9. CLIMATE

9.1 GENERAL

The proposed development will involve the upgrade of the Clonakilty wastewater treatment facility. The potential impacts of the proposed development are addressed in relation to the generation of greenhouse gases from process activities, through energy consumption and from traffic associated with the construction and operational phases of the development. The following section was prepared with reference to the EPA's Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.

9.2 Existing Environment

The climate of the area is best described by meteorological measurements collected by the National Meteorological Service from the synoptic stations at Cork Airport. To characterise the prevailing conditions at the site, historical meteorological data compiled by Met Eireann (www.meteireann.ie) is presented for Cork Airport for the period 1962-1991. Cork airport is located 154m above mean sea level on a ridge approximately 6km south of Cork city. It is particularly prone to fog conditions due to its location near the south coast and its height above sea level. The most important meteorological parameters in relation to the proposed development are; wind speed, rainfall, temperature and evapo transpiration.

9.2.1 Wind Speed

Mean monthly wind speed data for Cork Airport (1962-1991) is presented in Table 9.1. The speeds ranged from 4.68m/s in July to 6.64m/s in January.

Table 9.1: Wind Speed Data for Cork Airport Meteorological Station (1962-1991)

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Av.
Mean Monthly Speed (m/s)	6.64	6.48	6.33	5.66	5.45	4.89	4.68	4.73	5.30	5.76	5.97	6.38	5.71

9.2.2 Rainfall

Average monthly and annual precipitation rates over the period 1962 – 1991 for Cork Airport are presented in Table 9.2. The results show that the annual average rate of precipitation in this area is 1194mm over the 30 year period. The average monthly rainfall values at Cork Airport will vary from around 66mm in July to 138mm in January. The highest monthly rainfall occurs in the winter months from October to February and is often associated with Atlantic frontal depressions. In the summer

months, high rainfall amounts tend to be associated with intense thunder showers which may be localised in rainfall intensity.

Table 9.2: Rainfall Data for Cork Airport Meteorological Station (1962-1991)

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Ann
Mean Monthly Total (mm)	138	116	99	68	83	69	66	89	96	125	111	134	1194

9.2.3 Air Temperature and Relative Humidity

Air temperatures range from a mean daily minimum of 2.5°C in February to a mean daily maximum of 18.5°C in July over the period 1962 – 1991 for Cork Airport. The relative humidity ranges from about 85-95% in the winter months to 70-90% in the summer months.

9.2.4 Evapo Transpiration

Evapotranspiration (ET) is the loss of water to the atmosphere from the earth's surface by evaporation and by transpiration through plants. However, the indicative calculation for the annual average potential evapo transpiration (PE) is approximately 500mm as calculated from data collected at Cork airport and presented in Table 9.3. Annual actual evapo transpiration (AE) is less than the PE due to the development of a soil moisture deficit (SMD) in the drier summer months. The calculated AE provides an approximation of the moisture losses to the atmosphere and to vegetation and varies depending on the nature of the ground surface.

Table 9.3: PE, SMD and ET values

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Ann
PE (mm) Note 1	4	15	34	59	77	89	84	69	43	19	6	1	500
SMD (mm) Note 2	-4.4	-2.9	1.9	11	26.1	33.8	44.2	32.1	21	-4.8	-3.0	-4.3	155
ET (mm) Note 3	5.5	5.5	5	4.8	4.2	3.8	3.4	3.1	4.0	5.5	5.4	5.5	55.7

Note 1: PE- Potential Evapotranspiration (Cork Airport, 1958-1982)

Note 2: SMD – Soil Moisture Deficit (Cork Airport, 1995- 2004)

Note 3: ET – Actual Evapotranspiration (Calculated from ET/PE = (1-((SMD-30)/90)

9.2.5 Microclimate

The microclimate is defined as the climate within the immediate locality of a particular site over an area within 1-2km of the site. The difference in weather conditions at the site of the proposed development and that at Cork Airport meteorological station is not expected to be significant.

9.2.6 Global Climate

The Clonakilty wastewater treatment facility does not currently fall under the remit of Directive 2003/87/EC which relates to emissions trading. The proposed upgrade of the wastewater treatment works will also not require a greenhouse gas permit. With the exception of emissions from vehicles entering/leaving the facility, there will be no emissions of acidifying gases from the process itself. The existing plant does not use or produce 'ozone-depleting substances', neither will the proposed upgrade. There is therefore no impact on ozone depletion.

9.3 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

9.3.1 Introduction

The proposed development will involve the upgrade of the Clonakilty wastewater treatment works. Given the relatively small scale of the development and the nature of the local environment, it is anticipated that the development will not have an adverse impact on the local climate. Potential release of minor pollutants may occur during both the construction and operational phases.

9.3.2 Construction Phase

During the construction phase, the main potential impacts on climate will be those associated with site traffic (HGV's and cars) entering and leaving the site and machinery in use on-site. This will result in minor emissions of the greenhouse gas, CO_2 and the acid gases, NO_x and SO_2. Levels of the pollutants emitted to atmosphere will be low, significantly lower than any published standards, and therefore impact on climate will not be of any significance. There will be no ozone depleting substances used or emitted during the construction phase of the project.

9.3.3 Operational Phase

The predominant emissions during the operational phase are likely to arise form the following sources:

- CO_2 generation from aerobic degradation of waste,
- CO_2, NO_x and SO_2 emissions from traffic emissions as a result of customers/employees entering/leaving the proposed development in car/vans,
- Consumption of energy.

In the natural carbon cycle, plants absorb carbon dioxide from the atmosphere and convert it to biomass. Carbon dioxide is produced naturally from aerobic degradation of waste. Natural degradation can be accelerated and controlled using a waste water treatment plant. During the process of aerobic

9.6 INTERACTIONS

There are 11 environmental topics evaluated in this EIS. Emissions from the process and traffic would most likely interact with climate. The interaction of climate with traffic and process emissions has been evaluated in Section 9.3.3 and are considered to be minimal. Emissions of carbon dioxide from the process will have a neutral impact on the environment and the increase in emissions from traffic as a result of the proposed WWTP upgrade is considered negligible.

9.7 REFERENCES

www.meteireann.ie

Environmental Protection Agency, 2000, Climate Change, Scenarios and Impacts for Ireland

'National Climate Change Strategy' (Department of the Environment, 2000)

EPA Report, 2005 Air Quality and Emissions to Air, Report 2003

EPA, 2003, Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)

10. NOISE

10.1 INTRODUCTION

This assessment of the existing noise environment and potential impact on the noise environment from the proposed development has been undertaken in accordance with the *Draft Guidelines on the Information to be contained in Environmental Impact Statements* (Environmental Protection Agency, 2002), *S. I. 93 of 1993, European Communities (Environmental Impact Assessment) (Amendment) Regulations 1999* and also *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements* (Environmental Protection Agency, 2003).

10.2 EXISTING NOISE ENVIRONMENT

In order to characterise the existing noise environment, a baseline noise survey was undertaken in the vicinity of the proposed development site. The noise survey was undertaken during the daytime and night-time hours of the 22nd August 2005.

10.2.1 Local Environmental Setting

Details of the receiving environment including the location of the facility are presented in Section 2 (Project Description).

The site is bounded by the local Gaelic Athletic Association (GAA) ground to the west, the Model Railway Village tourist attraction to the south, the river Fealge to the north and the harbour to the east.

The nearest houses are located 240m to the south east of the site and 170m to the south west of the site along the Inchydoney beach road. Housing along this local road consists of sporadic developments and dispersed farmsteads. The houses to the north of the site are located approximately 95m to the north west of the site off the N71 and 165m to the north of the site along the Ring road. Housing in this area consists of small scale housing developments together with newly constructed apartment blocks.

10.2.2 Existing Noise Sources

The predominant noise sources at the site consisted of continuous noise from the existing works such as the oxidation tanks, settling tanks and the control house. Additional noise sources consisted of non site traffic noise from the Inchydoney beach road to the south of the site and the N71 to the north west of the site. Construction noise was also audible from sites located to the north west of the treatment plant.

The nearest noise sensitive receptors are located approximately 95 – 240m from the proposed development. The predominant noise sources at the nearest noise sensitive receptors to the south of the site consisted of non site traffic noise from the Inchydoney beach road and the N71. The predominant noise sources at the nearest noise sensitive receptors to the north of the site consisted of non site traffic noise from N71 and construction noise from nearby sites.

10.2.3 Measurement Positions and Survey Details

The noise monitoring locations chosen for this survey were selected in order to assess the noise climate in the local vicinity. The EPA defines a noise sensitive receptor as *"any dwelling, house, hotel or hostel, health building, educational establishment, or any other facility or area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels"*. Four measurements were carried out at the site boundaries (N1, N2, N3 and N4), and four measurements at the nearest noise sensitive locations, (N5, N6, N7 and N8). Noise monitoring locations are illustrated in Figure 10.1.

For the daytime and night-time survey a 30 minute and 15 minute ambient noise level measurement was carried out at eight locations respectively, using an integrating sound level meter.

Weather conditions during the daytime survey were dry, calm and sunny. Weather conditions during the night-time survey were dry and calm. Windspeed measured during the daytime monitoring period ranged from 1 – 2.5 meters per second (m/s). Windspeed measured during the night-time monitoring period remained less than 0.5 m/s.

Noise monitoring locations were chosen according to the guidelines in *ISO 1996: Acoustics – Description and Measurement of Environmental Noise*. In all cases, the microphone was mounted on an outdoor microphone stand, which in turn was mounted on a tripod at 1.5m above ground level and at least 3.5m away from any sound reflecting objects. A windshield was placed on the microphone to reduce any wind interference during measurements.

Table 10.1: Description of Noise Monitoring Locations

Location	GPS Location Reference	Description of Location	Justification
N1	38980 41227	Southern Boundary	Boundary location
N2	39030 41259	Eastern Boundary	Boundary location
N3	39002 41333	Northern Boundary	Boundary location
N4	38923 41275	Western Boundary	Boundary location
N5	39006 41047	1m from entrance gate of dwelling, Inchydoney beach road	NSR location
N6	38669 41137	1m from entrance gate of dwelling, Local road.	NSR location
N7	38889 41437	1m from entrance gate of dwelling, N71 road.	NSR location
N8	39032 41471	1m from entrance gate of dwelling, Ring road.	NSR location

10.2.4 Instrumentation and Methodology

The measurements were made according to the requirements of *ISO 1996: Acoustics – Description and Measurement of Environmental Noise, Part 1*, and the EPA "*Environmental Noise Guidance Document*". The measurements were made using a Cirrus 831A Data logging integrating sound level meter fitted with 1:1 and 1:3 Octave Band Filters. The instrument was calibrated *in situ* at 94dB prior to and after use, using a Cirrus CR 513A acoustic calibrator. Factory calibration certificates for the noise level meter and acoustic calibrator, detailing equipment serial numbers, calibration traceability and re-calibration dates are presented in Appendix 10.1 of this report. The sound level meter was orientated towards the noise source for all measurements. This instrument is a Type 1 instrument in accordance with IEC 651 regulations. The Time Weighting used was Fast and the Frequency Weighting was A-weighted as per IEC 651. A glossary of noise related terms is presented in Appendix 10.2.

10.2.5 Survey Implementation

The measurement duration was 30 minutes for the daytime survey and 15 minutes for the night time survey. A five minute one third octave reading was also taken at each location. The measurement parameters included meteorological observations of prevailing conditions at the time of the survey. The primary measurement parameter was the equivalent continuous A-Weighted Sound Pressure level, $L_{Aeq, T}$ over 30-minute measurement intervals for the duration of the day-time monitoring survey and 15 minute for the night-time.

A statistical analysis of the measurement results was also completed so that the percentile levels, $L_{AN, T}$, for N = 90% and 10% over 30-minute measurement intervals were also recorded.

L_{A10}

The noise level that is equalled or exceeded for 10% of the measurement period. The level is indicative of the contribution from traffic noise at the measurement location.

L_{A90}

The noise level that is equalled or exceeded for 90% of the measurement period. The L_{A90} readings are taken to represent the background noise levels.

L_{Aeq}

Equivalent continuous A-weighted sound level. The continuous steady noise level, which would have the same total A-weighted acoustic energy as the real fluctuating noise measured over the same period of time.

An octave band frequency analysis was also carried out to determine whether a tonal character was present at the noise monitoring locations. High or very low frequency is considered to be more disturbing than middle range frequency noise. A tonal element exists if any given 1/3rd octave frequency band exceeds its adjacent bands by 5dB or more (ISO 1996: Acoustics – Description and Measurement of Environmental Noise, Part 2). All sources of noise were noted, recorded and where possible, identified during each survey.

10.2.6 Assessment Criteria

In 1995, the EPA published a document entitled 'Guidance Note for Noise in relation to scheduled activities' which stipulates daytime and night time L_{Aeq} noise levels as 55dB and 45 dB respectively. This standard is widely used in Ireland for various types of activities and for setting noise control targets. The World Health Organisation recommends guideline values for noise levels in specific environments. The most applicable levels are presented in Table 10.2

Table 10.2: WHO recommended Guideline Levels

Specific Environment	Critical health effect(s)	L_{Aeq} dB(A)
Outdoor living area	Serious annoyance, daytime and evening	55
Outside bedrooms	Sleep disturbance, window open (Outdoor values)	45

The noise criteria presented above are applicable at noise sensitive locations only; however, the recorded levels at boundary locations are compared to the above guideline levels for comparison purposes only. The development will not be subject to an Integrated Pollution Prevention Control Licence from the EPA therefore the WHO guideline limits are most applicable in this case.

10.2.7 Noise Survey Results

The noise measurement results for the day-time and night-time noise monitoring survey are reported in Tables 10.3 and 10.4 respectively. A graphical representation of noise measurement spectra, including octave band frequency analysis is presented in Appendix 10.3.

Table 10.3: Daytime Noise Survey Results

Monitoring Location	Survey Date & Time	$L_{Aeq,\ 30\ mins}$ dB	$L_{A90,30\ mins}$ dB	$L_{A10,30\ mins}$ dB	Windspeed m/s	Description of Sources
N-1	22/08/05 09:35	56	54	57	2	Continuous site noise, distant non site traffic noise, distant construction noise, car alarm audible in distance.
N-2	22/08/05 10:12	53	50	54	2	Continuous site noise, occasional on site traffic noise, distant non site traffic noise, birdsong.
N-3	22/08/05 10:59	55	53	56	2	Continuous site noise from oxidation tanks, distant non site traffic noise, birdsong.
N-4	22/08/05 11:38	58	58	59	2.5	Continuous site noise from oxidation tanks, distant non site traffic noise, distant construction noise.
N-5	22/08/05 12:20	61	45	63	2	Non site traffic noise dominant, birdsong, activity in model railway village, intermittent horn of train.
N-6	22/08/05 12:59	45	42	47	1	Distant non site traffic noise, birdsong.
N-7	22/08/05 13:40	62	50	65	1.5	Non site traffic noise dominant.
N-8	22/08/05 14:19	66	48	69	1	Non site traffic noise dominant, birdsong.

Table 10.4: Night-time Noise Survey Results

Monitoring Location	Survey Date & Time	$L_{Aeq,\ 15\ mins}$ dB	$L_{A90,15\ mins}$ dB	$L_{A10,15\ mins}$ dB	Windspeed m/s	Description of Sources
N-1	22/08/05 21:57	53	52	53	<0.5	Continuous site noise dominant.
N-2	22/08/05 22:20	47	46	47	<0.5	Continuous site noise from oxidation tanks dominant.
N-3	22/08/05 23:10	63	63	63	<0.5	Continuous site noise from oxidation tanks dominant, intermittent noise from the control house.
N-4	22/08/05 22:46	57	57	57	<0.5	Continuous site noise from oxidation tanks dominant.
N-5	22/08/05 23:42	57	31	40	<0.5	Occasional non site traffic noise.
N-6	23/08/05 00:08	37	31	39	<0.5	Distant non site traffic noise, intermittent dog barking, hum of central heating from adjacent dwelling.
N-7	23/08/05 00:32	52	37	55	<0.5	Occasional non site traffic noise, noise from nearby dairy.
N-8	23/08/05 00:55	57	33	47	<0.5	Occasional non site traffic noise, birdsong.

10.2.8 Discussion

Daytime Noise Survey – On-site Noise Monitoring Locations

The site is located to the east of Clonakilty town Cork and the surrounding land use is a mixture of residential, retail, recreational and agricultural. Observations made during the survey indicate that the noise climate in the vicinity of the proposed development is influenced by a combination of noise from the Model Railway Village, construction noise and traffic noise.

The predominant noise sources generated at the existing waste water treatment plant include the oxidation tanks, control house and the movement of vehicles.

Noise measurements were carried out at eight locations during both the daytime and night-time survey. Four measurements were carried out at the site boundaries (N1, N2, N3 and N4), and four measurements at the nearest noise sensitive locations, (N5, N6, N7 and N8). Noise monitoring locations are illustrated in Figure 10.1.

Noise measurement location N1 was located at the southern boundary of the site adjacent to the Model Railway Village. The daytime $L(A)_{eq, 30mins}$ recorded at this location was 56 dB. The $L(A)_{90}$, which reflects the background noise level was 54dB and the $L(A)_{10}$ was measured as 57dB. The predominant noise sources noted at this location comprised of continuous site noise from the oxidation tanks and the control house. Additional noise sources included distant non site traffic noise and construction noise from nearby sites. The sound pressure level graph corresponding to this monitoring location shows relatively steady state noise levels arising from the continuous on site noise sources.

Noise measurement location N2 was located at the eastern boundary of the site adjacent to the Model Railway Village. The daytime $L(A)_{eq, 30mins}$ recorded at this location was 53 dB. The $L(A)_{90}$, which reflects the background noise level was 50 dB and the $L(A)_{10}$ was measured as 54 dB. The predominant noise sources noted at this location comprised of continuous site noise from the oxidation tanks and the control house. Additional noise sources included, occasional on site traffic noise, distant non site traffic noise and birdsong. The sound pressure level graph for this monitoring location shows relatively steady state noise levels with an occasional peak arising from activities such as the movement of employee cars on site.

Noise measurement location N3 was located at the northern boundary of the site adjacent to the Clonakilty estuary. The daytime $L(A)_{eq, 30mins}$ recorded at this location was 55 dB. The $L(A)_{90}$, which reflects the background noise level was 53dB and the $L(A)_{10}$ was measured as 56 dB. The predominant noise sources noted at this location comprised of continuous site noise from oxidation tanks and control house. Additional noise sources included birdsong and distant traffic noise from the N71. The sound pressure level graph corresponding to this monitoring location shows relatively steady state noise levels with occasional peaks arising from noise sources such as birdsong.

Noise measurement location N4 was located at the western boundary of the site adjacent to the GAA pitch. The daytime $L(A)_{eq,\ 30mins}$ recorded at this location was 58 dB. The $L(A)_{90}$, which reflects the background noise level was 58dB and the $L(A)_{10}$ was measured as 59 dB. The predominant noise sources noted at this location comprised of continuous site noise from the oxidation tanks and the control house. Additional noise sources included, distant non site traffic noise and birdsong. The sound pressure level graph for this monitoring location shows relatively steady state noise levels with an occasional peak arising from noise sources such as birdsong.

