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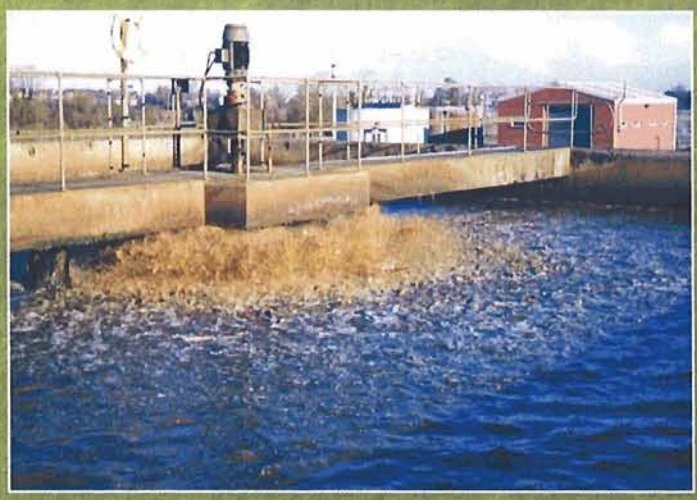

Ballinasloe Wastewater Treatment Plant Upgrade

Environmental Impact Statement

Volume III : Technical Appendices

November 2003

RPS mcos

DOCUMENT CONTROL SHEET

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F01	Final Issue	CW/LM	CW/LM	L Mulcair	Galway	10.11.2003

ENVIRONMENTL IMPACT STATEMENT

for the

Ballinasloe Wastewater Treatment Plant Upgrade

September 2003

VOLUME I **NON-TECHNICAL SUMMARY**

VOLUME II **MAIN REPORT**

VOLUME III **TECHNICAL APPENDICES**

VOLUME III

TECHNICAL APPENDICES

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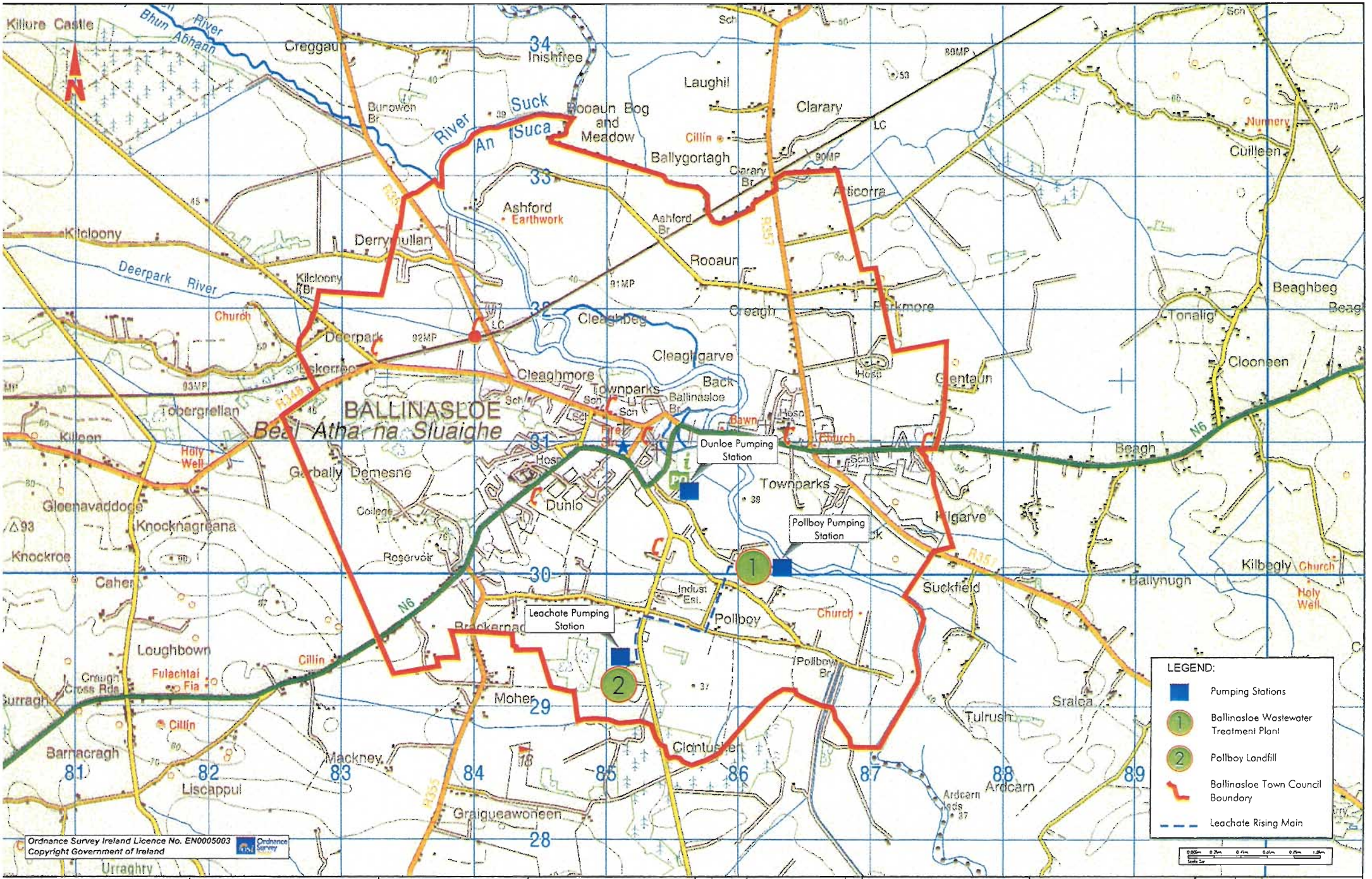

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F01 | 10/11/03 | Final Issue | LM

BALLINASLOE WASTEWATER TREATMENT PLANT UPGRADE

Title: Location Plan

Drawn by:	K B	Job No.	MGW0010
Checked by:		File No	MGW0010DG0002
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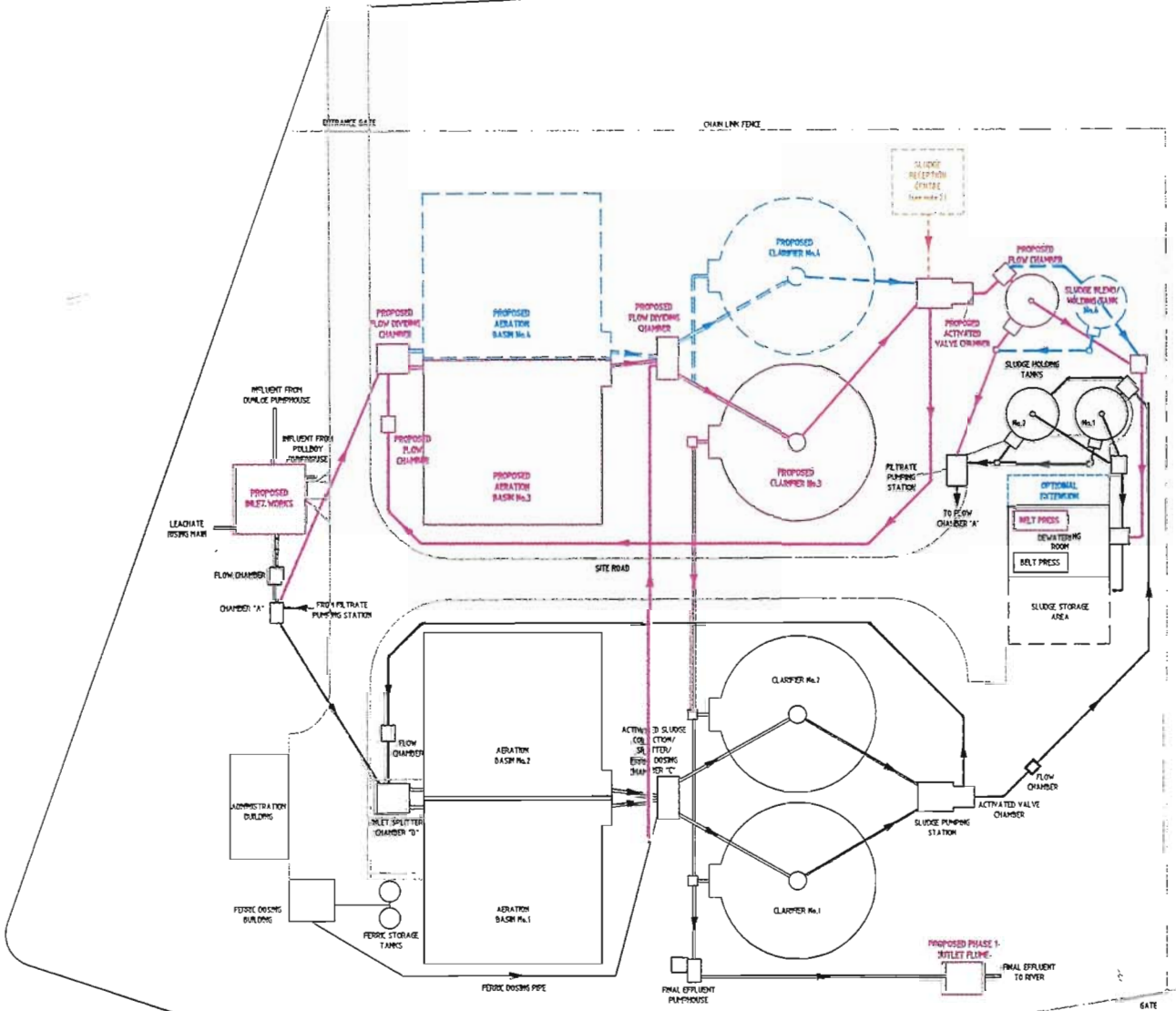
Scale	As Shown	Fig. 1.1	F01
Date	November 03		



KEY:

Existing

Phase 1

Phase 1 - Optional Facilities

Phase 2

NOTE:

1. Dewatering Plant upgrade may require new room or extension to existing dewatering room.

2. Proposed Sludge Reception Centre will be based on recommendations in approved Sludge Management Plan for Galway City & County.

0.00km 0.01km 0.02km 0.03km 0.04km 0.05km

Scale Bar

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BALLINASLOE WASTEWATER TREATMENT PLANT UPGRADE

Title: Schematic of Wastewater Treatment Plant Upgrade

Drawn by:	K.B.	Job No:	MGW0010
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Approved by:	L.M	Org. No:	
Scale:	As Shown	Rev:	F01
Date:	November 03	Fig. 1.2	

A

Ballinasloe Wastewater Treatment Plant Upgrade
Environmental Impact Statement

Volume III - Technical Appendices

Odour Impact Report

Report

BALLINASLOE WASTEWATER TREATMENT WORKS

CONTROL OF ODOUR EMISSION

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June 2003

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BALLINASLOE WASTEWATER TREATMENT WORKS

EMISSION AND CONTROL OF ODOUR

1. INTRODUCTION

Odour is the sensation transmitted to tlie brain by the olfactory receptors in tlie nasal cavity when exposed to so called odorous substances in the inhaled air. If these substances are of a malodorous nature and are present in air above a certain threshold concentration they may cause annoyance and constitute an environmental nuisance. The science of odour response measurement is known as olfactometry. Standard olfactometric methods for odour strength measurement by dilution techniques, using a panel of people operating according to standard procedures, have been developed (Frechen, 1994).

The concentration of odorants in air is expressed in odour units per cubic metre (OU/m^3). Its numerical value is quantified as the number of dilutions with clean air required to reach the odour perception threshold. The odour perception threshold is the lowest odour concentration which is detectable by half the members of a test panel (half the members do not detect any smell while the other half still smells something). At a concentration of 2 OU/m^3 an odour is faintly perceivable, at 3 OU/m^3 it is clearly perceivable while at 5 OU/m^3 is strongly perceivable and, if unpleasant, is likely to give rise to environmental nuisance. The duration of an odour is also significant. Dispersion calculations are normally based on meteorological data using mean I-hour wind speeds, producing hourly means of odour concentration. A concentration of 5 OU/m^3 lasting 15 to 30 minutes is commonly used as the nuisance threshold. If the mean hourly odour concentration is less than 1 OU/m^3, it is unlikely that shorter duration odour concentrations will exceed 5 OU/m^3.

