operational, the presence of the treatment works would not be expected to cause any disturbance to the birds using the adjacent shoreline and intertidal flats, especially if a fringe of trees is retained along the margin of the peninsula.

5.0 RECOMMENDATIONS AND MITIGATION MEASURES

5.1 Retention of scrub at site for treatment works

The scrub at the site for the treatment works is considered of Local conservation value. It is recommended that efforts should be made to retain as much as is feasible during the

construction stage. In particular, the fringe just above the shoreline should be retained as this would provide useful screening for otters and wintering waterfowl using the shore and adjacent mudflats.

At the commencement of construction works, the exact site area should be marked and then the remainder of the scrub cordoned off for the duration of construction. On no account should bulk materials be stored at the edge of the scrub areas. It is recommended that a qualified ecologist be on site to supervise the cordoning-off phase of the work.

5.2 Protection of salt marsh

Salt marsh is a valuable habitat and is listed on Annex I of the Habitats Directive. Whilst the pipe crossings would affect a relatively small amount of marsh, it is essential that efforts are made to limit this to the minimal possible and to prevent future possible erosion at the breach points.

If feasible (and after considering other issues), it would be preferable for the pipe to be buried beneath the salt marsh as in the long-term this would not result in the loss of habitat. Whether the pipe is buried or anchored to the surface, excavations will require the removal of the surface marsh. For mitigation, it is recommended that the marsh in the main construction zone should be cut out in sods and stored for later rehabilitation. The sods should be stored, vegetation side up, in a pre-chosen location at a similar tidal height. Further study would be required on the best location and method for storage. After construction, the sods may be used as follows: (i) if the pipe is buried, then they should simply be replaced in the disturbed area but would need to be anchored (perhaps by pinning or netting), and (ii) if the pipe is above ground, then sods should be used to restore disturbed areas. Marsh adjacent to the main construction zone may be disturbed by trampling, the placement of machinery etc. – in these areas it may be useful to temporarily cover the marsh with some sheeting so that the surface vegetation remains largely intact. The type of material used to cover the marsh would require further assessment. It is essential that the above measures should be supervised by a qualified ecologist and carried out in consultation with the National Parks & Wildlife Service (as the salt marsh is within the cSAC). Monitoring of the success of the rehabilitation would be required.

5.3 Protection of clay cliffs

The vegetated clay cliffs on the Rosmore peninsula are considered of Local conservation value. Whilst details of the construction works are not available, it is likely that a stretch of cliff will be significantly disturbed during the pipe laying process. As clay cliffs are relatively unstable habitats and prone to erosion, it is essential that as much vegetation cover is retained and that bare areas are re-vegetated as soon as possible. In this respect, it is recommended that mitigation should include the retention and storage of grassy sods in the construction area and their ultimate replacement. At the commencement of construction, these could be carefully cut and stored, vegetation side up, in a suitable pre-chosen location. After construction, they could then be replaced in the disturbed area but

would need to be anchored (perhaps by pinning or netting). Monitoring of the success of the rehabilitation would be required.

5.4 Protection of hedgerows and re-instatement

During hedgerow removal for pipe laying, strict attention should be given to removing only what is absolutely necessary. Sections to be removed should be carefully measured and marked prior to the arrival of construction machinery.

It is recommended that all cut sections should be re-instated afterwards. It is likely that trees replanted in wayleaves would need to be of low stature. The principal species used, which reflect the local landscape, should be hawthorn and blackthorn, with perhaps some hazel and holly which are useful for wildlife. For replanting, the services of a professional with experience in hedge-laying should be sought.

5.5 Measures re. the islands (route option B)

The location and engineering details are not available for pipe laying on Inishdaweel and Muckinish islands. Whilst it seems that there are no vulnerable habitats (such as salt marsh or vegetated shingle) that might be affected on these islands, it is noted that the islands are within the cSAC and therefore all works should be discussed with the National Parks & Wildlife Service in advance and provision should be made for a qualified ecologist to supervise works on these islands (if considered necessary by NPWS).