Daytime Noise Survey – NSR Noise Monitoring Locations

Noise measurement location N5 was located at the nearest noise sensitive receptor to the south east of the site. Monitoring was undertaken at approximately 1m from the entrance gate of the house. The daytime $L(A)_{eq,\ 30mins}$ recorded at this location was 61 dB. The $L(A)_{90}$, which reflects the background noise level was 45dB and the $L(A)_{10}$ was measured as 63dB. The predominant noise sources noted at this location comprised of traffic noise along the Inchydoney Beach Road. The sound pressure level graph for this location is highly fluctuating, indicating a high level of passing vehicles i.e. short-term high level noise events. The $L(A)_{eq,\ 30mins}$ noise level recorded of 61 dB exceeds the WHO recommended guideline level of 55 dB, the source is not the WWTP site but traffic on the Inchydoney Beach Road.

Noise measurement location N6 was located at the nearest noise sensitive receptor to the south west of the site. Monitoring was undertaken at approximately 1m from the entrance gate of the house. The daytime $L(A)_{eq,\ 30mins}$ recorded at this location was 45 dB. The $L(A)_{90}$, which reflects the background noise level was 42dB and the $L(A)_{10}$ was measured as 47dB. The predominant noise sources noted at this location comprised of traffic noise along the Inchydoney Beach Road and the N71. The sound pressure level graph for this location is fluctuating, indicating a high level of passing vehicles i.e. short-term high level noise events. The $L(A)_{eq,\ 30mins}$ noise level was less than the WHO recommended guideline level of 55 dB.

Noise measurement location N7 was located at the nearest noise sensitive receptor to the north west of the site. Monitoring was undertaken at approximately 1m from the entrance gate of the house. The daytime $L(A)_{eq,\ 30mins}$ recorded at this location was 62 dB. The $L(A)_{90}$, which reflects the background noise level was 50 dB and the $L(A)_{10}$ was measured as 65 dB. The predominant noise sources noted at this location comprised of traffic noise along the N71 road. The sound pressure level graph for this location is highly fluctuating, indicating a high level of passing vehicles i.e. short-term high level noise events. The $L(A)_{eq,\ 30mins}$ noise level recorded of 62 dB exceeds the WHO recommended guideline level of 55 dB, the source is not the WWTP site but traffic on the N71 Road.

Noise measurement location N8 was located at the nearest noise sensitive receptor to the north east of the site. Monitoring was undertaken at approximately 1m from the entrance gate of the house. The daytime $L(A)_{eq,\ 30mins}$ recorded at this location was 66 dB. The $L(A)_{90}$, which reflects the background noise level was 48dB and the $L(A)_{10}$ was measured as 69dB. The predominant noise sources noted at this location comprised of traffic noise along the Ring road. The sound pressure level graph for this location is highly fluctuating, indicating a high level of passing vehicles i.e. short-term high level noise

events. The $L(A)_{eq,\ 30mins}$ noise level recorded of 66 dB exceeds the WHO recommended guideline level of 55 dB, the source is not the WWTP site but traffic on the Ring Road.

Night-time Noise Survey – On-site Noise Monitoring Locations

The night-time $L(A)_{eq,\ 15mins}$ recorded at the on site monitoring locations (N1 – N4) ranged from 47 – 63 dB. The $L(A)_{90}$, which reflects the background noise level ranged from 46 – 63 and the $L(A)_{10}$ which represents traffic noise ranged from 47 – 63 dB. During the night-time survey noise monitoring location N3 was moved by approximately 5m, due to poor visibility on site, which lead to a higher noise level than the daytime result due to its closer proximity to the oxidation tanks.

The predominant noise sources noted at these locations comprised of continuous site noise from the oxidation tanks and the settling tanks. The sound pressure level graphs corresponding to these monitoring locations shows relatively steady state noise levels arising from the continuous on site noise sources.

Night-time Noise Survey – NSR Noise Monitoring Locations

The night-time $L(A)_{eq,\ 30mins}$ recorded at noise measurement location N5, located to the south east of the site was 57 dB. The $L(A)_{90}$, which reflects the background noise level was 31dB and the $L(A)_{10}$ was measured as 40 dB. The predominant noise sources noted at this location comprised of occasional non site traffic noise. The sound pressure level graph corresponding to this monitoring location shows steady state noise levels with occasional peaks arising from passing vehicles.

The night-time $L(A)_{eq,\ 30mins}$ recorded at noise monitoring location N6 located to the south west of the site was 37 dB. The $L(A)_{90}$, which reflects the background noise level was 31 dB and the $L(A)_{10}$ was measured as 39 dB. The predominant noise sources noted at this location comprised of occasional distant traffic noise. Additional noise sources included an intermittent dog barking and the hum of the central heating system in the adjacent house. The sound pressure level graph corresponding to this monitoring location shows relatively steady state noise levels with occasional peaks arising from passing vehicles in the distance. The $L(A)_{eq,\ 15mins}$ noise level was less than the WHO recommended guideline level of 45 dB.

The night-time $L(A)_{eq,\ 30mins}$ recorded at noise monitoring location N7, located to the north west of the site, was 52 dB. The $L(A)_{90}$, which reflects the background noise level was 37 dB and the $L(A)_{10}$ was measured as 55 dB. The predominant noise sources noted at this location comprised of traffic noise from the N71. The sound pressure level graph for this location is highly fluctuating, indicating a high level of passing vehicles i.e. short-term high level noise events. The $L(A)_{eq,\ 15mins}$ noise level recorded of 52 dB exceeds the WHO recommended guideline level of 45 dB, the source is not the WWTP site but traffic on the N71.

The night-time $L(A)_{eq,\ 30mins}$ recorded at noise measurement location N8, located to the north of the site, was 57 dB. The $L(A)_{90}$, which reflects the background noise level was 33dB and the $L(A)_{10}$ was measured at 47 dB. The predominant noise sources noted at this location comprised of traffic noise

along the Ring Road. The sound pressure level graph for this location is fluctuating, indicating a number of passing vehicles i.e. short-term high level noise events. The $L(A)_{eq,\ 15mins}$ noise level recorded of 57 dB exceeds the WHO recommended guideline level of 45 dB, the source is not the WWTP site but traffic on the Ring Road.

Octave Band Frequency Analysis

An octave band frequency analysis was also carried out as part of this assessment to obtain more detailed information regarding any potential tonal components at each of the noise monitoring locations. High or very low frequency noise is generally considered to be more disturbing than middle range frequency noise. In general, in order to minimise the potential for a noise source to be a nuisance or cause disturbance, any given 1/3-octave band must not exceed its adjacent band by 5dB or more (cf ISO 1996 Part 2). The frequency spectra are presented in Appendix 10.3 and show that a tonal character is present at all locations. This is most likely due to on site noise sources at the boundary monitoring points (N1, N2, N3 and N4) and due to traffic noise from the N21, the Inchydoney Beach Road and the Ring Road at the nearest noise sensitive receptors.

10.2.9 Summary of Existing Noise Environment

The existing noise environment was monitored at a total of eight locations. Four measurements were undertaken on site (N1, N2, N3 and N4). The remaining four measurements (N5, N6, N7 and N8) were undertaken at the nearest noise sensitive receptors to the site.

The acoustic environment within the site is characteristic of a rural environment on the outskirts of a town influenced by nearby transportation activities. Environmental noise sources such as birdsong and vegetation noise also influenced the survey results. The predominant noise sources comprised of continuous site noise from the oxidation tanks and the control house. Additional noise sources included distant non site traffic noise from the Inchydoney Beach road and the N71. Construction noise from nearby sites also influenced the noise levels at the site.

The night-time $L(A)_{eq,\ 30mins}$ recorded at the boundary monitoring locations ranged from 47 – 63 dB. The predominant noise sources comprised of continuous site noise from the oxidation tanks and the settling tanks.

The daytime $L(A)_{eq,\ 30mins}$ recorded at the nearest noise sensitive receptors ranged from 45 – 66 dB. The predominant noise sources noted at this location comprised of traffic noise along the Inchydoney beach road, the N71 and the Ring road. Noise from the WWTP was not audible at these locations during the survey.

The night-time $L(A)_{eq,\ 30mins}$ recorded at the nearest noise sensitive receptors ranged from 37 - 57 dB. The predominant noise sources comprised of non site traffic noise from the Inchydoney Beach Road, the N71 and the Ring Road. Additional noise sources included barking dogs and the hum of the central heating systems in the adjacent houses.

10.3 POTENTIAL IMPACTS OF THE DEVELOPMENT

10.3.1 Construction Impacts

Noise Impact

All construction projects generate noise and vibration impacts with the level of noise/vibration generally depending upon the precise construction methods employed. The significance of the effects of these various activities will depend upon the duration of each particular construction activity, the particular items of plant used and the time at which the activity occurs. In the absence of a detailed construction plan it is not possible to accurately model construction noise levels. It is possible; however, to predict indicative construction noise levels in accordance with *BS 5228:1997 - Noise and Vibration Control on Construction and Open Sites Part 1*. This standard sets out sound power levels for plant items normally encountered on construction sites which allows for the prediction of noise levels at selected locations. This standard does not however specify noise limits for construction activities but does recognise that since the activities are temporary, noise limits higher than those associated with permanent installations are generally acceptable in the community. International practice dictates that noise limits in the range L_{Aeq} 1hr of 65 to 75 dB are generally acceptable for daytime construction activities.

Table 10.5 presents details of the machinery to be used during the construction phase of the proposed development.

Table 10.5: Sound Pressure Levels of machinery to be used during construction phase

Machinery	Type	Sound Pressure Level [Note 1]
CAT 320 (x2)	Dozer	81
JCB 532 (x2)	Excavator	85
9 tonne dumper (x2)	Dumper	65
Crawler Crane	Tracked Crane	86

NOTE: **[1]** Sound Pressure Levels taken from BS 5228: Part 1: 1997, Annex C at a reference distance of 10m

Table 10.6 overleaf presents predicted noise impacts at sensitive receptors using the 'inverse square rule' for noise attenuation due to distance only. This law is based on the principle that as you double the distance from a source the noise level decreases by 6dB. It is noted that at distances in excess of 300 metres from a given noise source that predictions based on the inverse square law rule may not be truly representative of the noise level experienced at the receiver. As the distance between source and receiver increases so does the significance of other factors such as meteorological conditions on the noise level.

The 'inverse square law rule' is defined by the following equation:

SPL= 20log (R1/R2)

Where R2 is the distance from the source to the noise meter and R1 is the distance from the proposed construction area of the development to the noise sensitive receptors. The distances have been taken from scaled engineering drawings provided by Cork County Council and Ordinance Survey data. Natural and proposed attenuating factors such as topographical features have not been taken into consideration. It is noted that construction phase mitigation measures will be employed during the construction phase and are detailed in Section 10.4.1.

As it is difficult to predict exactly where construction activities will be located during the construction phase of the proposed development, the calculations are based on the assumption that two of each of the items of machinery detailed in Table 10.5 may be in operation simultaneously, with the exception of the crane. Although in reality this is highly unlikely. The worst case scenario has therefore been considered and it has also been assumed that the combined noise sources will be in operation at the nearest boundary of the construction area of the proposed facility to each noise sensitive receptor.

Table 10.6: Predicted Impacts Due to Construction Activities

Location	Noise level Combined Sound Pressure Level (dB) Note 1	Distance to receptor (metres) Note 2, 3	Attenuation due to distance (dB)	Predicted Noise Level (dB)	Daytime Background Noise Level (dB)	Combined Noise Level (dB)
NSR – N5	91	180	25	66	45	66
NSR – N6		250	28	63	42	63
NSR – N7		105	20	71	50	71
NSR – N8		175	25	66	48	66

NOTE: **[1]** It is assumed that two of each item of plant will be in operation simultaneously and at the same location with the exception of the crane.

[2] For calculation of the distance it has been assumed that the combined noise source will be in operation 10m from the nearest boundary of the construction area of the proposed facility to each noise sensitive receptor.

[3] Estimated distances based on site engineering drawings and ordinance survey data.

The main construction noise sources will result from site preparation where large plant and earth moving machinery will be in operation. This initial phase of works will be temporary and during daytime hours only. Lighter plant and eventually domestic vehicles will be present on site during the latter phases of construction. It is not expected that bedrock will be encountered during any excavation works and therefore rock breaking is unlikely during the construction phase.

Furthermore, it is expected that excavation work will be completed within a short timeframe during the initial construction phase.

In summary, construction works may temporarily increase the noise levels in the immediate vicinity of the site for a short timeframe during the initial site preparation and construction phase of the project. However, taking into consideration effective noise mitigation measures and the fact that all on-site construction activities will be conducted during day-time hours, it is not considered that noise impacts on the receiving noise climate will be significant and will remain within the recommended community noise exposure in the range $L_{Aeq\ 1hr}$ of 65 to 75 dB.

Vibration Impact

No piling will take place on site and rock breaking is not anticipated. Potential vibration sources could include the use of plant machinery involved in earthworks, dump trucks, bulldozers and compacting equipment. It is noted; however, that potential vibration impacts from such sources will only be experienced in the immediate vicinity of the operation itself. If during construction, rock is encountered vibration monitoring will be undertaken in order to verify that appropriate vibration criteria set out in the following standards are not exceeded.

- BS 7385: parts 1 and 2:1990 and 1993 respectively, provide guidance on the measurement and evaluation of vibration and its effects on buildings, and a guide to damage levels from ground borne vibration
- Building Research Establishment (BRE) Digest 353(July 1990): Damage to structures from ground borne vibration
- BS 5228:1997 - Noise and Vibration Control on Construction and Open Sites Part 1

10.3.2 Operational Impacts

The contract documents will include performance requirements for the facility which the contractor will be required to comply with. The performance requirements will cover noise emissions due to site activities at the nearest noise sensitive receptors. Based on current legislation and standards it is anticipated that it will be a requirement that noise emissions due to all plant noise sources does not exceed $L(A)_{eq,\ 30mins}$ 55 dB during daytime hours and $L(A)_{eq,\ 30mins}$ 45 dB during night-time hours, at the nearest noise sensitive receptors.

In the absence of any detailed sound pressure levels for the various plant items it is assumed that the noise emissions will not exceed the limit values as stated above. The operation and maintenance element of the contract will include a significant monitoring requirement to confirm that the wastewater treatment plant meets the required standards. The Contractor will be required to provide process guarantees. Financial penalties will be imposed should the required standards not be met.

Table 10.7 presents predicted worst case scenario noise impacts at sensitive receptors. The baseline survey established that the existing plant had very little impact on the sensitive receptors and it's anticipated that the more modern designed extension will likewise have limited impacts.

Table 10.7: Predicted Worst Case Scenario Impacts Due to Operational Activities - Daytime

Location	Worst Case Scenario Noise Level * (dB)	Ambient Noise Level (dB)	Overall Noise Level (dB)
NSR – N5	55	61	62
NSR – N6	55	45	55
NSR – N7	55	62	63
NSR – N8	55	66	66

* Noise level at sensitive receptor from the WWTP

The daytime ambient noise levels at the nearest noise sensitive receptors to the proposed development ranged from L_{Aeq} 45 – 66dB. As can be seen from Table 10.7 the overall noise level has been calculated as ranging from 55 to 66 dB, however it is not anticipated that noise from the treatment plant will be the dominant noise source. The overall noise level at noise sensitive receptor N6 has been calculated as 55 dB, which is within the WHO recommended guideline level. At noise sensitive receptors N5 and N7 the increase in the overall noise level has been calculated as 1 dB which is an imperceptible increase. Furthermore the overall noise level at noise sensitive receptor N8 will remain at 66 dB and again noise from the treatment plant will not be the dominant noise source.

Table 10.8: Predicted Worst Case Scenario Impacts Due to Operational Activities – Night-time

Location	Worst Case Scenario Noise Level * (dB)	Ambient Noise Level (dB)	Overall Noise Level (dB)
NSR – N5	45	57	57
NSR – N6	45	37	45
NSR – N7	45	52	53
NSR – N8	45	57	57

* Noise level at sensitive receptor from the WWTP

The night-time ambient noise levels at the nearest noise sensitive receptors to the proposed development ranged from L_{Aeq} 37 – 57 dB. As can be seen from Table 10.8 the overall noise level has been calculated as ranging from 45 to 57 dB, however it is not anticipated that noise from the treatment plant will be the dominant noise source. At noise sensitive receptors N5, N7 and N8 there will be no perceptible increase in the overall noise level. The overall noise level at noise sensitive receptor N6 has been calculated as 45 dB, which is within the WHO recommended guideline level. Three of the locations already exceed the recommended night limit for noise sensitive receptors. As established from the

baseline survey the existing treatment plant is not having any significant impact on these receptors and it is not anticipated that the upgraded plant will have any impact.

10.4 MITIGATION MEASURES

10.4.1 Construction Phase

A comprehensive quantitative assessment of the potential noise impacts resulting from construction of the proposed development has shown that no adverse impacts will occur as a result of the construction phase. However, to ensure this, all best practicable means will be used to minimise noise produced during construction and operation of the proposed facility in accordance with the recommendations in British Standard 5228, Noise Control on Construction and Open Sites - 1997. The following parts of this British Standard are applicable;

- Part 1: Code of practice for basic information and procedures for noise and vibration control.
- Part 2: Guide to noise and vibration control legislation for construction and demolition, including road construction and maintenance.

The site operator shall comply in particular with the following requirements for control of noise from plant;

- All vehicles and mechanical plant used for the purpose of works shall be fitted with effective exhaust silencers and shall be maintained in good and efficient order as per EC regulations. In addition, all plant, JCB, bulldozer, loader, dumper etc, used during excavation must comply with the noise levels set down in SI No 320 of 1988 European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988. All noise producing equipment will comply with *S. I. No. 632 of 2001 European Communities (Noise Emission by Equipment for use Outdoors) Regulations, 2001*. All construction vehicles and plant will be fitted with effective exhaust silencers.

- Machines in intermittent use shall be shut down in the intervening period between works or throttled down to a minimum.

- Where particularly 'noisy' work is expected to occur, this will be scheduled between the hours of 9.00 – 17.30.

- Enclosures to usually noisy activities will be provided where these works cannot be scheduled for the hours of 9.00 – 17.30.

- Employees working on the construction site will be informed about the requirement to minimise noise and will undergo training on the following aspects:
    - The proper use and maintenance of tools and equipment.

- The positioning of machinery on site to reduce the emission of noise to the noise sensitive receptors.
- Avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment.
- The use and maintenance of sound reduction equipment fitted to power pressure tools and machines.
- Reporting defective noise control equipment.

It is also recommended that periodic noise monitoring be undertaken during the initial construction phase to determine levels at noise sensitive receptors, in particular during particularly 'noisy' activities e.g. loading or unloading of dump trucks. Where the community noise exposure levels or EPA guideline values are breached, further mitigation measures will be employed including temporary enclosure or screens around particularly 'noisy' plant.

10.4.2 Operation Phase

It was concluded that operational phase noise sources resulting from the proposed development will not adversely affect the existing ambient noise climate in the vicinity of the nearest sensitive receptor.

To ensure that the plant is not contributing to noise levels exceeding the day and night time WHO levels of 55dBA and 45dBA respectively at noise sensitive receptors, the following mitigation measures will be implemented:

- The facility will be operated in accordance with EC (Waste Water Treatment) (Prevention of Odours and Noise) Regulations 2005, S.I. No. 787 of 2005.
- All pumps, coolers, compressors, generators will be housed internally
- The interior plant layout and design, where possible will be constructed to minimise noise output from plant machinery.
- The walls of the sludge dewatering building will be acoustically clad with Kingspan Insulated Panels to reduce noise levels.
- Machines in intermittent use shall be shut down in the intervening period between works or throttled down to a minimum
- A regular maintenance programme will be implemented for all plant items to ensure they are operating effectively
- All vehicle engines will be switched off when not in use.