2. WASTEWATER TREATMENT PLANT ODOURS

Wastewater odours arise either through the discharge of odorous substances of industrial origin to the sewer system or from the anaerobic decomposition of biodegradable matter in the wastewater. Anaerobic biodegradadon produces volatile fatty acids and a variety of reduced sulphur compounds most of which have a very low odour threshold concentration as indicated in Table 1.

Anaerobic biodegradation is inhibited in the presence of dissolved oxygen and thus does not occur while wastewaters remain aerobic. However, where there is a long residence time in the sewer system or where sewer gradients are small, resulting in low velocities and solids deposition, wastewaters are likely to become septic and malodorous. Biodegradation rates are also strongly influenced by temperature, hence odour problems are likely to be accentuated during warm weather or where industrial discharges raise the wastewater temperature.

2.1 Odour emission from wastewater treatment processes

The rate of release of odorous compounds into the atmosphere at wastewater treatment works (WWTWs) is influenced by:

(a) tlie concentration of odorous substances in tlie liquid phase exposed to air
(b) total air/wastewater interface area
(c) conditions at airlwastewater interface.

Table I
Odour threshold concentrations (Vincent & Hobson, 1998)

Substance	Threshold conc. ($\mu g/m^3$ air)
Ammonia	100-1000
Methylamine	1.2-65
Dimethylamine	47-160
Indole	7.1
Scatole	0.012-0.35
Ethylmercapton	0.043
Diethyl sulphide	1.4
Hydrogen sulphide	0.76
Methylmercapton	0.003-38
Methyl sulphide	0.34-1.1
Acetic acid	43
Butyric acid	0.35-86
Acetaldehyde	0.01-4
Butyraldehyde	15
Isobutyraldehyde	15-22
Valeraldehyde	2.5-34

Raw wastewaters and sludges generally have high concentrations of odorous substances. Processes that generate surface turbulence and high rates of interface renewal, such as open channel flow, weir overflows, biofilter flow distribution systems etc., have much higher rates of volatilisation of odorous compounds than quiescent processes such as sedimentation.

The specific odour emission rate from a water or sludge surface can be measured experimentally in a standardised way using a floating collector hood into which is discharged a measured flow of odour-free air. The odour concentration is then measured in the emergent air stream. The specific odour emission rate ($OU/m^2.h$) is quantified as the product of the emitted odour concentration (OU/m^3) and the specific air flow rate ($m^3/m^2.h$). A sample set of wastewater process odour emission rates, measured in this way, is presented in Table 2.

Table 2
Odour emission measurement results
(Frechen, 1992)

Odour source	Odour Concentration (OU/m^3)	Specific air flow rate ($m^3/m^2.h$)	Specific emission rate ($OU/m^2.h$)
Influent pumping station	307.00	9.8	3009
Aerated grit chamber	1021.00	7.0	7147
Grit container	6923.00	7.0	48461
Aeration tank	80.00	7.6	608
Secondary sedimentation tank	39.50	6.7	265
Secondary sedimentation overflow	52.00	5.5	286

Wastewater screening, grit separation, primary treatment processes, biofiltration processes and sludge handling processes are the major foul odour sources at WWTWs. With the exception of aerobically stabilised sludges, sludge residues are the primary sources of very high odour concentration at WWTWs. This is because of their potentially high concentrations of reduced volatile substances including hydrogen sulphide (H_2S). It should be noted that anaerobically digested sludge, though biologically stable, can bc a significant source of malodour, particularly if it contains H_2S - 1 ppm by

volume of H_2S in air is approximately equivalent to an odour concentration of 200 OU/m^3. Aerobically stabilised sludges, on the otherhand, have a relatively low odour emission rate. Surplus activated sludges from medium or high rate processes also have low odour emission rates while maintained in an aerobic condition.

2.2 **Odour standards for wastewater treatment plants**

The European Community has not as yet developed environmental directives relating to the control of odour nuisance nor are there any mandatory national standards in force in Ireland. The Irish EPA, in its general approach to environmental protection, promotes the use of so-called BATNEEC solutions (use of the best available technology not entailing excessive cost). It is well established that odour nuisance in the vicinity of wastewater treatment facilities can be avoided by the application of this principle to the design new wastewater treatment facilities.

It is also useful to look to the example of the approach used in other countries. The Netherlands, for example, has adopted a policy aimed at the reduction of environmental odour to an as low as reasonably achievable level (ALARA principle). For wastewater treatment plants this translates into the following maximum environmental concentration levels:

At locations surrounded by residential areas, ribbon-development or other odour-sensitive receptors:

- 1 ou/m^3 at 98% non-exceedence level for new WWTWs
- 3 ou/m^3 at 98% non-exceedence level for existing situations

At locations with scattered houses or industrial estates:

- 2 ou/m^3 at 98% non-exceedence level for new WWTWs
- 7 ou/m^3 at 98% non-exceedence level for existing plants

Ballinasloe WWTP is located in an area of scattered housing, and may in future be surrounded by residential areas due to its proximity to Ballinasloe. As the proposed development is an upgrade of an existing WWTP, it is proposed that an odour level of 3 OU/m^3 at a 98% non-exceedence level at a distance of 20m of the site boundary is taken as the environmental odour standard for this development.

2.3 **Odour abatement at wastewater treatment plants**

The emission of foul odours from wastewater treatment facilities can be controlled by covering/housing the primary odour sources and by providing forced ventilation of the enclosed air spaces to appropriate air treatment facilities. The required rate of ventilation should, at minimum, maintain a slight negative pressure within the enclosed air space, thus preventing air escape other than to the forced ventilation system. Higher sates of ventilation are required for accessible enclosures while low rates are adequate for enclosures that are not accessible. Ventilation rates are typically expressed in terms of a ventilation factor or frequency of ail- change (ventilation factor x enclosed air volume = ventilation rate). Ventilation factors may vary from 2 h^{-1} for non-accessible enclosures to 20 h^{-1} for frequently used rooms with high odour-emission potential.

Treatment technologies for odorous air streams, such as generated at wastewater treatment plants, include:

- Biofiltration and bioscrubbing
- Activated carbon
- Wet chemical scrubbing
- Thermal oxidation

In biological treatment processes such as biofiltration and bioscrubbing the odour contaminants are adsorbed on to a moist contact medium, where they are decomposed by selected bacteria that are capable of using the contaminants as a growth substrate. Peat or heather is used as the contact medium in biofilters while a variety of packing materials is used in biotower scrubbers.

Biofiltration will probably be the most suitable method of treatment for the Ballinasloe WWTW application. A well-designed enclosed biofilter, equipped with a wetting system for the filter bed, should be capable of achieving an odour reduction efficiency of in the range 90%-95%.

3. ODOUR DISPERSION MODELLING FOR BALLINASLOE WWTW

The odours emitted from WWTWs are carried downwind and are diluted through atmospheric dispersion by mixing and transport mechanisms. Wind speed and atmospheric turbulence are primary agents in odour dispersion. In general terms, the lower the wind speed and the more stable the atmospheric conditions, the poorer will be the atmospheric dilution of odour and the greater the environmental odour concentration.

Atmospheric stability is a measure of the atmosphere's ability to disperse emitted air contaminants. A stable atmosphere will dampen the movement of an air parcel, whereas an unstable atmosphere will enhance the movement of a displaced air parcel. A standard stability classification scheme, known as the Gifford-Turner classification is typically used in air quality modelling. This scheme categorises atmospheric stability into 6 classes ranging from A (very unstable) to F (very stable), based on such factors as wind speed, isolation (exposure to the sun), and cloudiness.

The atmospheric odour dilution process can be mathematically modelled as a Gaussian plume (Pasquill, 1974), taking wind speed, wind direction and atmospheric stability conditions into account (USEPA, 1987). Thus, using the local meteorological data and the estimated odour emission rates from the individual treatment processes, it is possible to compute the odour concentration fluctuation at sensitive receptor locations in the vicinity of a WWTW.

3.1 **Meteorological data**

The required meteorological data consists of the mean hourly values for wind speed, wind direction and the stability classification for the WWTW location for at least one year's duration. The prevailing stability category has a strong influence on the rate odour dilution with distance from source. Unfavourable dispersion conditions arise when there is a combination of low wind velocity and reduced solar radiation such as occurs at night-time or in overcast conditions during the daytime.

The nearest weather station, which may reasonably be regarded as having similar climatic conditions to Ballinasloe, is located at Birr. The results of a statistical analysis of wind speed/wind direction for the 30-year period January 1973 to December 2002 for the Birr station are plotted on Figure A.1.

As can be seen in Figure A.1, the predominant wind condition for low wind speeds is a south westerly wind. The data for 2002 can be seen to be representative of the 30 year average conditions at Birr.

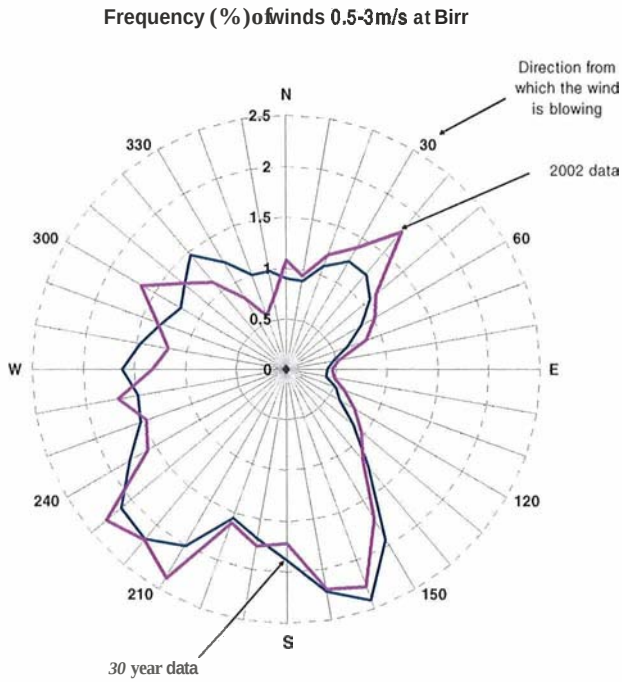

Figure A.1 30 **year** (1973-2002) **frequency distribution of wind direction and speed for low wind speeds at Birr Met. Station**

3.2 **Process odour emission estimates**

The existing WWTW at Ballinasloe treats municipal wastewater from the town of Ballinasloe and its environs. In the proposed upgrade, the treatment capacity of the works is being expanded to cater for an organic load of 18000 PE (population equivalents). The WWTW consists of an inlet works, two aeration basins, two secondary clarifiers and facilities for sludge treatment. The proposed upgrade includes the addition of two new aeration basins, two new secondary clarifiers and additional sludge treatment facilities including a sludge import facility, sludge holding tanks and dewatering facilities (site layout is shown on Figure 1.2). In addition to municipal wastewater, the inflow to the upgraded WWTW will include a small amount (<5% of combined flow) of landfill leachate. The sludge import facility is expected to receive $23m^3$ of sludge from septic tanks and package plants per week.

Two levels of odour emission were examined:

Level (1): relates to the situation at the end of phase two which would prevail in the absence of odour abatement measures. The estimated odour emission rates are given in Table 3. In this analysis, the odour emission potential from leachate has been taken as the same as the odour emission potential from influent wastewater.

Level (2): relates to the estimated reduced level of odour emission required to meet the target environmental standard of 98% non-exceedence of 3 OU/m^3 within 20m of the site boundary. Odour abatement measures are applied to all potential sources of unpleasant odour viz. the inlet works and sludge processes; the estimated reduced odour emission rates are given in Table 4. With this level of odour control in place, the residual odour emission is estimated at 923 OU/s, some 94% of which is derived from aerobic secondary treatment processes. While there is a perceptible odour associated with the latter, it is normally described as an "earthy" odour and does not cause odour nuisance.

The odour emission estimates are based on the specific odour emission rates presented in Table 2, modified by a peaking factor of two.