5.6 Measures for otter

The pollution control measures as recommended by the consultant marine ecologists will be adequate to ensure that the food supplies of the local otter population are not adversely affected.

As already noted, a recommendation is made for the retention of a strip of the existing woodland along the north shore of the Caulicaun peninsula so as to provide screening for otters using the shoreline.

5.7 Measures for badger

Whilst no badger setts were located in the site proposed for the treatment works, badgers are present in the area. It is recommended that a full badger survey be undertaken prior to construction. This should be done during winter (mid-November to late-March) when vegetation cover is at its lowest. Should an active badger sett be found in the area of construction, then under the Wildlife [Amendment] Act (2000), appropriate measures are

required to evacuate the badgers from the sett. This operation must be carried out by personnel licensed to do so by the National Parks and Wildlife Service.

5.8 Measures for birds

Removal of trees, scrub and hedgerows, which provide breeding habitat for bird species, should take place outside of the bird nesting season, which is officially the period March 1st and August 31st. This would comply with Section 46 of the Wildlife (Amendment) Act 2000¹.

As already noted, a recommendation is made for the retention of a strip of the existing woodland along the north shore of the Caulicaun peninsula so as to provide screening for birds using the shoreline.

5.9 Landscaping

Non-native species or hybrids of trees such as willow and alder should not be used in landscaping works around the new treatment works, as the existing scrub and low woodland appears to be composed of native species. A list of species proposed for the site should be agreed with a qualified ecologist in advance.

6.0 LIKELY SIGNIFICANT IMPACTS AFTER MITIGATION MEASURES

Providing mitigation measures as outlined are followed, impacts on terrestrial ecology due to the proposed scheme are rated as from Negligible to Low.

All species, including those of high conservation importance such as otter and kingfisher, are expected to continue to occur in the area after the construction is complete.

The mitigation measures outlined in the report if fully implemented will ensure compliance by the local authority with the various National and EU legislation relating to habitats and species.

¹ Refer to Section 46 of the Wildlife [Amendment] Act (2000), which limits clearance of vegetation from 1st March to 31st August, with exemptions for certain construction works.

7.0 REFERENCES

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APPENDIX 1

NPWS SITE SYNOPSIS FOR CLEW BAY cSAC

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SITE NAME: CLEW BAY COMPLEX

SITE CODE: 001482

Clew Bay is a wide, west-facing bay on the west coast of Co. Mayo. It is open to the westerly swells and winds from the Atlantic with Clare Island giving only a small amount of protection. The drumlin landscape was formed during the last glacial period when sediments were laid down and smoothed over by advancing ice - the sea has subsequently inundated this area, creating a multitude of islands. The geomorphology of the bay has resulted in a complex series of interlocking bays creating a wide variety of marine and terrestrial habitats, including several listed on Annex I of the E.U. Habitats Directive: large shallow bay, lagoon, Atlantic salt-meadows, drift lines, perennial vegetation of stony banks, embryonic shifting dunes, Marram dunes and dune slacks.

Within the shallow bay, subtidal sediments are characterised by typical bivalve communities in fine sand (*Chamelea striatula* and *Ensis* sp.), and by the polychaete worm *Euclymene* and the bivalve *Thyasira flexuosa* in muddy sand. The intertidal sediment communities are characterised by polychaetes and bivalves in the mid-shore and by the sand mason worm *Lanice conchilega* in the low shore. In areas where there is maerl debris with small amounts of live maerl the infaunal community has a mixture of species characteristic of coarse sand (e.g. the bivalves *Timoclea ovata*, *Spisula* sp., and the polychaetes *Nephtys cirrosa* and *Glycera lapidum*) and medium sand (e.g., the bivalve *Ensis* sp. and the polychaetes *Lanice conchilega*, *Scoloplos armiger* and *Sthenelais boa*). The bivalves *Timoclea ovata*, *Tapes rhomboides* and the polychaetes *Branchiomma bombyx* and *Glycera lapidum* are typical of gravels and medium sands, whereas the bivalves *Abra alba*, *Corbula gibba*, *Thyasira flexuosa* and *Mysella bidentata* and the polychaete *Euclymene* are characteristic of muddy sands. Beds of live maerl of *Lithothamnion corallioides* are also present in a number of areas.