10.5 RESIDUAL IMPACTS

A comprehensive assessment of the potential noise impacts associated with the proposed development has been completed. In summary with proposed mitigation implemented, the proposed development will not result in an increase in ambient noise levels in excess of specified guideline levels at the nearest noise sensitive receptors. Vibration impacts may occur during the construction phase and will be minimised by adherence to guideline values.

10.6 INTERACTIONS

The main interaction of noise and vibration is likely to be with human beings. Noise levels recorded at the nearest noise sensitive receptors ranged from 45 to 66 dB $L(A)_{eq}$ during daytime hours and traffic noise was noted as the dominant noise source. It is considered that there will be minimal change to the existing level of traffic movements associated with the operation and maintenance of the WWTP. This is not considered to be of significance and will be barely perceptible at these locations. Vibration impacts may occur during the construction phase and will be minimised by adherence to guideline values.

Interaction of noise or vibration with animals or ecological habitats will be minimal and not significant.

Interactions of noise with other elements addressed in the environmental impact statement are not relevant.

10.7 REFERENCES

- British Standard 5228, Noise Control on Construction and Open Sites – 1997, Part 1, 2 and 4
- EPA *Environmental Noise Guidance Document, 2004*
- Environmental Protection Agency (2003). *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.* EPA, Wexford, Ireland.
- Environmental Protection Agency (2002). *Draft Guidelines on the information to be contained in Environmental Impact Statements.* EPA, Wexford, Ireland.
- Environmental Protection Agency (1995). *Guidance Note for Noise in relation to scheduled activities.* EPA, Wexford Ireland.
- Guidelines for Community Noise, 1999 - World Health Organisation (WHO)
- *ISO 1996: Acoustics – Description and Measurement of Environmental Noise Parts 1, 2 and 3*

- BS 7385: parts 1 and 2:1990 and 1993 respectively, provide guidance on the measurement and evaluation of vibration and its effects on buildings, and a guide to damage levels from ground borne vibration and

- Building Research Establishment (BRE) Digest 353(July 1990): Damage to structures from ground borne vibration.

- European Communities (Waste Water Treatment) (Prevention of Odours and Noise) Regulations 2005.

11. ROADS AND TRAFFIC

11.1 INTRODUCTION

11.1.1 Background

This section describes the traffic impact assessment undertaken for the proposed upgrade of the Clonakilty Waste Water Treatment Plant (WWTP). The assessment was undertaken in accordance with the EPA's *Guidelines on the information to be contained in Environmental Impact Statements, 2002.*

11.1.2 Project Description

The project involves the upgrading and expansion of the existing Clonakilty WWTP to increase its treatment capacity from 5,333 PE to 20,500 PE. The current load on the WWTP is estimated to be 15,000 PE at peak. The expansion will be achieved by the construction of additional treatment facilities including primary settling tanks, oxidation ditch, clarifier, sludge thickener and sludge drying plant.

11.1.3 Site Location

The proposed development is located at the existing wastewater treatment plant site at the southern edge of Clonakilty, West Cork. The site is located on the road to Inchydoney off the N71 national primary road, at the north western tip of Clonakilty Harbour where the river Feale emerges from the town and enters the harbour. The site is bounded by the local Gaelic Athletic Association (GAA) ground to the west, the Model Railway Village tourist attraction to the south, the river Fealge to the north and the harbour to the east.

11.1.4 Timescale

The timescale for the proposed upgrading and expansion of the WWTP is not definite at this stage. The project was included in the Department of the Environment, Heritage and Local Government's Capital Water Services Investment Programme for 2004-2006 as a scheme to commence construction in 2006. This programme is unlikely to be met however. The project is likely to be submitted for planning in early 2006, contract documents could be prepared in late 2006, procurement for a contractor could take place in the first half of 2007 and construction commence towards the end on 2007. The overall construction period could be in the order of twelve months but would be dependent on the appointed contractor's programme.

11.2 EXISTING TRAFFIC

Existing traffic was surveyed over a 12 hour period on 10 July 2000 on the road from Clonakilty to Inchydoney as part of the EIS for a tidal barrage in Clonakilty Harbour. The survey location is shown in Figure 11.1.

Data from this survey was updated using the traffic growth factors from table 6.1 of the National Roads Needs Study (NRA, 1998) and was used to determine the traffic passing the site. The results are shown in **Table 11.1** below

Period	From Clonakilty								Towards Clonakilty							
	Cars	LGV	HGV	Tractors	Buses	Motorcycles	Bicycles	Pedestrians	Cars	LGV	HGV	Tractors	Buses	Motorcycles	Bicycles	Pedestrians
07:00–07:40	0	0	0	0	0	0	1	2	3	1	0	0	0	0	0	1
07:40-08:10	7	1	0	0	0	0	0	0	14	0	0	0	0	0	2	1
08:10-08:40	13	3	0	0	0	0	2	1	9	3	0	0	0	0	0	1
08:40-09:10	13	3	0	0	0	0	0	0	17	1	0	0	0	0	0	0
09:10-09:40	21	0	1	0	0	0	1	6	13	1	0	0	0	0	0	0
09:40-10:10	10	0	0	0	0	0	2	2	17	0	0	0	0	1	2	1
10:10-10:40	17	2	0	0	0	0	1	1	13	2	0	0	0	0	0	1
10:40-11:10	23	2	0	0	0	0	0	7	24	3	0	0	0	0	2	3
11:10-11:40	29	3	0	0	0	0	0	5	12	1	0	0	0	0	0	0
11:40-12:10	51	3	0	0	1	0	0	8	39	2	0	1	0	0	0	9
12:10-12:40	35	2	0	0	0	0	0	1	28	6	0	0	0	0	0	13
12:40-13:10	29	2	0	1	0	0	3	14	32	0	0	0	0	0	3	2
13:10-13:40	53	5	0	0	0	1	6	10	39	1	0	0	0	1	0	6
13:40-14:10	48	0	0	0	0	0	2	8	45	5	0	0	0	0	2	9
14:10-14:40	43	5	0	0	0	1	0	10	36	2	0	0	0	0	2	6
14:40-15:10	65	0	0	0	1	0	1	0	55	2	1	0	1	0	1	8
15:10-15:40	25	0	0	0	0	0	1	1	25	1	0	0	0	0	0	2
15:40-16:10	39	6	0	0	1	0	0	10	48	2	0	0	1	0	2	3
16:10-16:40	42	0	0	0	0	0	0	8	37	2	0	0	0	0	1	0
16:40-17:10	43	3	0	0	0	0	2	6	62	2	0	0	1	0	3	14
17:10-17:40	35	0	0	0	0	0	1	7	42	2	0	0	0	0	1	3
17:40-18:10	38	1	0	0	0	0	1	0	31	2	1	0	0	0	1	8
18:10-18:40	32	3	0	0	0	0	0	3	30	1	0	0	0	0	1	0
Total Traffic	711	44	1	1	3	2	24	110	671	42	2	1	3	2	23	91

The survey was carried out in the summer time when it would be expected that tourist traffic would be at or near its peak. It is expected that the winter profile will result in more traffic in the morning and afternoons due to school traffic and less traffic during the middle of the day due to less tourist traffic.

The design capacity of the road was calculated using data from the EIS for the tidal barrage and the peak hourly flow was found to be 30% – 34% of the road capacity.

11.3 POTENTIAL IMPACTS OF THE DEVELOPMENT

11.3.1 Construction Impacts

Additional traffic volumes will be generated during the construction period and the level of traffic will be influenced by:

- the construction workforce
- the removal of demolition waste material off-site
- the delivery of construction material to site.

It is expected that at most, a workforce of twenty will be employed during the construction phase. This could generate an additional forty traffic movements per day assuming everyone travels to work separately.

The majority of the demolition waste will be removed from site over a short period (two months approximately) at the commencement of the construction programme and heavy truck movements should not exceed four per hour or forty per day over this period.

It will be a condition of the contract documents that the re-use of demolition waste material should be maximized on site. In particular, excavated soil will be re-used to form embankments along the site boundary where possible. The removal of demolition waste from the site, therefore, will be minimized.

The most significant deliveries to site will be of broken stone for the sub road-bases of structures and roads and ready mixed concrete for insitu concrete structures. These deliveries will lead to increased traffic movements - approximately four per hour - for short periods of time.

It is considered that the expected increase in construction traffic will lead to only a small reduction in the road capacity.

11.3.2 Operational Impacts

The current traffic movements at the WWTP site are due to:

- Staff
- Material deliveries
- Removal of screenings, grit and sludge.
- Maintenance crew

One caretaker carries out the current operational duties at the WWTP. It is expected that one person will continue to be employed in the operation of the plant following its upgrade and expansion as the process will be largely automated and only requires surveillance and monitoring for the most part. There are periodic visits to the WWTP at present to take samples of the treated effluent for laboratory analysis. This is not expected to change in the future.

There is very little material required for the operation of the plant. Polyelectrolyte is required in the sludge treatment process. The increased throughput in the WWTP will lead to an increased requirement for polyelectrolyte but it is expected that the quantity of polyelectrolyte per delivery will increase and the frequency of deliveries will remain the same.

The only other consumables would be general office supplies.

Screenings are extracted from the raw sewage as it enters the WWTP. The screenings are then dewatered and placed in a skip. The screenings are removed from site approximately once per fortnight and disposed of at a licenced landfill facility. The quantity of screenings will increase over time in proportion to the increase in sewage passing through the WWTP. The current flow through the plant is approximately 15,000 PE which is to increase to 20,000 PE due to the upgrade, therefore the increase in screenings will therefore be of the order of 33%. At most, the traffic movements will increase from 2 to 3 per month.

The grit removal system produces approximately 2 bins of 180 litres capacity per week. Again, with the increase in flow, the quantity of grit will increase by approximately 33%. The method of grit removal will, however, be upgraded with the result that washed and de-watered grit will be discharge into a skip for removal once per week. There will therefore be a reduction in traffic movements associated with the grit removal.

At present, sludge from the treatment process is thickened and de-watered on site with 2 to 3 tankers of sludge being removed from the WWTP each week. It is expected that the traffic movements will increase by one in the future due to the increased quantity of sludge being produced.

Currently, maintenance of mechanical and electrical plant at the WWTP is carried out on a scheduled basis and when required due to breakdowns. It is expected that, following the upgrade of the plant with more modern equipment, on additional traffic movements will be generated.

11.4 MITIGATION MEASURES

11.4.1 Construction Phase

The contract documents will require the contractor to maintain traffic flows on the road at the entrance to the WWTP at all times. There will also be a requirement to maintain the road in a clean condition through regular washing and sweeping.

Advance warning signs will be placed at appropriate distances on both sides of the site entrance to warn road users of the presence of construction and slow moving traffic entering and leaving the site.

The contractor will be required to prepare a specific traffic management plan for the project. This plan will set out the planned traffic movements entering and leaving the site and the contractor's proposals to minimize traffic disruption on the public road. This plan will be subject to the approval of the Client and his Engineer.

Traffic control may be used at the entrance to the WWTP site at times of peak traffic movements to ensure safe entering and exiting of the site.

11.4.2 Operational Phase

It is considered that there will be minimal change to the existing level of traffic movements associated with the operation and maintenance of the WWTP

11.5 RESIDUAL IMPACTS

An assessment of the potential traffic impacts associated with the proposed upgrade and expansion of the Clonakilty WWTP has been completed. In summary, the expected construction traffic impacts will have only a small negative impact on current road capacity. The construction traffic impacts will be mitigated through the preparation and use of a project specific traffic management plan, the use of adequate signage to warn traffic users of the construction traffic and through the use of traffic control at the entrance to the site if deemed necessary.

There are not expected to be any impacts during the operational phase of the WWTP.

11.6 REFERENCES

- Environmental Protection Agency (2003). *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.* EPA, Wexford, Ireland.
- Environmental Protection Agency (2002). *Draft Guidelines on the information to be Contained in Environmental Impact Statements.* EPA, Wexford, Ireland.
- RPS / MCOS (2004). *Upgrading of the Clonakilty Sewage Treatment Plant and Associated Works Preliminary Report.* RPS / MCOS, Cork, Ireland.
- MCOS (2001). *Clonakilty Tidal Barrage Environmental Impact Statement.* MCOS, Cork, Ireland.

12 CULTURAL HERITAGE

12.1 INTRODUCTION

The following section comprises the results of an archaeological desk survey of the site of the proposed development and a field survey of the land on which the development is planned. A description of the site location and scope of the proposed development can be found in Section 2 (Project Description). For the purpose of the desk survey *c.* 1.5km around the site was considered. For the purpose of the field survey the site of the proposed development and its immediate environs including the Fealge River, Deasy's Quay, The Croppy Road and the north-western portion of Clonakilty Harbour were assessed.

12.2 METHODOLOGY

12.2.1 Introduction

For the purpose of setting the proposed development within its wider archaeological and cultural heritage landscape, and to assess the archaeological potential of the site, a comprehensive desk survey of all available archaeological, historical and cartographic sources was undertaken. The desk survey was undertaken to provide an archaeological and historical context for the site and involved the review of sources including the Record of Monuments and Places, the topographical files of the National Museum of Ireland, cartographic sources, previous excavations in the area and documentary sources (for further detail see below). The desk survey was supplemented by a field survey of the site and its environs which was undertaken on the 30th September 2005. The field survey was undertaken to verify the results of the desk survey and to assess on the ground the impact of the proposed development on recorded archaeological monuments and areas of archaeological potential.

12.2.2 Recorded archaeological monuments and places

The Record of Monuments and Places was consulted for a radius of approximately 1.5km of the proposed development. The National Monuments Service has a list of known archaeological sites. The relevant files for these sites contain details of documentary sources and aerial photographs, early maps, OS memoirs, OPW Archaeological Survey notes and other relevant publications. These were studied in the Sites and Monuments Records Office. These monuments are listed in Appendix 12.1 (see Figure 12.1). The Draft Maritime Sites and Monuments Record was consulted for Clonakilty Harbour. The Draft Maritime SMR contains an inventory of all known shipwrecks in Ireland, produced by the Underwater Unit in the Department of Environment, Heritage and Local Government. Recorded shipwrecks in the vicinity of the study area are listed in Appendix 12.2.

12.2.3 Recorded archaeological finds

The topographical files in the National Museum of Ireland were consulted to determine if any archaeological artefacts had been recorded from the area. This is the national archive of all known finds recorded by the National Museum. It relates primarily to artefacts but also includes references to monuments and has a unique archive of records of previous excavations.

Other published catalogues of prehistoric material were also studied: Raftery (1983 - Iron Age antiquities), Eogan (1965; 1993; 1994 - bronze swords, Bronze Age hoards and goldwork), Harbison (1968; 1969a; 1969b - bronze axes, halberds and daggers) and the Irish Stone Axe Project Database (Archaeology Dept., U.C.D.). All townlands within the study area were assessed. A list of recorded finds from the area is given in Appendix 12.3.

12.2.4 Cartographic sources

Reference to cartographic sources is important in tracing land use development within the area as well as providing important topographical information on sites and areas of archaeological potential. Primary cartographic sources consulted consisted of the Ordnance Survey 6" maps, first and later editions (T.C.D. Map Library).

12.2.5 Previous Excavations

The excavation bulletin website (www.excavations.ie) was consulted to identify previous excavations that may have been carried out within the study area. This database contains summary accounts of excavations carried out in Ireland from 1970. The available *Excavations* publications were also consulted (Bennett 2003; Bennett 2004). No previous excavations were undertaken in the townlands assessed, which included Ashgrove, Cappeen, Cloheen, Clonakilty, Desert, Scartagh, Tawnies Lower, Tawnies Upper and Youghals.

12.2.6 Historical research

Historical sources consulted included the Hayes' Indices, the *1659 Census of Ireland* and Lewis's *Topographical Dictionary* as well as local journals including the *Journal of the Cork Historical and Archaeological Society* and the *Bandon Historical Journal*. Other bibliographic sources including the *Royal Historical Society Bibliography (www.rhs.ac.uk/bibl)*, the *Planning Architecture Design Database Ireland (www.paddi.net)* and the *British and Irish Archaeological Bibliography (www.biab.co.uk)* were also consulted.

12.3 ARCHAEOLOGICAL SIGNIFICANCE OF THE SITE

The site lies immediately adjacent to the 17th century market town of Clonakilty, which is defined as a zone of archaeological potential (CO135:052(01)).

In the early 19th century the site comprised one large field bounded to the north by the estuary of the Fealge River and on the east and south by Clonakilty Harbour (see Figure 12.2). Unlike the neighbouring agricultural land which is subdivided into small roughly rectangular fields no subdivision is evident in the immediate area and it is possible that these fields were formed by reclamation in the late 18th or early 19th centuries. Further land reclamation took place immediately to the north of the site in the late 20th century infilling the area between North Quay and Long Quay. Land reclamation has the potential to trap archaeological features and finds which in this location may include shell middens, fish traps or ship timbers.

12.4 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

12.4.1 Prehistory (c. 7000 BC - AD 500)

Estuarine and coastal landscapes were frequently exploited by prehistoric peoples and while there are no upstanding monuments of this date in the immediate vicinity of the proposed development a number of finds of prehistoric date have been recovered (see Appendix 12.2). A hoard of Bronze Age axes was recovered in the townland of Cappeen in 1896 (NMI 1896:16-20), while six copper axes all of the Lough Ravel type were found in the same townland in 1913 (NMI 1913:24-29). The 'Lough Ravel' typology is named for a find from Co. Antrim and is represented by simple, flat axes, some almost trapezoidal in shape and some with more curving sides (Waddell 2000, 123). They are a very primitive style of copper axe, and represent the earliest phases of metalworking in Ireland (*c.* 2400-2200 BC).

12.4.2 Early medieval period (c. AD 500 - 1170)

Secular settlement in the early medieval period is represented by a number of ringforts within the study area including two in the townland of Desert (CO135:054, CO135:055), two in the townland of Scartagh (CO135:020, CO135:021) and single examples in the townlands of Cloheen (CO135:051) and Tawnies Upper (CO135:018). The site is situated in an area of median ringfort density which covers most of Cork and Kerry (Stout 1997, 74). Ringforts generally comprise a circular or oval area, between 25m and 50m in diameter, delimited by a bank and fosse/ditch. Ringforts enclosed by a single bank and ditch (univallate) are the most common type but examples with two (bivallate) or three enclosing elements (trivallate) are also known. Ringforts are considered to be the defended settlements of early medieval farmers and excavated examples have uncovered evidence for the presence of industrial areas and houses and outbuildings which may have been used to shelter livestock.

The early medieval period also saw the introduction of Christianity to Ireland, and the site of the church and graveyard at Desert (CO135:05301, CO135:05302; see Appendix 12.1) may originally date to this period. The name Desert is an anglicised version of *Diseart*, derived from the Latin *desertum*, meaning deserted place or hermitage. There have been suggestions that the spread of this placename element may be associated with the ascetic *Céli Dé* movement of the 8th and 9th centuries, but some sites containing the name have allegedly earlier associations (Flanagan & Flanagan 1994, 69).