Table 3
Estimated odour emission rates from Ballinasloe WWTP
(Level 1 odour emission)

Source	Open surface Gross area (m^2)	Specific odour emission ($OU/m^2.s$)	Process emission (OU/s)
Inlet works [1]	n/a	n/a	339
Aeration tanks	1770	0.34	601
Secondary clarifiers	1170	0.15	173
Sludge Holding Tank	129	7.57	974
Sludge Dewatering	110	3.14	345
Sludge Reception Tank[3]	13	7.57	95
Misc [2]	n/a	n/a	465
		Total	2992

Footnotes to Table 3:
(1) Inlet works consisting of:
Aerated Grit Chamber (119 OUls)
Screening (86 OUls)
Grit Container (134 OUls)
(2) Misc consisting of:
Flow dividing chambers (115 OUls)
Sludge pumping stations (190 OUls)
Sludge storage (161 OUls)
(3) Open to air tank

Table 4
Estimated odour emission rates from Ballinasloe WWTP
with odour abatement measures applied to inlet works,
and sludge processes
(Level 2 odour emission)

Source	Open surface Gross area (m^2)	Specific odour Emission ($OU/m^2.s$)	Process emission (OU/s)
Odour treatment unit 1[1]	n/a	n/a	18
Odour treatment unit 2[2]	n/a	n/a	35
Aeration	1770	0.34	601
Secondary clarifiers	1170	0.15	173
Misc[3]	n/a	n/a	96
		Total	**923**
Intermittent additional output from odour treatment unit 2[4]	n/a	n/a	3
		Total[4]	**926**

Footnotes to Table 4:
(1) Discharge from odour treatment unit 1, serving inlet works, 95% odour reduction, located to the north of inlet works
(2) Discharge form odour treatment unit 2, serving the sludge buildings, the sludge holding tanks, sludge reception tank, 95% odour reduction. located to the south west of dewatering building.
(3) Flow dividing chambers (96 OU/s)
(4) When filling the sludge reception tank, which is closed and ventilated to odour treatment unit 2

3.3 **Results** of dispersion analysis

A series of computer analyses of odour dispersion from the Ballinasloe WWTW, using the Birr hourly wind data and the odour emission rates set out in Tables 3 and 4, was carried out. The output data was analysed to define the 1 OU/m^3/ 98% and the 3 OU/m^3/98% isolines for the treatment plant environs.

The resultant odour isolines are plotted on Figures A.3 and A.4. As shown on Figure A.3, the dispersion analysis indicates that, in the absence of odour control measures, the 1 OU/m^3/ 98% isoline extends well outside the site boundary, but within a radius of about 350m from the centre of the site (this is the isoline where half of a test panel would detect the odour). The 3 OU/m^3/ 98% isoline also extends outside the site boundary, but within a radius of about 200m from the centre of the site (this odour level would be clearly perceivable to a test panel).

However, if the odour emission rates are reduced to the values given in Table 4, the 3OU/m^3 198% isoline spread is reduced to fit within a radius of about 70m from the centre of the site, as shown on Figure A.4. This isoline extends outside the site boundary at some points to a maximum of about 1Om. It should be noted that this isoline includes all odour sources, including that from aeration and secondary sedimentation processes which are generally not considered as nuisance odours.

Offensive odours primarily come from sludge sources. Figure A.4 includes odour isolines for odour emanating from sludge sources only, including the situation when a sludge tanker is being discharged. The results indicate that the covering of the sludge-containing vessels and the ventilation of the resulting enclosed air spaces to odour treatment ensure that sludge-related 1 OU/m^3 odour isolines remain within the site boundary. Also the proposed environmental odour standard for the WWTW of 3 OU/m^3 within 20m of the site boundary has been met, and nuisance odours have been contained to the site.

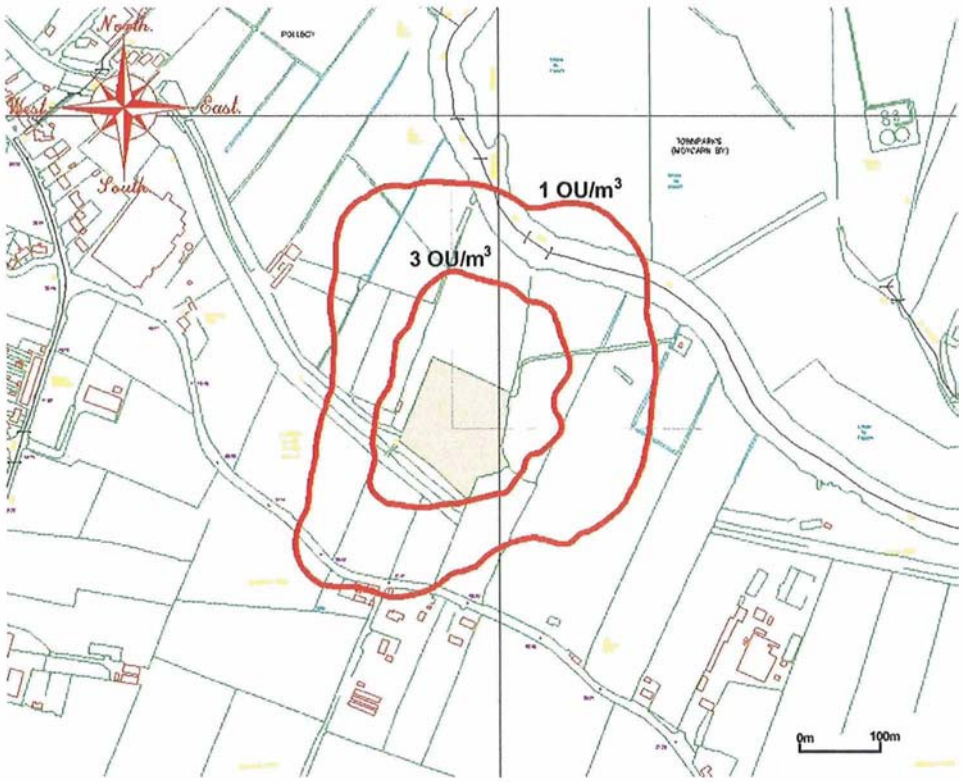

Figure **A.3** Computed extent of odour spread **(1OU/m^3** and **3 OU/m^3)** at the **98% non-**exceedence
Level without odour treatment:

relates to odour spread in the absence of control measures (refer Table 3). Site marked with shading.

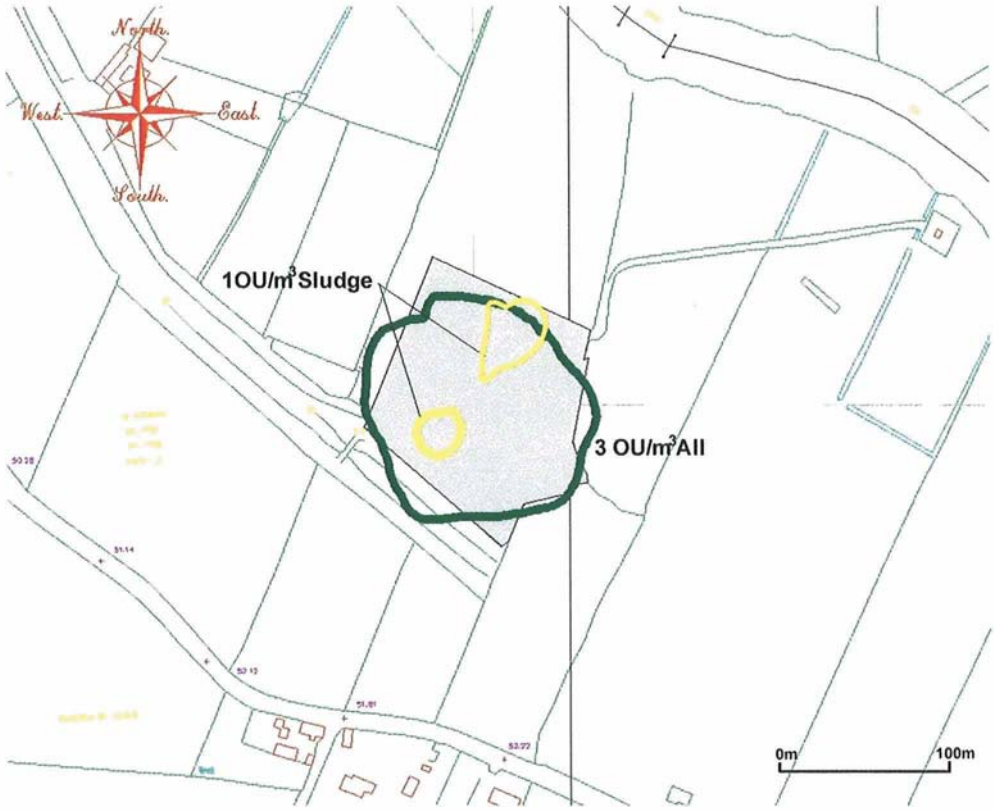

Figure A.4 Computed extent of odour spread at the 98% non-exceedence level with odour treatment: relates to odour spread with control measures limiting odour emission to the level indicated in Table 4. Site marked with shading.
Contours on this figure are:

- 3 OU/m^3 for all sources (in green)
- 1 OU/m^3 for sludge sources only (in yellow)

4. CONCLUSIONS

An environmental odour standard of 3 OU/m^3 at a 98% non-exceedence level within 20m of the WWTW site boundary is considered appropriate to this development. It has been shown by odour dispersion analysis that this standard is achievable by the application of appropriate odour control measures to those processes that generate foul odours. The control measures required are feasible within the economic confines of the BATNEEC principle.

5. RECOMMENDATIONS

(a) It is recommended that an environmental odour standard of 3 OU/m^3 with a 98% non-exceedence level at a distance of 20m outside the WWTW site boundary be set as the odour control goal.

(b) To meet the recommended odour standard, it will be necessary to provide odour control and treatment facilities for all process units that are potential sources of foul odours, including:
- Inlet works/preliminary treatment, including influent pumping, screening, grit separation, treatment and disposal of screenings and grit.
- sludge processing including dewatering, storage, sludge import tank and offsite transport.

(c) The ventilated air should be de-odourised in odour treatment facilities designed to reduce the environmental odour concentration within 20m of the site boundary to a level not exceeding 3 OU/m^3 on a 98%ile basis.

(d) If this proposed level of odour treatment is implemented then the development can be considered as not significant in terms of the degree of impact/significance level.

Professor T J Casey

Revised issue: 07 November 2003

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B

Ballinasloe Wastewater Treatment Plant Upgrade
Environmental Impact Statement

Volume III - Technical Appendices
Visual & Landscape Impact Report

RPS mcos

Landscape and Visual Impact Assessment of

A Proposed Extension to an Existing Wastewater Treatment Plant

At Ballinasloe, County Galway

For

M. C. O'Sullivan

By

MosArt
LANDSCAPE-ARCHITECTURE-RESEARCH

May 2003

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1. Scope and Objectives

MosArt were coinmissioned by M. C. O'Sullivan to carry out a landscape and visual impact assessment of a proposed upgrading of an existing wastewater treatment plant located to the southeast of the town centre of Ballinasloe, County Galway. This report will be included along with others as part of an Environmental Impact Assessment. M. C. O'Sullivan provided MosArt with layout drawings of the proposed development as well as terrestrial photographs depicting the site in context of the surrounding landscape.

The principal objective of this report is to describe and assess the likely landscape and visual impact of the proposed works. The level of significance of impact, if any, will be summarised and appropriate mitigation measures outlined in order to reduce or eliminate potential adverse effects.

2. Description of Proposed Development

Galway County Council propose to upgrade the existing wastewater treatment plant located south of the River Suck, approximately lkm from the town centre of Ballinasloe. The existing plant covers approximately half of the entire site which measures approximately 1.5 hectares and is less than 150 meters away from the river. Existing structures include a number of buildings (administration, ferric dosing and sludge storage) as well as tanks and basins (aeration, clarifiers and sludge holding). The buildings and some of the tanks are approximately single storey in height, while the aeration basins and clarifiers are lower in elevation and without roofs. While some of the buildings are designed to resemble residential units (for example, the administration block), viewers are left in no doubt that the complex is some sort of waste treatment facility (Plate 1).

