Appendix 1

Waste Licence

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Headquarters
P.O. Box 3000
Johnstown Castle Estate
County Wexford
Ireland

TECHNICAL AMENDMENT A TO WASTE LICENCE

Licence Register Number:	W0082-02
Licensee:	Greenstar Environmental Services Limited
Location of Facility:	Ballykeefe Townland, Waste Management Section, Dock Road, Limerick

Reasons for the Decision

The Environmental Protection Agency is satisfied, on the basis of the information available, that subject to compliance with the conditions of licence Reg. No. W0082-02 granted on 6th November 2003, as well as any amendments noted herein, any emissions from the activity will comply with and not contravene any of the requirements of Section 40(4) of the Waste Management Acts 1996 to 2010.

Technical Amendment

In pursuance of the powers conferred on it by Section 42B(1)(c) of the Waste Management Acts 1996 to 2010, the Agency amends Licence Reg. No. W0082-02, granted to Greenstar Environmental Services Limited.

Henceforth, the licence shall be read in conjunction with the amendments set out below.

This technical amendment is limited to the following Condition(s):

Amendments

Conditions of Licence

1. Amend Condition 1.6

   Waste may be accepted at the Civic Amenity Area only between the hours of 9 am and 6 pm, seven days a week, unless otherwise agreed in advance with the Agency.

To be inserted after existing text in condition 1.6 of the licence.

2. Insert new Condition 3.4.3

   The licensee shall install and maintain security fencing around the Civic Amenity Area which shall prevent access by the general public to the remaining area of the facility. The base of the fencing shall be set in the ground.

To be inserted after condition 3.4.2 of the licence.

3. Insert new Condition 3.10.4

   The licensee shall connect the discharge of surface water runoff from the Civic Amenity Area to the facility's sewage and foul water collection system.

To be inserted after condition 3.10.3 of the existing licence.

4. Amend Condition 3.11.5

The integrity and water tightness of all underground pipes, tanks, bunding structures and containers and their resistance to penetration by water or other materials carried or stored therein shall be tested and demonstrated by the licensee at least once every three years and reported to the Agency on each occasion. This testing shall be carried out in accordance with any guidance published by the Agency. A written record of all integrity tests and any maintenance or remedial work arising from them shall be maintained by the licensee.

To replace the existing condition 3.11.5 of the licence.

5. Insert Condition 3.13 ii)

The licensee shall provide safe and permanent access to a sampling point on surface water emission point FE1 that is representative of the final discharge. The location of the sampling point shall be agreed in advance with the Agency.

To be inserted after condition 3.13 i) of the licence.

6. Amend Condition 4.2.3

Other than waste accepted at the Civic Amenity Area, waste shall only be accepted at the facility from Local Authority waste collection or transport vehicles or holders of valid waste collection permits, unless exempted or excluded, issued under the Waste Management (Collection Permit) Regulations 2007, or as may be amended.

To replace the existing condition 4.2.3 of the licence.

7. Insert new Condition 4.9

Civic Amenity Area

4.9.1 The acceptance of waste at the Civic Amenity Area is not permitted until the requirements of conditions 3.10.4 and 4.7.1 have been met.

4.9.2 The licensee shall provide and maintain appropriate receptacles at the Civic Amenity Area for the storage of the various waste types, the acceptance of which is to be agreed in advance with the Agency.

4.9.3 The licensee shall assign and clearly label each receptacle at the Civic Amenity Area to indicate their contents.

4.9.4. At the end of the working day the ground area of the Civic Amenity Area shall be cleared of waste.

4.9.5 Casual access by the general public from the Civic Amenity Area to the remaining areas of the facility is prohibited.

To be inserted after condition 4.8 of the licence.

8. Amend Condition 5.4.1

The licensee shall, no later than 1 June 2011, determine background levels of total organic carbon (TOC), suspended solids and ammonia in uncontaminated surface water at the facility. The licensee shall submit to the Agency for its agreement trigger levels for these parameters in the surface water discharge at FE1.

To replace the existing condition 5.4.1 of the licence.

9. Insert new Condition 5.8

A visual examination of the surface water discharge at FE1 shall be carried out daily. A log of such inspections shall be maintained.

To be inserted after condition 5.7 of the licence.

10. Amend Condition 6.4.1

All waste for disposal and all mixed residual and putrescible waste stored overnight at the facility, shall be stored in a secure area within the Waste Transfer Building, and shall be removed from the facility within forty eight hours. In the case where waste delivered to the facility after midday on Friday cannot be transferred due to inaccessibility (e.g. closure) of offsite disposal or recovery facilities, then the waste may be stored for a maximum of 72 hours. These loads of waste shall, in each case be recorded, including the time the waste was held on site and the reasons for inaccessibility (e.g. closure) of a facility for disposal or recovery.

To replace the existing condition 6.4.1 of the licence.

This technical amendment shall be cited as Amendment A (in pursuance of Section 42B(1) of the Waste Management Acts 1996 to 2010) to Waste Licence Register No.W0082-02.

Sealed by the seal of the Agency on this the 2nd day of February 2011

PRESENT when the seal of the Agency was affixed hereto:

_____

Frank Clinton, Authorised Person

Headquarters
P.O. Box 3000
Johnstown Castle Estate
County Wexford
Ireland

WASTE LICENCE

Waste Licence Register No:	82-2
Licensee:	Ipodec (Ireland) Limited
Location of Facility:	Ballykeefe Townland, Waste Management Section, Dock Road, Limerick, County Limerick.

INTRODUCTION

This introduction is not part of the licence and does not purport to be a legal interpretation of the licence.

The facility is a licensed waste transfer station located on the Dock Road in Limerick, close to Limerick City. The facility accepts municipal, commercial and industrial, construction and demolition wastes. The reviewed licence relates to various grounds including changes to the facility boundary, fencing, site offices, foul water drainage, extension of the existing transfer building, changes to hours of operation and waste types and an increase in waste tonnages etc. Waste transported to the facility is either transported to landfill for disposal or separated for recycling.

The licence sets out in detail the conditions under which Ipodec (Ireland) Limited will operate and manage this facility.

Table of Contents

DECISION & REASONS FOR THE DECISION

Reasons for the Decision

The Environmental Protection Agency (the Agency) is satisfied, on the basis of the information available, that the waste activity, or activities, licensed hereunder will comply with the requirements of Section 40(4) of the Waste Management Act, 1996.

In reaching this decision the Agency has considered the application and supporting documentation received from the applicant, a submission and objections received and the reports of its inspectors.

Part I Activities Licensed

In pursuance of the powers conferred on it by the Waste Management Act, 1996, the Environmental Protection Agency (the Agency), under Section 46(2) of the said Act hereby grants this Waste Licence to Ipodec (Ireland) Limited to carry on the waste activity/activities listed below at Dock Road, Limerick subject to conditions, with the reasons therefor and the associated schedules attached thereto set out in the licence.

Licensed Waste Disposal Activities, in accordance with the Third Schedule of the Waste Management Act 1996

Class 12.	**Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.** This refers to the licensee transferring waste to landfill for disposal in accordance with the conditions of the licence.
Class 13.	**Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned was produced.** This refers to the licensee storing waste on a temporary basis in accordance with the conditions of the licence, before transferring it to landfill.

Licensed Waste Recovery Activities, in accordance with the Fourth Schedule of the Waste Management Act 1996

Class 2.	**Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes):** This activity is limited to the recovery of organic substances such as cardboard and wood or other materials as agreed by the Agency.
Class 3.	**Recycling or reclamation of metals and metal compounds:** This activity is limited to the recovery of metal and the separation of metal from other waste for recovery.
Class 4.	**Recycling or reclamation of other inorganic materials:** This activity is limited to the recovery of glass, construction and demolition wastes and other inorganic materials, as agreed by the Agency.
Class 13.	**Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced:** This activity is limited to the storage of waste, destined for recovery.

INTERPRETATION

All terms in this licence should be interpreted in accordance with the definitions in the Waste Management Act, (the Act), unless otherwise defined in this section.

Adequate lighting	20 lux measured at ground level.
Agreement	Agreement in writing.
Annually	At approximately twelve monthly intervals.
Attachment	Any reference to Attachments in this licence refers to attachments submitted as part of the waste licence application.
Application	The application by the licensee for this waste licence.
Appropriate facility	A waste management facility, duly authorised under relevant law and technically suitable.
BATNEEC	Best Available Technology Not Entailing Excessive Cost as defined in Section 5(2) of the Act.
Bi-annually	All or part of a period of six consecutive months.
Biodegradable waste	Any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food, garden waste, sewage sludge, paper and paperboard.
Condition	A condition of this licence.
Consignment Note	All movements of hazardous waste within Ireland must be accompanied by a "C1" consignment note issued by a local authority under the Waste Management (Movement of Hazardous Waste) Regulations (SI No. 147 of 1998).
Construction and Demolition Waste	All wastes which arise from construction, renovation and demolition activities.
Containment boom	A boom which can contain spillages and prevent them from entering drains or watercourses.
Daytime	8.00 a.m. to 10.00 p.m.
Documentation	Any report, record, result, data, drawing, proposal, interpretation or other document in written or electronic form which is required by this licence.
Drawing	Any reference to a drawing or drawing number means a drawing or drawing number contained in the application, unless otherwise specified in this licence.
Emergency	Those occurrences defined in Condition 9.4.
Emission Limits	Those limits, including concentration limits and deposition levels established in *Schedule C: Emission Limits*, of this licence.
European Waste Catalogue (EWC)	A harmonised, non-exhaustive list of wastes drawn up by the European Commission and published as Commission Decision 94/3/EC and any subsequent amendment published in the Official Journal of the European Community.
Hours of Operation	The hours during which the facility is authorised to be operational.

Hours of Waste Acceptance	The hours during which the facility is authorised to accept waste.
Incident	The following shall constitute an incident for the purposes of this licence: a) an emergency; b) any emission which does not comply with the requirements of this licence; c) any exceedance of the daily duty capacity of the waste handling equipment; d) any trigger level specified in this licence which is attained or exceeded; and any indication that environmental pollution has, or may have, taken place.
Industrial Waste	As defined in Section 5(1) of the Act.
Inert waste	Waste as defined in SI 336 of 2002 Waste Management (Licensing) (Amendment) Regulations, 2002.
Landfill Directive	Council Directive 1999/31/EC.
Licence	A Waste Licence issued in accordance with the Act.
Licensee	Ipodec Ireland Limited
Liquid Waste	Any waste in liquid form and containing less than 2% dry matter. Any waste tankered to the facility.
Maintain	Keep in a fit state, including such regular inspection, servicing, calibration and repair as may be necessary to adequately perform its function.
Mobile Plant	Self-propelled machinery used for the emplacement of wastes or for the construction of specified engineering works.
Monthly	A minimum of 12 times per year, at approximately monthly intervals.
Municipal waste	As defined in Section 5(1) of the Waste Management Act 1996.
Night-time	10.00 p.m. to 8.00 a.m.
Noise Sensitive Location (NSL)	Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
Quarterly	At approximately three monthly intervals.
Sanitary Authority	Limerick County Council.
Sample(s)	Unless the context of this licence indicates to the contrary, samples shall include measurements by electronic instruments.
Specified Emissions	Those emissions listed in *Schedule C: Emission Limits* of this licence.
Specified Engineering Works	Those engineering works listed in *Schedule B: Specified Engineering Works* of this licence.
Trigger Level	A parameter value specified in the licence, the achievement or exceedance of which requires certain actions to be taken by the licensee.

Wastewater	Contaminated water including water that has been used for washing and/or flushing (including foul water).
Weekly	During all weeks of plant operation, and in the case of emissions, when emissions are taking place; with no more than one measurement in any one week.
White Goods	Refrigerators, cookers, ovens and other similar appliances.
EPA Working Day	Refers to the following hours; 9.00 a.m. to 5.30 p.m. Monday to Friday inclusive.

PART II CONDITIONS

CONDITION 1 SCOPE OF THE LICENCE

1.1. Waste activities at the facility shall be restricted to those listed and described in Part I: Activities Licensed and authorised by this licence.

1.2. For the purposes of this licence, the facility is the area of land outlined in orange on Drawing No. C98-101-B2-01 Rev 2 of the application and the area outlined in green in Drawing No C98-101-B2-01, until decontaminated as agreed by the Agency. Any reference in this licence to "facility" shall mean the area thus outlined unless otherwise agreed with the Agency.

1.3. This licence is for the purposes of waste licensing under the Waste Management Act 1996 only and nothing in this licence shall be construed as negating the licensee's statutory obligations or requirements under any other enactments or regulations.

1.4. Only those waste categories and quantities listed in *Schedule A: Waste Acceptance* of this licence, shall be accepted at the facility.

1.5. No hazardous wastes or liquid wastes shall be accepted at the facility.

1.6. Waste Acceptance Hours and Hours of Operation

The facility may operate and accept waste on a twenty-four hour basis, seven days per week.

1.7. Where the Agency considers that a non-compliance with any condition of this licence has occurred, it may serve a notice on the licensee specifying.

1.7.1 That only those wastes as specified, if any, in the notice are to be accepted at the facility after the date set down in the notice.

1.7.2 That the licensee shall undertake the works stipulated in the notice, and/or otherwise comply with the requirements of the notice as set down therein, within the time-scale contained in the notice.

1.7.3 That the licensee shall carry out any other requirement specified in the notice.

When the notice has been complied with, the licensee shall provide written confirmation that the requirements of the notice have been carried out. No waste, other than that which is stipulated in the notice, shall be accepted at the facility until written permission is received from the Agency.

1.8 Every plan, programme or proposal submitted to the Agency for its agreement pursuant to any condition of this licence shall include a proposed timescale for its implementation. The Agency may modify or alter any such plan, programme or proposal in so far as it considers such modification or alteration to be necessary and shall notify the licensee in writing of any such modification or alteration. Every such plan, programme or proposal shall be carried out within the timescale fixed by the Agency but shall not be undertaken without the agreement of the Agency. Every such plan, programme or proposal agreed by the Agency shall be covered by the conditions of this licence.

1.9 This licence is being granted in substitution for the waste licence granted to the licensee on the 19th of May 2000 and bears Waste Licence Register No: 82-2. The previous waste licence (Register No: 82-1) is superseded by this licence.

REASON: *To clarify the scope of this licence.*

CONDITION 2 MANAGEMENT OF THE FACILITY

2.1 Facility Management

2.1.1 The licensee shall employ a suitably qualified facility manager with experience commensurate with the expertise required who shall be designated as the person in charge. The facility manager or a nominated, suitably qualified and experienced, deputy shall be present on the facility at all times during its operation.

2.1.2 Both the facility manager and deputy, and any replacement manager or deputy, shall successfully complete both the FAS waste management training programme (or equivalent agreed by the Agency) and associated on site assessment appraisal within twelve months of appointment.

2.1.3 The licensee shall ensure that personnel performing specifically assigned tasks shall be qualified on the basis of appropriate education, training and experience, as required and shall be aware of the requirements of this licence.

2.2 Management Structure

2.2.1 Within three months from the date of grant of this licence, the licensee shall submit written updated details of the management structure of the facility to the Agency. Any proposed replacement in the management structure shall be notified in advance in writing to the Agency. Written details of the management structure shall include the following information.

a) the names of all persons who are to provide the management and supervision of the waste activities authorised by the licence, in particular the name of the facility manager and any nominated deputies;

b) details of the responsibilities for each individual named under a) above; and

c) details of the relevant education, training and experience held by each of the persons nominated under a) above.

2.3 Environmental Management System (EMS)

2.3.1 The licensee shall maintain an EMS. The EMS shall be updated on an annual basis with amendments being submitted to the Agency for its agreement.

2.3.2 The EMS shall include as a minimum the following elements:

2.3.2.1 Schedule of Environmental Objectives and Targets

The objectives should be specific and the targets measurable. The Schedule shall address a five-year period as a minimum. The Schedule shall include a time-scale for achieving the objectives and targets and shall comply with any other written guidance issued by the Agency.

2.3.2.2 Environmental Management Plan (EMP)

The EMP shall include, as a minimum, the following:

(i) methods by which the objectives and targets will be achieved in the coming year and the designation of responsibility for targets; and

(ii) any other items required by written guidance issued by the Agency.

2.3.2.3 Corrective Action Procedures

The Corrective Action Procedures shall detail the corrective actions to be taken should any of the procedures detailed in the EMS not be followed.

2.3.2.4 Awareness and Training Programme

The Awareness and Training Programme shall identify training needs, for personnel who work in or have responsibility for the licensed facility.

2.4 Communications Programme

2.4.1 The licensee shall maintain a Communications Programme to inform and involve the local community and ensure that members of the public can obtain information at the facility, at all reasonable times, concerning the environmental performance of the facility. This shall be established within six months of the date of grant of this licence.

REASON: *To make provision for the proper management of the activity on a planned basis having regard to the desirability of ongoing assessment, recording and reporting of matters affecting the environment.*

CONDITION 3 FACILITY INFRASTRUCTURE

3.1 The licensee shall establish all infrastructure referred to in this licence prior to the commencement of the licensed activities or as required by the conditions of this licence.

3.2 Specified Engineering Works

3.2.1 The licensee shall submit proposals for all Specified Engineering Works, as defined in *Schedule B: Specified Engineering Works* of this licence, to the Agency for its agreement at least two months prior to the intended date of commencement of any such works. No such works shall be carried out without the prior agreement of the Agency.

3.2.2 All specified engineering works shall be supervised by a competent person(s) and that person, or persons, shall be present at all times during which relevant works are being undertaken.

3.2.3 Following the completion of all specified engineering works, the licensee shall complete a construction quality assurance validation. The validation report shall be made available to the Agency on request. The report shall include the following information:-

a) a description of the works;

b) as-built drawings of the works;

c) records and results of all tests carried out (including failures);

d) drawings and sections showing the location of all samples and tests carried out;

e) daily record sheets/diary;

f) name(s) of contractor(s)/individual(s) responsible for undertaking the specified engineering works;

g) name(s) of individual(s) responsible for supervision of works and for quality assurance validation of works;

h) records of any problems and the remedial works carried out to resolve those problems; and

i) any other information requested in writing by the Agency.

3.3 Facility Notice Board

3.3.1 The licensee shall provide and maintain a Facility Notice Board at the entrance leading to the facility from the main road so that it is legible to persons outside the main entrance to the facility. The minimum dimensions of the board shall be 1200 mm by 750 mm.

3.3.2 The board shall clearly show:-

a) the name and telephone number of the facility;

b) the normal hours of opening;

c) the name of the licence holder;

d) an emergency out of hours contact telephone number;

e) the licence reference number; and

f) where environmental information relating to the facility can be obtained.

3.4 Facility Security

3.4.1 Security fencing and gates shall be installed and maintained around the boundary of the facility, except where the existing boundary walls are in place. The gates shall be at the locations shown on Drawing No. C98-101-B2-01 Rev.2. The base of the fencing shall be set in the ground.

3.4.2 The licensee shall remedy any defect in the gates and/or fencing as follows:-

a) a temporary repair shall be made by the end of the working day; and

b) a repair to the standard of the original gates and/or fencing shall be undertaken within three working days.

3.5 Facility Roads and Site Surfaces

3.5.1 Site roads shall be provided and maintained to ensure the safe movement of vehicles within the facility.

3.5.2 The licensee shall provide, and maintain an impermeable hardstanding surface in all areas of the facility. In addition, the floor of the building extensions shall be concreted and constructed to British Standard 8110 or an alternative as agreed by the Agency.

3.6 Facility Office

3.6.1 The licensee shall provide and maintain an office at the facility. The office shall be constructed and maintained in a manner suitable for the processing and storing of documentation.