Around the edges of the inner part of the bay are shores of mixed boulders, cobbles, gravel with some sand and mud. They have a typical zonation of intertidal communities found on sheltered shores of mixed substratum. The shore at Murisk is unusual as a distinct zone characterised by archiannelids occurs above the sandhopper zone in the upper shore under the boulders and cobbles. This is an unusual habitat. In sheltered areas of shallow water with little sand scour a well developed community of hydroids, sponges and solitary sea squirts is present. Where the sediments includes gravel and mud the species richness in the area can be exceptionally high (180 species). A number of marine species that are rarely recorded are found in Clew Bay: the stalked jellyfish *Lucernariopsis cruxmelitensis*; the polychaetes *Anitides rosea*, *Clymenura clypeata*, *Pterosyllis formosa* and *Pionosyllis* sp. and the snail *Clypterea chinensis*.

Clew Bay is considered to have the most significant shingle reserves in the country, and has (on the islands) the only examples of incipient gravel barriers in Ireland. Associated with

the shingle (and dunes) are good examples of annual vegetation of drift lines. Characteristic species found in these habitats include: Spear-leaved Orache (*Atriplex prostrata*), Red Fescue (*Festuca rubra*), Sea Sandwort (*Honkenya peploides*), Thrift (*Armeria maritima*), Common Scurvygrass (*Cochlearia officinalis*), Sea Mayweed (*Matricaria maritima*) and Sea Campion (*Silene vulgaris* subsp. *maritima*).

Lough Furnace is located at the north-eastern corner of Clew Bay. The lough is a good example of a deep, stratified, saline lake lagoon in a very natural state. Salinity levels can vary considerably here depending on rainfall and tides. The lake is one of the very few permanently stratified lakes known in Ireland and Britain. The lake is ringed by Common Reed (*Phragmites australis*) and Common Club-rush (*Scirpus lacustris*), with small patches of Great Fen-sedge (*Cladium mariscus*) and Bottle Sedge (*Carex rostrata*). Lough Furnace supports a relatively high faunal diversity (41 taxa recorded in the 1996 survey) including a number of important invertebrate species. The relict mysid species *Neomysis integer*, the isopods *Jaera albifrons*, *J. ischiosetosa* and *J. nordmanni*, and two rare amphipods (*Lembos longipes* and *Leptocheirus pilosus*) have all been recorded from the lake. Both Irish species of tasselweed (*Ruppia maritima* and *R. cirrhosa*) occur in the lagoon. Eel, Flounder and Mullet also occur in the lake waters. Mallard nest around the lough, while Saint's Island contains nesting Black-headed Gull.

At the north-western end of Lough Furnace lie two associated lakes, Lough Napransky and Lough Navroony. A stream drains from the latter into the main lake. The area contains flush and quaking-mire vegetation, which is of interest as Irish Heath (*Erica erigena*) is found there, with Bog Moss (*Sphagnum* spp.), Black Bog-rush (*Schoenus nigricans*), Bog Asphodel (*Narthecium ossifragum*), Common Cottongrass (*Eriophorum angustifolium*) and Round-leaved Sundew (*Drosera rotundifolia*). Bog Orchid (*Hammarbya paludosa*), a species listed in the Irish Red Data Book is also found in this area. Beyond the wet area there is a Hazel (*Corylus avellana*) dominated woodland growing over abandoned fields. Birch (*Betula pubescens*), Hawthorn (*Crataegus monogyna*) and Holly (*Ilex aquifolium*) are common, with occasional Oak (*Quercus petraea*). The ground flora contains such species as Bluebell (*Hyacinthoides non-scripta*), Sanicle (*Sanicula europaea*) and Wood-sorrel (*Oxalis acetosella*).