Plate 1: **View from ridge to the south of existing wastewater treatment plant with the River Suck and edge of Ballinasloe in the background**

The proposed upgrading will involve, in very simple visual terms, an approximate mirroring of what currently exists, locating the proposed new components in that part of the site which is currently undeveloped. In broad outline, the new components will likely involve inlet works, aeration basins, clarifiers, a sludge pumping station and other optional items (refer to design drawings prepared by M. C. O'Sullivan for a detailed schematic). The scale and height of individual components proposed are, in the main, no greater than what currently exists on the site. Therefore, while the upgrading will result in effectively doubling the size of the existing plant, the proposed development does not contrast greatly with what is already there. Unlike the introduction of a wastewater treatment plant in a virgin or undeveloped site, which could cause adverse impact depending upon exposure, character and sensitivity, the proposed upgrading involves expanding upon an existing facility. Accordingly, it can be anticipated that landscape and visual impacts would be low in order of magnitude.

3. Methodology

An outline of the methodology used by MosArt in preparing this impact assessment report is provided below in bullet form:

- MosArt were initially briefed by M. C. O'Sullivan , including presentation of maps and photographs depicting the existing site from nearby locations.
- A site visit was carried out in order to examine visual exposure of the development from nearby (surrounding) locations, with photographs taken as a record of views on offer.
- During the site visit, cognisance was taken of local landscape character and apparent sensitivity as evident to the landscape assessor.
- A summary written assessment of likely impacts was prepared taking potential viewing locations into account and highlighting where, if any, Significant impacts might arise.
- Summary recommendations regarding mitigation measures are presented in order to mitigate any adverse impacts and assimilate the development into the surrounds.

4. Description of Existing Landscape

The landscape context for the proposed development is dealt with below under the headings of landscape character and landscape sensitivity.

4.1 Landscape Character

The town of Ballinasloe is located in east Galway on the banks of the River Suck. This river is navigable up to the eastern edge of the town, from where it connects downstream to the River Shannon. The land immediately flanking the River Suck is very flat as it flows south-eastwards, with the only significant rise in elevation being a low esker-like ridge (Plate 1) which runs parallel to the river before descending again to planar ground a short distance to the east. Aside from atop this low ridge, , long distance views are rare in this landscape. Overall, elevation is low in this part of east Galway, with most of the land being 40m or thereabouts above sea level.

In terms of landcover, the built land comprising the town of Ballinasloe appears to be steadily expanding in all directions, with new housing estates currently under development along many approach roads. The land bordering the River Suck is predominantly used for farming and, judging by the presence of rushes, suffers from regular flooding. The field pattern is one of rectangular elongated fields stretching along a north-south axis towards the river. Land is predominantly used for grazing but tillage ground is not uncommon. Fields are defined, in the main, by stone walls and loose mature broadleaf hedgerows which, in combination with the flat terrain, obscure long distance views. In terms of industrial elements in the landscape, perhaps the

most prominent is the large factory located east of the existing wastewater treatment plant, occupying a commanding position over the River Suck (Plate 2).

The approach lane to the existing treatment plant has a strongly degraded appearance, especially regrettable considering the proximity to the nearby amenity that is the River Suck. Overall the character at this specific location is industrial and unkempt.

In summary concerning the general local character of the Ballinasloe area, this is a strongly human-made or anthropogenic landscape into which developments of low height such as that proposed might not be expected to create Significant adverse impacts.

Plate 2: View southwards over typical landcover towards the River Suck, with a factory located in the centre of the photograph on a low ridge

4.2 Landscape Sensitivity

In terms of landscape amenitiesthe River Suck without doubt the most important feature, providing a navigable connection to the River Shannon and a walking amenity alongside (Plate 3). The recent development of Ballinasloe Harbour, with its floating marina and high quality facilities, provides a valuable opportunity for boating enthusiasts and others to directly enjoy the amenities that are provided by the River Suck and River Shannon beyond. Views from the River Suck in the vicinity of Ballinasloe are generally limited to the foreground, blocked by vegetation to the north, and the low ridge described earlier to the south. Accordingly, as one meanders lazily

downstream from Ballinasloe Harbour, views tend to be dominated by such elements as the existing treatment plant and, more critically, the factory further beyond.

Plate 3: Ballinasloe Harbour and floating marina on the River Suck

Other amenities in the local area include the Ballinasloe Equestrian Centre, located immediately west of the existing treatment plant, and the tennis and sports grounds located to the north of the River Suck just east to the river crossing. Both locations offer views of the River Suck as well as views of the treatment plant site, albeit somewhat filtered by intermediate vegetation.

In summary concerning this section of the report, the assessors deem the most sensitive aspect of the landscape under study to be the River Suck and the important amenity that it provides. Regrettably, the land immediately flanking the river is far from pristine, with the existing treatment plant and factory diminishing the quality of the local landscape to some degree.

5. Assessment of Impact

Sections 5.1 and 5.2 below will assess the landscape and visual impact respectively of the proposed upgraded plant. In the context of this report, the following distinction is made between both aspects:

- Landscape impact assessment concerns the impact of the proposed works at a macro level and considers both the character and sensitivity of the area in which the proposed upgrading is located.
- Visual impact assessment, on the other hand, deals with the specific visual impact likely to arise from the proposed development as experienced by local residents and passer-by. It deals with the impact at a more detailed level and is not particularly concerned with the broad character of the surrounding context.

As will be seen below, MosArt has determined that the overall landscape impact of the scheme is Not Significant (referring to the classification presented later in Table 1), whereas the visual impact ranges from Not Significant to Moderately Significant depending upon the specific location in question. Accordingly, much of Section 5 of this report will focus upon the visual impact rather than the landscape impact.

5.1 landscape Impact Assessment

As mentioned in Section 4 above, the context for the development is interpreted as an anthropogenic landscape comprising farmed land, peri-urban and urban built land, industrial areas and the meandering River Suck. MosArt suggests that the impact upon landscape character, overall, is Not Significant for the following reasons:

- The site location is in the peri-urban fringe of Ballinasloe where developed ground is part and parcel of the character of the immediate landscape.
- If this location were being developed for the first time, a considerable adverse effect might arise due to the impact upon the visual and physical amenity of the River Suck. The site for the proposed works, however, is already a wastewater treatment facility and therefore there will be no great contrast with the surroundings arising from the introduction of additional plant. In addition, as the development will take place on what is already a developed site, there will be no need for removal of scrub or trees.
- While the proposed upgrading will no doubt increase the scale of what currently exists, considerable screening exists in the area so as to reduce visual exposure from many locations. Furthermore, the obliqueness of viewing in the landscape due to the flatness of terrain means that most of the open views of the scheme will be limited in extent to the foreground.

In summary, the overall character of the landscape in east Galway will remain largely unaffected by the proposed upgrading.

5.2 Visual Impact Assessment

This Section of the report forms the core part of the detailed assessment of the proposed upgrading of the Ballinasloe wastewater treatment plant. The procedure used by MosArt in assessing the extent of visual impact is outlined as follows:

- Examining the extent of visibility from habitable private residences, amenities and other places of public gathering within close proximity of the proposed scheme.
- Summarise the level of visual impact as either Significant or Not Significant as defined in Table 1 below. Locations where Significant impact might arise are depicted in Figure B.1 below.

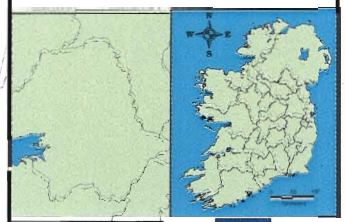
Table 1: General Criteria used to quantify the potential impacts of the proposed scheme

Degree of Impact/significance level (EIS)	EPA definition of Impacts	Definition (EIS)
Severe	Significant Impact "An impact which by its magnitude, duration or intensity alters an important aspect of the environment "	Impacts generally associated with sites, features or populations of national, regional or district importance. Represent key factors in decision making and design process. Typically mitigation measures are unlikely to remove such effects.
Major		Impacts associated with sites, features or populations of district or local importance. Of concern to the project, may become key factors in the decision making and design process. Mitigation measures are unlikely to remove all such effects.
Moderate		Impacts associated with sites, features or populations of local importance. Unlikely to influence key decision making processes but may influence design process Mitigation measures are likely to remove some but not all such effects.
Minor		Impacts associated with local issues. Unlikely to influence decision making process. May influence detailed design. Mitigation measures should remove most such effects.
Not significant	Neutral, Imperceptible or Slight Impact	An impact which does not change the quality of the environment, is capable of being measured but without noticeable consequences, causes changes in the character of the environment which are not significant or profound

Ahead of the assessment results, it is worthwhile to consider at this point the nature of visual impacts which might arise. It is not just the introduction of the plant itself into the landscape which can cause adverse effects, but also the commissioning and operation of that plant. The construction of the upgraded plant will introduce structures into what is currently a grassed area and could potentially erode the quality of views on offer from, for example, the River Suck. The operation of the plant, on the other hand, involving the possibility of seeing swirling pools of waste matter, is perhaps a more critical impact. Put simply, it would be hard to argue that views into wastewater treatment plants are of high aesthetic quality.

Legend

Significant Visual Impact



Galway County Council

Ballinasloe Town Council

Project
Ballinasloe WWTP - EIS

Title
Visual Impact

Figure B.1

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Issue Details

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Views from the south
Views of the proposed scheme from the south are potentially available along the third class road located on a low ridge at Pollboy. Along this road are located a number of one-off houses on private sites and a small recently developed housing estate. The only house with a full open view of the site is the one closest to Ballinasloe centre and located on the northern side of the third class road (Figure B.l). Otherwise, residents along this road would have at most a filtered view of the upgraded works or no view at all due to intermittent screening by vegetation or landform. Filtered views arise where the site is partially screened by either nearby vegetation or, indeed, existing plant or buildings located on the site.

In summary concerning views from the south, the impact is classified as Minor Significant (referring to Table 1 above) where open exposure arises and Not Significant elsewhere.

Views from the west and northwest
The closest point of possible public viewing from the west is at the Ballinasloe Equestrian Centre. The view from this location is classified as filtered, due principally to the location of intermittent screening coupled with the obliqueness of viewing. Nevertheless, the increased scale of the treatment plant will doubtless be perceived by users of the Ballinasloe Equestrian Centre. Otherwise, houses located along the access road leading down to the treatment plant have no views of the site.

Also included in this sub-section are potential views from the town centre of Ballinasloe and Ballinasloe harbour, located to the northwest of the site. Considering firstly the town centre, there will be no views of the upgrading works from street level due to the obliqueness of view and presence of intermittent screening by hedgerows and buildings. Filtered views (at worst) might be available from Ballinasloe Harbour, on the other hand, although in reality the additional structures proposed would be difficult to perceive through the hedgerows and copses of trees.

In summary concerning views from the west and northwest, the impact at the equestrian centre, given its amenity value, is described as Significant, albeit at the level of Minor. Elsewhere, the impact is deemed to be Not Significant.

Views from the north
Views from the north are provided from the navigable waters of the River Suck as well as from the residential and urban areas flanking the N6 and the R357. An open view of the proposed upgraded plant will be provided from the River Suck. Due to the close proximity of viewing, it will likely be possible to see most if not all of the equipment proposed. While close-up views are already provided of the existing wastewater treatment plant, the increase in the scale of the facility would result in an adverse impact. The plant may be perceived to impact adversely upon the peace and tranquillity of the navigable waters, although this sense is already eroded by the presence of the factory located downstream. There is practically no screening presently between the site and the River Suck and the planting of even a narrow hedge would mitigate any adverse impacts considerably (refer to Section 6).

Other views from the north include those provided from private houses and other buildings located along the N6 and R357 (including, for example, Saint Bridget's Hospital, Arus Banaltra and a school). In the main, only filtered views of the existing plant are afforded from these

locations due to intermittent screening provided by mature hedgerows[1]. A large housing estate located further east along the R357, Greenhills, is also mostly screened by mature trees with little or no visual exposure provided.