3.6.2 The licensee shall provide and maintain a working telephone and a method for electronic transfer of information at the facility.

3.7 Waste Inspection and Quarantine Areas

3.7.1 A Waste Inspection Area and a Waste Quarantine Area shall be provided and maintained at the facility.

3.7.2 These areas shall be constructed and maintained in a manner suitable, and be of a size appropriate, for the inspection of waste and subsequent quarantine if required. The

waste inspection area and the waste quarantine area shall be clearly identified and segregated from each other.

3.8 Weighbridge and Wheel Cleaning

3.8.1 The licensee shall provide and maintain a weighbridge and a wheel cleaner at the facility.

3.9 Waste handling, ventilation and processing plant

3.9.1 Items of plant deemed critical to the efficient and adequate processing of waste at the facility (including *inter alia* waste loading vehicles and ejector trailers) shall be provided on the following basis:-

a) 100% duty capacity;

b) 50% standby capacity available on a routine basis; and

c) Provision of contingency arrangements and/or back up and spares in the case of breakdown of critical equipment.

3.9.2 Within six months from the date of grant of this licence, the licensee shall provide a report for the agreement of the Agency detailing the duty and standby capacity in tonnes per day, of all waste handling and processing equipment to be used at the facility. These capacities shall be based on the licensed waste intake, as per *Schedule A: Waste Acceptance*, of this licence.

3.9.3 The quantity of waste to be accepted at the facility on a daily basis shall not exceed the duty capacity of the equipment at the facility. Any exceedance of this intake shall be treated as an incident.

3.10 Waste Water Treatment System / Surface Water Management

3.10.1 The licensee shall, subject to Condition 4.7 provide and maintain a Waste Water Treatment System at the facility. The specification of the treatment system shall be agreed in advance with the Agency Any proposed treatment system including percolation area shall satisfy the criteria set out in the Wastewater Treatment Manual, *Treatment Systems for Single Houses*, published by the Environmental Protection Agency.

3.10.2 Runoff from all areas used for the handling and storage of waste, and vehicle wash water shall discharge to the treatment system or other collection system, subject to Condition 4.7 via a silt trap and Class 1 oil interceptor.

3.10.3 Runoff from all areas not used for the handling and storage of waste shall be discharged to surface water via a silt trap and Class 1 oil interceptor.

3.11 Tank and Drum Storage Areas

3.11.1 All tank and drum storage areas shall be rendered impervious to the materials stored therein.

3.11.2 All tank and drum storage areas shall, as a minimum, be bunded, either locally or remotely, to a volume not less than the greater of the following:-

a) 110% of the capacity of the largest tank or drum within the bunded area; or

b) 25% of the total volume of substance which could be stored within the bunded area.

3.11.3 All drainage from bunded areas shall be diverted for collection and safe disposal.

3.11.4 All inlets, outlets, vent pipes, valves and gauges must be within the bunded area.

3.11.5 The integrity and water tightness of all the bunds and their resistance to penetration by water or other materials stored therein shall be confirmed by the licensee and shall be reported to the Agency within 12 months of the date of grant of this licence.

This confirmation shall be repeated at least once every three years thereafter and reported to the Agency on each occasion.

3.11.6 The licensee shall install and maintain oil interceptor(s) at the facility to ensure that all surface water discharges from the facility pass through a grit trap and an oil interceptor prior to discharge. The interceptors shall be Class I full retention interceptors and shall be in accordance with European Standard prEN 858 (installations for the separation of light liquids).

3.11.7 All wastewater gullies, drainage grids and manhole covers shall be painted with red squares whilst all surface water discharge gullies, drainage grids and manhole covers shall be painted with blue triangles. These colour codes shall be maintained so as to be visible at all times during facility operation, and any identification designated in this licence (e.g. SW1) shall be inscribed on these manholes.

3.11.8 The drainage system, bunds, silt traps and oil separators shall be inspected weekly, desludged as necessary and properly maintained at all times. All sludge and drainage from these operations shall be collected for safe disposal. A written record shall be kept of the inspections, desludging, cleaning, disposal of associated waste products, maintenance and performance of the interceptors, bunds and drains.

3.12 Construction and Demolition Waste Recovery Area

3.12.1 Within six months of the date of grant of this licence, the licensee shall provide and maintain a construction and demolition waste recovery area at the location indicated in Drawing no. C98-101-D2-9. This infrastructure shall at a minimum comprise the following:-

a) an impermeable concrete slab;

b) collection and disposal infrastructure for all run-off;

c) appropriate screening to provide visual and noise screening;

d) All stockpiles shall be adequately contained to minimise dust generation; and

e) Within eight months of the date of grant of this licence, the licensee shall review the measures in place to minimise dust generation at this facility and shall provide a report to the Agency for its agreement, making recommendations for the control of dust nuisance from the facility. Any remedial works recommended in this report must be implemented within a time-scale to be agreed by the Agency.

3.13 Monitoring Infrastructure

Replacement of Infrastructure

i) Monitoring infrastructure which is damaged or proves to be unsuitable for its purpose shall be replaced within three months of it being damaged or recognised as being unsuitable.

REASON: *To provide appropriate infrastructure for the protection of the environment.*

CONDITION 4 FACILITY OPERATIONS

4.1 All waste processing shall be carried out inside the waste transfer building.

4.2 Waste Acceptance and Characterisation Procedures

4.2.1 Waste arriving at the facility shall be weighed, documented and directed to the Waste Transfer Building. Each load of waste arriving at the Waste Transfer Building shall be inspected upon tipping within this building. Only after such inspections shall the waste be processed for disposal or recovery.

4.2.2 Any waste deemed unsuitable for processing at the facility and/or in contravention of this licence shall be immediately separated and removed from the facility at the earliest possible time. Temporary storage of such wastes shall be in a designated Waste Quarantine Area. Waste shall be stored under appropriate conditions in the quarantine area to avoid putrefaction, odour generation, the attraction of vermin and any other nuisance or objectionable condition.

4.2.3 Waste shall only be accepted at the facility, from customers who are holders of a waste permit, unless exempted, under the Waste Management (Collection Permit) Regulations 2001 or from other licensed/permitted facilities.

4.3 Operational Controls

4.3.1 The floor of the waste transfer building shall be washed down and cleared of all waste on a daily basis. The floor of the storage bays for recovered wastes shall be washed down and cleaned as required.

4.3.2 The overnight storage of any waste loads which remain on any working day shall be in designated, secure areas within the transfer building.

4.3.3 Any waste stored overnight in the transfer building shall be processed at the commencement of operations on the following working day.

4.3.4 Wastes for recovery may be stored outside the transfer building in designated, secure storage areas, subject to the agreement of the Agency provided the storage area is rendered impervious to the materials stored therein.

4.3.5 Scavenging shall not be permitted at the facility.

4.3.6 Gates shall be locked shut when the facility is unsupervised.

4.3.7 The licensee shall provide and use adequate lighting during the operation of the facility in hours of darkness.

4.3.8 Fuels shall be stored only at appropriately bunded locations on the facility.

4.3.9 All tanks and drums shall be labelled to clearly indicate their contents.

4.3.10 No smoking shall be allowed on the facility (other than in the facility office, as shown on Drawing No. C98-101-B2-01 Rev. 2).

4.4 Waste sent off-site for recovery or disposal shall be conveyed only by a waste carrier agreed in advance by the Agency. Any request for such agreement of a waste carrier shall include the following:

i) Copies of the waste carrier's permit(s) under the Waste Management (Collection Permit) Regulations 2001.

ii) Details of the waste types it is proposed the carrier will transfer from the facility.

4.5 All waste transferred from the facility shall be transferred only to an appropriate facility agreed by the Agency. Any request for agreement of such a facility shall be forwarded to the Agency at least one month in advance of its proposed use and shall include the following:

i) A copy of the waste permit or waste licence where applicable.

ii) The proposed waste types and quantities.

iii) Details of any limitations on waste types and quantities acceptable at the facility.

4.6 Construction and Demolition Waste Recovery Area

4.6.1 Only Construction and Demolition waste shall be accepted at this Area. Wastes which are capable of being recovered shall be separated and shall be stored temporarily in this area prior to being subjected to other recovery activities at the facility or transport off the facility.

4.6.2 All stockpiles shall be maintained so as to minimise dust generation.

4.7 Foul Water, Surface Water and Sewage Management

4.7.1 Upon completion of the Limerick Main Drainage Scheme and subject to the agreement of the Sanitary Authority, sewage and foul water arising on site shall be discharged to the sanitary authority sewer.

4.7.2 Prior to the completion of the Limerick Main Drainage Scheme and treatment plant works the following shall apply: either

(a) an on-site treatment plant shall be installed subject to the requirements of Condition 3.10, or

(b) sewage and wastewater arising on site shall be stored in on-site storage tanks and tankered off-site in fully enclosed road tankers to an appropriate Wastewater Treatment Plant, agreed in advance with the Agency.

4.8 Maintenance

4.8.1 All processing, treatment, abatement and emission control equipment shall be calibrated and maintained, in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the licensee.

4.8.2 The licensee shall maintain and clearly label and name all sampling and monitoring locations.

4.8.3 The wheel cleaner shall be inspected on a daily basis and drained as required. Silt, stones and other accumulated material shall be removed as required from the wheel cleaner and disposed of appropriately.

***REASON**: To provide for appropriate operation of the facility to ensure protection of the environment.*

CONDITION 5 EMISSIONS

5.1 No specified emission from the facility shall exceed the emission limit values set out in *Schedule C: Emission Limits* of this licence. There shall be no other emissions of environmental significance.

5.2 The licensee shall ensure that the activities shall be carried out in a manner such that emissions do not result in significant impairment of, or significant interference with the environment beyond the facility boundary.

5.3 Emission limits for emissions to atmosphere in this licence shall be interpreted in the following way.

5.3.1 Non-Continuous Monitoring

(i) For any parameter where, due to sampling/analytical limitations, a 30 minute samples is inappropriate, a suitable sampling period should be employed and the value obtained therein shall not exceed the emission limit value.

(ii) For all other parameters, no 30 minute mean value shall exceed the emission limit value.

(iii) For flow, no hourly or daily mean value shall exceed the emission limit value.

5.4 Emissions to Surface Water

5.4.1 The trigger levels for surface water discharges from the facility measured at monitoring point(s) Fe1 and Fe2 are:-

a) BOD 25mg/l

b) Suspended Solids 60mg/l.

5.4.2 No substance shall be discharged in a manner, or at a concentration which, following initial dilution causes tainting of fish or shellfish.

5.5 There shall be no direct emissions to groundwater.

5.6 There shall be no clearly audible tonal component or impulsive component in the noise emissions from the activity at the noise sensitive locations.

5.7 Disposal of Wastewater

No waste water shall be discharged to surface water.

REASON: *To control emissions from the facility and provide for the protection of the environment.*

CONDITION 6 NUISANCE CONTROL

6.1 The licensee shall ensure that vermin, birds, flies, mud, dust, noise**,** litter and odours do not give rise to nuisance at the facility or in the immediate area of the facility. Any method used by the licensee to control any such nuisance shall not cause environmental pollution.

6.2 The road network in the vicinity of the facility shall be kept free from any debris caused by vehicles entering or leaving the facility. Any such debris or deposited materials shall be removed without delay.

6.3 Litter Control

6.3.1 All loose litter or other waste, placed on or in the vicinity of the facility, other than in accordance with the requirements of this licences, shall be removed, subject to the agreement of the landowners, immediately and in any event by 10.00am of the next working day after such waste is discovered.

6.3.2 The licensee shall ensure that all vehicles delivering waste to and removing waste and materials from the facility are appropriately covered.

6.4 Dust/Odour Control

6.4.1 All waste for disposal stored overnight at the facility, shall be stored in a secure area within the Waste Transfer Building, and shall be removed from the facility within forty eight hours. In the case where waste delivered to the facility after midday on Friday cannot be transferred due to inaccessibility (e.g. closure) of offsite disposal or recovery facilities, then the waste may be stored for a maximum of 72 hours. These loads of waste shall, in each case be recorded, including the time the waste was held on site and the reasons for inaccessibility (e.g. closure) of a facility for disposal or recovery.

6.4.2 The licensee shall review the measures in place to control dust at the facility and submit a report to Agency within six months of the date of grant of the licence including proposals for additional measures.

6.5 Prior to exiting the facility, all waste vehicles shall use the wheelwash.

REASON: *To provide for the control of nuisances.*

CONDITION 7 MONITORING

7.1 The licensee shall carry out such monitoring and at such locations and frequencies as set out in *Schedule D: Monitoring* of this licence. Unless otherwise specified by this licence, all environmental monitoring shall commence no later than two months after the date of grant of this licence.

7.2 The licensee shall amend the frequency, locations, methods and scope of monitoring as required by this licence only upon the written instruction of the Agency and shall provide such information concerning such amendments as may be requested in writing by the Agency. Such alterations shall be carried out within any timescale nominated by the Agency.

7.3 Monitoring and analysis equipment shall be operated and maintained in accordance with the manufacturers' instructions (if any) so that all monitoring results accurately reflect any emission, discharge or environmental parameter.

7.4 The licensee shall provide safe and permanent access to all on-site sampling and monitoring points and to off-site points as required by the Agency.

7.5 The licensee shall maintain all sampling and monitoring points, and clearly label and name all sampling and monitoring locations, so that they may be used for representative sampling and monitoring.

7.6 The licensee shall install on all emission points such sampling points or equipment, including any data-logging or other electronic communication equipment, as may be required by the Agency. All such equipment shall be consistent with the safe operation of all sampling and monitoring systems.

7.7 All automatic monitors and samplers shall be functioning at all times (except during maintenance and calibration) when the activity is being carried on, unless alternative sampling or monitoring has been agreed, in writing, by the Agency for a limited period. In the event of the malfunction of any continuous monitor, the licensee shall contact the Agency as soon as practicable, and alternative sampling and monitoring facilities shall be put in place. Prior written agreement for the use of alternative equipment, other than in emergency situations, shall be obtained from the Agency.

7.8 Nuisance Monitoring

The licensee shall, at a minimum of one week intervals, inspect the facility and its immediate surrounds for nuisances caused by litter, vermin, birds, flies, mud, dust and odours.

REASON: *To ensure compliance with the conditions of this licence by provision of a satisfactory system of monitoring of emissions.*

CONDITION 8 CONTINGENCY ARRANGEMENTS

8.1 In the event of an incident the licensee shall immediately:-

a) identify the date, time and place of the incident;

b) carry out an immediate investigation to identify the nature, source and cause of the incident and any emission arising therefrom;

c) isolate the source of any such emission;

d) evaluate the environmental pollution, if any, caused by the incident;

e) identify and execute measures to minimise the emissions/malfunction and the effects thereof; and

f) provide a proposal to the Agency for its agreement within one month of the incident occurring to:-

i) identify and put in place measures to avoid reoccurrence of the incident; and

ii) identify and put in place any other appropriate remedial action.

8.2 The licensee shall, within nine months of the date of grant of this licence, submit a written Emergency Response Procedure (ERP) to the Agency for its agreement. The ERP shall address any emergency situations which may originate on the facility and shall include provision for minimising the effects of any emergency on the environment.

8.3 The licensee shall have in storage an adequate supply of containment booms and/or suitable absorbent material to contain and absorb any spillage at the facility. Once used the absorbent material shall be disposed of at an appropriate facility.

8.4 Emergencies

8.4.1 In the event of a complete breakdown of equipment or any other occurrence which results in the closure of the transfer station building, any waste arriving at or already collected at the facility shall be transferred directly to appropriate landfill sites or any other appropriate facility until such time as the transfer station building is returned to a

fully operational status. Such a breakdown event will be treated as an emergency and rectified as soon as possible.

8.4.2 All significant spillages occurring at the facility shall be treated as an emergency and immediately cleaned up and dealt with so as to alleviate their effects.

8.4.3 No waste shall be burnt within the boundaries of the facility. A fire at the facility shall be treated as an emergency and immediate action shall be taken to extinguish it and notify the appropriate authorities.

***REASON**: To ensure compliance with the conditions of this licence by provision of a satisfactory system of monitoring of emissions.*

CONDITION 9 RECORDS

9.1 The licensee shall keep the following documents at the facility office:-

a) the current waste licence relating to the facility;

b) the current EMS for the facility;

c) the previous year's AER for the facility;

d) application(s) for a licence; and,

e) all written procedures produced by the licensee which relate to the licensed activities.

9.2 The licensee shall maintain a written record for each load of waste arriving at and departing from the facility. The licensee shall record the following:-

a) the date;

b) the name of the carrier (including if appropriate, the waste collection permit details);

c) the vehicle registration number;

d) the name of the producer(s)/collector(s) of the waste as appropriate;

e) the name of the waste facility (if appropriate) from which the load originated including the waste licence or waste permit register number;

f) a description of the waste including the associated EWC codes;

g) the quantity of the waste, recorded in tonnes;

h) the name of the person checking the load;

i) where loads or wastes are removed or rejected, details of the date of occurrence, the types of waste and the facility to which they were removed including the waste licence and waste permit register number of these facilities as appropriate; and

j) where applicable a consignment note number (including transfrontier shipment notification and movement/tracking form numbers, as appropriate).

9.3 Written Records

The following written records shall be maintained by the licensee:-

a) the types and quantities of waste recovered at the facility each year. These records shall include the relevant EWC Codes and any details required to complete national reports on waste statistics;

b) all training undertaken by facility staff;

c) results from all integrity tests of bunds and other structures and any maintenance or remedial work arising from them;

d) details of all nuisance inspections;

e) the names and qualifications of all persons who carry out all sampling and monitoring as required by this licence and who carry out the interpretation of the results of such sampling and monitoring; and

f) details of daily floor washing and cleaning.

9.4 The licensee shall maintain a written record of all complaints relating to the operation of the activity. Each such record shall give details of the following:-

a) date and time of the complaint;

b) the name of the complainant;

c) details of the nature of the complaint;

d) actions taken on foot of the complaint and the results of such actions; and,

e) the response made to each complainant.

9.5 A written record shall be kept of each consignment of waste water removed from the facility. The record shall include the following:-

a) the name of the carrier;

b) the date and time of removal of waste water from the facility;

c) the volume of waste water, in cubic metres, removed from the facility on each occasion;

d) the name and address of the Waste Water Treatment Plant to which the waste water was transported; and

e) any incidents or spillages of waste water during its removal or transportation.

9.6 A written record shall be kept at the facility of the programme for the control and eradication of vermin and fly infestations at the facility. These records shall include as a minimum the following:-

a) the date and time during which spraying of insecticide is carried out;

b) contractor details;

c) contractor logs and site inspection reports;

d) details of the rodenticide(s) and insecticide(s) used;

e) operator training details;

f) details of any infestations;

g) mode, frequency, location and quantity of application; and,

h) measures to contain sprays within the facility boundary.

REASON: *To provide for the keeping of proper records of the operation of the facility.*

CONDITION 10 REPORTS AND NOTIFICATIONS

10.1 Unless otherwise agreed by the Agency, all reports and notifications submitted to the Agency shall:-

a) be sent to the Agency's Regional Inspectorate, Inniscarra, Cork;

b) comprise one original and three copies unless additional copies are required;

c) be formatted in accordance with any written instruction or guidance issued by the Agency;

d) include whatever information as is specified in writing by the Agency;

e) be identified by a unique code, indicate any modification or amendment, and be correctly dated to reflect any such modification or amendment;

f) be submitted in accordance to the relevant reporting frequencies specified by this licence, such as in *Schedule E: Recording and Reporting to the Agency* of this licence;

g) be accompanied by a written interpretation setting out their significance in the case of all monitoring data; and

h) be transferred electronically to the Agency's computer system if required by the Agency.