12.4.3 Late medieval and post medieval period (c. AD 1170 - 1900)

The earliest reference to Clonakilty in the later medieval period occurs in a plea roll dating from 1378, in which *Clogh na Kylte* is listed among the lands of William de Barry (Tuipéar 1988). It would seem that the de Barry's had a castle here and, although its exact location is not known, it is thought to have been on the site of the present Church of Ireland (Tuipéar 1988, 3). In 1373 the castle of Clonakilty (known under the English name of Coyltescastell) was in the hands of Sir William FitzDavid de Barry, known in later generations as Sir William Maol ('the bald') (Nicholls 1993, 179). At some stage in the 15th century however the de Barry's lost possession of the castle and it, together with the surrounding district known as Toughnakilly, became absorbed into the territory of the MacCarthy Reagh lordship. In 1559 McCarthy Reagh held lands around Clonakilty as well as large parts of East Carberry and land around Rosscarbery, Muskerry and Dulhallow (Butler 1904; 75).

A petition dating to 1605 lists the corporation of Clonakilty, however, the settlement by Sir Richard Boyle, the first Earl of Cork, of 100 English families provided the base for the settlement to develop as a market and industry centre (Zajac, Cronon and Kiely 1995; 23). The Earl of Cork was one of the foremost planters and colonists in Ireland, and was also involved in the Ulster plantation. In 1613-15 Lord Deputy Chichester's parliament was summoned to Dublin in an attempt to extend plantation to the whole country. Munster towns such as Lismore, Mallow, Baltimore, Ennis, Tralee and Askeaton were represented while the newly built towns of Clonakilty and Bandon Bridge were ratified and obtained charters of incorporation from James I (Ó Saothrai 1985, 11).

The town was the scene of some unrest during the 17th century. During the rebellion of 1641 the town was temporarily taken by Irish forces and the settlers were forced to flee to Bandon. In the following year an English regiment, under Lord Forbes, and some companies of the Bandon Militia passed through the town on their way to the siege at Rathbarry. Two companies of Scottish troops and one of the Bandon companies were left at Clonakilty to secure the town. Soon after they were attacked from all sides and the Scottish were 'cut to pieces' (Lewis 1837, 347). The Bandon men retreated to an 'old danish fort' on the road to Ross where they defended themselves until reinforcements arrived. The combined troops then turned on the Irish who were forced to retreat back to the strand near Inchidoney where, caught between British troops on one side and the rising tide on the other, many drowned attempting an escape to Inchidoney Island (Bennett 1869, 471-2; Lewis 1837, 347). The town was again attacked in 1691 by 800 Irish troops in the service of James II. From then Clonakilty enjoyed relative

stability with the exception of skirmishes during the 1798 rebellion (Lewis 1837, 347) in which a number of Croppy's, under the leadership of Tadhg O'Donovan Asna, were killed.

The full extent of the 17th century market town is unknown, but is thought to have been originally built in the form of a cross (Smith 1750 vol 1, 251; Bennett 1869, 354) which, 'sprang out in every direction' as trade increased in the town (Bennett 1896, 354). This cross is likely to correspond to the intersection of streets presently known as Asna Square.

Asna Square is the current location of the 'the Kilty Stone' reputed to have originated from Arundel Castle on the eastern side of Clonakilty Harbour (Healy 1988, 221). The market house (CO135:133) was erected on west side of McCurtain Hill and is first mentioned in 1642 (Tuipéar 1988, 33). This was replaced with a new building in the early 19th century and the associated shambles were constructed in 1838 (Lewis 1837, 347).

The 19th century appears to have heralded a period of relative prosperity for the town reflected in the addition of a number of new public buildings including a classical school in 1808 and a library in 1825 (see Figure 14.4). The Church of Ireland parish church (CO135:01902) was also rebuilt in 1818. The church and associated graveyard may be on an earlier church site. At this time the town was engaged chiefly in the manufacture of linen and cotton and Lewis (1837) records that the linen trade at Clonakilty employed 1000 people on 400 looms, manufacturing between £250 and £300 worth of linen per week. When the industry was at its most prosperous weekly sales of £1000 were said to have been common (Lewis 1837, 347).

Despite its coastal location Clonakilty never realised its full potential as shipping channels as the harbour was narrow, shallow and prone to silting. Large vessels were forced to discharge their cargoes at Ring, situated about a mile to the southeast of the town. Cargoes were then transferred and shipped by smaller vessels before being unloaded at Long Quay, Deasy's Quay and North Quay on the east side of the town (see Figure 12.2). Corn and potatoes were among the chief exports of the town and were transported to Cork and Dublin (Zajac, Cronon and Kiely 1995; 23). Deasy's Quay and the adjacent shipyard, built by the prominent 19th century brewing and merchant family, are the only elements of the once extensive quay system to have survived to the present day. Sixteen wrecks are recorded in the vicinity of Clonakilty harbour, ranging in date from 1763-4 (*Dorothea/Dorethea*) to 1906 (*Beatrice*) (see Appendix 14.2). The *Beauty of Munster* was a 27 year old smack based in Skibereen, weighing 43 tons and owned by T. McCarthy. The ship was stranded on Muckross Bar in Clonakilty bay. Although the ship was wrecked no lives were lost.

12.5 FIELD SURVEY

A field survey of the site and its environs was undertaken on the 30th September 2005, in order to assess on the ground the impact of the proposed development on recorded archaeological monuments and areas of archaeological potential (see Figure 1.4 Site Layout for layout of existing and proposed development).

The wastewater treatment plant is located on the southeast side of Clonakilty. The site is bounded to the west by hedgerow and trees and adjoined by the GAA playing pitch (see Plate 1, Appendix 12.4). It is bounded to the south by hedgerow and trees and adjoined by the Model Railway Village (see Plate 2, Appendix 12.4). The Fealge River enters Clonakilty Harbour immediately to the northwest of the site (see Plate 3, Appendix 12.4). There are currently two oxidation tanks running east-west through the site, two settling tanks at the east end of the site (see Plate 4, Appendix 12.4) and a control house to the east of the site entrance. The proposed development at the north-western boundary of the site will involve the installation of two new primary settling tanks. This portion of the site is relatively flat and grass covered and is screened to the north by tall trees (see Plate 5, Appendix 12.4). Development in the southern section of the site will involve the construction of a new aeration tank, settling tank, compressor/dewatering house and picket fence thickener tank. This portion of the site is relatively flat and grass covered and is screened to the south by tall trees (see Plate 6 and Plate 7, Appendix 12.4).

A new storm water holding tank will be constructed to the south of the current Long Quay Pumphouse. The site consists of a small park bounded to the north by Long Quay and to the south by Croppy Road (see Plate 8). The area consists of land reclaimed in the late 1970s and subsequently used to construct the Clonakilty By-pass.

No previously recorded archaeological sites are located within the areas to be developed and no additional archaeological sites were revealed during the field survey.

12.6 POTENTIAL IMPACTS

The site of the proposed development contains no previously recorded archaeological sites or finds and no additional archaeological sites were revealed during the field survey. However, the site lies immediately to the east of the town of Clonakilty (CO135:052(01) and the reclaimed nature of the area indicates the potential for archaeological remains to occur within the site.

12.7 MITIGATION MEASURES

As noted above, although the proposed development does not impact on any known archaeological sites or monuments, there is a possibility that previously unrecorded material or finds will be encountered during ground disturbance associated with this development. Thus it is recommended that a programme of archaeological assessment should be undertaken as follows:

Monitoring

Monitoring by a suitably qualified archaeologist, under licence from National Monuments Section of the Department of Environment, Heritage and Local Government, is recommended during the ground disturbance phases of the development at the site of the Long Quay storm water holding tank and the Wastewater Treatment Works.

Logistics

Should any archaeological features or material be uncovered during excavation, works should cease immediately, and the National Monuments Section of the Department of Environment, Heritage and Local Government should be informed. Time must be allowed for a suitably qualified archaeologist(s) to inspect and assess any such material. If it is established that archaeologically significant material is present full archaeological excavation and recording may be required. Adequate financial and logistical provision should be made for any such archaeological excavation, related post-excavation and/or conservation work and for the publication of the results.

Please note that the recommendations given here are subject to the approval of The National Monuments Section of the Department of Environment, Heritage and Local Government.

12.8 INTERACTIONS

Archaeology and other aspects of cultural heritage have the potential to interact with a number of other environmental factors examined in this study. If archaeological mitigation consisting of archaeological excavation is necessary it may impact on both ground and surface water, soils and the landscape

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13. MATERIAL ASSETS

13.1 INTRODUCTION

This chapter evaluates the impacts, if any, which the development will have on material assets. In the EPA advice notes on current practice in the preparation of Environmental Impact Assessments, 2003, material assets are defined as '*resources that are valued and that are intrinsic to specific places, they may be either human or natural origin and the value may arise for either economic or cultural reasons*'. Table 13.1 outlines the recommended objectives which should be assessed as part of the material assets study.

Table 13.1 Material Assets – EPA Recommended Assessment Objectives

Economic Asset	Cultural Asset
- assimilative capacity (air &water) - non renewable resources - renewable resources - settlements - transportation infrastructure - major utilities - ownership and access	- archaeology - architecture -settlements - monuments, features, landmarks - historic sites and structures - geological heritage - language and dialects - folklore and tradition - religion and belief - literary and artistic association

The assessment of cultural heritage is discussed under Section 12, Cultural Heritage, therefore; this section evaluates the economic assets only.

13.2 OWNERSHIP AND ACCESS

As outlined in Section 1, the proposed development consists of the upgrading of the existing Clonakilty wastewater treatment plant to a 20,500 PE to treat effluent from Clonakilty, Inchdoney and Ring. The main upgrades to the plant involve additional aeration and settling capacity, upgrading of the inlet works, sludge treatment and odour control. Cork County Council (CCC) intends to apply for full planning permission to Clonakilty Town Council for the redevelopment of the existing waste water treatment plant on lands owned by CCC in the town land of Youghals, Clonakilty, County Cork. The proposed redevelopment will be located on the existing plant site and within the existing site boundary. This environmental impact assessment evaluates the site (2.2 ha) in its entirety.

13.3 LOCAL SETTLEMENTS

The existing site is located within the townland of Youghals in Clonakilty, Co. Cork. Other nearby settlements include:

- Rosscarbery – located 13.5 km from the site
- Skibbereen – located 32.8 km from the site
- Leap – located 22.2 km from the site
- Drinagh – located 25.6 km from the site
- Timoleague – located 9.8 km from the site
- Bandon – located 20.9 km from the site
- Ballinspittle – located 25.6 km from the site
- Kinsale – located 35.2 km from site

The local settlement has been evaluated in detail in Section 3 (Human Beings).

Tourism

Tourism is discussed in Section 3 (Human Beings).

13.4 WATER SUPPLY AND USAGE

Potable Water

Potable water will continue to be obtained from the mains. It is estimated that approximately 25 m^3/day of potable water will be required on site during the operational phase of the development.

Fire Water

Water to fight fires if any will be supplied from on-site hydrants. Due to the nature of the plant the most likely source for a fire would emanate from electrical panels etc. in which case fire extinguishers or foam will be used.

Foul Water

There will be no foul water effluent generated by the proposed development. The existing toilet will remain sewered to the WWTP and there will not be in increase in the level of foul water discharge as staff numbers are to remain the same.

Surface Water

The existing surface water drainage system runs along the perimeter of the site. There are currently no plans to alter the existing surface water drainage system. The surface water is described in more detail in Section 6, (Water Quality).

Air

An assessment of the existing air quality and proposed impacts and mitigation measures are described in Section 8 (Air).

13.5 NON RENEWABLE RESOURCES

Non renewable resources are defined as resources that are not continuously replenished by nature, the most well know being fossil fuels including coal, oil etc. In so far as possible, non renewable construction materials will be sourced from locally and all imported material that will be used on site will be from approved sources. The range of materials that would normally be associated with an infrastructural project of this nature would include the following:

- Hardcore stone
- Concrete
- Steel Reinforcement
- Timber
- Blockwork
- Waterproof membranes such as DPC, DPMs and Hydrophilic Strips, tanking
- Wall ties, lintols and various ancillaries for constructing blockwork
- Steel work including beams, columns, rafters, tie beams, purlins, bracing and holding down bolts
- Cladding for building elevations
- Gantry Cranes
- Drainage materials such as concrete, upcv, HDPE pipe work
- Plaster
- Windows, doors , ironmongery
- Precast concrete units
- Light weight partitions
- Mechanical plant and equipment
- Electrical plant and equipment
- Control equipment
- Cabling

13.6 TRANSPORTATION INFRASTRUCTURE

Details regarding the road network are discussed under Section 11 (Roads and Traffic).

13.7 WASTE MANAGEMENT

Waste management: Construction Phase

During the construction phase both solid and liquid waste will be produced at the facility. Minor quantities of liquid waste will be produced during the construction phase of the facility. Waste oils, solvents and paints will be stored in a temporary bunded area prior to transport off site by a licensed contractor. During the construction phase all domestic effluent generated on site will discharge to temporary sewage containment facilities prior to transport and treatment off site by an authorised contractor.

During excavation works the removal of the contaminated fill material, if present, will be undertaken in a controlled manner in order to eliminate the potential for health and safety impacts. Contaminated materials will be segregated and sent to a licensed facility by suitably licensed haulers for disposal.

Waste management: Operational Phase

The waste arising from the operation of the WWTP will mainly consist of screenings, grit and sludge.

The screenings are extracted from the raw sewage as it enters the WWTP. The screenings are then dewatered and placed in a skip. The screenings are removed from site approximately once per fortnight and disposed of at a licensed landfill facility. The quantity of screenings will increase over time in proportion to the increase in sewage passing through the WWTP. The increase in screenings will therefore be in the order of 33%.

A grit classifier is to be installed at the inlet works which will wash organic material from the grit and allow it to drain properly before depositing the grit in a skip for removal from site to a licensed landfill facility. The grit removal system currently produces approximately two bins of 180 litres capacity per week. Again with the increase in flow the quantity of grit will increase by approximately 33%. The upgraded method of grit removal will result in washed and de-watered grit being discharged into a skip for removal to a licensed landfill facility once per week.

At present, sludge from the treatment process is thickened and de-watered on site with two to three tankers of sludge being removed from the WWTP each week. Currently the sludge cake is disposed of by soil injection into agricultural land at Balineen. This method of disposal is in line with the Sludge Management Plan for County Cork, 2000, Code of Good Farming Practice and Disposal of Sludge to Agriculture Regulations This method of disposal is proposed to continue following the upgrade of the works.

13.8 SITE UTILITIES

Electricity supply

ESB provide the electrical network and supply for the existing site and it is proposed to continue using them. The current electrical consumption for the development is 1,500 kwh/day, this is expected to increase to approximately 3,000 kwh/day as a result of the upgrade.

13.9 IMPACTS & MITIGATION MEASURES

Ownership and Access

There will be no severance of land as a result of the proposed development or loss of rights of ways or amenities or rezoning of land required. The proposed development will be constructed on Cork County Council lands only that currently form part of the WWTP site. The impacts that the proposed development will have on the environment have been assessed in full in Sections 3 to 13 and mitigation measures required to reduce significant impacts have been outlined.

Local Settlements

Impacts and mitigation measures associated with human beings and tourism is detailed in Section 3 (Human Beings).

As discussed in Section 1.3 the town of Clonakilty has grown immensely and now serves a population far greater than the original plant was designed for. The upgraded WWTP will treat effluent generated from Clonakilty, Inchdoney and Ring. The Clonakilty Town Council Development Plan notes that the plant "is presently overloaded and requires upgrading". Therefore the proposed development is in line with the development plan.

Transportation Infrastructure

Impacts and mitigation measures associated with transportation is detailed in Section 11 (Roads and Traffic).

13.10 RESIDUAL IMPACTS

With the above mitigation measures in place, neither the construction nor operational phases of the proposed development will result in any significant negative impacts on the existing economic assets.

13.11 INTERACTIONS

The main interactions that material assets will have with other environmental topics include water, air and transport. These interactions may result due to the proposed development generating dust during construction, generating air emissions during operation, increasing traffic to and from the facility during construction and as a result of the installation of site utilities. The development would have the potential of a negative impact as outlined in Section 6 (Water Quality) and 8 (Air) however appropriate mitigation measures will protect these resources from potential damage.