The Rosmurrevagh area in the north of Clew Bay displays a high diversity of habitats, from seashore to dunes and coastal grassland, as well as saltmarsh, bog and fen. The sandy beach on the seaward side grades into dunes of Marram (*Ammophila arenaria*). Adjacent to this, the saltmarsh vegetation, which is approximately 5 m wide, comprises Thrift, Common Scurvygrass, Common Saltmarsh-grass (*Puccinellia maritima*) and 'turf fucoids' (diminutive forms of brown algae). These plant species are typical of Atlantic salt meadows. Similar saltmarshes occur scattered around the entire shoreline of the bay. Next to the saltmarsh at Rosmurrevagh is an area of coastal grassland with species such as Daisy (*Bellis perennis*), Ribwort Plantain (*Plantago lanceolata*), Dandelion (*Taraxacum officinale*), Heath Wood-rush (*Luzula multiflora*), Common Ragwort (*Senecio jacobaea*) and Yarrow (*Achillea millefolium*). Flushes introduce a species-rich bog/fen type vegetation. Yellow Iris (*Iris pseudacorus*), Soft Rush (*Juncus effusus*), Irish Heath, Bog Mosses, sedges, Water Mint (*Mentha aquatica*), Bog-myrtle (*Myrica gale*), Bog Asphodel and Cuckooflower (*Cardamine pratensis*) are found.

A further dune system occurs at Bartraw in the south-west of the site. Here Marram and embryonic dunes occur along a shingle ridge which links a small island where dunes also occur. Embryonic dunes, characterised by the presence of Sand Couch (*Elymus farctus*), also occur on some of the islands in the bay.

Important populations of Otter and Common Seal are found in Clew Bay. Both of these species are listed on Annex II of the E.U. Habitats Directive.

The Clew Bay Complex supports a good diversity of wintering waterfowl, with nationally important numbers of Red-breasted Merganser (average maximum of 70 in the winters 1995/96-1999/00) and Ringed Plover (average maximum of 142 in the winters 1995/96-1999/00). A population of Barnacle Geese (between 100 and 200 birds) frequents the islands during winter. Other species which occur in significant numbers include Great Northern Diver (14), Brent Goose (118), Shelduck (74), Wigeon (112), Teal (127), Mallard (64), Oystercatcher (250), Dunlin (450), Bar-tailed Godwit (73), Curlew (373), Redshank (172), Greenshank (10) and Turnstone (27) (all figures are average maxima for the winters 1995/95-1999/00). Species which breed in important numbers include Cormorant (115 pairs in 1985), Common Tern (20+ pairs in 2000/01), Arctic Tern (100+ pairs in 2000/01) and Little Tern (9 pairs in 2000). The various tern species, as well as Barnacle Goose, Great Northern Diver and Bar-tailed Godwit, are listed on Annex I of the E.U. Birds Directive.

The juxtaposition within Clew Bay of a wide variety of habitats, including seven listed on Annex I of the E.U. Habitats Directive, and the combination of important flora and fauna, including one Red Data Book plant and two mammals listed on Annex II of the E.U. Habitats Directive, make this a site of considerable national and international importance.

25.10.2001

APPENDIX 2

**MAP OF SECTION OF CLEW BAY CSAC
RELEVANT TO PROPOSED DEVELOPMENT**

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APPENDIX 3

**I-WEBS DATA FOR NEWPORT AREA
OF CLEW BAY
1998/99 TO 2002/03
(PROVIDED BY BIRDWATCH IRELAND)**

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Clew Bay: Newport Bay/Rockfleet Bay - Castleaffy Strand