10.2 In the event of an incident occurring on the facility, the licensee shall:-

a) notify the Agency as soon as practicable and in any case not later than 10.00 am the following working day after the occurrence of any incident;

b) submit a written record of the incident, including all aspects described in Condition 9.1(a-e), to the Agency as soon as practicable and in any case within five working days after the occurrence of any incident;

c) in the event of any incident which relates to discharges to surface/sewer water, notify Limerick County Council as soon as practicable and in any case not later than 10:00am on the following working day after such an incident; and

d) Should any further actions be taken as a result of an incident occurring, the licensee shall forward a written report of those actions to the Agency as soon as practicable and no later than ten days after the initiation of those actions.

10.3 A proposal for a Decommissioning and Aftercare Plan for the facility shall be submitted to the Agency within 18 months of the date of grant of this licence. The licensee shall update these schemes when required by the Agency.

10.4 Waste Recovery Reports

Within six months of the date of grant of this licence, a report examining waste recovery options shall be submitted to the Agency for its agreement. This report shall address methods to contribute to the achievement of the recovery targets stated in national and European Union waste policies and shall include the following:-

a) proposals for the contribution of the facility to the achievement of targets for the reduction of biodegradable waste to landfill as specified in the Landfill Directive;

b) the separation of recyclable materials from the waste;

c) the recovery of Construction and Demolition Waste;

d) the recovery of metal waste and white goods;

e) the recovery of commercial waste, including cardboard; and

f) other wastes.

10.5 Monitoring Locations

Within three months of the date of grant of this licence, the licensee shall submit to the Agency an appropriately scaled drawing(s) showing all the monitoring locations that are stipulated in this licence. The drawing(s) shall include the reference code of each monitoring point.

10.6 Annual Environmental Report

10.6.1 The licensee shall submit to the Agency for its agreement, by 31st of January 2004, and one month after the end of each calendar year thereafter, an Annual Environmental Report (AER).

10.6.2 The AER shall include as a minimum the information specified in *Schedule F: Content of the Annual Environmental Report*, of this licence and shall be prepared in accordance with any relevant written guidance issued by the Agency.

REASON: *To provide for proper reporting and notification of the Agency.*

CONDITION 11 CHARGES AND FINANCIAL PROVISIONS

11.1 Agency Charges

11.1.1 The licensee shall pay to the Agency an annual contribution of €17,401.84 or such sum as the Agency from time to time determines, towards the cost of monitoring the activity or otherwise in performing any functions in relation to the activity, as the Agency considers necessary for the performance of its functions under the Waste Management Act, 1996. The licensee shall in 2004 and subsequent years, not later than January 31 of each year, pay to the Agency this amount updated in accordance with changes in the Public Sector Average Earnings Index from the date of the licence to the renewal date. The updated amount shall be notified to the licensee by the Agency. For 2003, the licensee shall pay a pro rata amount from the date of this licence to 31st December. This amount shall be paid to the Agency within one month of the date of grant of this licence.

11.1.2 In the event that the frequency or extent of monitoring or other functions carried out by the Agency needs to be increased the licensee shall contribute such sums as determined by the Agency to defraying its costs.

11.2 Financial Provision for Closure, Restoration and Aftercare

11.2.1 The licensee shall arrange for an independent third party risk assessment of the facility to be carried out. The risk assessment shall have particular regard to any accidents, emergencies, or other incidents, which might occur at the facility and their effect on the environment. The risk assessment shall include a comprehensive and fully costed Environmental Liabilities Risk Assessment for the facility together with a proposal for

Financial Provision arising from the carrying on of the activities to which this licence relates including the restoration of the facility. The risk assessment shall be submitted to the Agency for its agreement within six months of the date of grant of this licence.

11.2.2 The licensee shall within six months establish and maintain a fund, or provide a written guarantee for the costs determined under Condition 11.2.1. The type of fund established and means of its release/recovery shall be agreed by the Agency prior to its establishment.

11.2.3 The licensee shall within two weeks of purchase, renewal or revision of the financial provision required under Condition 11.2.1, forward to the Agency written proof of such indemnity.

11.2.4 Unless otherwise agreed any revision to the fund shall be computed using the following formula:

Cost = (ECOST x WPI) + CiCC
Where:

Cost	=	Revised decommisioning and aftercare cost.
ECOST	=	Existing decommisioning and aftercare cost.
WPI	=	Appropriate Wholesale Price Index [Capital Goods, Building & Construction (i.e. Materials & Wages) Index], as published by the Central Statistics Office, for the year since last closure calculation/revision.
CiCC	=	Change in compliance costs as a result of change in site conditions, changes in law, regulations, regulatory authority charges, or other significant changes.

11.3 Sanitary Authority Charges

11.3.1 Upon connection to the sewer the licensee shall pay to the Sanitary Authority a charge per cubic meter of trade effluent discharged to the foul sewer or such sum as may be determined by the Agency, having regard to the variations in the cost of providing drainage and the variation in effluent reception and treatment costs. This amount shall be paid to the Sanitary Authority within one month of connection to the sewer and annually thereafter within one month of the date of notification by the Sanitary Authority of the updated annual amount.

11.3.2 The licensee shall pay to the Sanitary Authority a charge or such sum as may be determined by the Agency towards the cost of monitoring the discharge of trade effluent. This amount shall be paid to the Sanitary Authority within one month of connection to the sewer and annually thereafter within one month of the date of notification by the Sanitary Authority of the updated annual amount.

REASON: *To provide for adequate financing for monitoring and financial provisions for measures to protect the environment.*

SCHEDULE A : Waste Acceptance

A.1 Waste Acceptance

Table A.1 Waste Categories and Quantities

WASTE TYPE	MAXIMUM (TONNES PER ANNUM) Note 1
Construction and Demolition Waste	**4,500**
Commercial and Industrial	**70,000**
Municipal	**15,500**
TOTAL	**90,000**

Note 1: The quantities of the individual waste types may be adjusted, only with the agreement of the Agency, subject to the total waste quantity remaining the same.

SCHEDULE B : Specified Engineering Works

Specified Engineering Works
Installation of any new silt traps and oil interceptors.
Installation of waste handling, processing, recycling/recovery infrastructure and installation of increased waste processing capacity.
Construction of a designated secure storage area for overnight storage of waste within the Waste Transfer Building.
Any other works notified in writing by the Agency.

SCHEDULE C : Emission Limits

C.1 Noise Emissions: (Measured at the monitoring points indicated in Table D.1.1).

Day dB(A) L_{Aeq}(30 minutes)	Night dB(A) L_{Aeq}(30 minutes)
55	45

C.*2 Dust Deposition Limits:* (Measured at the monitoring points indicated in Table D.1.2).

Level (mg/m^2 /day)Note 1
350

Note 1: 30 day composite sample with the results expressed as mg/m^2 /day.

C.3 Surface Water Discharge Limits (i.e. discharges from oil interceptor):

Measured at the monitoring point FE1.

Parameter	Emission Limit Value
Mineral oils	5mg/l for discharges from Class I interceptor to receiving water
Suspended Solids	60 mg/l

C.4 Sewer Emission Limits

Emission Point Reference No. FE2

Volume to be emitted: Note 1 Maximum in any one day: m^3 Note 1

Parameter Note 2	Emission Limit Value Note 1
	Daily Mean Concentration (mg/l) Note 1
BOD	10,000
COD	30,000
Ammoniacal Nitrogen	50
Suspended solids	2,000
Sulphate	500
PH	6-9
Temperature (degrees Celcius)	42
Other parameters	

Note 1: To be agreed with the Sanitary Authority and the Agency and may be amended subject to the agreement of the Sanitary Authority and the Agency.

Note 2: Additional parameters may be included by the Sanitary Authority and agreed by the Agency.

SCHEDULE D : Monitoring

Monitoring to be carried out as specified below.

D.1 Monitoring Locations

Monitoring locations shall be those as set out in Table D.1.1and/or Drawing No. C98-101-02-Rev.2.

Table D.1.1 Noise, surface water and wastewater Monitoring Locations

GROUND-WATER STATIONS	SURFACE WATER STATIONS		WASTE WATER STATIONS
GMB1	WS0	WS9	FE1 (Outlet from oil interceptors Note 1)
GMB2	WS10	WS11	FE2 (Outlet from wastewater treatment plant Note 2)
GMB3	WS12		

Note 1: Outlet from oil interceptors, prior to discharge to percolation area
Note 2: Outlet from wastewater treatment plant, if one is installed

Table D.1.2 Emissions to Atmosphere Monitoring Locations

DUST	NOISE STATIONS
STATIONS	STATIONS
DM1	NI1
DM2	NI2
DM3	NI3
	NI4

D.2 Dust

Table D.2.1 Dust Monitoring Frequency and Technique

Parameter (mg/m^2/day)	Monitoring Frequency	Analysis Method/Technique
Dust	Three times a year Note 2	Standard Method Note 1

Note 1: Standard method VDI2119 (Measurement of Dustfall, Determination of Dustfall using Bergerhoff Instrument (Standard Method) German Engineering Institute). A modification (not included in the standard) which 2 methoxy ethanol may be employed to eliminate interference due to algae growth in the gauge.

Note 2: Twice during the period May to September.

D.3 Noise

Table D.3.1 Noise Monitoring Frequency and Technique

Parameter	Monitoring Frequency	Analysis Method/Technique
$L(A)_{EQ}$ [30 minutes]	Annual	Standard [Note 1]
$L(A)_{10}$ [30 minutes]	Annual	Standard [Note 1]
$L(A)_{90}$ [30 minutes]	Annual	Standard [Note 1]
Frequency Analysis(1/3 Octave band analysis)	Annual	Standard [Note 1]

Note 1: "International Standards Organisation. ISO 1996. Acoustics - description and Measurement of Environmental noise. Parts 1, 2 and 3."

D.4 Surface Water Emissions

Table D.4.1 Surface water/Groundwater Monitoring Frequency and Techniques

Parameter	Surface Water Monitoring Frequency	Groundwater Monitoring Frequency	Analysis Method/Technique
PH	Bi-annually	Bi-annually	Electrometry
Biological Oxygen Demand	Bi-annually	Bi-annually	Standard Methods[Note 1]
Suspended Solids	Bi-annually	Bi-annually	Standard Methods[Note 1]
Mineral Oils	Bi-annually	Bi-annually	Standard Methods[Note 1]
Fats, Oils, Grease	Bi-annually	Bi-annually	Standard Methods[Note 1]
Diesel Range Hydrocarbons	Not applicable	Bi-annually	Standard Methods[Note 1]
Aliphatic Hydrocarbons	Not applicable	Bi-annually	Standard Methods[Note 1]
Undecane	Not applicable	Bi-annually	Standard Methods[Note 1]

Note 1: "Standards Methods for the Examination of Water and Wastewater", (prepared and published jointly by A.P.H.A., A.W.W.A & W.E.F) 20th Ed., American Public Health Association, 1015 Fifteenth Street, Washington DC 20005, USA.

D.5 Wastewater Emissions

Table D.5.1 Waste water Monitoring Frequency and Techniques

Parameter [Note 3]	Monitoring Frequency [Note 2]	Analysis Method/Technique
PH	Bi-annually	Electrometry
Biological Oxygen Demand	Bi-annually	Standard Methods[Note 1]
Suspended Solids	Bi-annually	Standard Methods[Note 1]
Fats, Oils, Grease	Bi-annually	Standard Methods[Note 1]
Temperature	Bi-annually	Temperature probe
Sulphate	Bi-annually	Standard Methods[Note 1]
Ammoniacal nitrogen	Bi-annually	Standard Methods[Note 1]
Total Phosphorus	Bi-annually	Standard Methods[Note 1]
Total Nitrogen	Bi-annually	Standard Methods[Note 1]
Other parameters		

Note 1: "Standards Methods for the Examination of Water and Wastewater", (prepared and published jointly by A.P.H.A., A.W.W.A & W.E.F) 20th Ed., American Public Health Association, 1015 Fifteenth Street, Washington DC 20005, USA.
Note 2: May be amended by agreement with the Sanitary Authority and the Agency.
Note 3: Additional parameters may be included by the sanitary authority and agreed by the Agency.

SCHEDULE E : Recording and Reporting to the Agency

Report	Reporting Frequency Note1	Report Submission Date
Environmental Management System Updates	Annually	One month after the end of the year reported on.
Annual Environment Report (AER)	Annually	Thirteen months from the date of grant of licence and one month after the end of each calendar year thereafter.
Record of incidents	As they occur	Within five days of the incident.
Bund, tank and container integrity assessment	Every three years	Six months from the date of grant of licence and one month after end of the three year period being reported on.
Specified Engineering Works reports	As they arise	Prior to the works commencing.
Monitoring of Surface Water Quality	Bi-annually	Ten days after end of the quarter being reported on.
Monitoring of Groundwater Quality	Bi-annually	Ten days after end of the quarter being reported on.
Monitoring of Wastewater	Bi-annually	Ten days after end of the quarter being reported on.
Dust Monitoring	Three times a year	Ten days after the period being reported on.
Noise Monitoring	Annually	One month after end of the year being reported on.
Any other monitoring	As they occur.	Within ten days of obtaining results.

Note 1: Unless altered at the request of the Agency.

SCHEDULE F : Content of the Annual Environmental Report

Annual Environmental Report Content [Note 1]
Reporting Period.
Waste activities carried out at the facility.
Quantity and Composition of waste recovered, received and disposed of during the reporting period and each previous year (relevant EWC codes to be used).
Summary report on emissions.
Summary of results and interpretations of environmental monitoring, including a location plan of all monitoring locations.
Resource and energy consumption summary.
Development / Infrastructural works in place and planned, to process waste quantities projected for the following year (including plant operating capacity, provision of adequate standby capacity and provision of contingency, backup and spares in the case of breakdown).
Schedule of Environmental Objectives and Targets for the forthcoming year.
Report on biodegradable waste targets, as per Condition 11.3.
Report on the progress towards achievement of the Environmental Objectives and Targets contained in previous year's report.
Full title and a written summary of any procedures developed by the licensee in the year which relates to the facility operation.
Tank, drum, pipeline and bund testing and inspection report.
Reported Incidents and Complaints summaries.
Review of Nuisance Controls.
Reports on financial provision made under this licence, management and staffing structure of the facility, and a programme for public information.
Volume of foul water produced and volume of foul water transported off-site.
Any other items specified by the Agency.

Note 1 Content to be revised subject to the agreement of the Agency after cessation of waste acceptance at the facility.

Sealed by the seal of the Agency on this the 6th day of November 2003

PRESENT when the seal of the Agency was affixed hereto:

Dr Padraic Larkin, Director/Authorised Person

Appendix 2

Waste Water
Treatment Plant Assessment

Foul Water Monitoring

Foul water is treated in the on-site Klargestor treatment plant, with the treated effluent discharged to an on-site percolation area. Following a request by the Agency in December 2011 a detailed Waste Water Treatment System Risk Assessment was completed by IE Consulting Engineers in 2012. The report showed that the average daily treated effluent discharge to the percolation area is 0.4m^3/day, which is a relatively low volume of discharge. When rainfall over the percolation area is taken into consideration, the total hydraulic loading is 0.483m^3/day. Effluent monitoring data from 2011 to date indicates concentrations of all parameters within the treated effluent (pre sand filter) are within the Agency's recommended minimum performance standards and within the manufacturer's design standards.

The Waste Licence requires foul water monitoring to be carried out at two monitoring locations, FE2 which is the discharge from the treatment plant and at the truckwash discharge. The truckwash has not been used since Q3 2010. The monitoring results for 2012 are presented in the Table below.

There are no emission limit values set in the Licence and for comparative purposes the Table includes the performance standards set in the EPA Waste Water Treatment Manual Guidelines. The discharge was generally of good quality, with the exception of TSS levels in January and October. The TSS is however relatively low and at this level is not considered significant. The treated effluent discharges to ground and it is understood that the percolation area is not categorised as being located in a nutritionally sensitive area.

Table 3.7 – Foul Water Monitoring Results 2012

Parameter	Units	Jan*	Feb	Apr	June	July	Oct	Dec	Performance Standards
pH	pH units	7.6	6.72	8.21	7.35	7.46	6.73	7.55	*Ns*
BOD	mg/l	3.8	1	<1	2	6	11	-	*20*
TSS	mg/l	37	26	23	<2	26	81	7	*30*
Ammoniacal Nitrogen	mg/l	0.06	2	0.43	0.2	<1	0.12	0.49	*20*
Fats Oils Grease	mg/l	-	<0.01	<0.01	<1	3.4	<1	6.6	*Ns*
Sulphate	mg/l	33	65.61	76.8	26.8	44.3	160.5	56.9	*Ns*
Total Phosphorous	mg/l	-	0.569	0.609	0.17	<1	2.54	0.32	*Ns*
Total Nitrogen	mg/l	-	22.1	14.2	<7	10.47	40.51	<10	*Ns*
Nitrate	mg/l	-	33.6	54.5	15.59	32.60	136.2	26.89	*Ns*
Nitrite	mg/l	-	0.70	0.38	0.16	1.68	<0.66	<0.66	*Ns*
COD	mg/l	44	30	22	15	51	116	29	*Ns*

*EPA monitoring.
-Not Analysed
Ns – Not set

Appendix 3

Traffic Impact Assessment

O'Callaghan Moran & Associates

Proposed Intensification of Existing Waste Management Facility,
Dock Road, Co. Limerick

Traffic Impact Assessment

February 2013
Revision A

TOBIN CONSULTING ENGINEERS

TOBIN
Patrick J. Tobin & Co. Ltd.

REPORT

PROJECT:

Proposed Intensification of Existing Waste Management Facility, Dock Road, Co. Limerick

Traffic Impact Assessment

CLIENT:

O'Callaghan Moran & Associates,
Environmental & Hydrological Consultants,
Granaty House,
Rutland Street,
Cork.

COMPANY:

TOBIN Consulting Engineers
Fairgreen House,
Fairgreen Road,
Galway.

www.tobin.ie

Template rep 003

DOCUMENT AMENDMENT RECORD

Client:	**O'Callaghan Moran & Associates**
Project:	**Proposed Intensification of Existing Waste Management Facility, Dock Road, Co. Limerick**
Title:	**Traffic Impact Assessment**

PROJECT NUMBER: 7097			DOCUMENT REF: TR01-TIA	
A	Issue	BW 3/05/13	GR 3/05/13	TC 3/05/13
Revision	**Description & Rationale**	**Originated/Date**	**Checked/Date**	**Authorised/Date**
		TOBIN Consulting Engineers		

TABLE OF CONTENTS

TABLES & APPENDICES

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

1.1 INTRODUCTION

TOBIN Consulting Engineers Ltd has been appointed by Greenstar Environmental Services Ltd. to prepare a Traffic Impact Assessment Report for proposed intensification of an existing waste management facility at Dock Road, Limerick.

In preparing this report, TOBIN Consulting Engineers has made reference to

- The Limerick County Development Plan 2010 - 2016;
- NRA 'Traffic and Transport Assessment Guidelines';
- NRA DMRB TD 41-42;
- NRA DMRB TA 79;
- NRA Project Appraisal Guidelines Unit 5.5: Link-Based Traffic Growth Forecasting
- The UK DETR "Guidance on the Use of Tactile Paving Surfaces";
- Department of Transport "Traffic Management Guidelines";
- TRL RR67.

1.2 OBJECTIVES

The objective of this report is to assess the impact the proposed development will have on the existing road network. This report will calculate the expected volume of traffic that will be generated by the proposed development and assess the impact that this traffic will have on the operational capacity of the road network in the vicinity of the development. The junction to be analysed as part of this report is the existing site access junction on the N69.