13.12 REFERENCES

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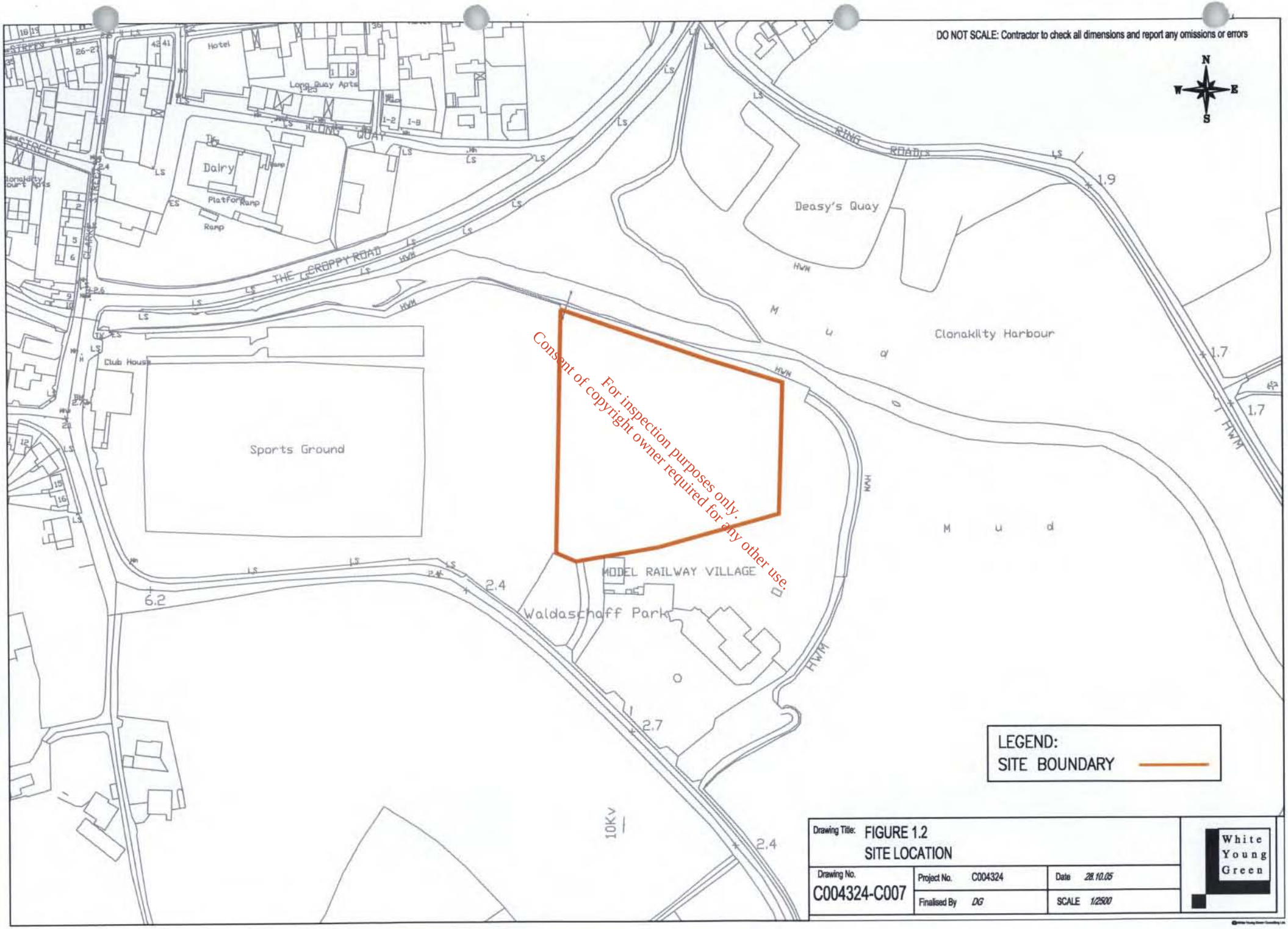
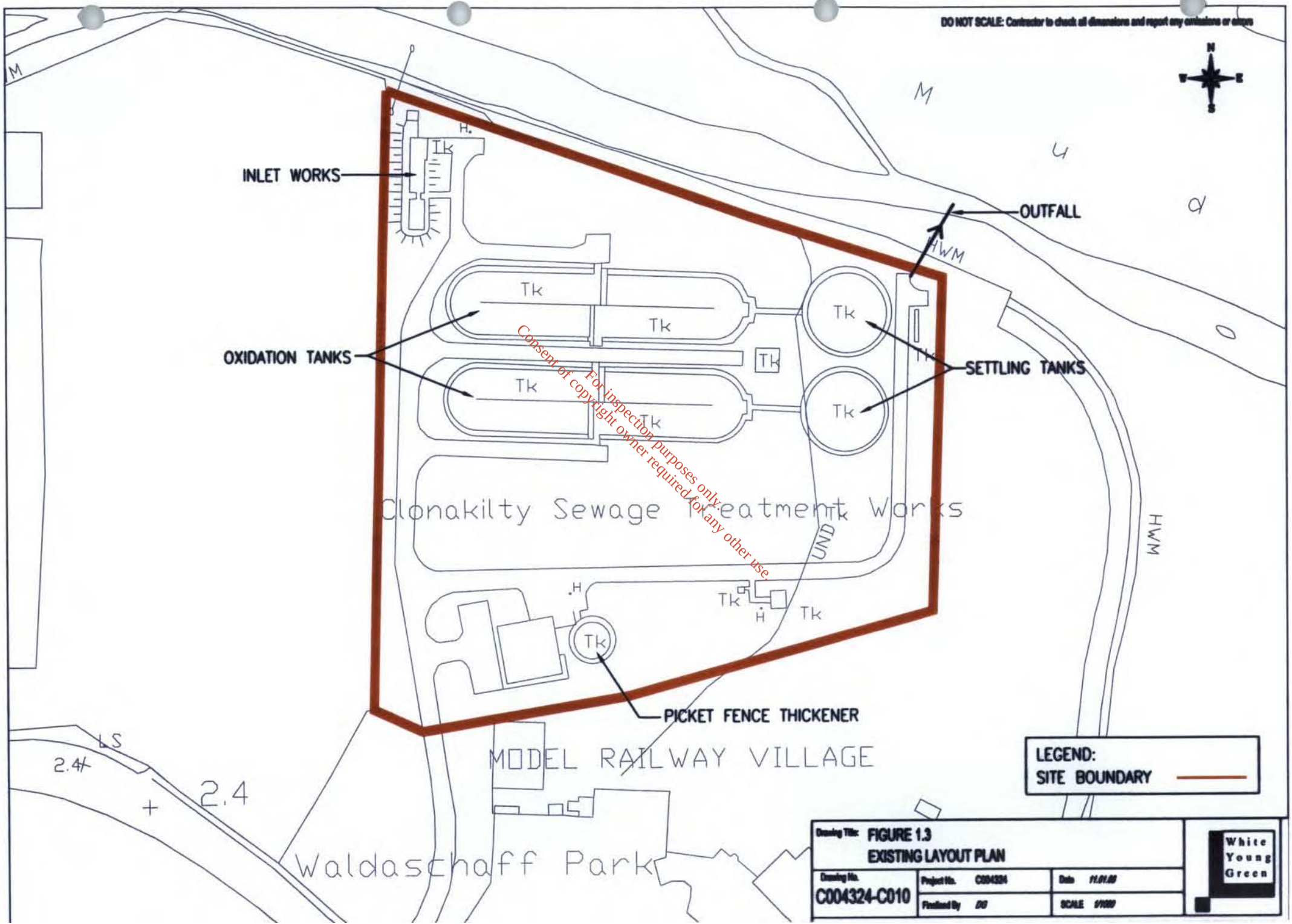
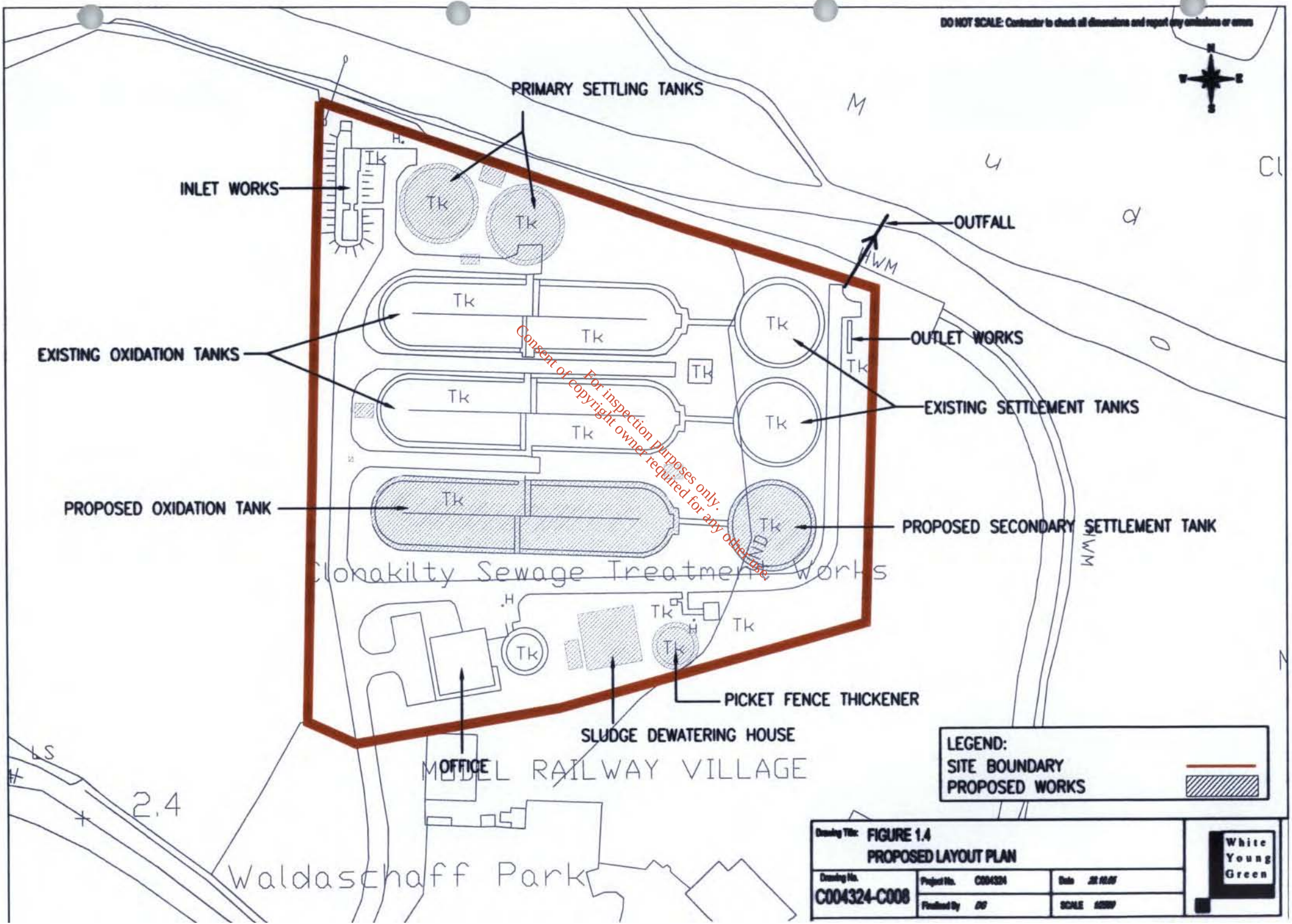
FIGURES







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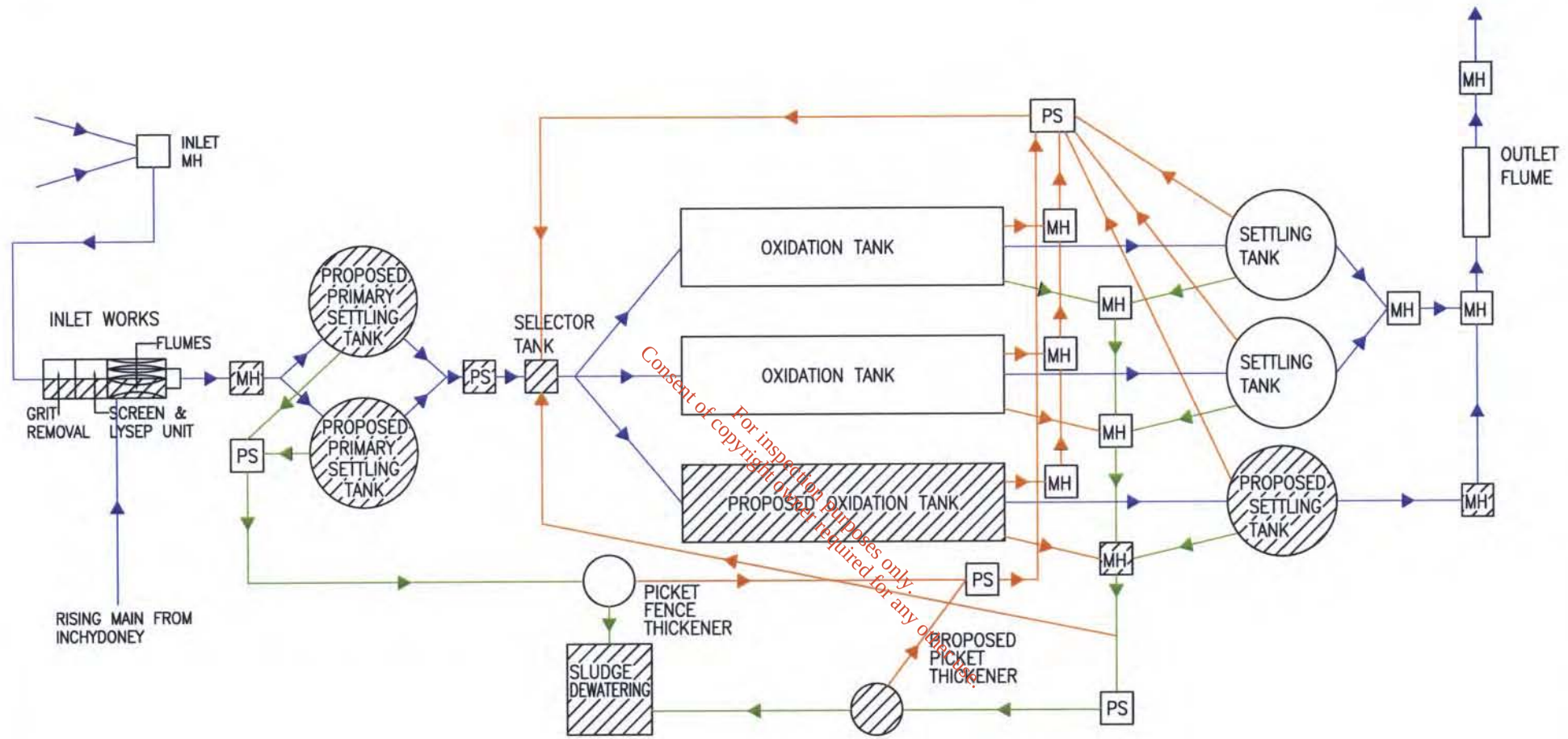

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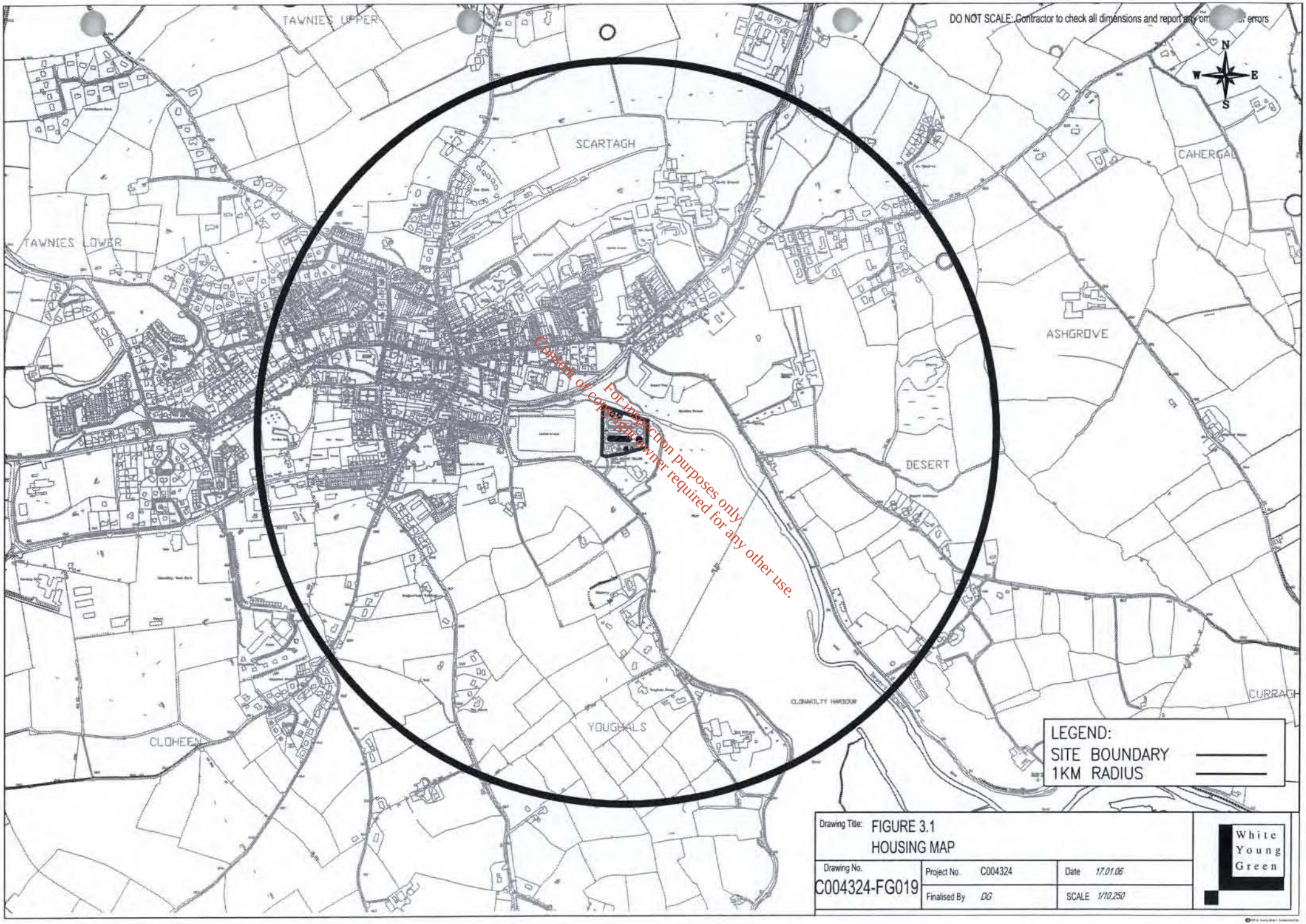
Rev	Description	By	Chk	App	Date

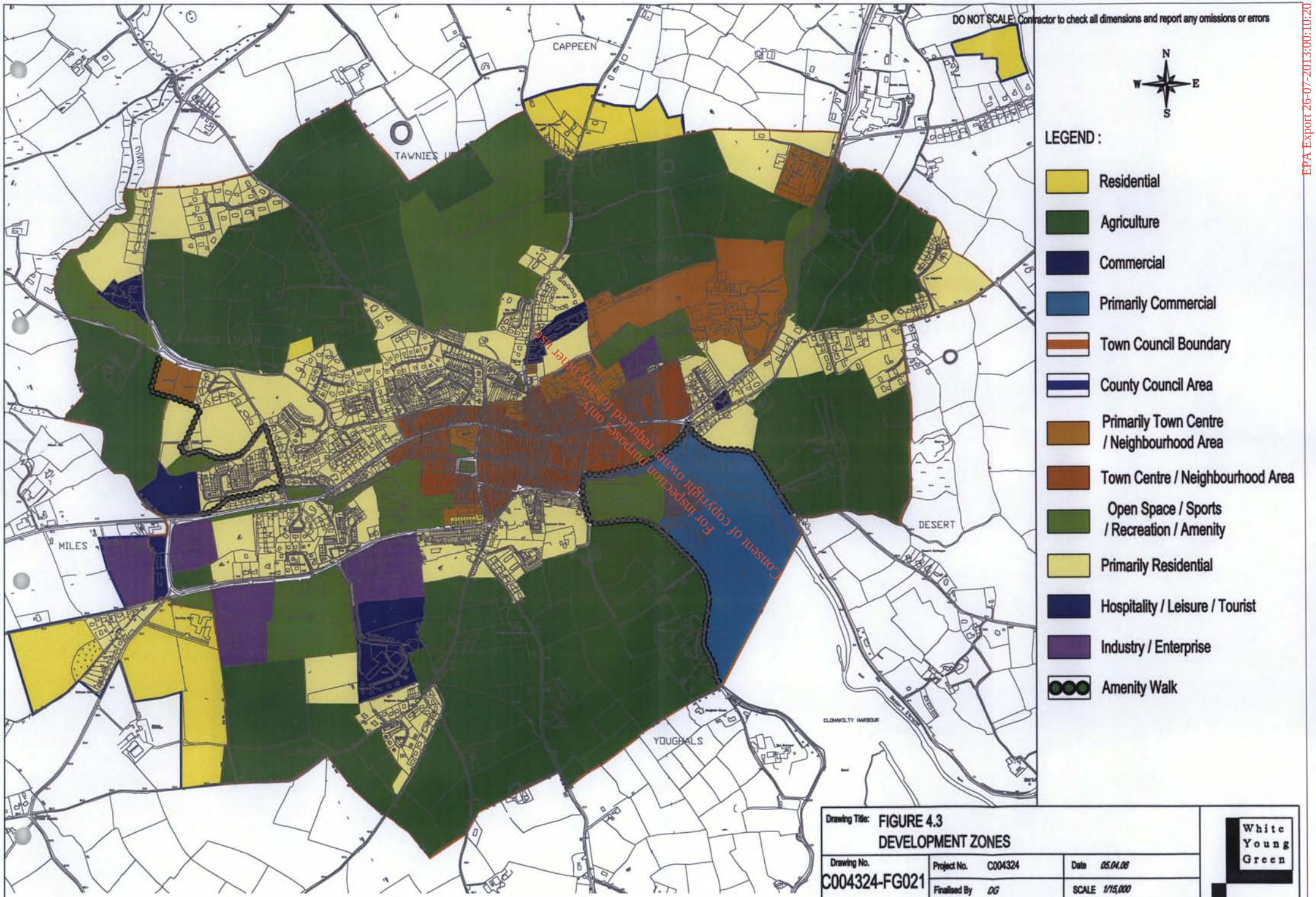
Drawing Title:
FIGURE 2.1
FLOW CHART FOR PROPOSED WWTP