Species name	1% national	1% international	1998/ 99	1999/ 00	2000/ 01	2001/ 02	2002/ 03	Mean	Peak
Red-throated Diver		750					2	0	2
Great Northern Diver		50		4	2	1	4	2	4
Little Grebe	30				16	28	11	11	28
Great Crested Grebe	35			7	1			2	7
Cormorant	105	1,200		2	8	23	9	8	23
Grey Heron	105	4,500	4	7	15	31	23	16	31
Mute Swan	100	2,400	2	8	9	10	11	8	11
Whooper Swan	100	160		3				1	3
Light-bellied Brent Goose	200	200				11	13	5	13
Shelduck	125	3,000		13	13	19	16	12	19
Wigeon	1,000	12,500		46	59	108	57	54	108
Teal	500	4,000		33	70	162	35	60	162
Mallard	500	20,000	2	40	80	155	61	68	155
Tufted Duck	300	10,000					4	1	4
Smew		150				1		0	1
Red-breasted Merganser	25	1,250	5	24	52	22	37	28	52
Oystercatcher	700	9,000	4	43	70	81	65	53	81
Ringed Plover	100	500		7	25	79	36	29	79
Golden Plover	1,500	18,000				12	60	14	60
Grey Plover	50	1,500				8		2	8
Lapwing	2,000	20,000			18	35	37	18	37
Knot	250	3,500			12			2	12
Dunlin	1,200	14,000		102	93	72	53	64	102
Snipe		10,000					3	1	3
Woodcock		20,000				1		0	1
Bar-tailed Godwit	175	1,000		13	17		2	6	17
Whimbrel		6,500				3		1	3
Curlew	1,000	3,500	13	107	134	194	117	113	194
Redshank	250	1,500	35	139	136	199	137	129	199
Greenshank	20	3,000	8	7	10	11	10	9	11
Common Sandpiper				8		3		2	8
Turnstone	100	700			7	10		3	10
Black-headed Gull		20,000	15		25			8	25
Common Gull		16,000	4		122			25	122
Lesser Black-backed Gull		4,500			4			1	4
Herring Gull		13,000			62			12	62
Great Black-backed Gull		4,800			39			8	39
Kingfisher					1	1		0	1

The counts presented in the table refer to the peak counts of species in each I-WeBS season. Subsite peak is calculated as the peak count over the seasons specified, while the subsite mean is calculated as the average of the season peaks. Blank columns indicate seasons for which no data are available, while blank cells within columns which contain positive values for one or more species constitute Zero for those species.

PHOTO CAPTIONS

Plates 1 & 2. The field in which the water treatment plant is proposed to be located comprises unmanaged grassland. A strip of willow-dominated scrub occupies the northern part of the field. Top photograph is looking westwards, lower photograph is looking eastwards from the low-lying, damp area of the field.

Plate 3. Scrub and bracken are encroaching into the grassland, in the field for the proposed treatment plant.

Plate 4. The scrub in the field is part of a larger stand of scrub/low woodland that continues north-eastwards on the Caulicaun peninsula. View is looking east-northeast from the shoreline.

Plate 5. The scrub on the Caulicaun peninsula is dense with a continuous, closed canopy.

Plate 6. Improved grassland occurs in the fields to the west and south of the site for the proposed treatment plant. View is looking westwards towards the tip of the peninsula. Note the planted conifers in the hedge.

Plates 7 & 8. Salt marsh fringes much of the Caulicaun peninsula. The strip is narrow (top photograph), and the edge of the marsh is about 20 cm above the stony shore and is marked by a low cliff (bottom photograph). The upper part of the marsh is only inundated on the highest of tides. Views are from the western tip of the Caulicaun peninsula.

Plate 9. Improved grassland is the main habitat on the Rosmore peninsula. It is a well-managed, grazed sward that is fertilised and has been reseeded in the past.

Plate 10. View from western tip of Rosmore peninsula looking eastwards.

Plates 11 & 12. A track runs much of the length on the Rosmore peninsula. Hedgerows line both sides – these are mostly of low stature and low species diversity (top photograph). The first section of the track is lined by taller hedgerows which have not been cut (bottom photograph). Ash is frequent here.

Plate 13. A patch of deciduous woodland at the eastern tip of the Rosmore peninsula is composed largely of ash and blackthorn. A salt marsh fringe occurs below the woodland.

Plate 14. The salt marsh which fringes the eastern tip of the Rosmore peninsula is similar in character and species diversity as that on the Caulicaun peninsula.

Plates 15 & 16. Clay cliffs, mostly well-vegetated, occur for much of the length of the northern shore of the Rosmore peninsula. These are substantial in height and occur immediately above the high tide mark. The vegetation of the cliffs is dominated by calcareous grassland and scrub. Top photograph is looking westwards, and bottom eastwards, from area of outfall for effluent pipe (option A).