1.3 STRUCTURE OF THE REPORT

This report is divided into seven chapters:

- Chapter 1 includes this introduction
- Chapter 2 describes the proposed development, and its location.
- Chapter 3 provides an overview of the existing and proposed traffic conditions, explaining how this information was obtained.
- Chapter 4 outlines the assumptions that have been made in the calculation of traffic generated by the development and the factors used to forecast the future road network traffic.
- Chapter 5 explains the methodology used and the results of the analysis performed on the nominated junction. An investigation into link capacity is also dealt with in this chapter.
- Chapter 6 addresses issues relating to road safety, parking provision, pedestrians & cyclists and access for people with disabilities.
- Chapter 7 concludes the report.

2 PROPOSED DEVELOPMENT

2.1 SITE LOCATION

The site is located along the N69 Dock Road, to the southwest of Limerick City. The proposed site is located adjacent to a proposed oil depot and Paddy Dore Commercials. Figure 2.1 below outlines the location of the existing waste management facility.

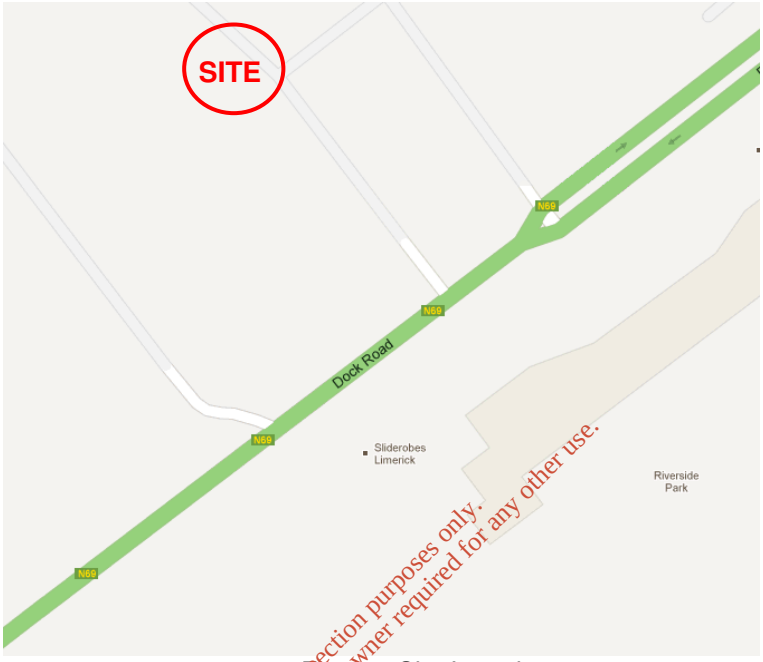


Fig 2.1: Site Location

2.2 DESCRIPTION OF PROPOSED DEVELOPMENT

It is proposed that the existing Waste Management Facility will increase its authorised annual tonnage allowance of non-hazardous wastes from 90,000 tonnes to 130,000 tonnes. Staff levels at the facility are not expected to increase despite the proposed increase in materials accepted.

Access to the site is proposed to continue through the existing priority junction on the N69 Dock Road.

2.3 COMMITTED DEVELOPMENT

Planning approval has recently been granted for a proposed Oil Depot located to the west of the subject site. In order to ensure a robust assessment of the road network, it has been assumed for the purposes of this report that the proposed Oil Depot will be operational by the year of opening of the development.

While planning approval has yet to be obtained (under Planning Reference 12373), in order to ensure a robust assessment of the road network, it has been assumed for the purposes of this report that the proposed Petrol Station, located adjacent to the Oil Depot, will be operational by the year of opening of the development.

While no major planning applications have recently been granted permission in the vicinity of the development which will significantly affect the operational capacity of the proposed site access junction, a significant amount of industrial-zoned lands are located in the area. While these zoned lands will be subject to individual planning applications, it was considered appropriate to assess the road network in the event that such zoned lands were to be developed. For the purposes of this report, is has been assumed that 30,000m^2 of industrial lands will be constructed by the proposed year of opening, 2013.

3 EXISTING AND PROPOSED TRAFFIC CONDITIONS

3.1 TRAFFIC SURVEY

In order to determine the magnitude of the existing traffic flows, the results of a two-way automated classified traffic survey was used. This traffic survey was carried out by Abacus Transportation Surveys on Wednesday 17th January 2013 between the hours 07:00 and 19:00 on the N69 Dock Road / existing Waste Management Facility priority access junction. This survey distinguished between cars, light good vehicles, buses and heavy good vehicles. The traffic count data is included in Appendix A of this report.

The results of this survey indicated that the peak traffic levels through this junction occurred between the hours of 08:15 and 09:15 and between 16:45 and 17:45.

In order to undertake an analysis of the junction, it was necessary first to convert the raw traffic survey data, which consisted of cars and heavy vehicles, into a common index known as passenger car units (PCU's). This was undertaken by applying a factor to all surveyed traffic movements to take account of the composition of the different types of vehicle. This factoring calculation assumes 1 car / light vehicle = 1 PCU, 1 heavy vehicle (type OGV1) = 1.5 PCU's, 1 heavy vehicle (type OGV2) = 2.3 PCU's and 1 bus = 2 PCU's in accordance with TRL RR67.

3.2 EXISTING ROAD NETWORK

The existing site entrance is located in a 60km/h speed limit. The N69 has a carriageway width of approximately 11.3m in the vicinity of the proposed site access junction, with a grass margin fronting the southern side of the carriageway. A ghost island with dedicated right-turning lane for vehicles wishing to access the existing Waste Management Facility is also located at this point, however these road markings have experienced deterioration. Street lighting is provided in the vicinity of the site. No pedestrian or cyclist facilities are currently provided in the vicinity of the site.

3.3 PROPOSED NETWORK IMPROVEMENTS

No major infrastructural improvements are currently planned in the immediate vicinity of the site which will have a significant impact on traffic movements in the area.

4 TRIP DISTRIBUTION AND GENERATION

4.1 TRIP GENERATION

The volume of traffic expected to be generated during the AM and PM peak hours for the proposed development was derived from the results of the traffic count carried out at the existing site access junction.

Trip Rates for the development have been determined based on the existing authorised annual tonnage allowance for the waste management facility. These trip rates for the AM and PM peak hours are shown below in Tables 4.1 and 4.2 respectively.

TRIP GENERATION RATE FOR DEVELOPMENT FOR AM PEAK HOUR					
Development Type	**Existing Authorised Annual Tonnage**	**Existing Arrivals**	**Arrivals per 1,000 Tonnes**	**Existing Departures**	**Departures per 1,000 Tonnes**
Waste Management Facility	90,000	23	0.256	21	0.233

Table 4.1: Trip Generation Rate for Development for AM Peak Hour

TRIP GENERATION RATE FOR DEVELOPMENT FOR PM PEAK HOUR					
Development Type	**Existing Authorised Annual Tonnage**	**Existing Arrivals**	**Arrivals per 1,000 Tonnes**	**Existing Departures**	**Departures per 1,000 Tonnes**
Waste Management Facility	90,000	27	0.300	40	0.444

Table 4.2: Trip Generation Rate for Development for PM Peak Hour

The volume of traffic expected to be generated by the development for the proposed additional tonnage allowance for the AM and PM peak hours is shown below in Tables 4.3 and 4.4 respectively.

EXPECTED TRIP GENERATION FOR PROPOSED DEVELOPMENT FOR AM PEAK HOUR					
Development Type	**Additional Tonnage**	**Arrivals per 1,000 Tonnes**	**Total Arrivals**	**Departures per 1,000 Tonnes**	**Total Departures**
WMF	40,000	0.256	10	0.233	9
Total			**10**		**9**

Table 4.3: Expected Trip Generation for Proposed Development for AM Peak Hour

EXPECTED TRIP GENERATION FOR PROPOSED DEVELOPMENT FOR PM PEAK HOUR					
Development Type	**Additional Tonnage**	**Arrivals per 1,000 Tonnes**	**Total Arrivals**	**Departures per 1,000 Tonnes**	**Total Departures**
WMF	40,000	0.300	12	0.444	18
Total			**12**		**18**

Table 4.4: Expected Trip Generation for Proposed Development for PM Peak Hour

Generated traffic for both the AM and PM peak hours for the proposed Oil Depot and Petrol Station developments have been obtained from the planning documents submitted in support of the application, and are outlined below in Tables 4.3 and 4.4. Trips rates have been determined for the industrial zoned lands for weekdays, to coincide with the maximum levels of existing traffic on the adjacent road network. The volume of traffic expected to be generated by the zoned lands for the AM and PM peak hours are shown below in Tables 4.5 and 4.6 respectively. The TRICS database outputs are contained in Appendix C of this report.

EXPECTED TRIP GENERATION FOR COMMITTED DEVELOPMENT FOR AM PEAK HOUR					
Development Type	**GFA**	**Arrivals per 100m² GFA**	**Total Arrivals**	**Departures per 100m² GFA**	**Total Departures**
Oil Depot	-		8	-	2
Petrol Station	-	-	64	-	62
Industrial Zoned Lands	30,000	0.450	135	0.178	53
Total			**207**		**117**

Table 4.5: Expected Trip Generation for Committed Development for AM Peak Hour

EXPECTED TRIP GENERATION FOR COMMITTED DEVELOPMENT FOR PM PEAK HOUR					
Development Type	**GFA**	**Arrivals per 100m² GFA**	**Total Arrivals**	**Departures per 100m² GFA**	**Total Departures**
Oil Depot	-	-	2	-	8
Petrol Station	-	-	65	-	65
Industrial Zoned Lands	30,000	0.115	35	0.378	113
Total			**37**		**121**

Table 4.6: Expected Trip Generation for Committed Development for PM Peak Hour

4.2 TRIP DISTRIBUTION

It has been assumed for the purposes of this report that traffic distributions will mirror existing distribution patterns.

The distribution of development-generated traffic for the AM and PM peak hours is shown below in Figures 4.1 and 4.2 respectively.

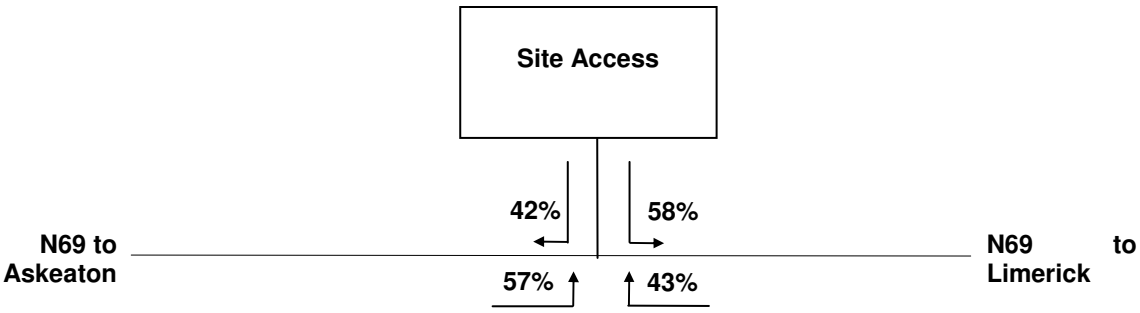


Fig 4.1: Generated Traffic Distribution for AM Peak Hour

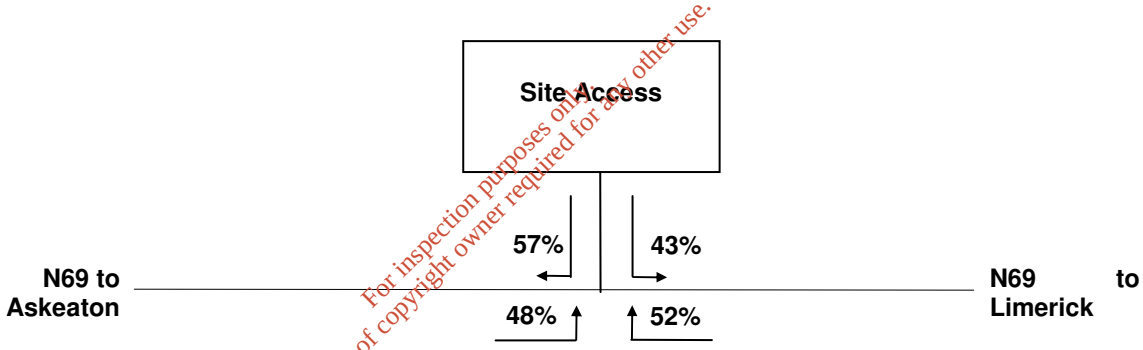


Fig 4.2: Generated Traffic Distribution for PM Peak Hour

The traffic generated by the proposed development for the AM and PM peak hours is shown below in Figures 4.3 and 4.4 respectively (All figures are in PCU's).

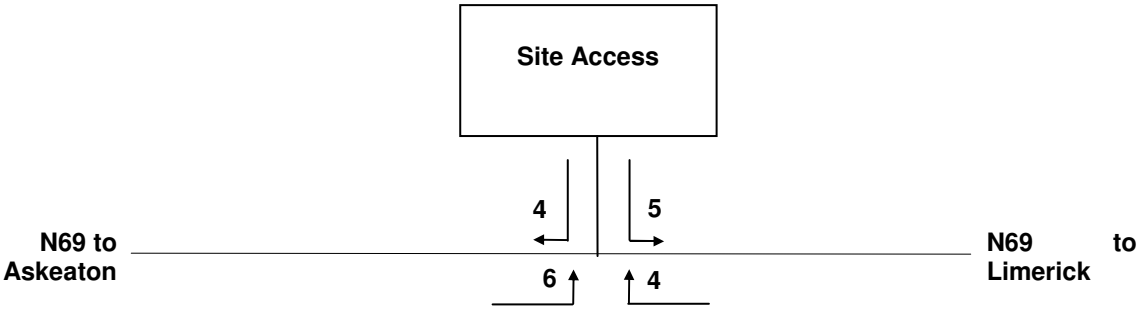


Fig 4.3: Generated Traffic for AM Peak Hour

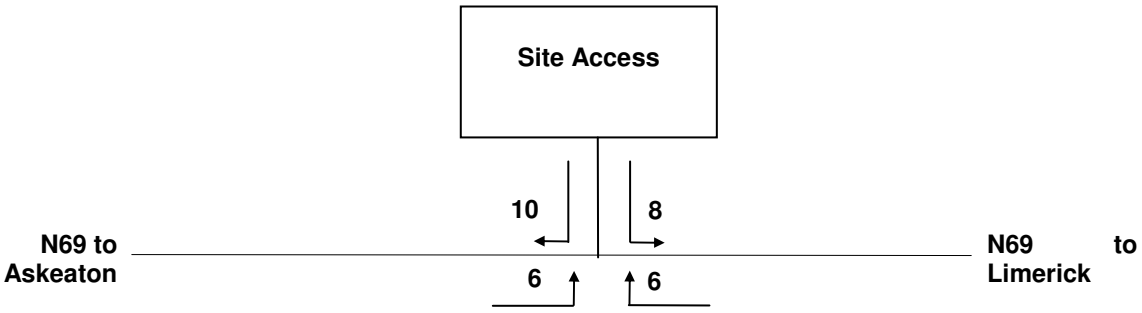


Fig 4.4: Generated Traffic for PM Peak Hour

4.3 SEASONAL ADJUSTMENT

In order to undertake an analysis of a junction, it may be necessary to apply a correction factor to convert the surveyed PCU values into seasonally adjusted traffic flows to take account of the seasonal variation that is experienced with traffic surveys (i.e. traffic count data). These seasonally adjusted conversion factors were calculated using data taken from a fixed automatic traffic counter located on Limerick Dock Road East (NRA counter N18-18) in 2011. Traffic flows in January were found to experience lower than average traffic flows due to significantly lower flows in the early part of the month. To get a more accurate picture of flows at the point in January the count was undertaken, the weekly flow corresponding to the traffic count was considered which also revealed that flows were lower than average. In order to convert the surveyed traffic flows to seasonal flows, a conversion factor of 1.09 has been applied to the surveyed traffic.

The results of the seasonally adjusted traffic count for the AM and PM peak hours are shown below in Figures 4.5 and 4.6.

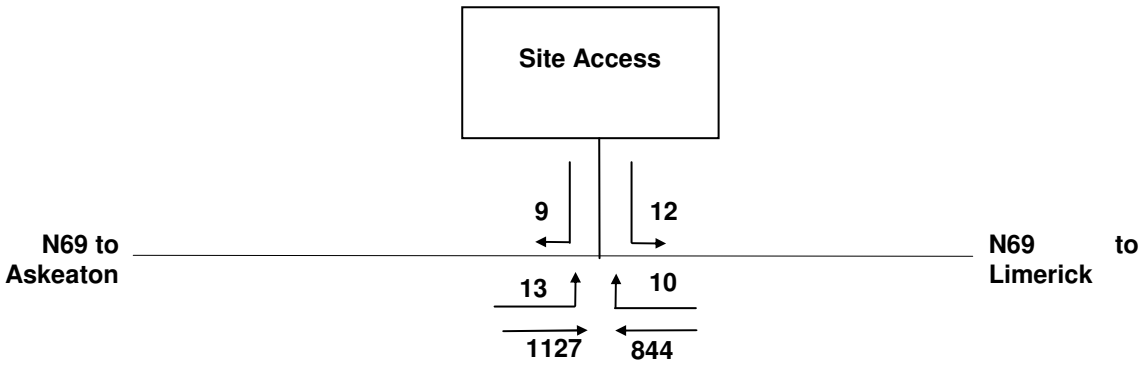


Fig 4.5: Seasonally Adjusted Surveyed Traffic AM Peak

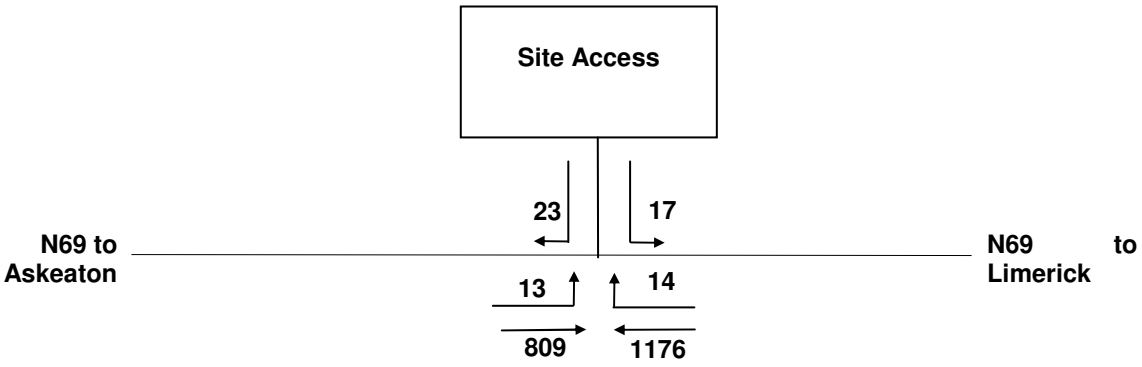


Fig 4.6: Seasonally Adjusted Surveyed Traffic PM Peak

4.4 TRAFFIC GROWTH

The background traffic growth factors used in the analysis in this report were established from the NRA's Project Appraisal Guidelines – Unit 5.5 Link-Based Traffic Growth Forecasting guidance document. In order to ensure a robust assessment of the road network, the high growth scenario for Region 7 was used in the analysis. These resulted in growth factors of:

- 1.32 growth factor from 2013 to 2028 (15 years beyond year of opening)

The baseline plus generated traffic (with both committed and proposed development) for the year of opening 2013, and the design year 2028 for both the AM and PM peak hours are shown below in Figures 4.7 to 4.10 (All figures are in PCU's).