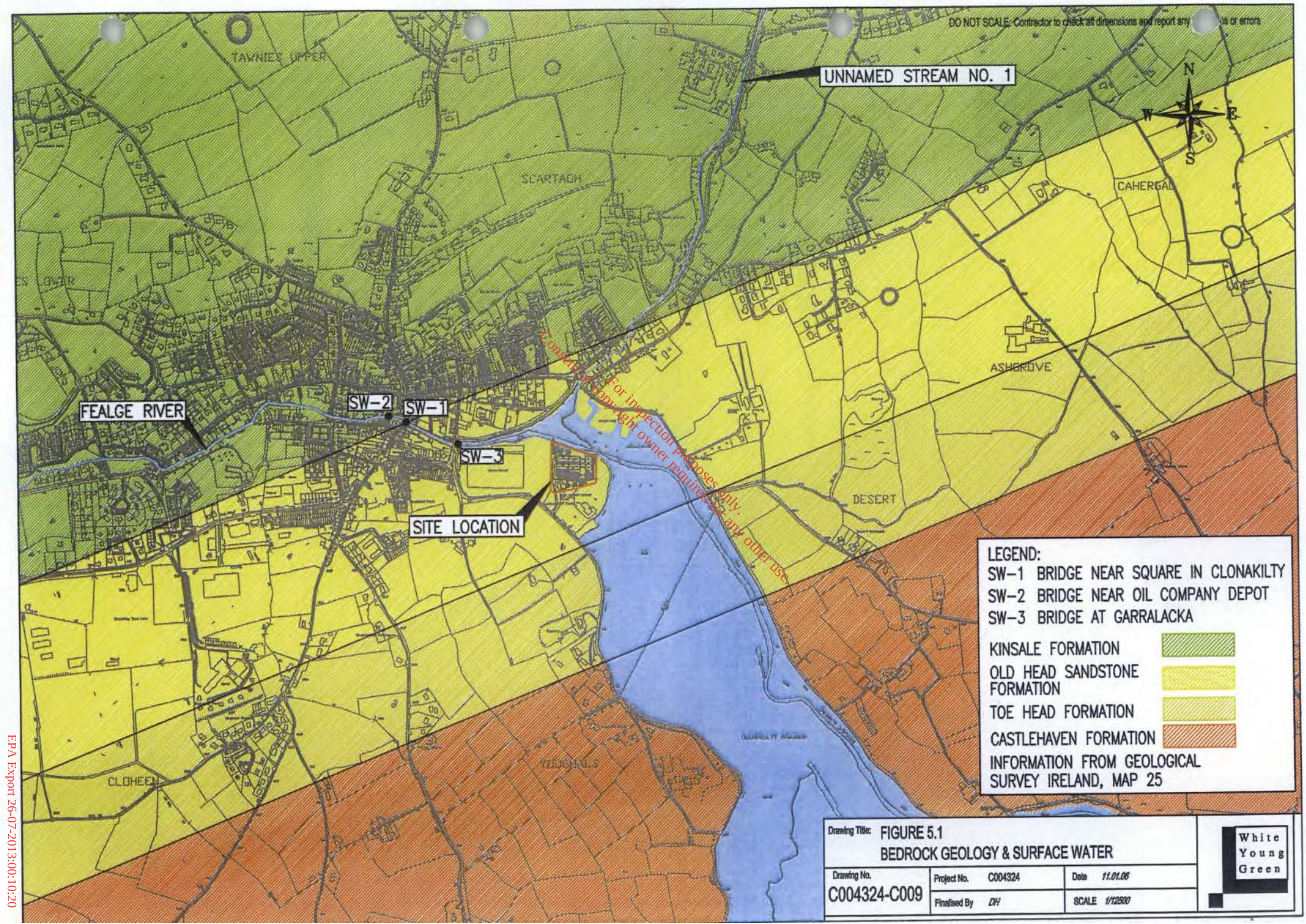
Scale	Drawn By	Date	Checked By	Date	Approved By	Date
N.T.S.	AM	10.11.05	KT	10.11.05	KT	10.11.05

Project No.	Office	Type	Drawing No.	Revision
C004324	12	C	C004324-C-SK005	P1

APPROVAL ☐ INFORMATION ☒ TENDER ☐ CONTRACT ☐ CONSTRUCTION ☐







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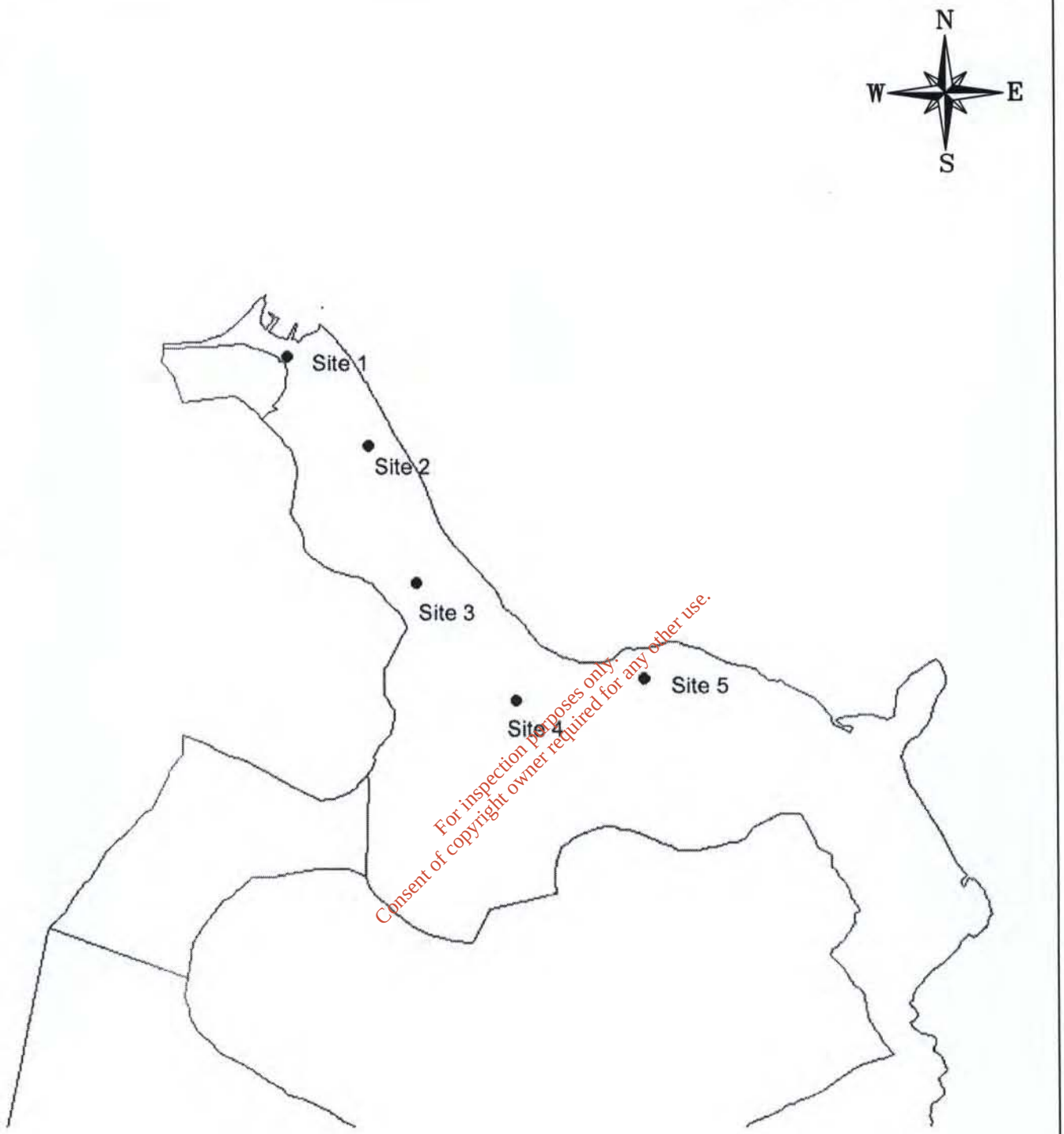

Drawing Title: FIGURE 7.1
LOCATION OF LITTORAL (INTERTIDAL) SAMPLING SITES

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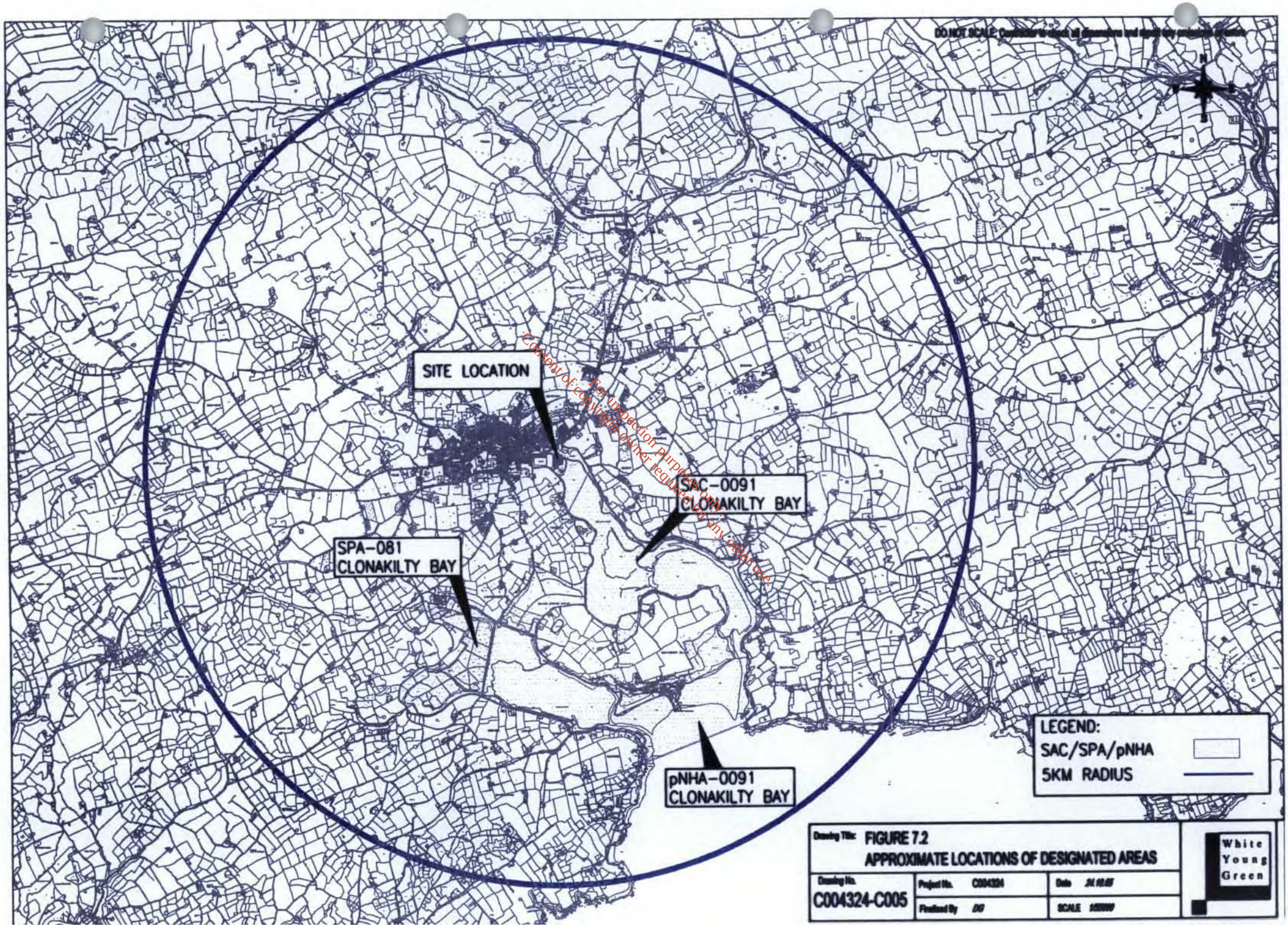