Regarding visual impact from the north, only that found along the River Suck is classified as being Significant, albeit at the level of Moderate. Otherwise, the impact from the north is deemed to be Not Significant.

Views from the east

The only open view of any major relevance of the existing plant is from the River Suck, the impact of which has been described above as being Significant at the level of Moderate. Otherwise, views from the east are not dealt with further in this report.

6. Mitigation Measures

The impact of the proposed scheme upon landscape is deemed to be Not Significant. Visual impact, on the other hand, has been classified in this report as being Significant from three locations (Figure B.1), as follows:

- Private house to the south
- Equestrian centre to the west
- River Suck to the north.

The objective of proposing mitigation measures is to attempt to reduce the level of visual impact at the above three locations from Significant to Not Significant. Due to the relative flatness of terrain, this can most easily be achieved by creating screening using tree planting (although elevated views over the plant are provided from the private house depicted in Figure B.1 making screening more difficult).

At present there exists very little tree planting on the grounds of the wastewater treatment plant. MosArt recommends that the site be evaluated in terms of identifying open space for tree and shrub planting and that the following species are used in order to mitigate adverse impacts:

- Fraxinus excelsior (common ash)
- Crataegus sp. (hawthorn)
- Prunus spinosa (blackthorn)
- Salix sp. (willow)
- Sambucus nigra (common elder).

The most critical locations for tree planting are along the northern, eastern and western boundaries as there exists considerable tree screening immediately to the south. If space is limited for planting, even a staggered hedge of randomly arranged different species would be of considerable benefit.

In addition to tree and shrub planting, two other mitigation measures are proposed which would help in reducing adverse impacts, as follows:

- Overall tidiness – judging from photographs taken within the site provided by M. C. O'Sullivan, there may be scope for removing unnecessary clutter such as pipework not required in the plant.

[1] It should be noted that access to the rear (southern) gardens of private houses was not gained and thus visibility had to be estimated

- It would be preferable to use a sand and cement render finish rather than red brick in the construction of buildings or walls, the latter being more intrusive in the landscape and typically associated with contemporary one-off houses rather than industrial developments.

Assuming successful achievement of mitigation measures recommended above, MosArt estimates that the level of impact could be reduced, in the long term, to Not Significant from all locations.

7. Summary and Conclusion

MosArt have concluded in this report that the level of impact upon landscape of the proposed upgrading will be Not Significant and that the level of visual impact will only be Significant from three locations and at worst at the level of Moderate. The reason for anticipating such relatively low adverse impact is principally due to the fact that there already exists a wastewater treatment facility at the location proposed for upgrading. Therefore, this is not a pristine landscape, but rather one which already accommodates a sizeable development near the shores of the River Suck. However, that is not to say that the proposed scheme would develop totally unnoticed, as there are some locations to the south, west and north which provide relatively open views in close proximity. Mitigation measures have been proposed to specifically address the impact at these locations and, if successful, could reduce the overall impact of the scheme to Not Significant over time.

C

Ballinasloe Wastewater Treatment Plant Upgrade
Environmental Impact Statement

Volume III - Technical Appendices

Noise Impact report

RPS mcos

Environment Department

CONFIDENTIAL REPORT

Client:

M C O'Sullivan,
Consulting Engineers
Carnegie House
Library Road
Dun Laoghaire
Co. Dublin

Title:

Ballinasloe WWTP upgrade
Environmental Impact Study
Noise and Vibration Aspects

Report Ref:	134699	Report by:	Larry Kenny
File no:	R.6/0021OM	Approved by:	Martin Reilly
Order No:	MDEO1430019ltDUN	Issue Date:	5th November 2003.

1 INTRODUCTION

1.1 This report was undertaken at the request of M.C. O'Sullivan, Consulting Engineers for the upgrade of the Ballinasloe Wastewater Treatment Works. The object of this report is to present the noise and vibration aspects of the Environmental Impact Study for the Scheme.

1.2 The principal noise-emitting element of the proposed scheme is the additional treatment works to be constructed on the adjoining land immediately west of the existing works, and within the existing boundary fence. It is proposed to provide additional aeration tanks with 'fine bubble diffusion in the tanks, and replace the existing surface aerators with the same system. The surface aerators are the existing major source of noise. Noise measurements were made on the site and at a number of residences in the area. A location plan is shown in figure C.1.

1.3 Sound levels are measured in units called decibels (dB), and noise is defined as unwanted sound. Environmental noise levels are usually assessed in terms of A-weighted decibels, the dB(A). The A-weighting approximates to the response of the human ear. Industrial, occupational and environmental noise are usually expressed in equivalent continuous levels, $L_{Aeq,T}$. This is based on the energy average level over the relevant time interval. Environmental noise may be corrected for tonal or impulsive characteristics and the unit is the rating level, $L_{Ar,T}$. Statistical parameters showing the time varying nature of environmental noise are also used as noise descriptors.

1.4 The construction phase of the development will give rise to noise, some of which will be perceptible off-site. There will be no vibration effects off-site.

2. SUMMARY

2.1 The construction and operation of the upgraded wastewater treatment plant can be undertaken without undue impact on the noise environment. There will be no vibration perceptible off-site.

2.2 The impact of the noise due to the operation of the proposed development is defined as 'significant beneficial impact'. The impact of the noise due to the construction of the proposed development is defined as 'temporary moderate impact'

3. EXISTING ENVIRONMENT

3.1 Ballinasloe Waste Water Treatment Plant (WWTP) is located on relatively low-lying land near the River Suck. The nearest houses, c.110 metres south of the Plant on a ridge, are designated A (one-storey), and A1 (two-storey) in figure C.1. These houses are set back from the brow of the ridge and partially screened by the road and verge. House B is located c.120 metres southeast, and with a clear view, of the Plant. A residential estate across the River, location C, is c.170 metres distant.

3.2 Baseline daytime and night-time noise measurements were made at the locations 1-3 shown in figure C.1. The microphone height was 1.5 metres above local ground level and the instrumentation consisted of CEL and Larson Davis Environmental Noise Analysers, with calibration checks being made with a B&K type 4230 sound level calibrator. The following parameters were measured.

- $L_{Aeq, T}$ the equivalent continuous noise level for the measurement period. This parameter is very sensitive to local high-level short time sources, e.g. local traffic, etc.
- $L_{A01, T}$ the sound level equalled or exceeded for 1% of the measurement period, the maximum levels.
- $L_{A10, T}$ the sound level equalled or exceeded for 10% of the measurement period, the parameter usually used for traffic noise assessment.
- $L_{A90, T}$ the sound level equalled or exceeded for 90% of the measurement period. This level is sometimes taken to represent the "background noise level.

3.3 The measurement results are shown below. The principal noise sources audible at location 1 and 2 were the WWTP surface aerators (and supplementary spiral aerators), with distant traffic at night, and local and distant traffic by day. The principal noise source audible at location 3, both day and night, was a Factory south east of this location.

Baseline Measurement Results

Location 14 May 03	Time start	Duration minutes	L_{Aeq} dB	L_{A01} dB	L_{A10} dB	L_{A90} dB	Comments
1	01:30	15	39.5	42.0	40.5	38.0	WWTP & distant traffic
	01:45	15	41.4	46.0	41.0	38.5	WWTP & distant traffic
	09:50	30	55.6	69.0	46.0	40.5	WWTP & 8 local cars
2	02:05	15	43.5	45.5	44.5	43.0	WWTP & distant traffic
	10:25	20	47.9	55.0	49.0	45.0	WWTP & local traffic
3	00:30	15	48.4	51.0	49.5	46.5	Factory noise
	00:45	15	49.1	51.5	50.0	47.5	Factory noise
	11:25	15	46.8	51.0	48.5	43.5	Factory noise (reduced)

4. PROPOSEDDEVELOPMENT

4.1 The major items of plant in the existing treatment works, the surface aerators, operate continuously. There are two in the existing plant. Phase 1 of the development will replace the surface aerators with diffusion type aerators, and add another diffusion type aerator tank. Phase 2 will add a second diffusion type aerator tank. The existing spiral aerators are an interim measure and will be removed as part of the Phase 1 Upgrade. The proposed sludge reception facility will receive a maximum of 2 tankers at any one time and during only during the daytime. The noise emission of the tankers discharging to the sludge reception facility will be of a short duration. The discharge of the tankers to the works should not cause the WWTP to exceed the daytime limits for existing residences.

4.2 Noise measurements of the current facility gave the following results:

Aerator Tanks

West tank, above edge of tank, 1.5m	74 dB(A)
East tank above edge of tank, 1.5m	73 dB(A)

Dewatering building

At entrance, fans on (daytime only)	48 dB(A)

4.3 Noise measurements were made at the boundary of the WWTP and the results are:

Location 14May03	Time start	Duration minutes	L_{Aeq} dB	L_{A01} dB	L_{A10} dB	L_{A90} dB	Comments
At gate	01:10	5	47.9	49.0	48.5	47.0	Aeratornoise
At gate	11:05	5	49.3	56.5	51.0	46.5	Aerator noise, birdsong

4.4 Noise measurements made at a diffused aerator plant at Greystones, Co. Wicklow, and the results were:

Aerator Tanks

Above edge of tank, 1.5m	50 dB(A)
20 metres from tank,	40 dB(A)

Decanter centrifuge

10 metres	50 dB(A)
40 metres	40 dB(A)

Compressor Building

10 metres	38 dB(A)

4.5 The air blowers and the sludge treatment plant will be housed in buildings of concrete construction. All air openings required for the plant will have attenuators sized and specified in terms of meeting the external night time noise criterion.

5 CRITERIA

5.1 Due to the continuous nature of the plant operation the night-time operation is of major importance, as this requires a lower limit than daytime. There are no statutory limits for environmental noise emissions for this type of plant, or industry in general, in this country.

5.2 In general, noise is likely to provoke complaints when its level exceeds the level of the background noise level by a certain margin or when certain absolute levels are attained. The criteria for industrial noise generally lie in the range 40-45 dB(A) at night and 50-55 dB(A) by day. Currently the most widely applied criteria for Industry are that of 45 dB(A) (night-time) and 55 dB(A) (daytime) with no impulsive or tonal characteristics.

5.3 Selection of the preferred noise criteria values within the range of values above depends on the pre-existing noise levels, the character of the area and the nature of the development. Taking the above into account and the existing "background" noise at the proposed location we propose the following criteria as being appropriate for minimal impact on the noise environment:

Existing residences

Night: 45 dB $L_{Aeq,\ 15\ mins}$

Day: 55 dB $L_{Aeq,\ 30\ mins}$

5.4 These are limit values for the noise from the proposed plant measured outside any dwelling. There should be no significant pure tones or impulsive elements in the noise spectrum of the emissions from the plant. The noise characteristic associated with plants of this nature is generally perceived as being of a broadband unobtrusive character.

6. IMPACT OF PROPOSED DEVELOPMENT

6.1 Diffused type aerator noise emission, based on the measurements reported herein, is over 20 dB(A) less than the current surface aerator installation. The noise immission at any residence due to the development is expected to be significantly less than the criteria or the current noise levels.

Construction

6.2 As construction work is of a temporary nature, the resulting higher noise levels are usually acceptable. British Standard BS 5228: 1997 on Noise Control on construction and demolition sites provides guidance on the methods available to control noise from construction work and is used on road and other large scale construction projects.