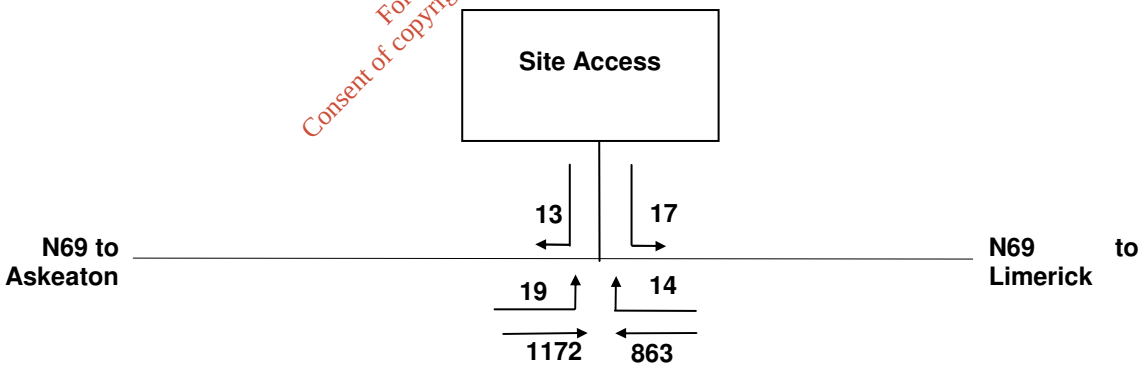


Fig 4.7: Baseflow Plus Generated Traffic 2013 AM Peak

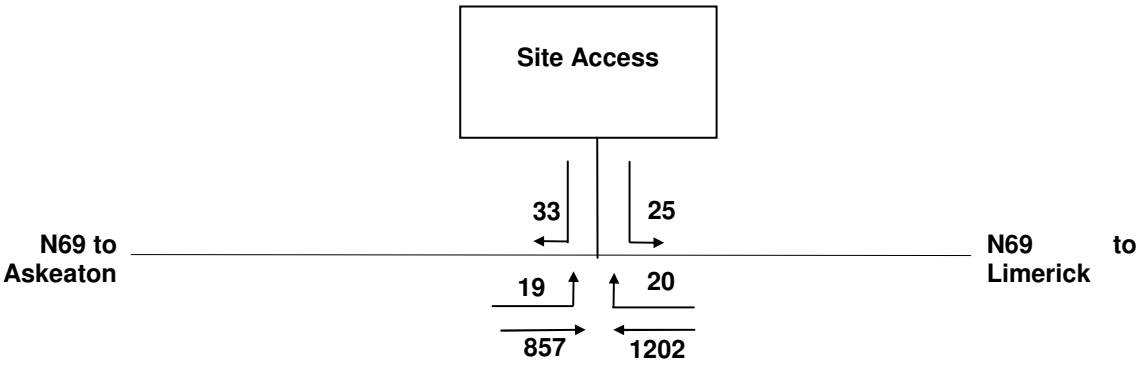


Fig 4.8: Baseflow Plus Generated Traffic 2013 PM Peak

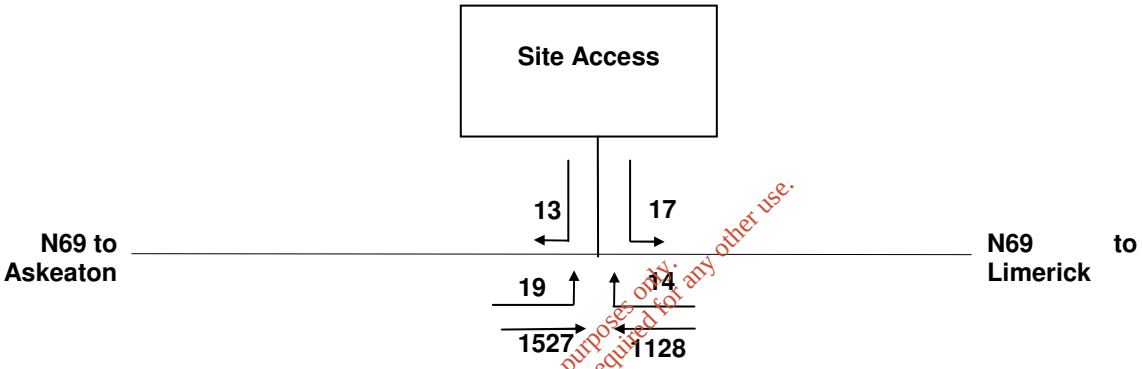


Fig 4.9: Baseflow Plus Generated Traffic 2028 AM Peak

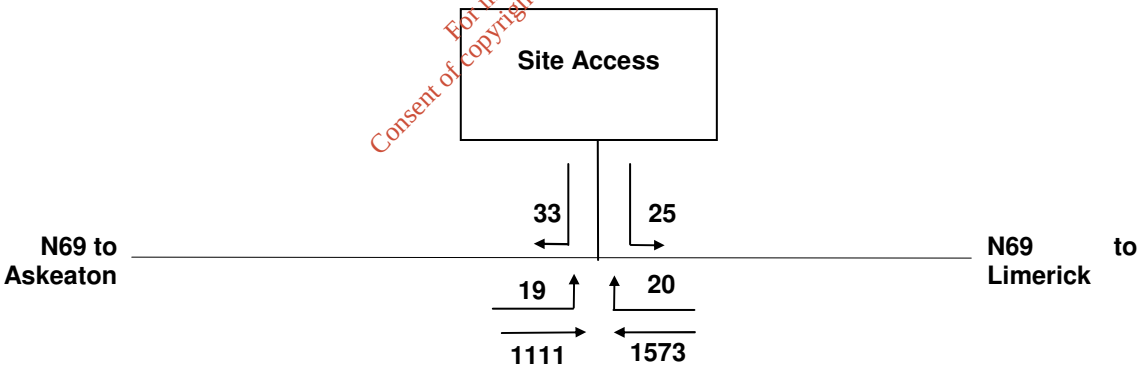


Fig 4.10: Baseflow Plus Generated Traffic 2028 PM Peak

5 ROAD IMPACT

5.1 JUNCTION ANALYSIS

5.1.1 *Introduction and Methodology*

The proposed site access junction has been analysed using the Transport Research Laboratory (TRL) computer program, PICADY, a widely accepted tool used for the analysis of priority junctions.

The performance of the junction has been analysed for the critical AM and PM peak hours, for the surveyed traffic, expected year of opening, 2013, and the design year 2028, 15 years beyond the year of opening.

The key parameters examined in the results of the analysis are the Ratio of Flow to Capacity Value (RFC value – desirable value should be no greater than 0.85 for PICADY – values over 1.00 indicate the approach arm is over capacity), the maximum queue length on any approach to the junctions and the average delay for each vehicle passing through the junction during the modelled period.

PICADY requires the following input data:

- Basic modelling parameters (usually peak hour traffic counts synthesised over a 90 minute model period)
- Geometric parameters (including lane numbers & widths, visibility, storage provision etc)
- Traffic demand data (usually peak hour origin/destination table with composition of heavy goods vehicles input*)

* For the purpose of this report, adjustments for varying vehicle types were made to the traffic figures prior to input. Traffic volumes input into PICADY were in PCU's and, accordingly, commercial vehicle composition was set to zero and car composition was set to 100% in the input.

The results of the PICADY analysis are presented in section 5.1.3. The origin/destination traffic demand tables for all the different scenarios tested for the analysed junctions are provided in the Appendix B of this report.

5.1.2 *Assessment Years*

The performance of the junction has been analysed for the critical AM peak hour (08:15 – 09:15) and PM peak hour (16:45 – 17:45). This analysis was carried out for both the expected year of opening of the development, expected to be 2013, and the design year of the development 2028, 15 years beyond full completion of the development in accordance with the NRA "Traffic and Transport Assessment Guidelines".

5.1.3 *Analysis Results*

A summary of the analysis results for the proposed site access junction for the AM and PM peak hours are provided below in Table 5.1. Full outputs from PICADY are included in Appendix D.

PICADY RESULTS: SITE ACCESS JUNCTION AM & PM PEAK HOURS							
Year & Time	Arm A – N69 to Askeaton		Arm B – Development		Arm C – N69 to Limerick		Average Delay (min/veh)
	RFC Value	Max Queue Length	RFC Value	Max Queue Length	RFC Value	Max Queue Length	
Existing AM	-	-	0.057	0.06	0.024	0.02	0.0
Existing PM	-	-	0.128	0.15	0.029	0.03	0.0
2013 AM + Dev	-	-	0.089	0.10	0.034	0.04	0.0
2013 PM + Dev	-	-	0.199	0.24	0.042	0.04	0.0
2028 AM	-	-	0.141	0.16	0.029	0.03	0.0
2028 PM	-	-	0.257	0.33	0.032	0.03	0.0
2028 AM + Dev	-	-	0.250	0.32	0.042	0.04	0.0
2028 PM + Dev	-	-	0.435	0.072	0.047	0.05	0.0

Table 5.1: PICADY Results: Site Access Junction AM & PM Peak Hours

The above results indicate that the proposed site access junction will operate below the maximum desirable 0.85 RFC up to and including the design year of 2028 with the inclusion of development-generated traffic.

5.2 LINK CAPACITY

A link capacity assessment for the Dock Road was undertaken using TA/ 79/99. TA 79/99 gives a means of estimating the link capacity of existing urban roads and this document was used for calculating the capacities of this road.

For the purposes of classification of Road Type, the Dock Road has been classified as UAP3 (Variable standard road carrying mixed traffic with frontage access, side roads, bus stops and at-grade pedestrian crossings). Existing carriageway widths are approximately 11m and there are 2-3 lanes giving a capacity estimate of 1620 PCU/hr in one direction. Of the scenarios analysed, the maximum one way flow expected occurs during the PM peak in 2028 with a flow of 1618 PCU expected. This suggests the road will operate just below capacity by the design year of 2028.

6 OTHER ROAD ISSUES

6.1 ROAD SAFETY

Visibility splays of 3.0 x 120 metres in accordance with the NRA DMRB TD 41-42 are required at the site access junction, and are achievable in both directions. It is recommended that the required sightlines at the site access junction be provided, maintained and kept free of all vegetation and other obstacles, such as signage, which may cause a visual obstruction.

It is further recommended that the existing right-turn lane along Dock Road be utilised for vehicles wishing to access the site from Limerick City. It is recommended that road markings be consistent with other access points along Dock Road. It is further recommended that all road markings in the vicinity of the site be reinstatement where marking deterioration is evident.

Accident data made available by the Road Safety Authority on www.rsa.ie has been reviewed and no accident cluster is recorded along the N69 in the vicinity of the entrance.

6.2 PARKING PROVISION

Due to the nature of the application, no additional car parking is required.

6.3 PEDESTRIANS & CYCLISTS

Due to the nature and rural location of the development, no pedestrian or cyclist facilities are currently provided fronting the site, nor are the provision of such facilities considered appropriate at this stage.

6.4 PUBLIC TRANSPORT

Due to the nature of the development, it is considered that the development will have no impact on public transport in the area, no limited modal shift anticipated from private car to public transport.

6.5 ACCESS FOR PEOPLE WITH DISABILITIES

It is recommended that dished kerbing and tactile paving slabs be installed at all internal crossing points, in accordance with “Guidance On The Use of Tactile Paving Slabs”.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

The conclusions to this report are as follows:

- The proposed site access junction will operate below the desired 0.85 RFC up to and including the design year of 2028, with the inclusion of committed and proposed development-generated traffic.
- The proposed development can be accommodated by the existing road network.
- 3.0 x 120 metre visibility splays are available in both directions at the site access junction.
- Due to the rural location, no pedestrian or cyclist facilities are considered appropriate fronting the development.

7.2 RECOMMENDATIONS

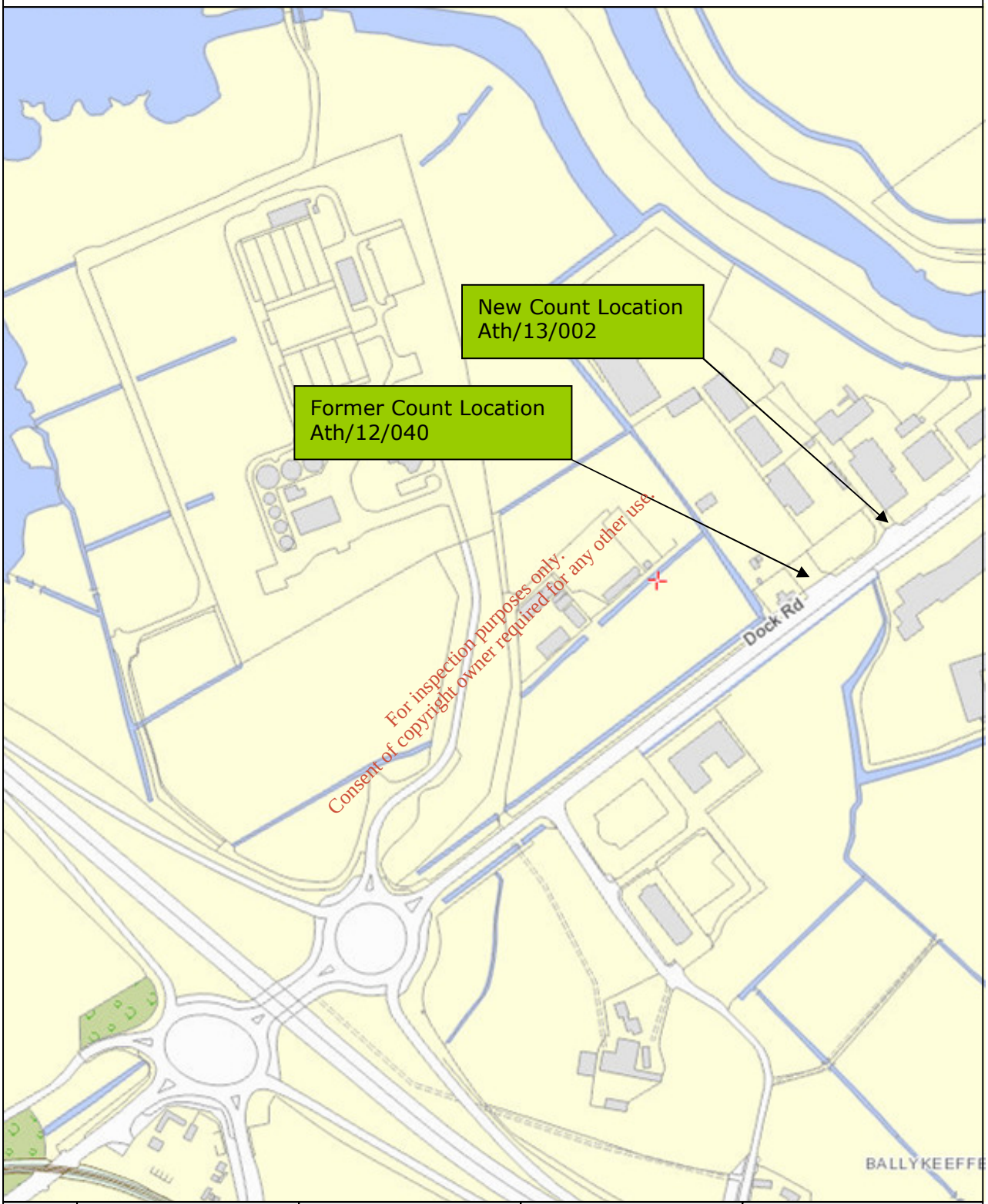
This report recommends that:

- Site access junction visibility splays be kept free of all restrictions including signage.
- The existing right-turn lane along Dock Road be modified, reinstated and utilised for vehicles wishing to access the site from Limerick City.
- Drop kerbing and tactile paving be provided at all internal pedestrian crossing points

APPENDIX A

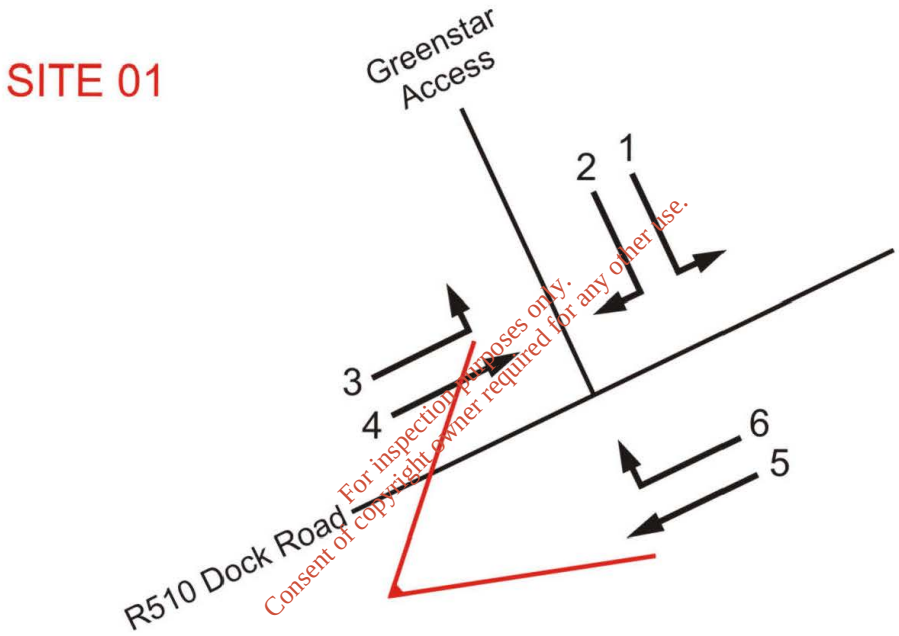
Traffic Survey Results

Site Location



Job number: ATH/13/002	Job date: 17th January 2013	Drawing No: ATH/13/002-1	abacus Transportation Surveys
Client: Tobin	Job day: Thursday	Author: SPW	

Movement Numbers & Directions



	Job number: ATH/13/002	Job date: 17th January 2013	Drawing No: ATH/13/002-2	abacus Transportation Surveys
	Client: Tobin	Job day: Thursday	Author: SPW	

ABACUS TRANSPORTATION SURVEYS

DOCK ROAD TRAFFIC COUNT **JANUARY 2013**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/13/002**