Plate 17. In a few places, the calcareous glacial till has allowed an incipient tufa habitat to occur but where noted this was poorly developed.

Plate 18. Part of Option F of the preferred wastewater collection system would run over a grassy/weedy strip of several metres width just inside a stone wall. This is along the margin of a stand of mixed woodland.

Plate 19. Much of Option D of the preferred wastewater collection system is along an overgrown track, with unmanaged hedgerows both sides.

Plate 20. Much of Option A of the preferred wastewater collection system runs along an existing road that is lined by treeline and/or mixed woodland.

Plate 21. The pumping station linked to the rising main would be built on existing developed land associated with the harbour area and new apartment block.

Plate 22. The site for the proposed pumping station on the Newport peninsula is at the tip of a mixed woodland stand. However, the station would be located mainly on a strip of rank grassland and weedy vegetation just inside the boundary wall.

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Plates 1 & 2. The field in which the water treatment plant is proposed to be located comprises unmanaged grassland. A strip of willow-dominated scrub occupies the northern part of the field. Top photograph is looking westwards, lower photograph is looking eastwards from the low-lying, damp area of the field.



Plate 3. Scrub and bracken are encroaching into the grassland, in the field for the proposed treatment plant.



Plate 4. The scrub in the field is part of a larger stand of scrub/low woodland that continues north-eastwards on the Caulicaun peninsula. View is looking east-northeast from the shoreline.



Plate 5. The scrub on the Caulicaun peninsula is dense with a continuous, closed canopy.



Plate 6. Improved grassland occurs in the fields to the west and south of the site for the proposed treatment plant. View is looking westwards towards the tip of the peninsula. Note the planted conifers in the hedge.



Plates 7 & 8. Salt marsh fringes much of the Caulicaun peninsula. The strip is narrow (top photograph), and the edge of the marsh is about 20 cm above the stony shore and is marked by a low cliff (bottom photograph). The upper part of the marsh is only inundated on the highest of tides. Views are from the western tip of the Caulicaun peninsula.



Plate 9. Improved grassland is the main habitat on the Rosmore peninsula. It is a well-managed, grazed sward that is fertilised and has been reseeded in the past.



Plate 10. View from western tip of Rosmore peninsula looking eastwards.



Plates 11 & 12. A track runs much of the length on the Rosmore peninsula. Hedgerows line both sides – these are mostly of low stature and low species diversity (top photograph). The first section of the track is lined by taller hedgerows which have not been cut (bottom photograph). Ash is frequent here.



Plate 13. A patch of deciduous woodland at the eastern tip of the Rosmore peninsula is composed largely of ash and blackthorn. A salt marsh fringe occurs below the woodland.



Plate 14. The salt marsh which fringes the eastern tip of the Rosmore peninsula is similar in character and species diversity as that on the Caulicaun peninsula.



Plates 15 & 16. Clay cliffs, mostly well-vegetated, occur for much of the length of the northern shore of the Rosmore peninsula. These are substantial in height and occur immediately above the high tide mark. The vegetation of the cliffs is dominated by calcareous grassland and scrub. Top photograph is looking westwards, and bottom eastwards, from area of outfall for effluent pipe (option A).



Plate 17. In a few places, the calcareous glacial till has allowed an incipient tufa habitat to occur but where noted this was poorly developed.



Plate 18. Part of Option F of the preferred wastewater collection system would run over a grassy/weedy strip of several metres width just inside a stone wall. This is along the margin of a stand of mixed woodland.



Plate 19. Much of Option D of the preferred wastewater collection system is along an overgrown track, with unmanaged hedgerows both sides.



Plate 20. Much of Option A of the preferred wastewater collection system runs along an existing road that is lined by treeline and/or mixed woodland.



Plate 21. The pumping station linked to the rising main would be built on existing developed land associated with the harbour area and new apartment block.



Plate 22. The site for the proposed pumping station on the Newport peninsula is at the tip of a mixed woodland stand. However, the station would be located mainly on a strip of rank grassland and weedy vegetation just inside the boundary wall.