7. ASSESSMENT

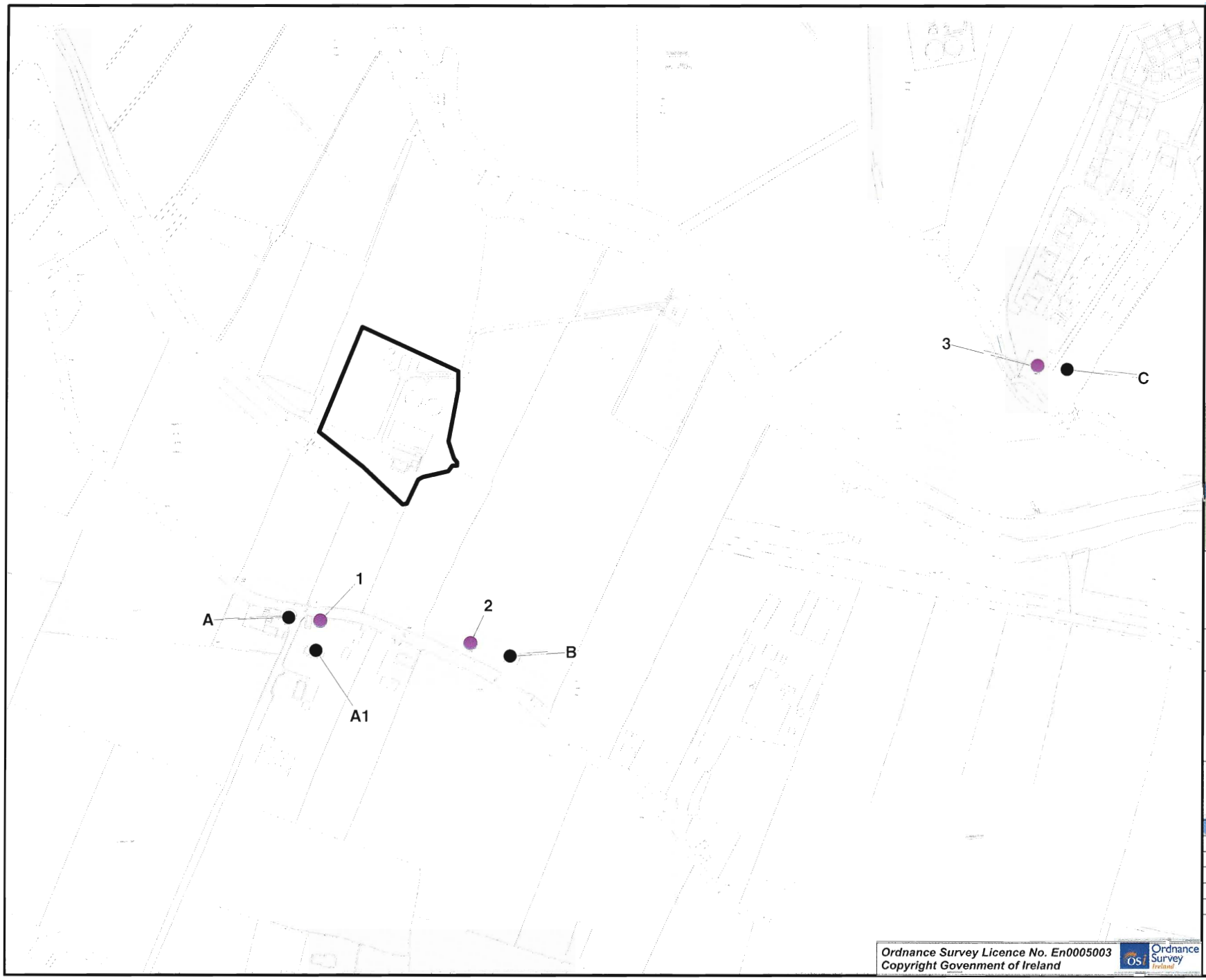
7.1 The construction and operation of the Treatment Plant and other facilities can be undertaken without undue disturbance to local residents. The sound from wastewater facilities is broadband in character and the noise emission will be less than the current values. The installation of a diffused aeration system in place of the existing aerators greatly reduces the noise emissions from the WWTP. Noise control measures will be built into the design of the WWTP with particular regard to the concrete building housing the air blowers for the diffused aeration system. The Upgrade of the WWTP will comply with the limits given for existing residences as follows:

Night: 45 dB $L_{Aeq,\ 15\ mins}$

Day: 55 dB $L_{Aeq,\ 30\ rnins}$

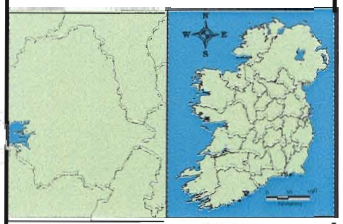
7.2 The impact of the WWTP Upgrade may be defined as:

Proposed development	Significant beneficial
Construction Phase	Moderate, temporary adverse



Legend

- Residence
- Measurement Location
- Site for Development



Galway County Council

Ballinasloe Town Council

Project
Ballinasloe WWTP - EIS

Title
Location Map of Residences Monitored for Noise Impact

Figure C.1

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Ballinasloe Wastewater Treatment Plant Upgrade
Environmental Impact Statement

Volume III - Technical Appendices

Archaeological Report

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Statutory Bodies: National Monuments and Historic Properties Division,
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Any recommendations contained in this report are subject to the ratification of the National Monuments and Historic Properties Division, Dúchas.

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FIGURES

1. Site location map (see Figure D.1)
2. Extract from First Edition Ordnance Survey map for Co. Galway, sheet no. 88.
3. Extract from Third Edition Ordnance Survey map for Co. Galway, sheet no. 88.
4. Extract from Sites and Monuments Record sheet no. 88, Co. Galway.
5. Plan of proposed development (see Figure 1.2).

PLATES

1. View of site of proposed development from south-west.
2. View of site of proposed development from north-east.
3. View of existing aeration basins from west.
4. View of existing clarifiers from north-east.

II ABBREVIATIONS AND TERMS USED IN TEXT

Barony, Parish, Townland *These terms refer to land divisions in Ireland. The barony is the largest land division in a county, wlziclz is formed from a number of parishes. These parishes are in turn made up of several townlands, which are the smallest land division in the country. The origins of these divisions are believed to he in the Early Medieval/Christian period (AD500-AD1000), or may date earlier in the Iron Age (500BC-AD500).*

First Edition *Tlzis relates to editions of the OS 6 inch maps for County Galway. The first edition map completed for the area dates to the early 1840s and this is referred to in the text as the 'first edition'.*

GA *- Tlzis number is the number of the site on the SMR/RMP map (see below). It begins with the county code, here GA for Galway, the 6-inch slzeet number, followed by the number of the arclzaeological site.*

M Metres, all dimensions are given in metres or part of a metre

OS *Ordnance Survey*

RMP Record of Monuments and Pluces. A record on wlziclz all known arclzaeological sites are marked and listed in an accompanying inventory. This resource is based on all publicly available material and cartographic sources and is read in conjunction with constraint maps. The RMP records known recorded monuments and the sites of such monuments (if the monument no longer survives).

Sheet *Tlzis relates to the six-inch map for county Galway, wlziclz are divided into sheets. Tlzis project is concerned with sheet number 88.*

1. INTRODUCTION

1.1 GENERAL INTRODUCTION

The following report was compiled at the request of MCOS Consulting Engineers on behalf of Galway County Council. It concerns the archaeological assessment of a proposed upgrade of the Ballinasloe waste water treatment plant. As outlined by MCOS, the upgrade of the plant is required to, (a) treat the leachate from the Pollboy landfill site, and (b) to cater for the development of the town of Ballinasloe over the next twenty years.

1.2 ARCHAEOLOGICAL BRIEF

The writer was contacted by MCOS Consulting Engineers to undertake an archaeological study in the townland of Pollboy. The report details the archaeological significance of the area in general and in particular that area of land which comprises the site of the proposed development.

The following items were to be addressed by the archaeological assessment:

1) The nature, extent and locations of archaeological material on the site of the proposed development.

2) Where archaeological material is shown to be present, archaeological recommendations will be included within the report highlighting the potential impact of the proposed development on the archaeology within the site.

1.3 ARCHAEOLOGICAL SURVEY

The survey consisted of the following three phases:

Plzase One: Paper Survey

Cartographic sources such as the Ordnance Survey Maps of 1837 and 1937 and earlier antiquarian maps of the area were examined.

- The Topographical files of the relevant townlands in the National Museum of Ireland were examined with particular attention paid to stray finds.

Plzase Two:

The second phase consisted of a detailed field inspection of the entire area of the proposed development. This allowed the opportunity of first hand observation of the terrain, which can often result in the discovery of hitherto unrecorded sites and finds.

Plzase Tlzree:

Phase three involved the collation and assessment of the material and the production of a report on the conclusions. This includes the potential impact on any archaeological features in the general environs of the proposed development. Hitherto unrecorded sites are often discovered in the course of fieldwalking. Archaeological monuments in the adjoining townlands of the sites were recorded so as to understand the type of archaeological landscape.

1.4 LOCATIONAL DETAILS

Townland	Pollboy	**Parish**	Kilcloony
Barony	Clonmacnowen	**OS 6" Sheet No.**	88

1.5 GENERAL HISTORICAL BACKGROUND

The town of Ballinasloe derives its name from *Beál Átha na Sluaighe*, the mouth of the ford of the hostings. Ballinasloe is situated on the River Suck, dividing the town into two unequal portions, the smaller of which is in county Roscommon. Queen Maeve of Connacht and her champion Ferdia are reputed to have rested here during their journey northwards to meet the legendary Ulster hero Cuchalain in combat, as depicted in the *Táin Bo Cuailnge,* the cattle raid of Cooley. This tale dates back to the beginnings of Christianity in Ireland (Spellissy 1999). In the county Galway section the town was built in the townland of Dunlo, which acquires its name from *Dúnleodha*, the fort of Leodha. This was probably a ringfort, which predated the castle built by Turlough O'Connor in 1124. Six years later Turlough became king of Connacht and soon afterwards built a bridge across the river at Dunlo. The castle was not constructed from stone as it was *'burned by casual fire'* in 1131. The small settlement which development around the castle and the bridge seems not to have been important until the latter half of the sixteenth century (Spellissy 1999, 267). In 1582 Sir Henry Sidney, lord deputy, records that *'I caused a bridge to be begun at tlzat time (c. 1570) over tlze great river Sowke, hard by tlze castle of Balisloglz which since was perfected by tlze wortlzy soldier, counsellor and colonel, Sir Nicholas Malby, who finished my work, and a good work for, after I lzad settled him in tlzat province, I lzad no cause to care for that province as it well proved by valiant overthrows of tlze rebels'* (O'Keeffe and Simington 1991, 196).

The townland of Pollboy is located in the parish of Kilcloony. The name 'Pollboy' comes from the Irish *Poll Buí*, meaning 'Yellow Hole' or 'Yellow Pool' (Flanagan and Flanagan 1994, 130). The medieval parish church is situated two miles north-west of the town of Ballinasloe. The church is also known as Pollboy Monastery and was reputedly a cell of Clontuskert Abbey, but this is refuted by Gwynn and Hadcock (1970). In 1837 Lewis referred to the village of Pollboy as Poolboy and noted '*the ruins of a priory, of which no account is extant; and a sclzool supported by the Earl of Clancarthy*' (Spellissy 1999, 275).

The Grand Canal runs from the east of Ireland into the town of Ballinasloe. The Commissioner of Inland Navigation was established in 1751. Work commenced on the Grand Canal Scheme in 1756. By 1824 work began on the Ballinasloe branch and in 1828 it was opened to traffic (www.iwai.ie). Through access to the Shannon and Barrow rivers, the Grand Canal provided Ballinasloe with direct communication to Dublin, Limerick, Athlone, Tullamore, Carrick-on-Shannon and Waterford. By 1850, with the advent of the railroads, passenger numbers on the Canal were decreasing, so that by 1852 passenger services were terminated. By 1923 inefficient dredging had reduced the depth of the canal resulting in barges being unable to carry their quota of cargo, while the facilities for loading and unloading were inadequate. In 1950 the Canal Company was merged with Coras Iompair Eireann, with CIE concentrating on road and rail transport. Canal barges were withdrawn in 1959, with Guinness' Brewery being permitted to keep barges until 1960 (Spellissy 1999, 275-6). In 1961, the Ballinasloe branch was officially closed to navigation, as were the Mountmellick, Kilbeggan and Naas branches (www.iwai.ie).