SITE: 01 DATE: 17th January 2013

LOCATION: Dock Road/Greenstar Works DAY: Thursday

	MOVEMENT 1							MOVEMENT 2							MOVEMENT 3						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
07:00	0	0	2	0	0	2	3	1	1	4	1	0	7	10	3	2	0	0	0	5	5
07:15	0	0	3	1	0	4	7	0	0	4	0	0	4	6	0	0	0	0	0	0	0
07:30	0	0	0	1	0	1	2	0	0	0	0	0	0	0	1	0	1	1	0	3	5
07:45	1	0	2	0	0	3	4	0	0	2	0	0	2	3	0	0	0	0	0	0	0
H/TOT	1	0	7	2	0	10	16	1	1	10	1	0	13	19	4	2	1	1	0	8	10
08:00	1	0	0	0	0	1	1	0	0	1	1	0	2	4	1	1	0	2	0	4	7
08:15	0	1	2	0	0	3	4	0	0	0	1	0	1	2	1	0	0	0	0	1	1
08:30	0	1	1	0	0	2	3	0	0	1	0	0	1	2	3	0	0	0	0	3	3
08:45	1	0	0	0	0	1	1	0	0	0	0	0	0	0	2	0	1	2	0	5	8
H/TOT	2	2	3	0	0	7	9	0	0	2	2	0	4	8	7	1	1	4	0	13	19
09:00	1	0	0	1	0	2	3	0	0	1	1	0	2	4	0	0	0	0	0	0	0
09:15	0	2	2	0	0	4	5	0	0	0	0	0	0	0	1	1	1	2	0	5	8
09:30	1	0	0	0	0	1	1	0	0	0	1	0	1	2	0	1	0	0	0	1	1
09:45	1	0	0	0	0	1	1	1	0	1	0	0	2	3	0	0	0	2	0	2	5
H/TOT	3	2	2	1	0	8	10	1	0	2	2	0	5	9	1	2	1	4	0	8	14
10:00	0	0	0	1	0	1	2	1	0	0	0	0	1	1	0	1	1	0	0	2	3
10:15	1	1	0	0	0	2	2	1	0	1	0	0	2	3	1	2	2	0	0	5	6
10:30	0	0	0	0	0	0	0	0	0	1	1	0	2	4	0	0	0	0	0	0	0
10:45	2	1	1	0	0	4	5	1	2	0	1	0	4	5	2	0	0	1	0	3	4
H/TOT	3	2	1	1	0	7	9	3	2	2	2	0	9	13	3	3	3	1	0	10	13
11:00	1	1	1	0	0	3	4	0	0	1	0	0	1	2	0	2	0	0	0	2	2
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	3
11:30	0	1	1	0	0	2	3	0	2	0	0	0	2	2	1	3	2	1	1	8	11
11:45	1	3	4	1	0	9	12	0	1	0	2	0	3	6	0	0	3	1	0	4	7
H/TOT	2	5	6	1	0	14	18	0	3	1	2	0	6	9	1	6	6	2	1	16	23
12:00	0	0	2	0	0	2	3	1	0	3	0	0	4	6	2	0	1	0	0	3	4
12:15	1	1	0	0	0	2	2	0	0	1	0	0	1	2	1	0	0	0	0	1	1
12:30	2	0	1	0	0	3	4	1	1	0	1	0	3	4	0	0	0	0	0	0	0
12:45	0	2	1	0	0	3	4	0	1	1	0	0	2	3	0	1	1	0	0	2	3
H/TOT	3	3	4	0	0	10	12	2	2	5	1	0	10	14	3	1	2	0	0	6	7

ABACUS TRANSPORTATION SURVEYS

DOCK ROAD TRAFFIC COUNT **JANUARY 2013**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/13/002**

SITE: 01 DATE: 17th January 2013

LOCATION: Dock Road/Greenstar Works DAY: Thursday

	MOVEMENT 1							MOVEMENT 2							MOVEMENT 3						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
13:00	3	2	0	1	0	6	7	0	0	0	0	0	0	0	0	0	1	1	0	2	4
13:15	0	2	1	0	0	3	4	0	0	2	0	0	2	3	1	0	0	0	0	1	1
13:30	0	0	0	0	0	0	0	0	0	0	2	0	2	5	1	0	1	0	0	2	3
13:45	0	0	0	0	0	0	0	1	0	1	0	0	2	3	0	0	0	1	0	1	2
H/TOT	3	4	1	1	0	9	11	1	0	3	2	0	6	10	2	0	2	2	0	6	10
14:00	1	1	1	1	0	4	6	0	0	0	1	0	1	2	1	0	3	0	0	4	6
14:15	1	2	1	0	0	4	5	0	1	1	1	0	3	5	0	2	0	0	0	2	2
14:30	0	2	1	1	0	4	6	1	0	0	0	0	1	1	0	0	0	2	0	2	5
14:45	0	0	0	0	0	0	0	1	1	0	0	0	2	2	0	1	1	0	0	2	3
H/TOT	2	5	3	2	0	12	16	2	2	1	2	0	7	10	1	3	4	2	0	10	15
15:00	0	2	0	0	0	2	2	1	0	2	0	0	3	4	0	0	0	1	0	1	2
15:15	2	0	2	0	0	4	5	3	0	1	1	0	6	8	1	1	2	1	0	5	7
15:30	4	0	0	2	0	6	9	2	2	1	0	0	5	6	0	1	2	0	0	3	4
15:45	2	1	0	0	0	3	3	2	0	0	0	0	2	2	0	0	0	2	0	2	5
H/TOT	8	3	2	2	0	15	19	8	3	4	1	0	16	19	1	2	4	4	0	11	18
16:00	0	0	0	0	0	0	0	3	0	2	0	0	5	6	0	0	1	0	0	1	2
16:15	1	0	1	0	0	2	3	2	0	0	0	0	2	2	0	0	1	0	0	1	2
16:30	1	0	0	0	0	1	1	0	0	0	2	0	2	5	1	0	0	0	0	1	1
16:45	1	1	1	0	0	3	4	2	0	0	1	0	3	4	0	1	0	0	0	1	1
H/TOT	3	1	2	0	0	6	7	7	0	2	3	0	12	17	1	1	2	0	0	4	5
17:00	2	1	2	0	0	5	6	2	2	0	0	0	4	4	0	0	2	0	0	2	3
17:15	1	0	0	0	0	1	1	2	2	1	1	0	6	8	0	0	2	2	0	4	8
17:30	4	1	0	0	0	5	5	2	1	1	0	0	4	5	0	0	0	0	0	0	0
17:45	1	0	1	0	0	2	3	4	0	1	0	0	5	6	0	0	1	0	0	1	2
H/TOT	8	2	3	0	0	13	15	10	5	3	1	0	19	22	0	0	5	2	0	7	12
18:00	3	0	0	0	0	3	3	1	1	0	0	0	2	2	0	0	0	0	0	0	0
18:15	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0	0	1	1
18:30	1	0	0	0	0	1	1	2	0	1	0	0	3	4	0	0	1	1	0	2	4
18:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	4	0	0	0	0	4	4	4	1	1	0	0	6	7	1	0	1	1	0	3	5
P/TOT	42	29	34	10	0	115	145	39	19	36	19	0	113	156	25	21	32	23	1	102	149

ABACUS TRANSPORTATION SURVEYS

DOCK ROAD TRAFFIC COUNT **JANUARY 2013**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/13/002**

SITE: 01 DATE: 17th January 2013

LOCATION: Dock Road/Greenstar Works DAY: Thursday

	MOVEMENT 4							MOVEMENT 5							MOVEMENT 6						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
07:00	41	5	6	2	1	55	62	48	15	1	1	0	65	67	1	0	0	0	0	1	1
07:15	63	11	10	3	1	88	98	66	11	1	5	0	83	90	2	1	0	0	0	3	3
07:30	86	15	3	6	2	112	123	78	17	5	5	0	105	114	0	0	0	0	0	0	0
07:45	111	24	14	8	0	157	174	102	25	6	9	1	143	159	2	1	1	0	0	4	5
H/TOT	301	55	33	19	4	412	457	294	68	13	20	1	396	430	5	2	1	0	0	8	9
08:00	194	30	5	8	0	237	250	95	20	6	5	0	126	136	1	0	3	0	0	4	6
08:15	249	27	2	5	0	283	291	117	14	7	5	2	145	157	0	1	1	0	0	2	3
08:30	159	22	5	1	0	187	191	160	16	9	9	2	194	210	1	1	0	0	0	2	2
08:45	231	21	9	4	1	266	277	128	23	8	6	5	170	187	0	0	0	0	0	0	0
H/TOT	833	100	21	18	1	973	1008	500	73	30	23	9	635	689	2	2	4	0	0	8	10
09:00	184	44	5	15	3	251	276	138	32	6	12	7	195	221	2	2	0	0	0	4	4
09:15	160	31	4	5	1	201	211	109	26	8	4	3	150	162	0	0	1	0	0	1	2
09:30	149	31	12	8	0	200	216	89	27	7	6	2	131	144	1	1	0	1	0	3	4
09:45	122	26	8	1	1	158	164	101	25	7	9	1	143	159	1	1	0	0	0	2	2
H/TOT	615	132	29	29	5	810	867	437	110	28	31	13	619	686	4	4	1	1	0	10	12
10:00	107	32	12	7	0	158	173	78	26	7	6	0	117	128	1	0	0	0	0	1	1
10:15	117	31	6	5	0	159	169	84	20	12	7	0	123	138	0	1	0	0	0	1	1
10:30	93	26	5	3	0	127	133	90	32	4	9	1	136	151	1	1	2	0	0	4	5
10:45	106	27	8	6	2	149	163	94	25	7	6	2	134	147	0	2	1	0	0	3	4
H/TOT	423	116	31	21	2	593	638	346	103	30	28	3	510	564	2	4	3	0	0	9	11
11:00	102	25	5	11	2	145	164	97	21	9	11	2	140	161	0	0	0	1	0	1	2
11:15	88	32	6	7	0	133	145	99	32	9	6	0	146	158	0	0	1	1	0	2	4
11:30	96	18	6	13	0	133	153	90	25	5	10	1	131	148	0	1	1	0	0	2	3
11:45	95	32	3	6	0	136	145	99	30	10	7	3	149	166	1	1	2	0	0	4	5
H/TOT	381	107	20	37	2	547	607	385	108	33	34	6	566	633	1	2	4	2	0	9	14
12:00	105	25	6	10	1	147	164	93	24	5	6	2	130	142	0	0	0	0	0	0	0
12:15	85	19	8	8	0	120	134	106	29	4	8	0	147	159	1	1	1	0	0	3	4
12:30	103	34	2	11	0	150	165	147	24	9	11	0	191	210	1	3	0	0	0	4	4
12:45	109	22	4	2	1	138	144	140	23	7	9	3	182	200	1	0	1	1	0	3	5
H/TOT	402	100	20	31	2	555	607	486	100	25	34	5	650	712	3	4	2	1	0	10	12

ABACUS TRANSPORTATION SURVEYS

DOCK ROAD TRAFFIC COUNT **JANUARY 2013**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/13/002**

SITE: 01 DATE: 17th January 2013

LOCATION: Dock Road/Greenstar Works DAY: Thursday

	MOVEMENT 4							MOVEMENT 5							MOVEMENT 6						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
13:00	113	28	7	3	0	151	158	140	29	6	3	0	178	185	0	0	1	0	0	1	2
13:15	94	22	3	6	3	128	140	159	26	8	4	0	197	206	1	1	0	0	0	2	2
13:30	97	25	7	6	0	135	146	149	16	9	6	0	180	192	0	1	0	0	0	1	1
13:45	13	32	3	6	2	56	67	122	16	7	6	2	153	166	5	1	1	0	0	7	8
H/TOT	317	107	20	21	5	470	512	570	87	30	19	2	708	750	6	3	2	0	0	11	12
14:00	101	22	9	7	2	141	157	125	19	4	5	4	157	170	1	2	0	0	0	3	3
14:15	121	17	8	8	1	155	170	156	28	4	6	2	196	208	0	1	2	0	0	3	4
14:30	115	29	8	4	1	157	167	132	24	6	6	0	168	179	0	0	1	2	0	3	6
14:45	107	17	7	5	0	136	146	114	22	7	6	3	152	166	1	1	4	0	0	6	8
H/TOT	444	85	32	24	4	589	640	527	93	21	23	9	673	722	2	4	7	2	0	15	21
15:00	103	22	7	5	3	140	153	157	25	7	7	6	202	221	0	1	4	1	0	6	9
15:15	133	16	10	9	1	169	187	182	24	5	5	1	217	227	1	2	0	0	0	3	3
15:30	105	24	6	5	1	141	152	165	31	11	6	2	215	230	0	0	0	0	0	0	0
15:45	112	31	10	1	2	156	164	182	26	9	5	2	224	237	0	0	1	2	0	3	6
H/TOT	453	93	33	20	7	606	656	686	106	32	23	11	858	915	1	3	5	3	0	12	18
16:00	134	22	9	4	1	170	181	153	27	12	3	0	195	205	0	0	2	0	0	2	3
16:15	118	26	5	1	1	151	156	143	32	4	4	1	184	192	0	0	0	1	0	1	2
16:30	147	23	8	8	1	187	202	177	27	9	2	2	217	226	1	0	2	0	0	3	4
16:45	138	25	7	6	0	176	187	196	23	7	3	2	231	240	1	0	2	0	0	3	4
H/TOT	537	96	29	19	3	684	726	669	109	32	12	5	827	864	2	0	6	1	0	9	13
17:00	155	23	7	3	1	189	197	232	30	5	3	1	271	278	1	1	0	0	0	2	2
17:15	147	16	5	5	0	173	182	233	28	5	1	1	268	273	0	0	0	1	0	1	2
17:30	138	15	6	6	0	165	176	253	26	3	0	2	284	288	1	2	1	0	0	4	5
17:45	124	17	3	4	0	148	155	206	17	4	2	0	229	234	0	0	0	0	0	0	0
H/TOT	564	71	21	18	1	675	710	924	101	17	6	4	1052	1072	2	3	1	1	0	7	9
18:00	117	16	1	0	1	135	137	214	27	2	3	0	246	251	0	0	1	0	0	1	2
18:15	120	23	1	4	0	148	154	202	26	3	2	0	233	237	0	0	0	0	0	0	0
18:30	113	10	3	1	0	127	130	154	11	0	3	1	169	174	0	0	0	0	0	0	0
18:45	113	12	0	2	0	127	130	118	14	2	3	1	138	144	0	0	0	0	0	0	0
H/TOT	463	61	5	7	1	537	550	688	78	7	11	2	786	806	0	0	1	0	0	1	2
P/TOT	5733	1123	294	264	37	7451	7978	6512	1136	298	264	70	8280	8842	30	31	37	11	0	109	142

APPENDIX B

Traffic Calculations

Existing Traffic Count - January 2013 AM

Vehicle Numbers converted to PCU ~ 1 lv = 1pcu, 1hgv = 2.3pcu

Site Access

Route	A	B	C
A		12	1034
B	8		11
C	774	9	

Seasonally Adjusted Factor
NRA Counter N18
AADT 2011 higher than Jan 2011 figures

	18783
	20494
	1.09

Seasonally adjusted Factor = 1.09

Oil Depot Junction

Route	A	B	C
A		13	1127
B	9		12
C	844	10	

Existing Traffic Count - June 2012 PM

Vehicle Numbers converted to PCU ~ 1 lv = 1pcu, 1hgv = 2.3pcu

N84 Junction

Route	A	B	C
A		12	742
B	21		16
C	1079	13	

Seasonally Adjusted Factor
NRA Counter N18
AADT 2011 higher than Jan 2011 figures

	18783	
	20494	
	1.09	
Seasonally adjusted Factor =		1.09

N84 Junction

Route	A	B	C
A		13	809
B	23		17
C	1176	14	

Traffic Calculations for Waste Management Facility, Dock Road, Co. Limerick

Site Access Priority Junction

At Present AM Peak (08:15 - 09:15)

Seasonally Adjusted 2013

National Traffic Growth Forecasts
Region 7 (High Growth)

2013 - Year of Opening

	LV
Yearly Growth Factor	*2.20%*
No Years	*0*

2012 - 2013 Growth Factor ***100.00%***

2028 - Design Year

	LV
Yearly Growth Factor	*2.20%*
No Years	*12*
Yearly Growth Factor	*1.70%*
No Years	*3*

2013 - 2028 Growth Factor ***131.50%***

Route	A	B	C
A		13	1127
B	9		12
C	844	10	

Route	A	B	C
A		13	1127
B	9		12
C	844	10	

Route	A	B	C
A		13	1482
B	9		12
C	1109	10	

With Other Proposed Committed Developments AM Peak (08:15 - 09:15)

Other Committed Development Only

Route	A	B	C
A		0	45
B	0		0
C	19	0	

2013 With other Committed Development

Route	A	B	C
A		13	1172
B	9		12
C	863	10	

2028 With other Committed Development

Route	A	B	C
A		13	1527
B	9		12
C	1128	10	

With Proposed Development AM Peak (08:15 - 09:15)

2028 With Development

Route	A	B	C
A		19	1172
B	13		17
C	863	14	

2028 With Development

Route	A	B	C
A		19	1527
B	13		17
C	1128	14	

Traffic Calculations for Waste Management Facility, Dock Road, Co. Limerick

Site Access Priority Junction

At Present PM Peak (16:45 - 17:45)

Seasonally Adjusted 2013

National Traffic Growth Forecasts
Region 7 (High Growth)

2013 - Year of Opening

	LV
Yearly Growth Factor	*2.20%*
No Years	*0*

2012 - 2013 Growth Factor ***100.00%***

2028 - Design Year

	LV
Yearly Growth Factor	*2.20%*
No Years	*12*
Yearly Growth Factor	*1.70%*
No Years	*3*

2013 - 2028 Growth Factor ***131.50%***

Route	A	B	C
A		13	809
B	23		17
C	1176	14	

Route	A	B	C
A		13	809
B	23		17
C	1176	14	

Route	A	B	C
A		13	1064
B	23		17
C	1547	14	

With Other Proposed Committed Developments PM Peak (16:45 - 17:45)

Other Committed Development Only

Route	A	B	C
A		0	47
B	0		0
C	26	0	

2013 With other Committed Development

Route	A	B	C
A		13	856
B	23		17
C	1202	14	

2028 With other Committed Development

Route	A	B	C
A		13	1111
B	23		17
C	1573	14	

With Proposed Development PM Peak (16:45 - 17:45)

2028 With Development

Route	A	B	C
A		19	856
B	33		25
C	1202	20	

2028 With Development

Route	A	B	C
A		19	1111
B	33		25
C	1573	20	

APPENDIX C

TRICS DATA

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 02 - EMPLOYMENT
Category : D - INDUSTRIAL ESTATE

VEHICLES

Selected regions and areas:

03	SOUTH WEST		
	CW	CORNWALL	1 days
	WL	WILTSHIRE	1 days
04	EAST ANGLIA		
	CA	CAMBRIDGESHIRE	1 days
	NF	NORFOLK	1 days
	SF	SUFFOLK	2 days
05	EAST MIDLANDS		
	DS	DERBYSHIRE	1 days
	LN	LINCOLNSHIRE	1 days
	NT	NOTTINGHAMSHIRE	1 days
06	WEST MIDLANDS		
	ST	STAFFORDSHIRE	1 days
	WM	WEST MIDLANDS	1 days
07	YORKSHIRE & NORTH LINCOLNSHIRE		
	KH	KINGSTON UPON HULL	1 days
	NY	NORTH YORKSHIRE	1 days
	WY	WEST YORKSHIRE	2 days
08	NORTH WEST		
	CH	CHESHIRE	1 days
	LC	LANCASHIRE	1 days
	MS	MERSEYSIDE	1 days
09	NORTH		
	CB	CUMBRIA	1 days
	DH	DURHAM	1 days
	NB	NORTHUMBERLAND	1 days
	TW	TYNE & WEAR	1 days
11	SCOTLAND		
	DG	DUMFRIES & GALLOWAY	1 days
	EA	EAST AYRSHIRE	1 days
	ER	EAST RENFREWSHIRE	2 days
15	GREATER DUBLIN		
	DL	DUBLIN	3 days

Main parameter selection:

Parameter: Gross floor area
Range: 552 to 234115 (units: sqm)

Date Range: 01/01/99 to 07/09/08

Selected survey days:

Monday	3 days
Tuesday	9 days
Wednesday	6 days
Thursday	4 days
Friday	7 days

Selected survey types:

Manual count	28 days
Directional ATC Count	1 days

Selected Locations:

Edge of Town Centre	2
Suburban Area (PPS6 Out of Centre)	7
Edge of Town	18
Free Standing (PPS6 Out of Town)	2

Selected Location Sub Categories:

Industrial Zone	18
Residential Zone	2
Built-Up Zone	2
Out of Town	1
No Sub Category	6

LIST OF SITES relevant to selection parameters

1	CA-02-D-01 STURROCK WAY BRETTON PETERBOROUGH	IND. ESTATE, PETERBOROUGH	CAMBRIDGESHIRE
	Total Gross floor area:	4300 sqm	
2	CB-02-D-03 CARLISLE ROAD BRAMPTON	INDUSTRIAL ESTATE, BRAMPTON	CUMBRIA
	Total Gross floor area:	13700 sqm	
3	CH-02-D-02 MANCHESTER ROAD WINCHAM NORTHWICH	INDUSTRIAL EST., NORTHWICH	CHESHIRE
	Total Gross floor area:	22000 sqm	
4	CW-02-D-02 DRUIDS ROAD CAMBORNE	INDUSTRIAL ESTATE, CAMBORNE	CORNWALL
	Total Gross floor area:	6515 sqm	
5	DG-02-D-01 A75(T) CARGENBRIDGE NEAR DUMFRIES	BUSINESS PARK, NEAR DUMFRIES	DUMFRIES & GALLOWAY
	Total Gross floor area:	5980 sqm	
6	DH-02-D-01 PARKWAY ANNFIELD PLAIN NEAR CONSETT	INDUSTRIAL ESTATE,NR CONSETT	DURHAM
	Total Gross floor area:	12025 sqm	
7	DL-02-D-01 SWORDS ROAD SANTRY DUBLIN	INDUSTRIAL ESTATE, DUBLIN	DUBLIN
	Total Gross floor area:	83000 sqm	
8	DL-02-D-02 GRANGE ROAD BALDOYLE DUBLIN	INDUSTRIAL ESTATE, DUBLIN	DUBLIN
	Total Gross floor area:	100000 sqm	
9	DL-02-D-03 CLOVERHILL ROAD DUBLIN	INDUSTRIAL ESTATE, DUBLIN	DUBLIN
	Total Gross floor area:	120000 sqm	
10	DS-02-D-01 BERRISTOW LANE SOUTH NORMANTON	IND. ESTATE,SOUTH NORMANTON	DERBYSHIRE
	Total Gross floor area:	92286 sqm	
11	EA-02-D-02 JAMES LITTLE STREET KILMARNOCK	INDUSTRIAL EST., KILMARNOCK	EAST AYRSHIRE
	Total Gross floor area:	552 sqm	
12	ER-02-D-01 MURIEL STREET BARRHEAD	INDUSTRIAL ESTATE, BARRHEAD	EAST RENFREWSHIRE
	Total Gross floor area:	7211 sqm	

LIST OF SITES relevant to selection parameters (Cont.)