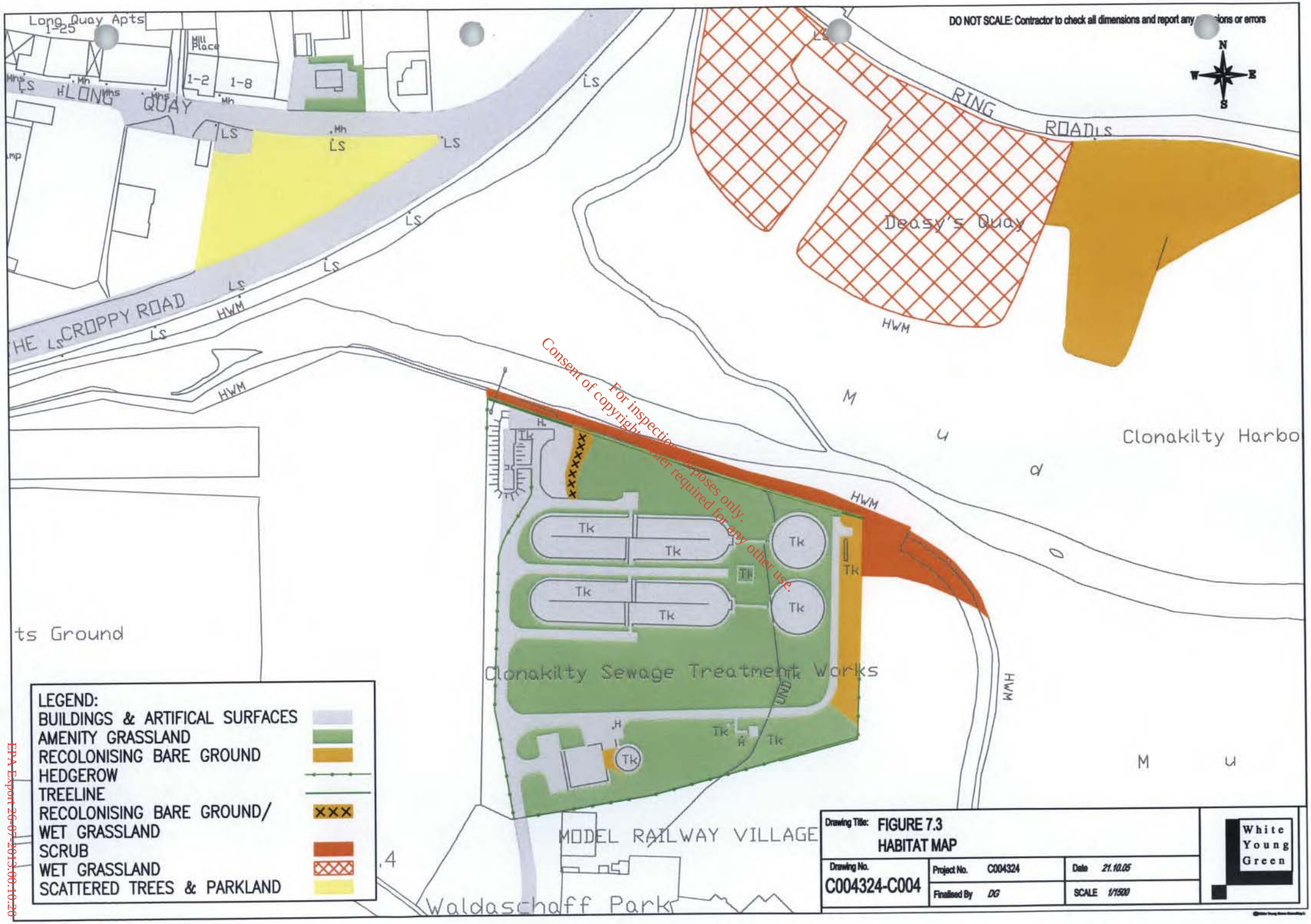

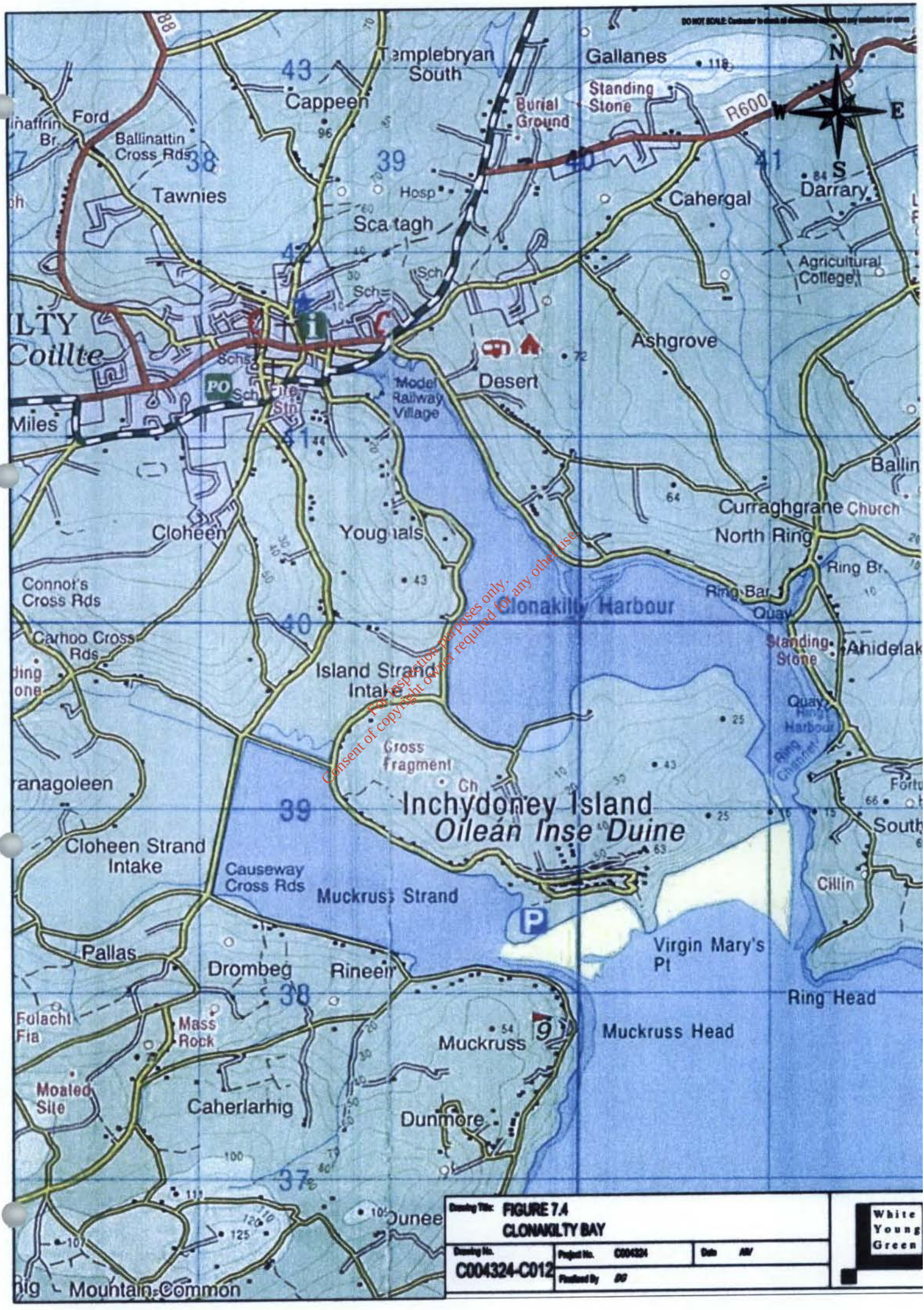

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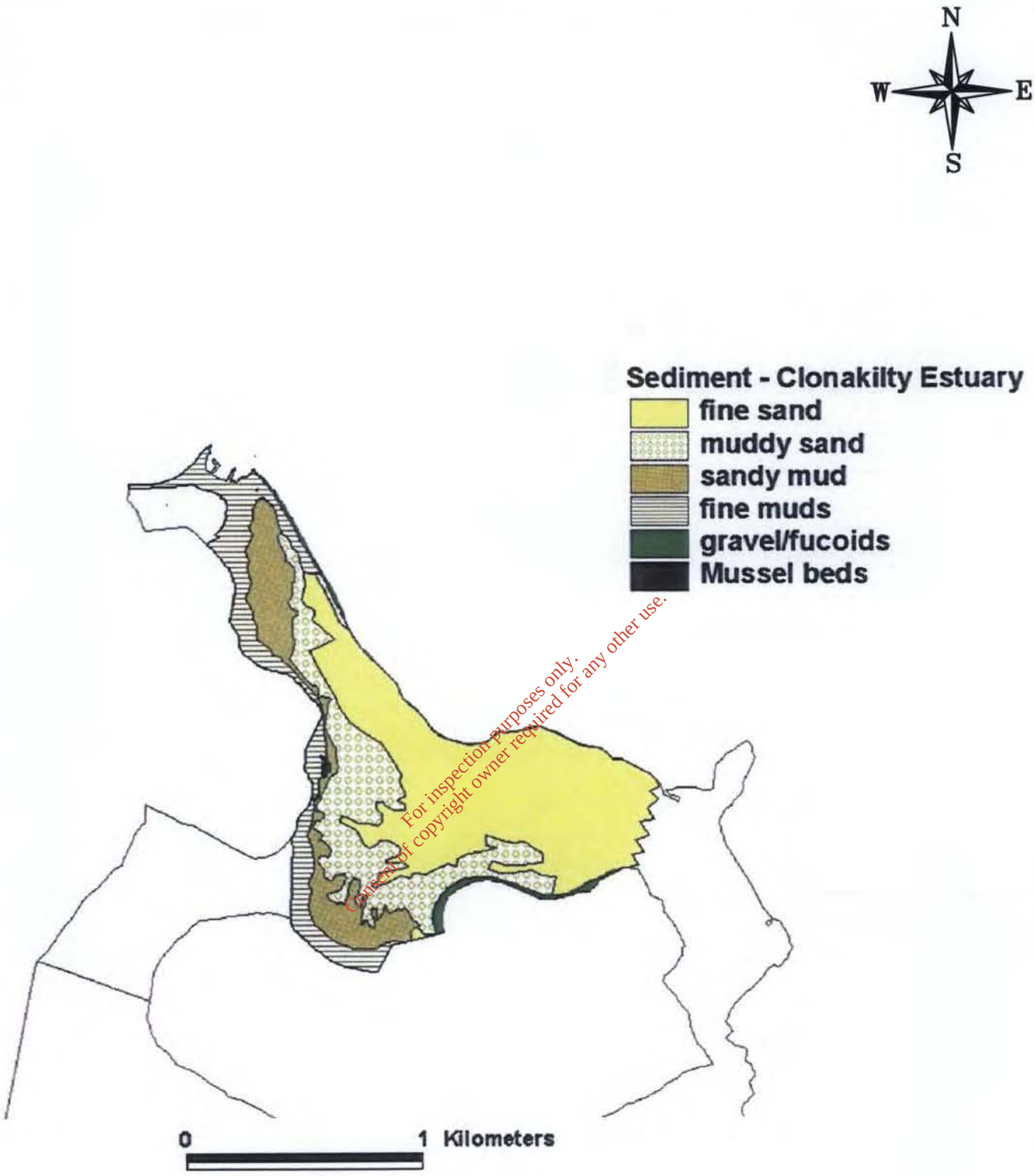

Drawing Title: FIGURE 7.5
SEDIMENT DISTRIBUTION WITHIN CLONAKILTY ESTUARY

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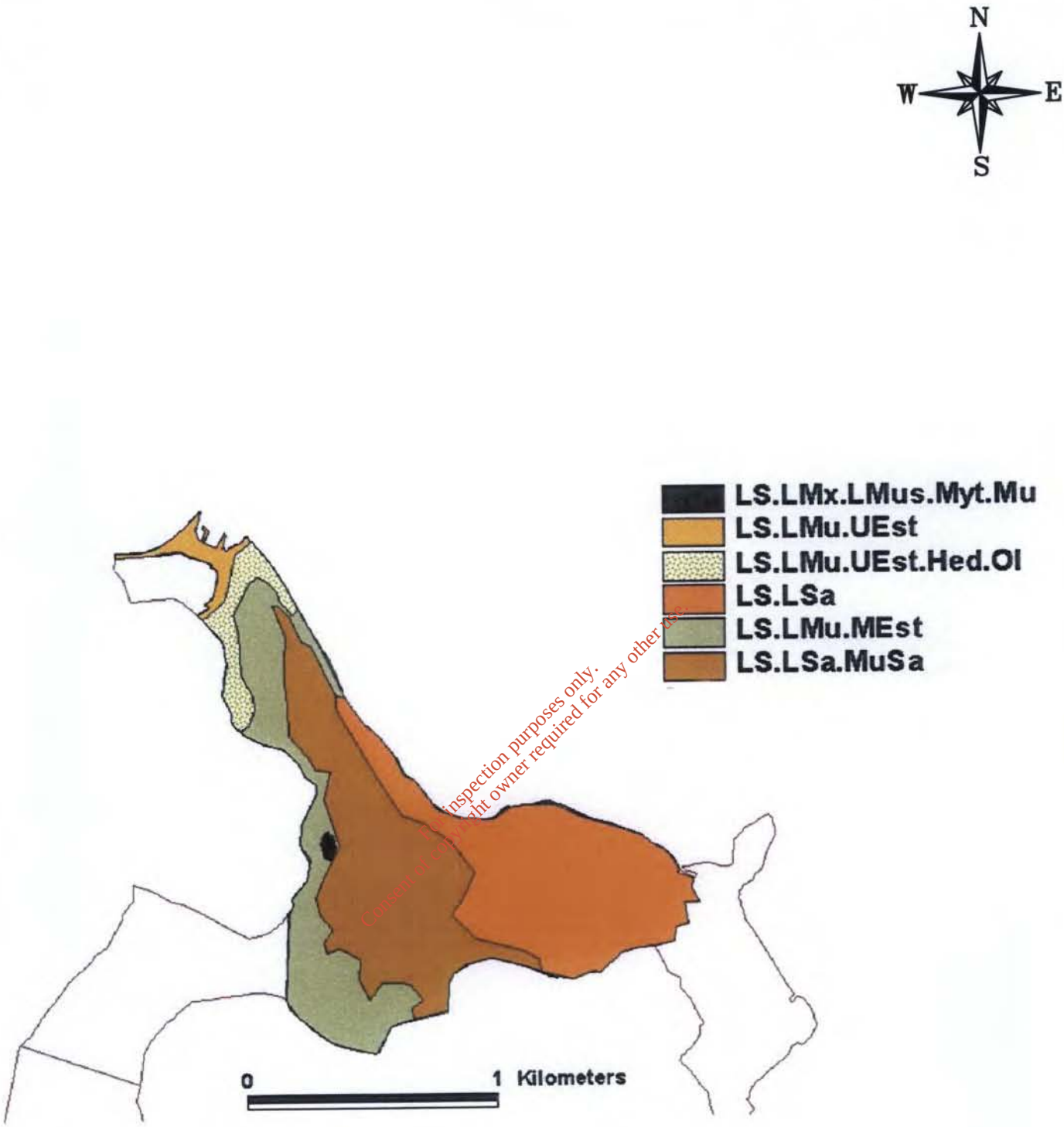

Drawing Title: FIGURE 7.6
BIOTOPE DISTRIBUTION:CLONAKILTY ESTUARY

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Project No. C004324

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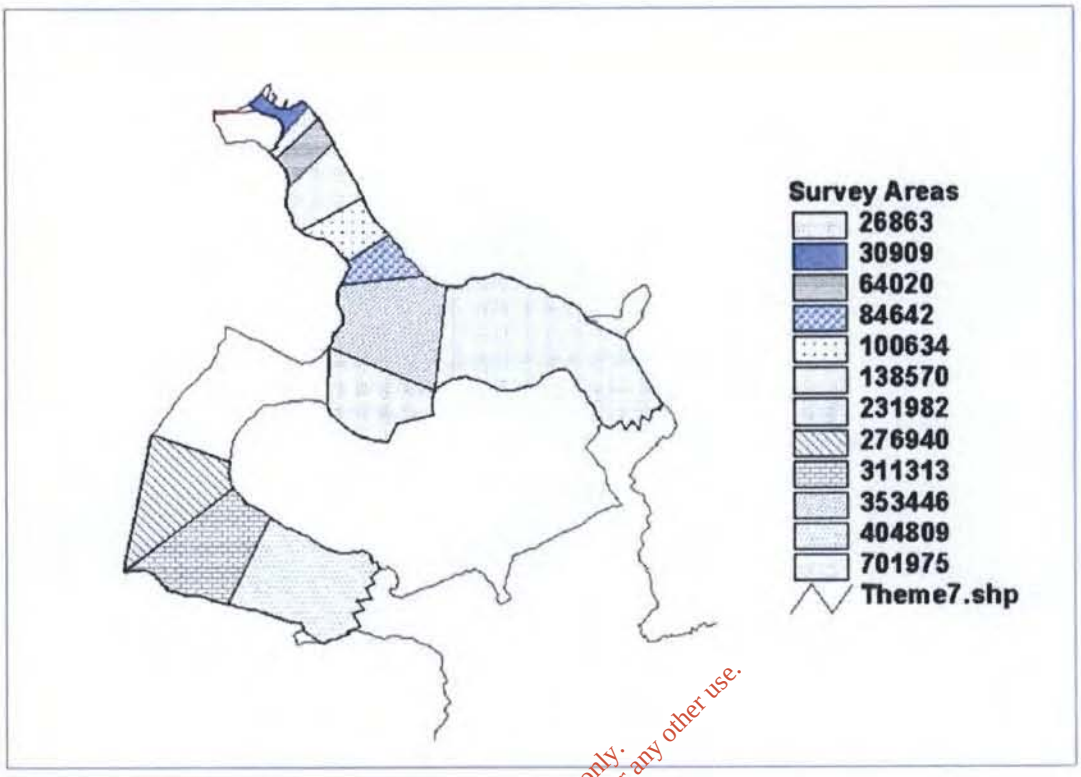
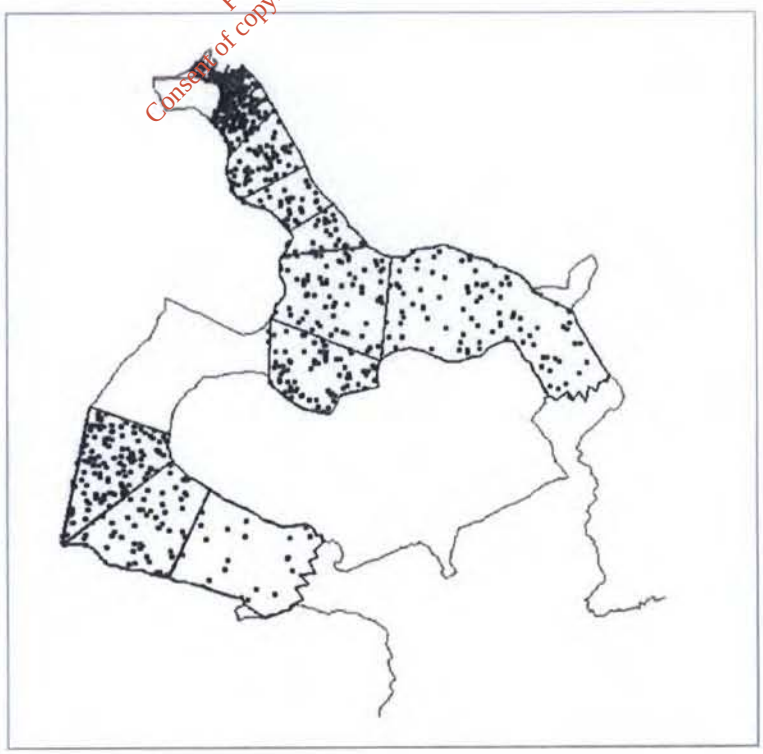
(a) Estuarine bird survey sections (areas in m^2).



(b) Low-tide distribution of total estuarine birds (all species combined). Average density/ha); 1 dot = 2 birds.



Drawing Title: FIGURE 7.7 ESTUARINE BIRD SURVEY			White Young Green
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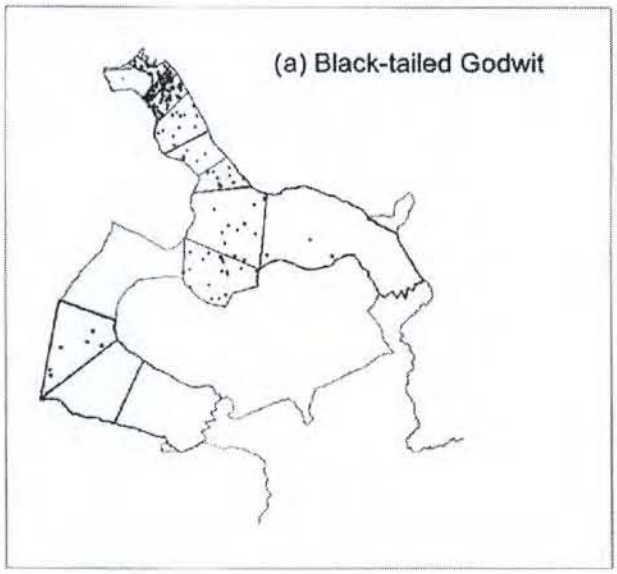
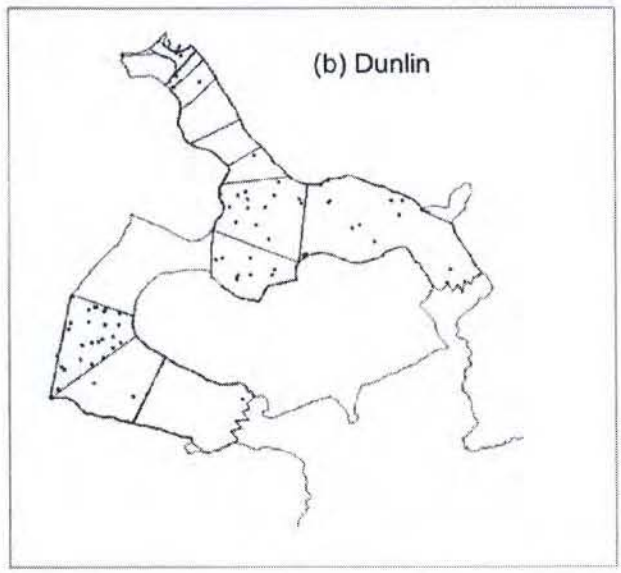
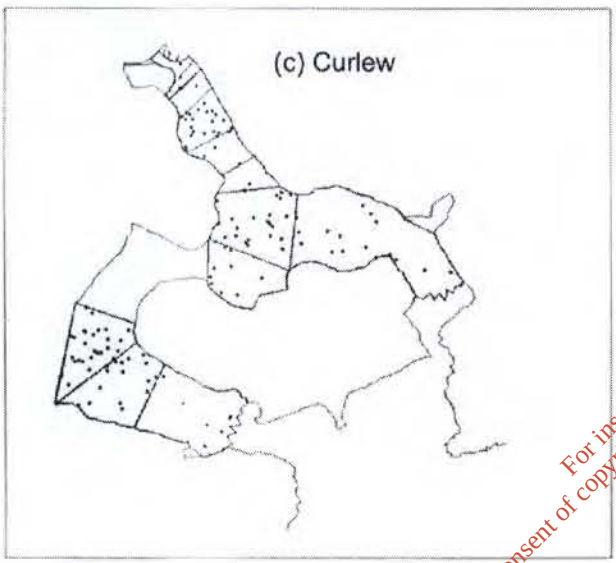
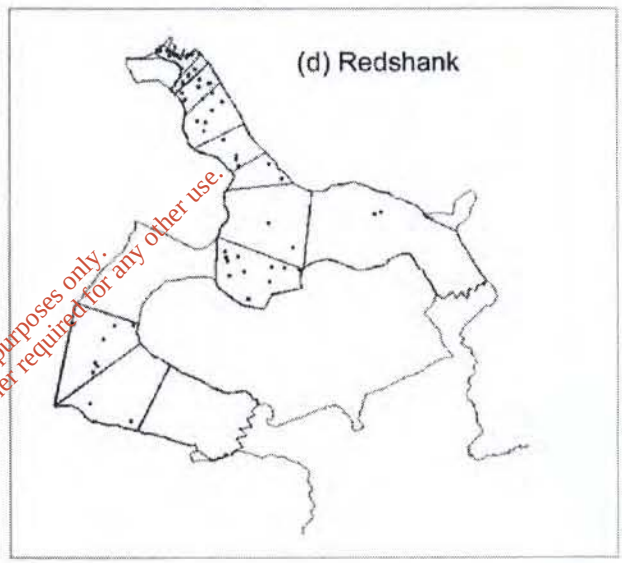
	Finalised By DG		

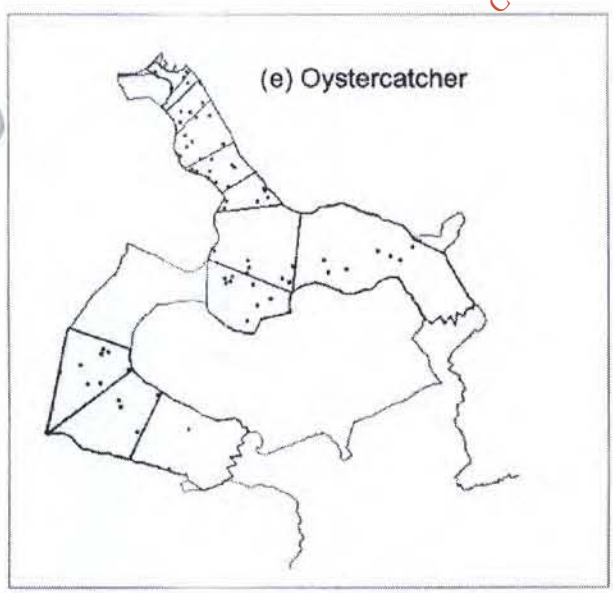
DO NOT SCALE: Contractor to check all dimensions and report any omissions or errors