1.6 TYPES OF MONUMENTS ENCOUNTERED IN THE VICINITY OF THE PROPOSED DEVELOPMENT

Ringforts

The construction of ringforts in Ireland dates from the early Christian/medieval period (*c.*500 AD to 1170 AD) and possibly continued up to the seventeenth century. Rath is the term applied to those ringforts of earthen construction, while cashel refers to those constructed from stone. A ringfort generally consists of a circular, subcircular, oval or D-shaped area, enclosed by one or more banks of earth or stone, or a combination of both. Earthen ringforts usually have an external fosse surrounding the bank, and a causewayed entrance giving access to the interior. The bank is generally built by piling up inside the fosse, the material obtained by digging the latter. The function of ringforts was generally as enclosed homesteads, with the defences protecting the houses and outbuildings in the interior, but they may also have been used for social gatherings.

Enclosures

Enclosures are usually distinguished on the basis of their anomalous characteristics, such as their large or small size, or lack of entrance features, which sets the apart from ringforts or other classifiable enclosures. The term usually refers to a site which consists of an enclosing bank surrounding a circular or subcircular area, and with no apparent entrance. Due to the lack of diagnostic remains it is difficult to suggest a period of construction or use for the monuments. Occasionally, the enclosures are surrounded by a ring of trees. The function of these sites is indeterminable from visual inspection alone, that is, without excavation due to the lack of identifiable features. Sites which are now destroyed but which have been detected on aerial photographs, marked on various Ordnance Survey maps or locally described as circular or subcircular areas defined by banks and/or fosses are usually categorised as enclosures.

Churches

Medieval churches, which often incorporate the fabric of early christian churches, are distinguished on the basis of their ground plan and date. Nave and chancel churches are dated to the twelfth to thirteenth century, while single-celled churches are assigned a thirteenth to seventeenth century date. The single-celled churches were generally orientated east/west and were entered at the west end of either the north or south wall. Some churches had opposing doorways at the west end of the church. These churches may also have had a subdivision at the west end of the church, in the form of a cross-wall, or the presence of corbels or beam-holes which indicate the former presence of a loft. These quarters comprised the accommodation for the parish priest.

Children's burial ground

These sites are usually found either in isolation or associated with other monuments such as enclosures and are characterised by the presence of numerous small, uninscribed set stones, often arranged in rows.

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Kelly 1991, www.excavations.ie

www.iwai.ie (Inland Waterways website)

2. RECORDED ARCHAEOLOGICAL SITES IN THE VICINITY OF THE PROPOSED DEVELOPMENT

The following archaeological monuments in the surrounding townlands are included to highlight the type of sites which survive in the general area of the proposed development (Figure D.l). It should be stressed that **none of these monuments will be directly affected by the proposed development.**

Townland	Archaeological Site Type	SMR
Cloonascragh Dunlo Kellysgrove Pollboy	Canal	88:10
Kilgarve	Enclosure	88:17
Pollboy	Church & children's burial ground	88:20
Pollboy	Mill	88:21
Portnick	Ringfort	88:27

CLOONASCRAGH, DUNLO, KELLYSGROVE & POLLBOY

SMR GA88:10

Location Details

Classification: Canal **OS Sheet:** 88

Plan: **Trace:**

National Grid Ref.:

Site description The canal was constructed throughout the eighteenth and nineteenth centuries, and is a feature of industrial archaeological importance. In county Galway it traverses the townlands of Cloonascragh, Dunlo, Kellysgrove and Pollboy. It was backfilled in recent years and is identifiable from the surrounding pasture land as a length of rough scutch grass. At Pollboy Bridge both sides of the canal are visible and it is constructed from well-coursed bands of rectangular limestone blocks which are cut and dressed. Accordingly, it may be conjectured that the entire length, or at least some of the canal may also have been constructed with cut stone.

KILGARVE

SMR GA88:17

Location Details

Classification: Enclosure **OS Sheet:** 88

Plan: 1 **Trace:** 6

National Grid Ref.: 187]8123054

Site Description: The large, unclassified enclosure is located on the eastern outskirts of the town of Ballinasloe. It is a subcircular enclosure (east-north-east/west-south-west 80.5m, south-south-eastlnorth-north-west 78.3m) in fair condition and is defined by an eroded earthen bank/scarp and a wide external fosse. The bank is visible from west-north-west through north to east-south-east. From east-south-east to south a field boundary seems to have been constructed on the line of its inner face. A quarry pit has been dug at south-south-west, outside of which is a shed. A scarp comprises the enclosing element from south-south-west to west-north-west. The fosse survives from north-north-west through north to east-south-east. There are a number of gaps in the bank, but that at north-north-east, which is 7m in width and with a corresponding causeway across the fosse may represent the original entrance. Outcropping rock is visible in the interior.

POLLBOY

SMR GA88:20

Location Details

Classification: Church and CBG **OS Sheet:** 88

Plan: 5 **Trace:** 3

National Grid Ref.: 18692122970

Site Description: The church is located in marshy land close to the southeastern limits of the town of Ballinasloe, on the east bank of the Grand Canal and 400m west of the River Suck. The church is identified locally as 'Tlze *Teampoilin*' and is reputedly a cell of Clontuskert Abbey. The remains of the church are heavily overgrown. It measures 16.1m eastlwest and 6.6m north/south. A section of the north wall has been replaced by a modern concrete wall, but the other three walls seem to

survive to their original height. The church is constructed on a plinth and has a marked base batter. In 1960 Egan noted *'corbel stones project[ing] from the four corners of the gables'*, but they were not visible during the survey in 1985 as the walls were ivy-covered. The original doorway, which is tall with a pointed arch is positioned at the west end of the south wall. Also in the south wall there is a single-light window, two aumbries and a possible sedilia, while in the east gable there is a twin-light ogee-headed window flanked by two aumbries. There are traces of a window visible at the east end of the north wall. At the west end of the church there are three pairs of beam-holes on the interior of the north and south walls, which probably represents the accommodation for the priest. According to Egan the priests' apartment was lit by *'two small rectangular lights'* high up on the north and south walls, but no trace of them were noted by the Archaeological Survey in 1985. Apart from the children's burial ground (CBG) located in the interior of the church, there is no trace of a graveyard or enclosing wall, but the church is delimited by a scarp from south through west to north. The CBG is situated in the eastern half of the church. It is comprised of irregular lines of limestone blocks, indicating graves orientated ease/west. An inscribed slab, dedicated to an infant and positioned under the south window is dated to 1828. Local tradition notes a togher running from the church to the abbey at Clontuskert.

POLLBOY

SMR GA88:21

Location Details

Classification:	Mill	**OS Sheet:**	88
Plan:	6	**Trace:**	4
National Grid Ref.:	18732122926		
Site Description:	------		

PORTNICK

SMR GA88:27

Location Details

Classification:	Ringfort	**OS Sheet:**	88
Plan:	5	**Trace:**	3

National Grid Ref.: 18718/23011

Site Description: This univallate ringfort is located in level grassland, 300m north of the River Suck. It is a poorly preserved subcircular rath, (east/west *c.* 23m, north/south *c.* 20m). It is defined by a bank and external fosse. A number of field boundaries cut the enclosing elements.

*Site descriptions taken from Alcock *et al*, 1999, *Arclzaeological Inventory of County Galway: volume 2 North Galway.*

3. RECORDED ARTEFACTS IN THE VICINITY OF THE DEVELOPMENT

The following archaeological artefacts are included to highlight the type of archaeological activity in the area and the importance of archaeological monitoring as stray finds are frequently found in the course of monitoring of groundworks. A study of the topographical files in the National Museum of Ireland yielded the following archaeological artefacts:

Location Pollboy (1940)

Decorated bronze axe with slight side flanges and stop-ridge found at river crossing in Pollboy.

Location Pollboy (1958)

A polished stone axehead found in the River Suck at the ford of Pollboy, on the border between counties Galway and Roscommon.

Location Near Ballinasloe in River Suck (1986)

A leaf-shaped bronze spearhead which has been broken and damaged in antiquity. The lower part of the socket (containing the peg-holes) has been broken off at the point where the blade springs from the socket. Part of the blade and socket at the upper end has been severely dented and the edge of the blade it torn. The cutting edges are bevelled. Maximum surviving length-14.6cm; maximum width of blade-3.48cm; maximum depth of socket-1.97cm.

Found during drainage of the River Suck.

Location Near Ballinasloe in River Suck

A bronze disk with notched butt and bun-shaped top. The blade nan-ows from the butt and then widens slightly and narrows again to a point. The section is a flattened lozenge shape. The object is in good condition except for some slight damage to the edges of the blade. It belongs to Burgess Class IV or Trump-Lisburn Class. Overall

length-24.35cm; maximum width-3.65cm; width of blade at mid-point-1.53~111; maximum thickness 4mm.

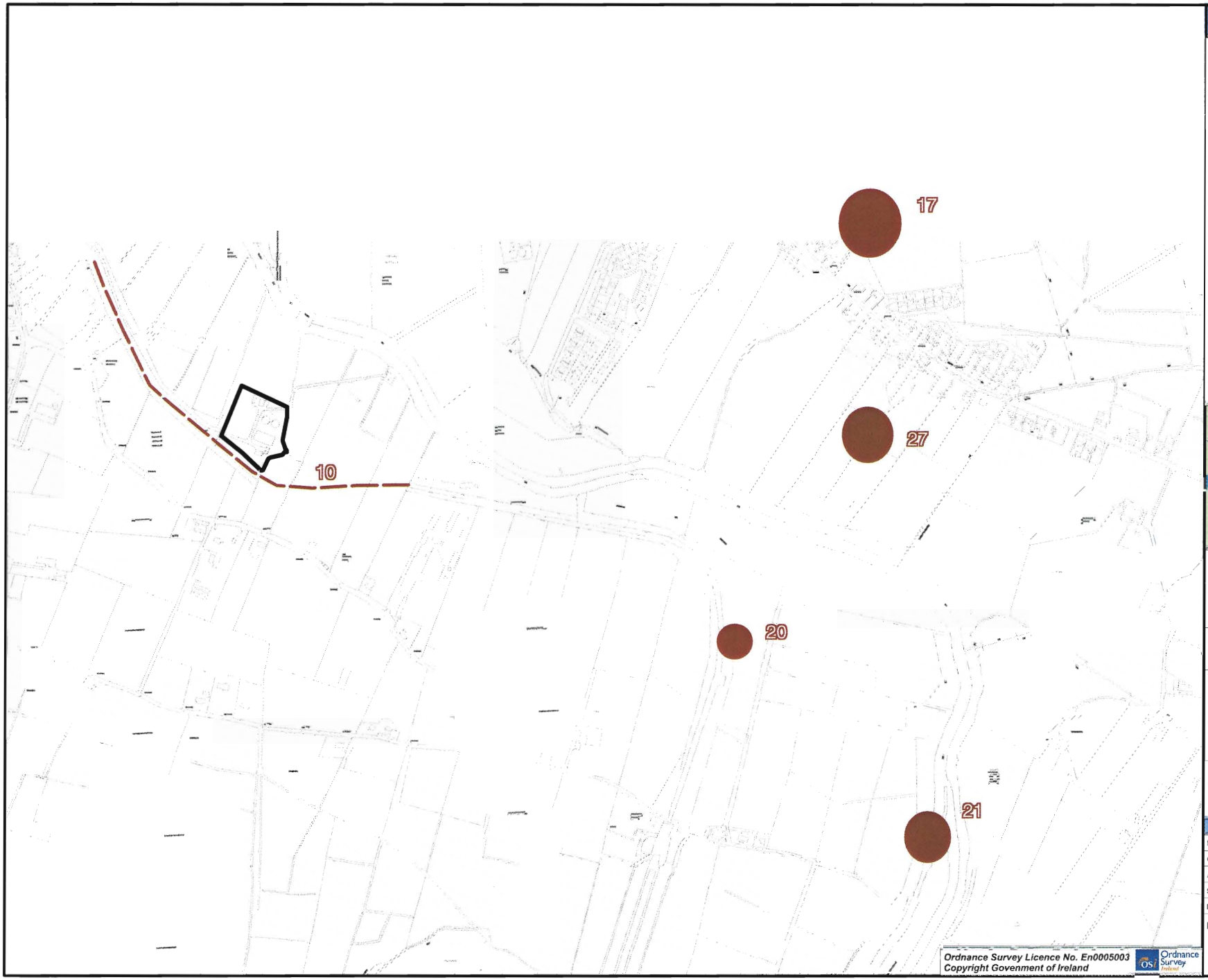
In 1990 portions of the bed of the River Suck in the area of Reilly's Ford and Pollock's Ford in the townland of Kellysgrove, were searched by the Irish Underwater Archaeological Research Team (Kelly 1991, www.excavations.ie). Artefacts recovered (mainly in the pool below Reilly's Ford) included a seventh/eighth century iron sword and iron spearhead and a tenth-century Viking axe. A sword of Irish type, dated to the sixteenth-century was also retrieved. Parts of the scabbard,,..includingthe chape survived (Kelly 1991, www.excavations.ie).