13	ER-02-D-02 SPIERSBRIDGE AVENUE THORNLIEBANK NEAR GLASGOW	INDUSTRIAL EST.,NEAR GLASGOW	EAST RENFREWSHIRE
	Total Gross floor area:	4233 sqm	
14	KH-02-D-02 BOULEVARD STREET KINGSTON UPON HULL	INDUSTRIAL ESTATE, HULL	KINGSTON UPON HULL
	Total Gross floor area:	2220 sqm	
15	LC-02-D-04 GREEN LANE WEST GARSTANG	INDUSTRIAL ESTATE, GARSTANG	LANCASHIRE
	Total Gross floor area:	4555 sqm	
16	LN-02-D-01 BELTON LANE GRANTHAM	INDUSTRIAL ESTATE, GRANTHAM	LINCOLNSHIRE
	Total Gross floor area:	5347 sqm	
17	MS-02-D-05 BROADOAK ROAD ST HELENS	INDUSTRIAL ESTATE, ST HELENS	MERSEYSIDE
	Total Gross floor area:	11700 sqm	
18	NB-02-D-01 A695 HEXHAM	INDUSTRIAL ESTATE, HEXHAM	NORTHUMBERLAND
	Total Gross floor area:	10525 sqm	
19	NF-02-D-02 RASHES GREEN BRECKLAND DEREHAM	INDUSTRIAL ESTATE, DEREHAM	NORFOLK
	Total Gross floor area:	51000 sqm	
20	NT-02-D-01 B6028 STONEYFORD ROAD STANTON HILL SUTTON-IN-ASHFIELD	IND. ESTATE, SUTTON-IN-ASHFLD	NOTTINGHAMSHIRE
	Total Gross floor area:	26400 sqm	
21	NY-02-D-01 AVIATION WAY SHERBURN IN ELMET	INDUSTRIAL ESTATE, SHERBURN	NORTH YORKSHIRE
	Total Gross floor area:	1197 sqm	
22	SF-02-D-01 RAPIER STREET STOKE IPSWICH	INDUSTRIAL ESTATE, IPSWICH	SUFFOLK
	Total Gross floor area:	17500 sqm	
23	SF-02-D-02 HADLEIGH ROAD WESTBOURNE IPSWICH	INDUSTRIAL ESTATE, IPSWICH	SUFFOLK
	Total Gross floor area:	102000 sqm	
24	ST-02-D-04 BURTON OLD ROAD BOLEY PARK LICHFIELD	INDUSTRIAL ESTATE, LICHFIELD	STAFFORDSHIRE
	Total Gross floor area:	40905 sqm	

LIST OF SITES relevant to selection parameters (Cont.)

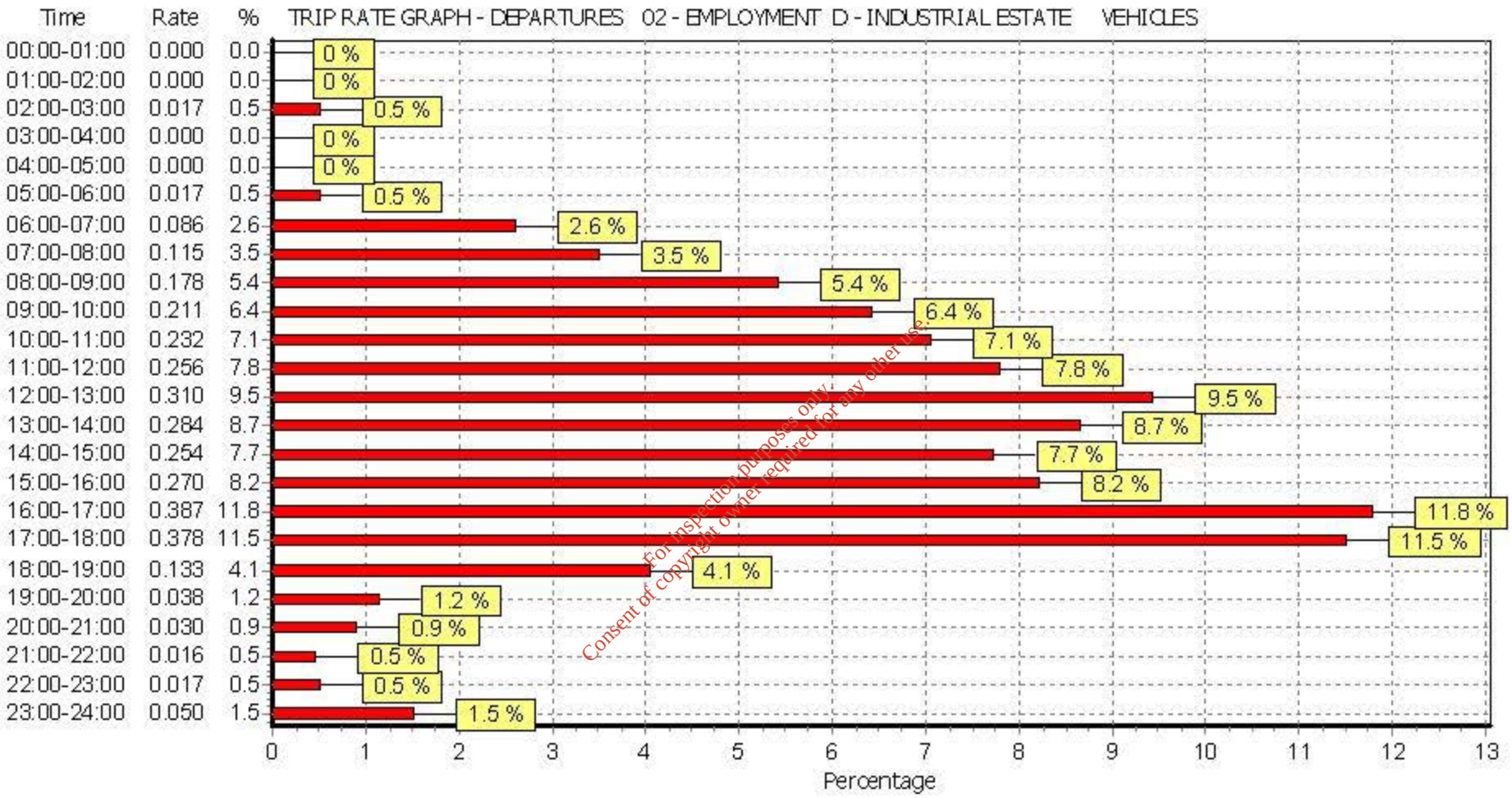
25	TW-02-D-06	INDUSTRIAL ESTATE, N. SHIELDS	TYNE & WEAR
	NORHAM ROAD		
	WEST CHIRTON		
	NORTH SHIELDS		
	Total Gross floor area:	23000 sqm	
26	WL-02-D-01	IND. ESTATE, WOOTTON BASSETT	WILTSHIRE
	MARLBOROUGH ROAD		
	WOOTTON BASSETT		
	Total Gross floor area:	7050 sqm	
27	WM-02-D-01	INDUSTRIAL EST., BIRMINGHAM	WEST MIDLANDS
	MELCHETT ROAD		
	KINGS NORTON		
	BIRMINGHAM		
	Total Gross floor area:	2510 sqm	
28	WY-02-D-01	INDUSTRIAL ESTATE, LEEDS	WEST YORKSHIRE
	PARK HOUSE WEST		
	LEEDS		
	Total Gross floor area:	4225 sqm	
29	WY-02-D-02	INDUSTRIAL EST., HUDDERSFIELD	WEST YORKSHIRE
	A629 WAKEFIELD ROAD		
	TANDEM		
	HUDDERSFIELD		
	Total Gross floor area:	20824 sqm	

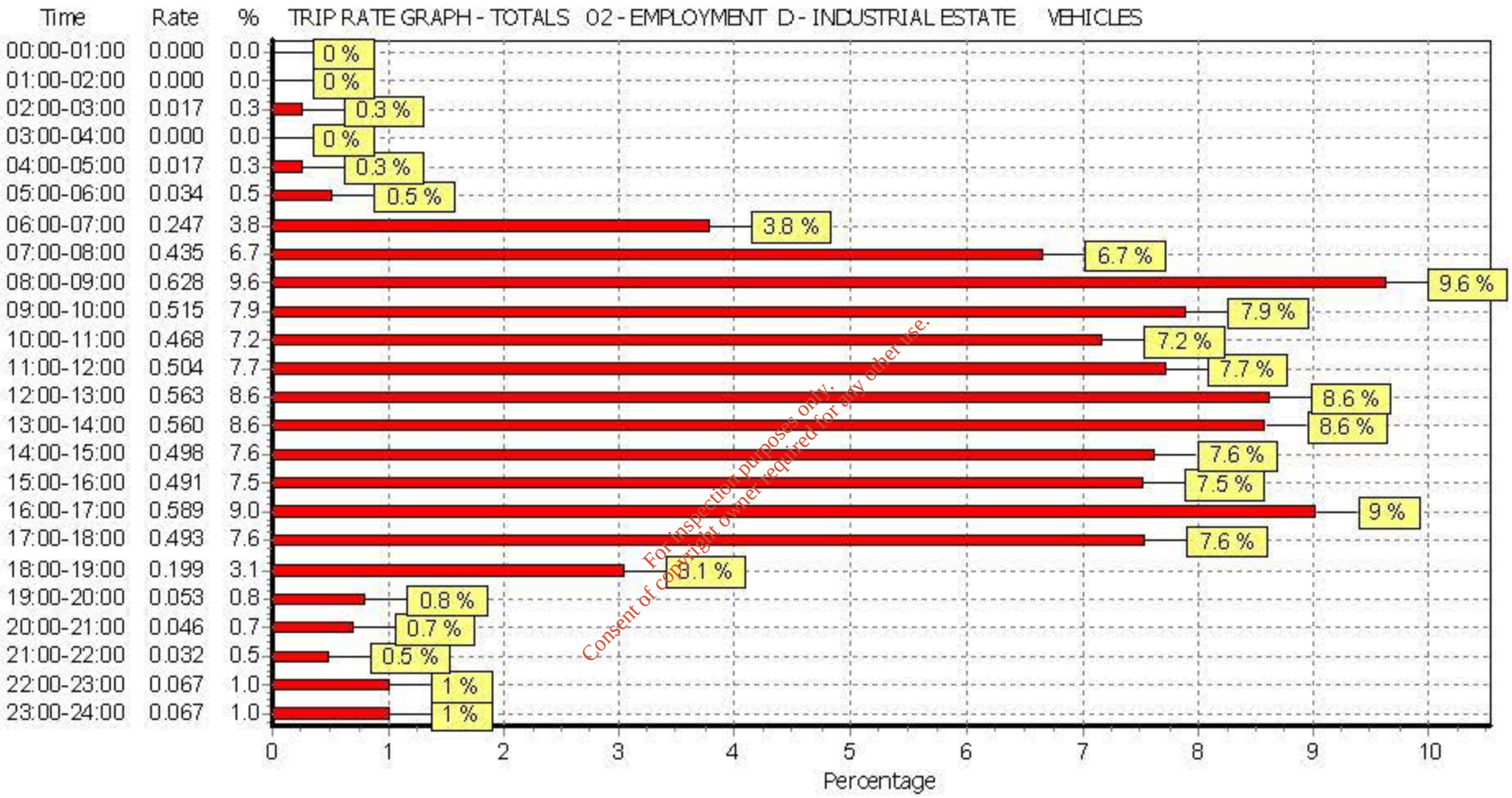
TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
VEHICLES
Calculation factor: 100 sqm
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate
00:00 - 00:30	1	5980	0.000	1	5980	0.000	1	5980	0.000
00:30 - 01:00	1	5980	0.000	1	5980	0.000	1	5980	0.000
01:00 - 01:30	1	5980	0.000	1	5980	0.000	1	5980	0.000
01:30 - 02:00	1	5980	0.000	1	5980	0.000	1	5980	0.000
02:00 - 02:30	1	5980	0.000	1	5980	0.000	1	5980	0.000
02:30 - 03:00	1	5980	0.000	1	5980	0.017	1	5980	0.017
03:00 - 03:30	1	5980	0.000	1	5980	0.000	1	5980	0.000
03:30 - 04:00	1	5980	0.000	1	5980	0.000	1	5980	0.000
04:00 - 04:30	1	5980	0.017	1	5980	0.000	1	5980	0.017
04:30 - 05:00	1	5980	0.000	1	5980	0.000	1	5980	0.000
05:00 - 05:30	1	5980	0.000	1	5980	0.017	1	5980	0.017
05:30 - 06:00	1	5980	0.017	1	5980	0.000	1	5980	0.017
06:00 - 06:30	3	5808	0.075	3	5808	0.040	3	5808	0.115
06:30 - 07:00	3	5808	0.086	3	5808	0.046	3	5808	0.132
07:00 - 07:30	28	28580	0.116	28	28580	0.051	28	28580	0.167
07:30 - 08:00	28	28580	0.204	28	28580	0.064	28	28580	0.268
08:00 - 08:30	29	27681	0.220	29	27681	0.083	29	27681	0.303
08:30 - 09:00	29	27681	0.230	29	27681	0.095	29	27681	0.325
09:00 - 09:30	29	27681	0.177	29	27681	0.098	29	27681	0.275
09:30 - 10:00	29	27681	0.127	29	27681	0.113	29	27681	0.240
10:00 - 10:30	29	27681	0.115	29	27681	0.116	29	27681	0.231
10:30 - 11:00	29	27681	0.121	29	27681	0.116	29	27681	0.237
11:00 - 11:30	29	27681	0.120	29	27681	0.123	29	27681	0.243
11:30 - 12:00	29	27681	0.128	29	27681	0.133	29	27681	0.261
12:00 - 12:30	29	27681	0.127	29	27681	0.155	29	27681	0.282
12:30 - 13:00	29	27681	0.126	29	27681	0.155	29	27681	0.281
13:00 - 13:30	29	27681	0.132	29	27681	0.155	29	27681	0.287
13:30 - 14:00	29	27681	0.144	29	27681	0.129	29	27681	0.273
14:00 - 14:30	29	27681	0.128	29	27681	0.127	29	27681	0.255
14:30 - 15:00	29	27681	0.116	29	27681	0.127	29	27681	0.243
15:00 - 15:30	29	27681	0.112	29	27681	0.129	29	27681	0.241
15:30 - 16:00	29	27681	0.109	29	27681	0.141	29	27681	0.250
16:00 - 16:30	29	27681	0.108	29	27681	0.175	29	27681	0.283
16:30 - 17:00	29	27681	0.094	29	27681	0.212	29	27681	0.306
17:00 - 17:30	29	27681	0.068	29	27681	0.224	29	27681	0.292
17:30 - 18:00	29	27681	0.047	29	27681	0.154	29	27681	0.201
18:00 - 18:30	28	28580	0.039	28	28580	0.083	28	28580	0.122
18:30 - 19:00	28	28580	0.027	28	28580	0.050	28	28580	0.077
19:00 - 19:30	2	6596	0.000	2	6596	0.015	2	6596	0.015
19:30 - 20:00	2	6596	0.015	2	6596	0.023	2	6596	0.038
20:00 - 20:30	2	6596	0.008	2	6596	0.015	2	6596	0.023
20:30 - 21:00	2	6596	0.008	2	6596	0.015	2	6596	0.023
21:00 - 21:30	2	6596	0.008	2	6596	0.008	2	6596	0.016
21:30 - 22:00	2	6596	0.008	2	6596	0.008	2	6596	0.016
22:00 - 22:30	1	5980	0.017	1	5980	0.017	1	5980	0.034
22:30 - 23:00	1	5980	0.033	1	5980	0.000	1	5980	0.033
23:00 - 23:30	1	5980	0.017	1	5980	0.017	1	5980	0.034
23:30 - 24:00	1	5980	0.000	1	5980	0.033	1	5980	0.033
Total Rates:			3.244			3.279			6.523

Parameter summary

Trip rate parameter range selected:	552 - 234115 (units: sqm)
Survey date date range:	01/01/99 - 07/09/08
Number of weekdays (Monday-Friday):	33
Number of Saturdays:	0
Number of Sundays:	0
Optional parameters used in selection:	NO
Surveys manually removed from selection:	0





APPENDIX D

PICADY OUTPUTS

PICADY

GUI Version: 5.00 AC
Analysis Program Release: 3.0 INTERIM (MAR 2006)

For sales and distribution information, program advice and maintenance, contact:

TRL Limited
Crowthorne House
Nine Mile Ride
Wokingham, Berks.
RG40 3GA, UK

Tel: +44 (0)1344 770758
Fax:+44 (0)1344 770864
E-mail: softwarebureau@trl.co.uk
Web: www.trlsoftware.co.uk

Run Analysis

Parameter	Values
File Run	W:\Projects\7097 - TIA Limerick WMF\05-Design\01-Calculations\PICADY\7097-AM.vpi
Date Run	12 February 2013
Time Run	11:59:00
Driving Side	Drive On The Left

Arm Names and Flow Scaling Factors

Arm	Arm Name	Flow Scaling Factor (%)
Arm A	N69 to Askeaton	100
Arm B	Development	100
Arm C	N69 to Limerick	100

Stream Labelling Convention

Stream A-B contains traffic going from A to B etc.