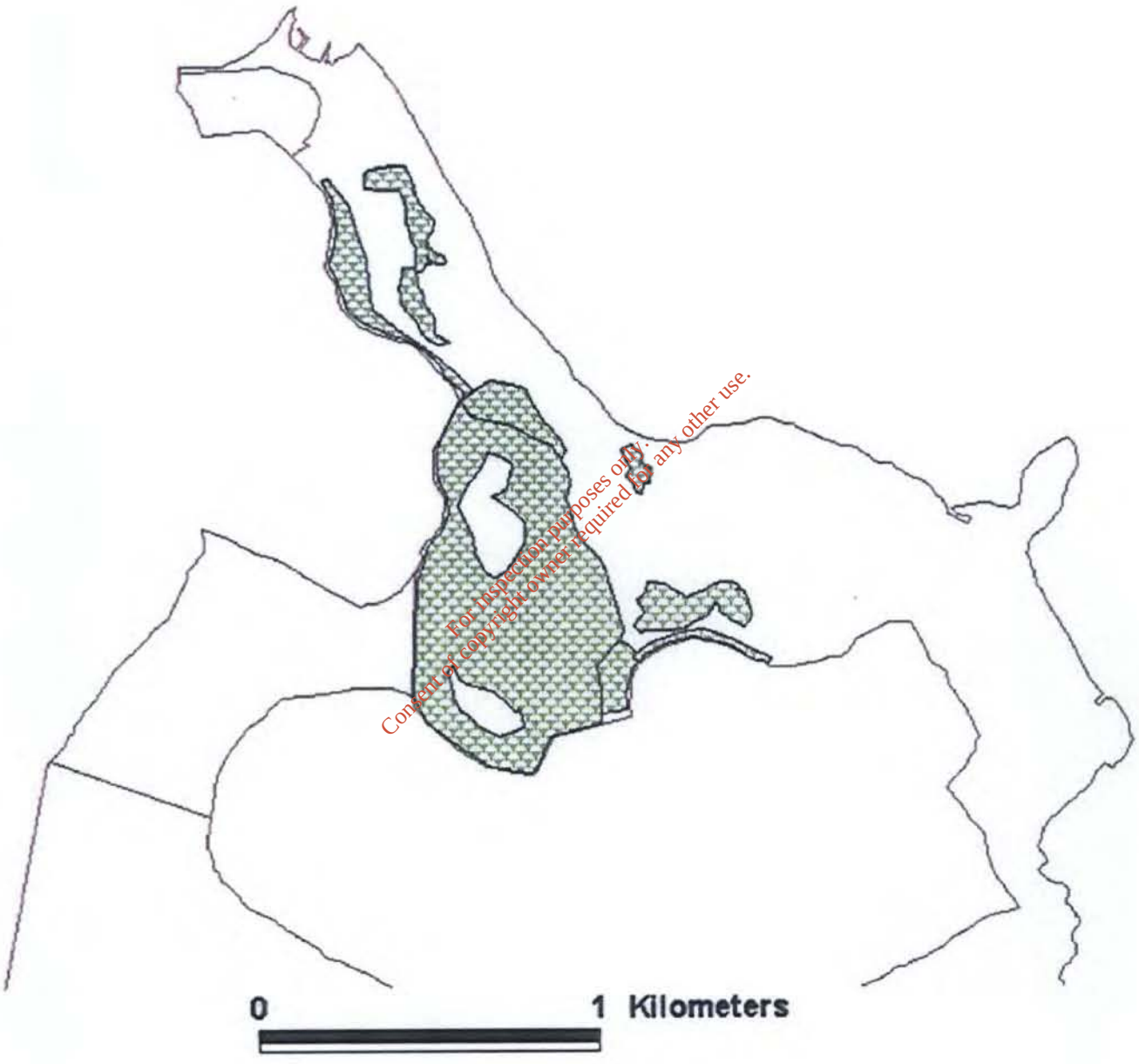




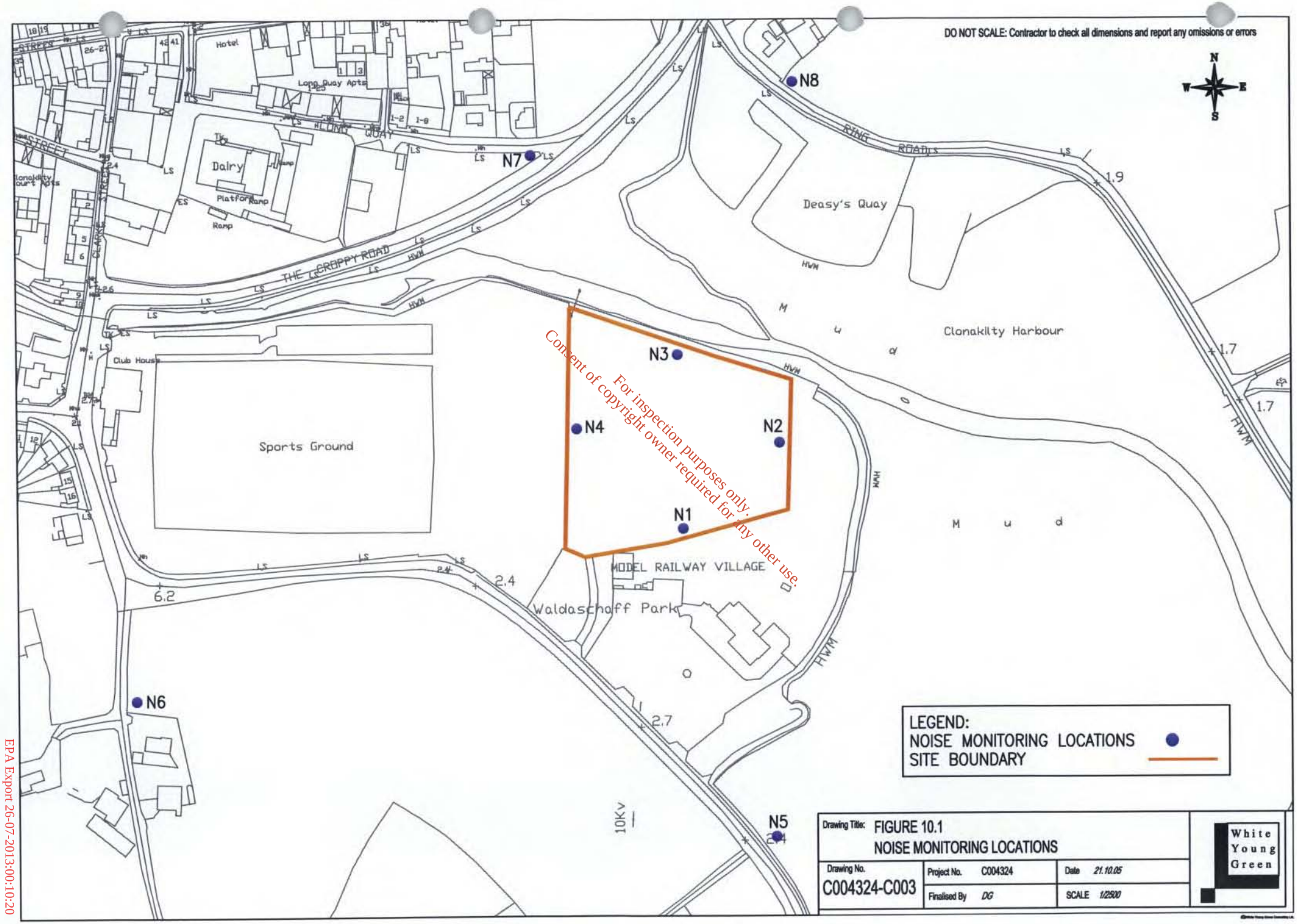


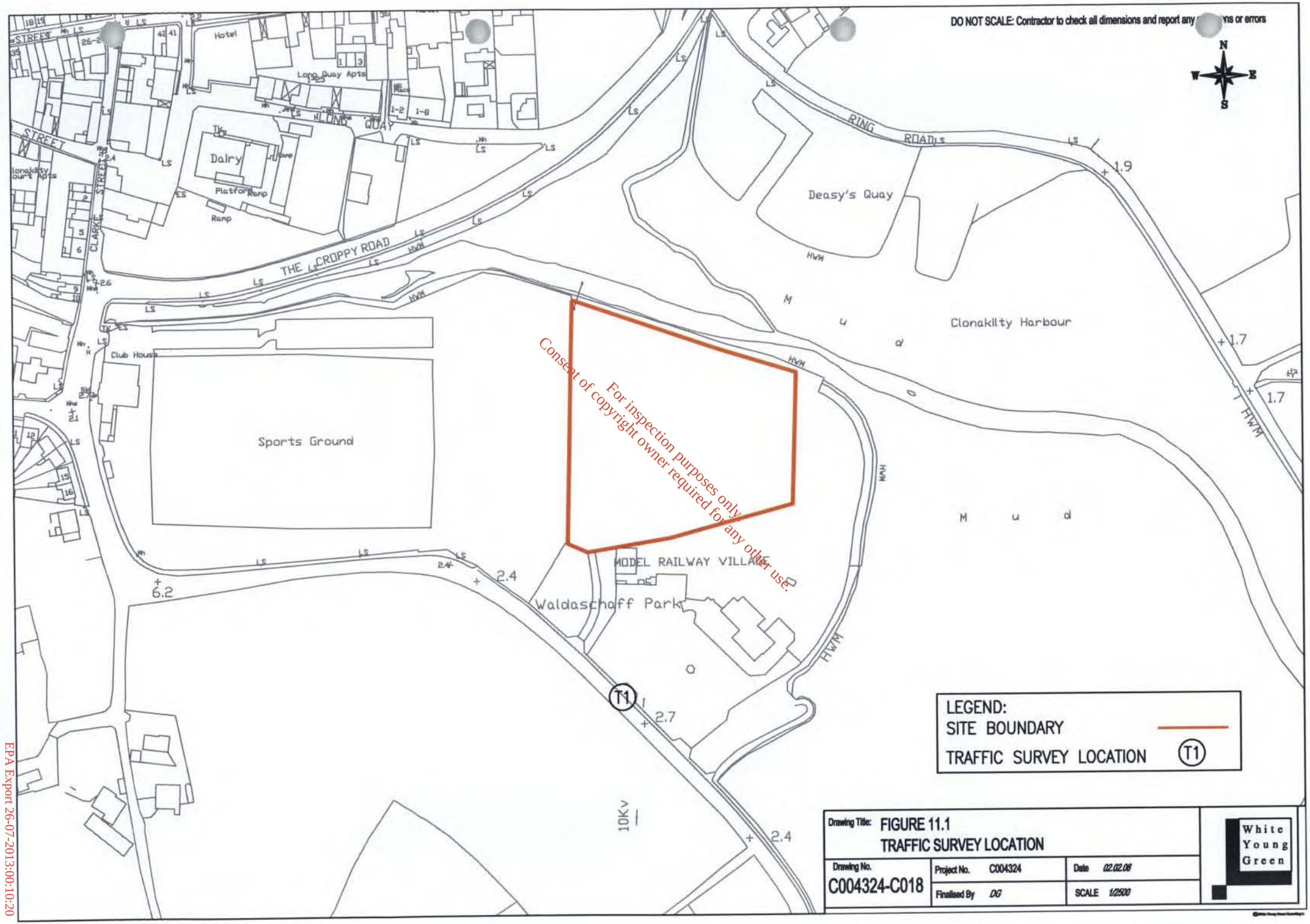
Drawing Title: FIGURE 7.8 a-f LOW TIDE DISTRIBUTION OF SELECTED ESTUARINE BIRDS			White Young Green
Drawing No. C004324-C016	Project No. C004324	Date NM	
	Finalised By DG		

DO NOT SCALE: Contractor to check all dimensions and report any omissions or errors



Drawing Title: FIGURE 7.9 EXAMPLE OF ALGAL COVER			White Young Green
Drawing No. C004324-C017	Project No. C004324	Date MM	
	Finalised By DG		





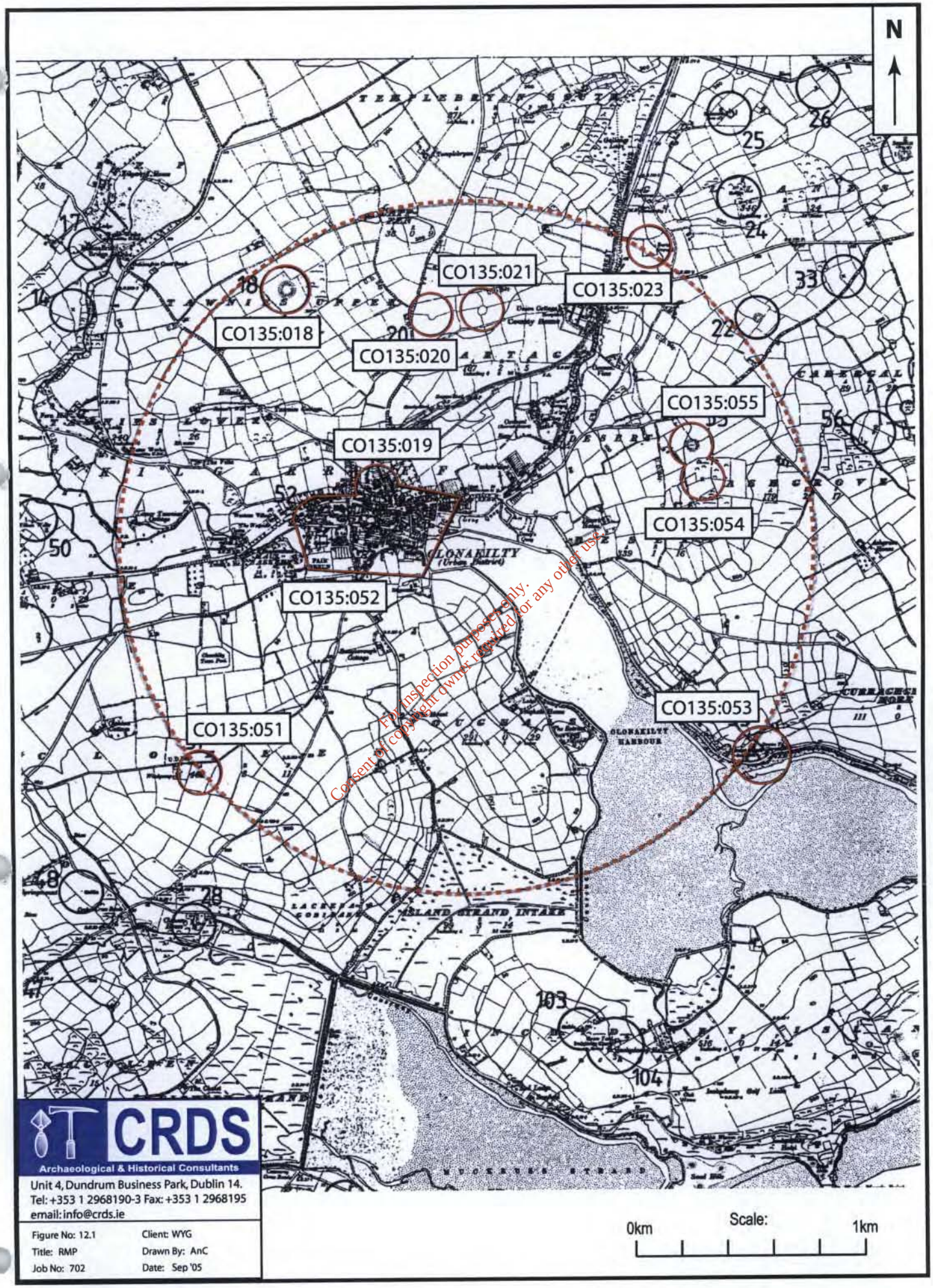


Figure 12.1: Recorded archaeological monuments and places within c. 1.5km of the proposed development.

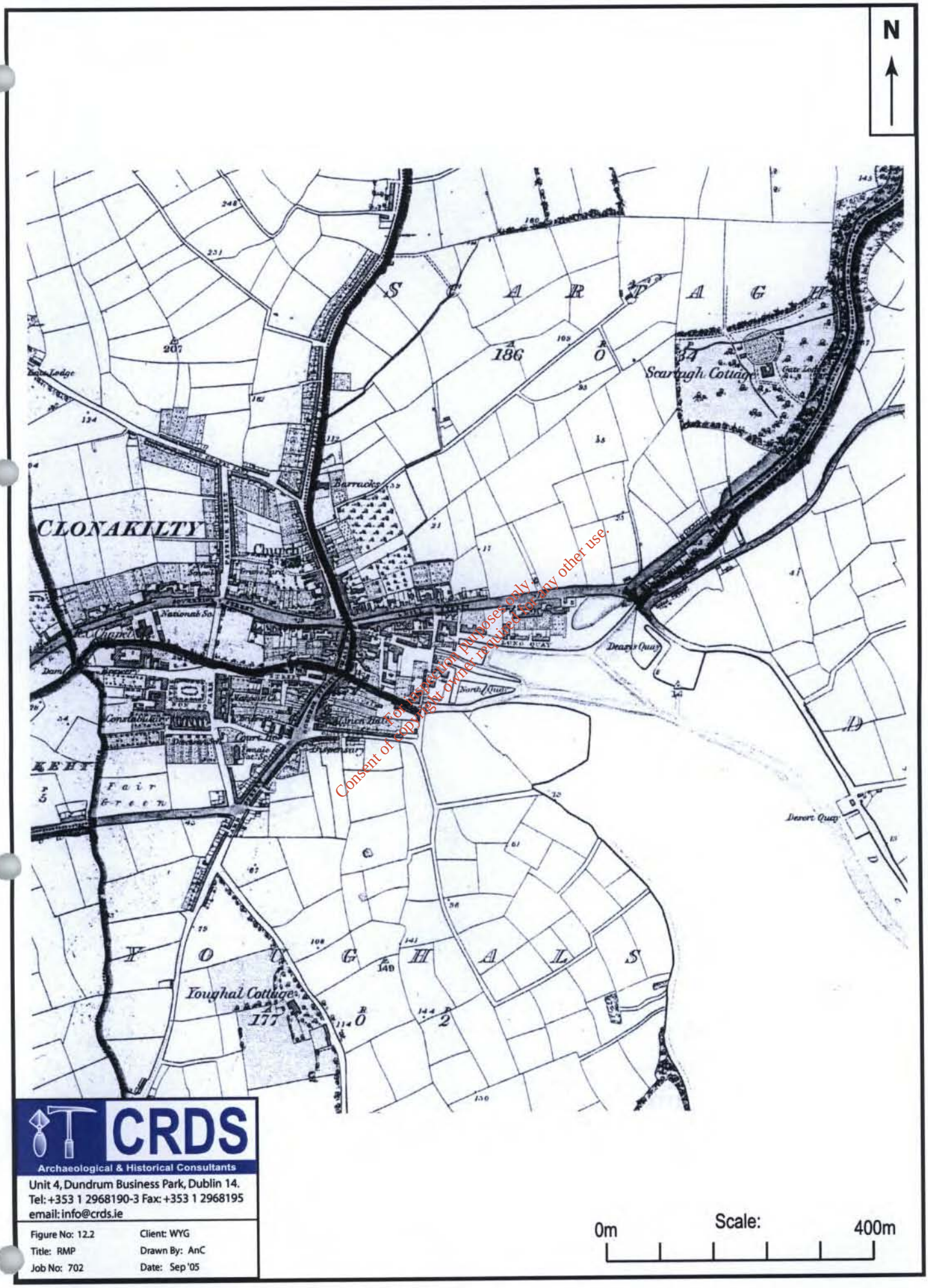


Figure 12.2: Extract from 1st edition Ordnance Survey map, 1841-2.