4. ARCHAEOLOGICAL ASSESSMENT

The site of the proposed development, at the existing waste water treatment plant is located in the townland of Pollboy, on the southeastern outskirts of the town of Ballinasloe, Co. Galway (Figure 1.1). The landfill which it will facilitate is located to the south-south-west. The proposed development is located within the existing boundary of the treatment plant. The River Suck flows to the north-east of the treatment plant, and receives the treated effluent from the plant (Plate 1, river visible in centre). The Grand Canal (SMR GA 88:10) is located approximately 100m to the south of the treatment plant.

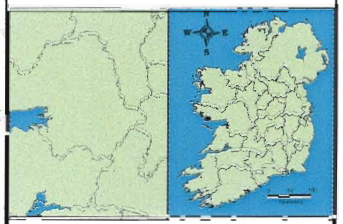
The site of the proposed upgrade is located to the immediate north-west of the existing treatment plant, separated by a roadway. The planned upgrade to the waste water treatment plant is to be iinplemented on a phased basis as outlined by MCOS, and is to include (a) new aeration tanks, (b) new settling tanks, (c) new sludge holding tanks and, (d) dewatering facilities for a full design capacity of 18,000 PE (the current capacity of the treatment plant is 9,000 PE).

The waste water plant currently comprises two clarifiers and aeration basins which are situated on an elevation position, with associated buildings and tanks to the north-east and south-west (Figure 1.2 and Plates 3-4). The proposed works include an inlet works and leachate rising main, to be located on the green area on the southwestern side of the plant. It is also proposed to construct an outlet flume at the southeastern end of the plant. The site of the main proposed works comprising aeration basins and clarifiers will be situated on a green area within the waste water treatment plant, which is currently being maintained as a lawn, with kerb surround (Plates 1-2; Figure 1.2). It is probable that during the construction of the existing waste water treatment plant this area was cultivated and reseeded. The grassed areas surrounding the structures at the plant all seem to be of artificial construction, such as the elevated area around the basins. No features of archaeological significance were noted in the area of the proposed development.



Legend

- Approx. line of Canal (Filled In)
- Other Archaeologocal sites
- 27 Reference Number
- Site for Development



Galway County Council

Ballinasloe Town Council

Project

Ballinasloe WWTP - EIS

Title

Archaeology Location Map

Figure **D.1**

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Issue Details

Drawn:	SK/CW/CP	Project No.	MGW0010
Checked:		File Ref.	
Approved:		MGW0010MI0305F01	
Scale:	Not to Scale	Drawing No.	Rev.
Date:	10/11/03	MI0005	F01

Notes

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2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
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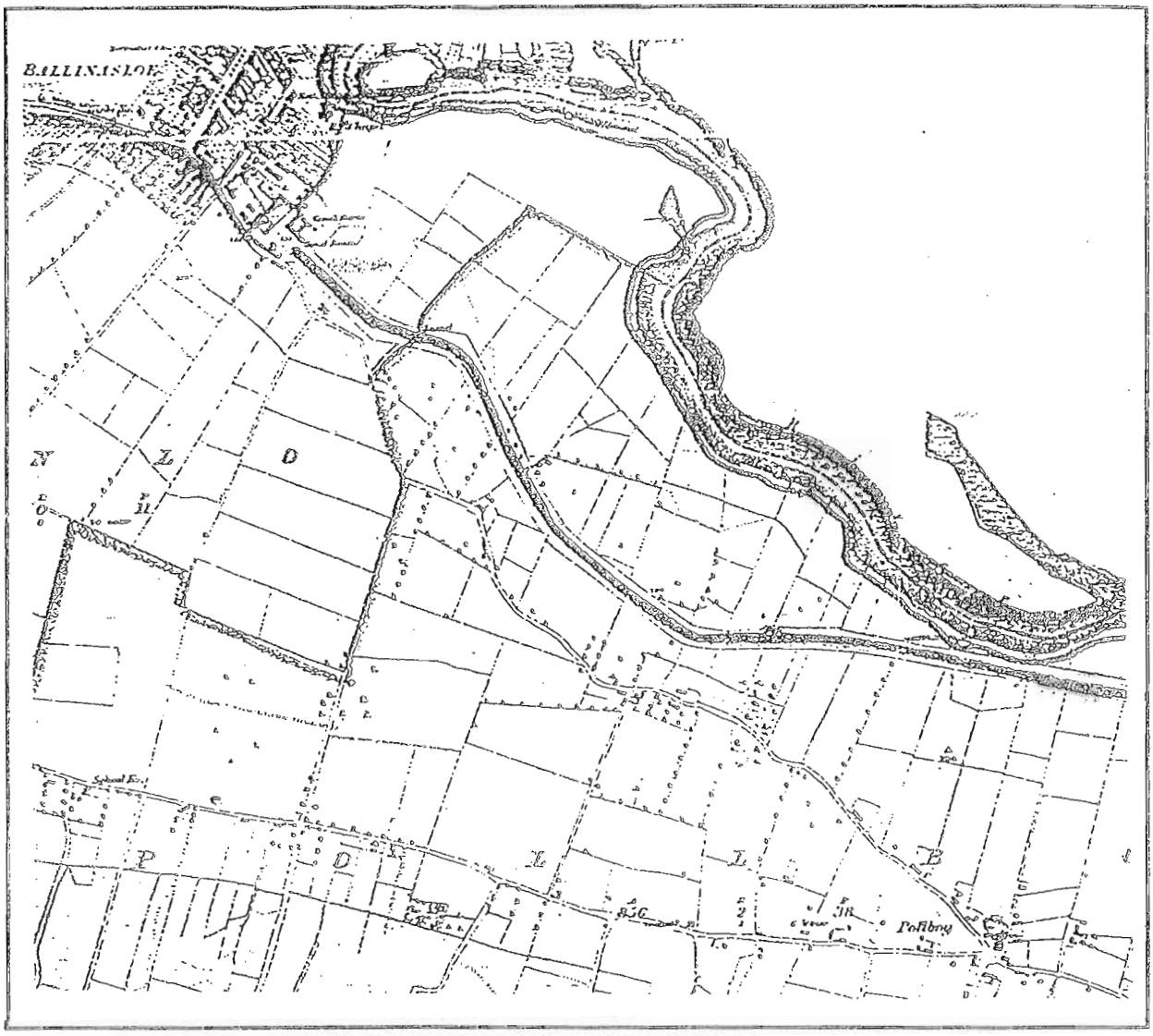

Fig. 2 Extract from First Edition Ordnance Survey map for Co. Galway, sheet no. 88.

Fig. 3 Extract from third edition OS map for Co. Galway, sheet no. 88

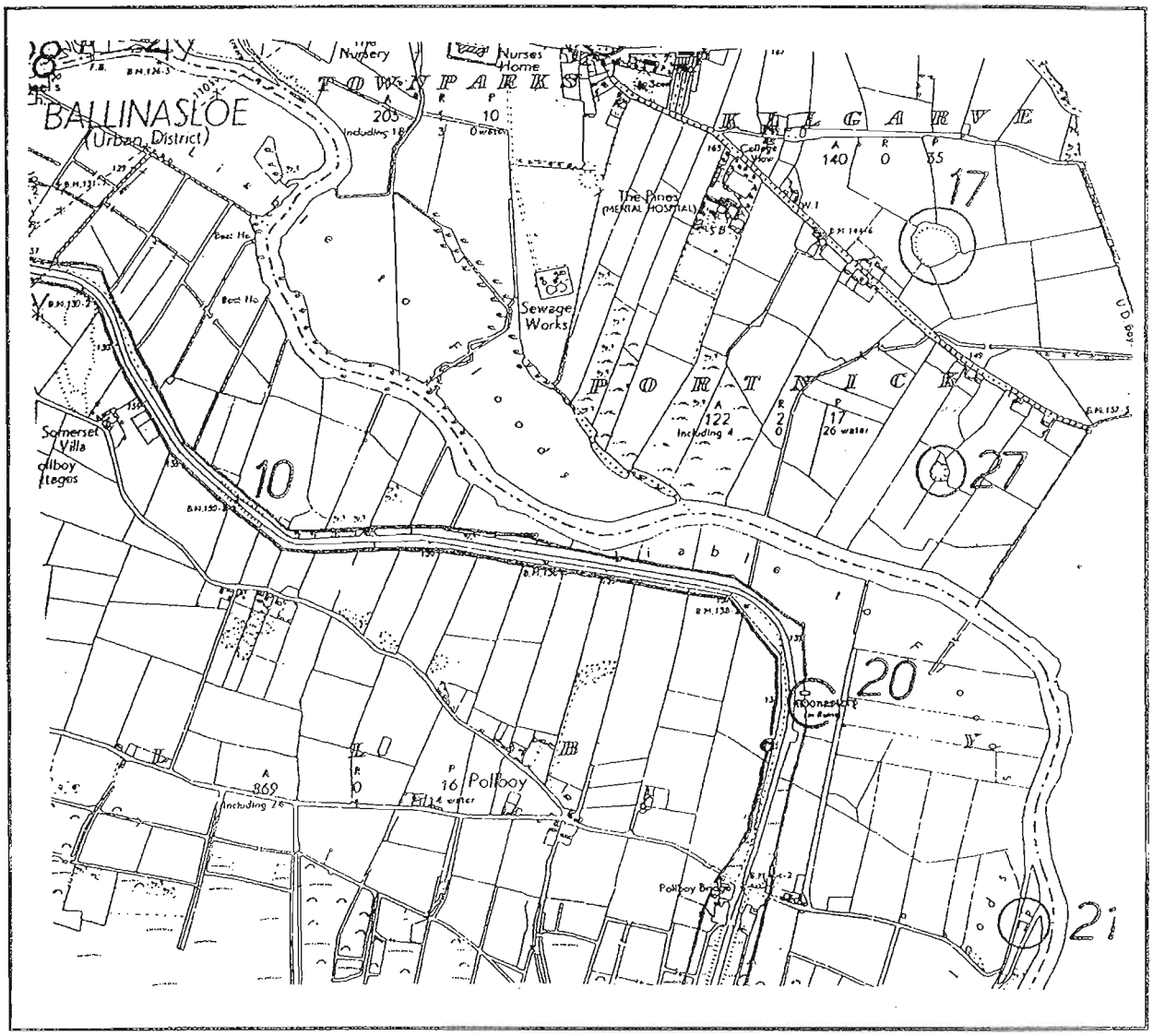

Fig. 4 Extract from Sites and Monuments Record, sheet no. 88 for Co. Galway.

5. CONCLUSIONS AND RECOMMENDATIONS

No features of archaeological significance were encountered in the area of the proposed development. A number of archaeological artefacts have been recovered from the River Suck, indicating archaeological activity in the area, dating to the Neolithic period (4000-2000 BC). The deposition of artefacts in water, particularly rivers and lakes, was widespread in Irish prehistory, with a very high proportion of Bronze Age artefacts recovered from Irish rivers and lake-bed contexts. Given the close proximity of the proposed development to the River Suck, it is recommended that all ground disturbance associated with the development should be monitored by a suitably qualified archaeologist.

Please Note: Any recommendations made in this report are subject to ratification by Dúchas-The Heritage Service.

Plate D.l View of proposed development from the South-West

Plate D.2 View of proposed development from the North-East

Plate D.3 View of proposed development from the West

Plate D.4 View of proposed development from the North-East