Run Information

Parameter	Values
Run Title	7097-Dock Road
Location	Limerick
Date	08 February 2013
Enumerator	Brendan Ward [DUB-35LJ52J-BW]
Job Number	7097
Status	TIA
Client	Greenstar
Description	-

Errors and Warnings

Parameter	Values
Warning	No Errors Or Warnings

Geometric Data

Geometric Parameters

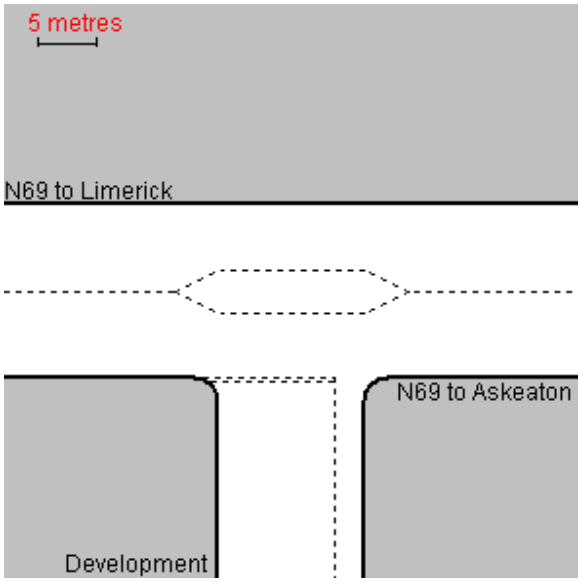
Parameter	Minor Arm B
Major Road Carriageway Width (m)	11.20
Major Road Kerbed Central Reserve Width (m)	0.00
Major Road Right Turning Lane Width (m)	3.80
Minor Road Width 0m Back from Junction (m)	10.00
Minor Road Width 5m Back from Junction (m)	8.00
Minor Road Width 10m Back from Junction (m)	6.00
Minor Road Width 15m Back from Junction (m)	3.00
Minor Road Width 20m Back from Junction (m)	3.00
Minor Road Derived Flare Length (PCU)	2.000
Minor Road Visibility To Right (m)	0
Minor Road Visibility To Left (m)	0
Major Road Right Turn Visibility (m)	100
Major Road Right Turn Blocks Traffic	No

Slope and Intercept Values

Stream	Intercept for Stream B-A	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	439.579	0.062	0.157	0.099	0.224
B-C	573.963	0.068	0.172	-	-
C-B	741.905	0.222	0.222	-	-

Note: Streams may be combined in which case capacity will be adjusted
These values do not allow for any site-specific corrections

Junction Diagram



Demand Data

Modelling Periods

Parameter	Period	Duration (min)	Segment Length (min)
First Modelling Period	08:00-09:30	90	15

ODTAB Turning Counts

Demand Set: Existing AM
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	0.0	13.0	1127.0
Arm B	9.0	0.0	12.0
Arm C	844.0	10.0	0.0

Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	0.0	19.0	1172.0
Arm B	13.0	0.0	17.0
Arm C	863.0	14.0	0.0

Demand Set: AM 2028
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	0.0	13.0	1482.0
Arm B	9.0	0.0	12.0
Arm C	1109.0	10.0	0.0

Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	0.0	19.0	1527.0
Arm B	13.0	0.0	17.0
Arm C	1128.0	14.0	0.0

ODTAB Synthesised Flows

Demand Set: Existing AM
Modelling Period: 08:00-09:30

Arm	Rising Time	Rising Flow (veh/min)	Peak Time	Peak Flow (veh/min)	Falling Time	Falling Flow (veh/min)
Arm A	08:15	14.250	08:15	21.375	08:45	14.250
Arm B	08:15	0.262	08:15	0.394	08:45	0.262
Arm C	08:15	10.675	08:15	16.013	08:45	10.675

Heavy Vehicles Percentages

Demand Set: Existing AM
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

Demand Set: AM 2028
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

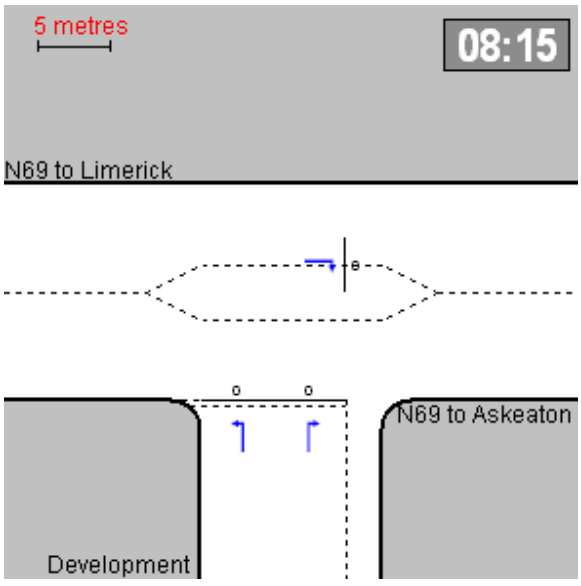
Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

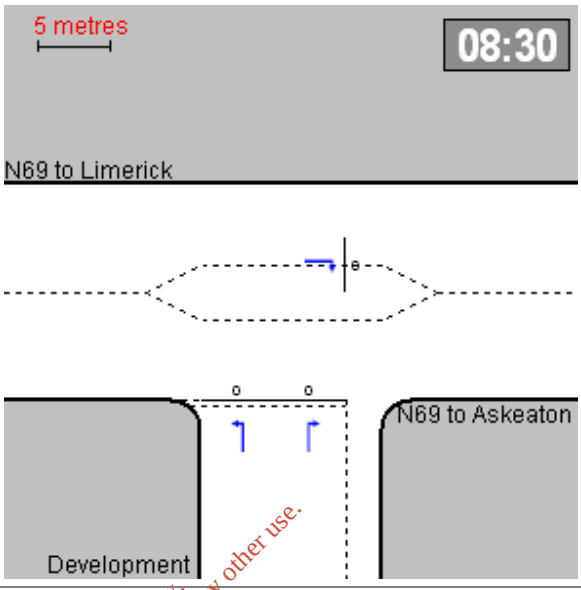
Queue Diagrams

Demand Set: Existing AM
Modelling Period: 08:00-09:30
View Extent: 40m

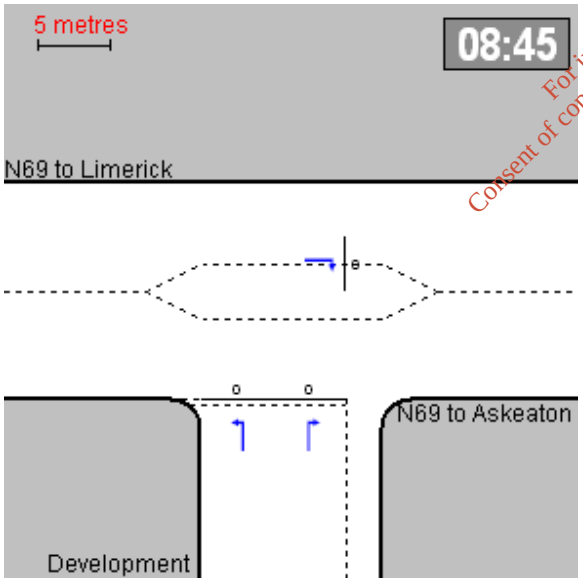
Queue Interval 1: 08:00-08:15



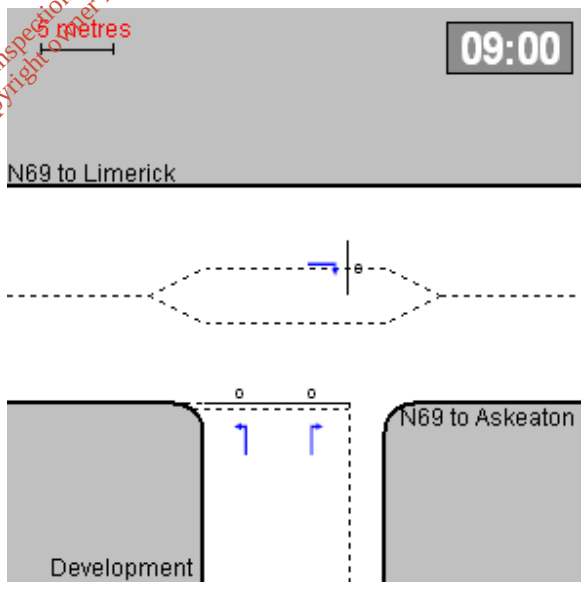
Queue Interval 2: 08:15-08:30

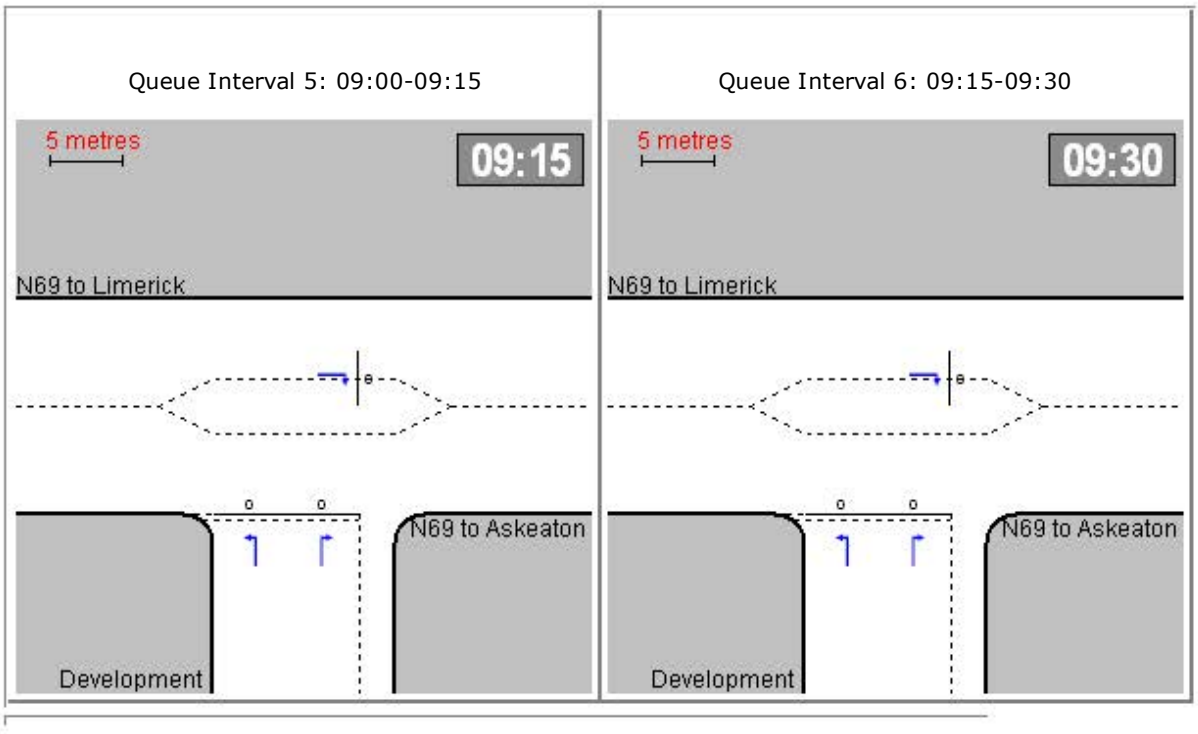


Queue Interval 3: 08:30-08:45



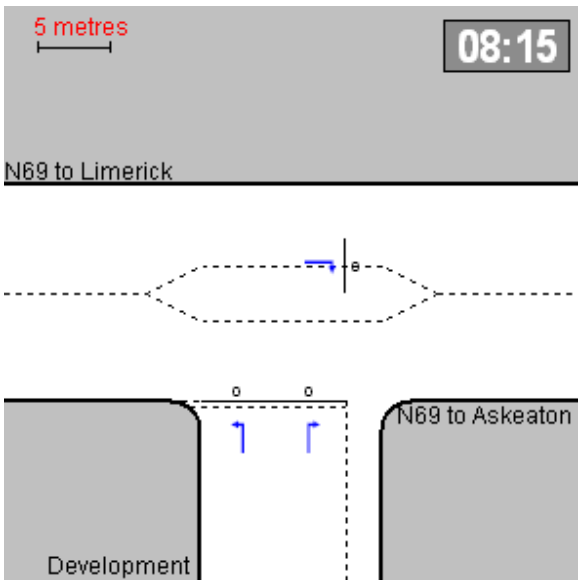
Queue Interval 4: 08:45-09:00



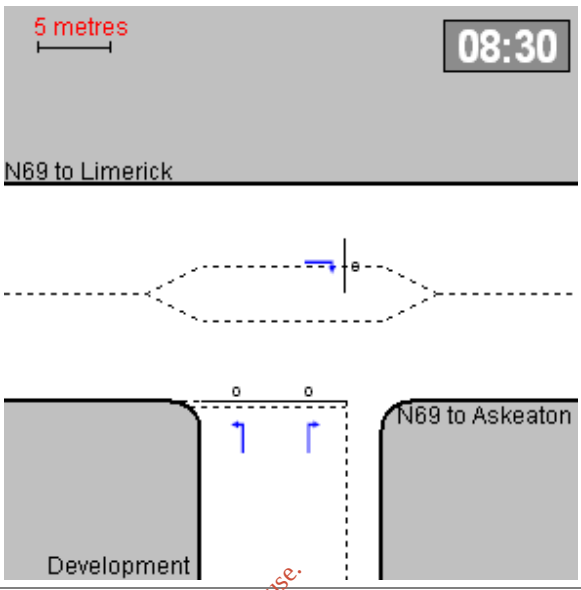


Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30
View Extent: 40m

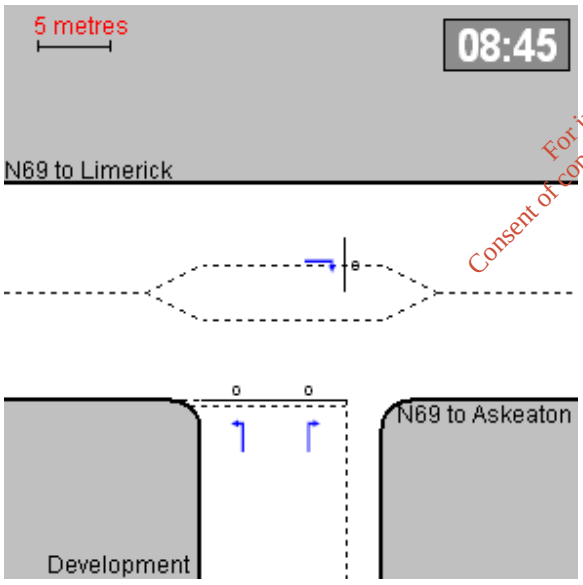
Queue Interval 1: 08:00-08:15



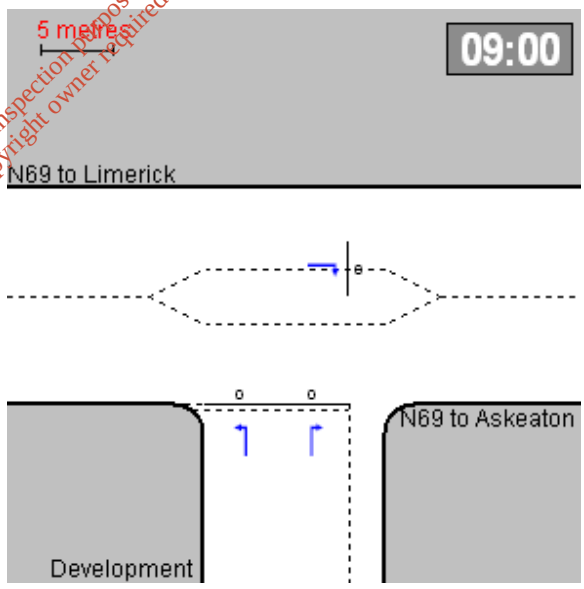
Queue Interval 2: 08:15-08:30

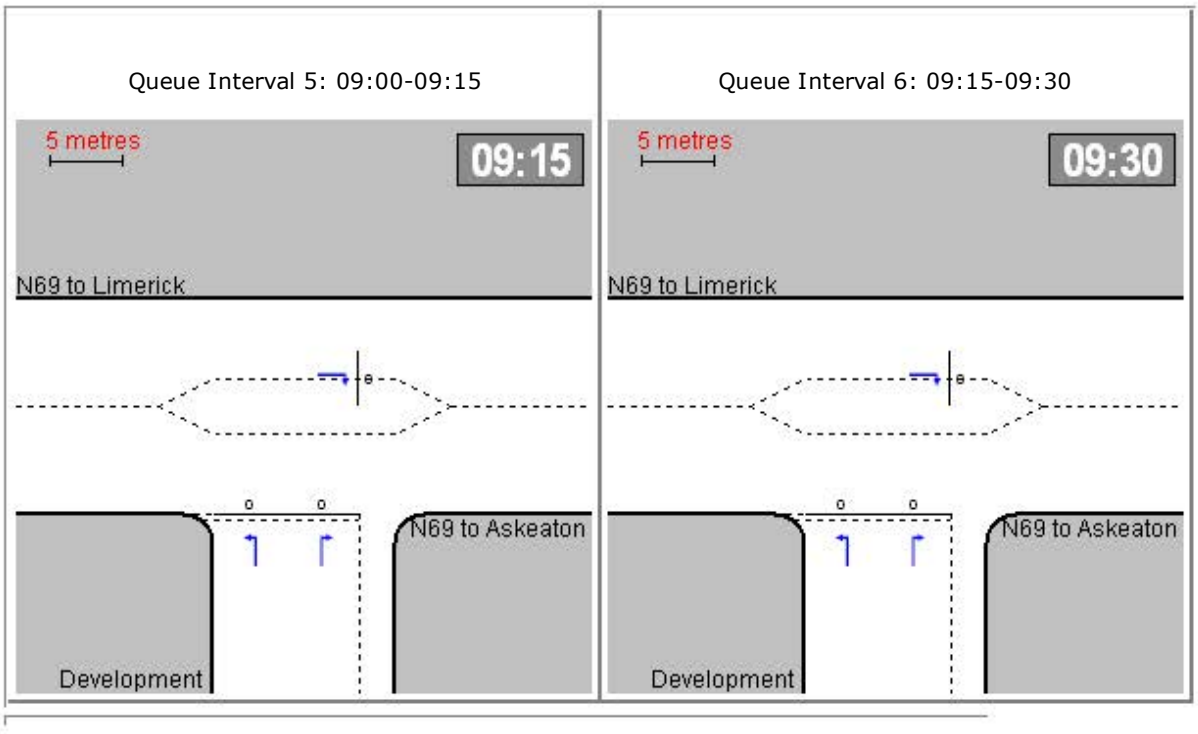


Queue Interval 3: 08:30-08:45



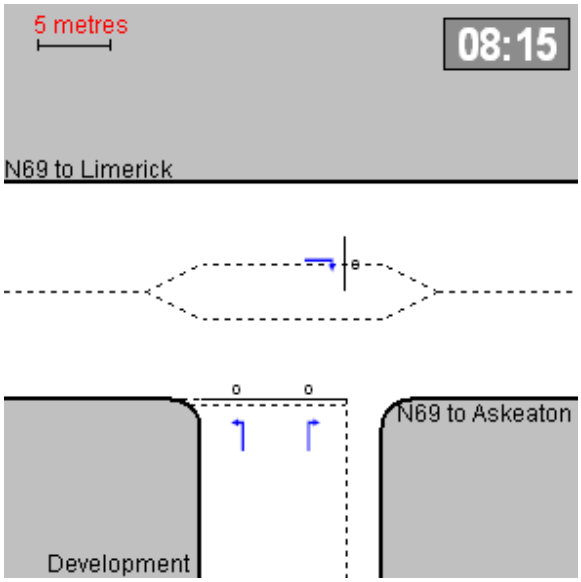
Queue Interval 4: 08:45-09:00



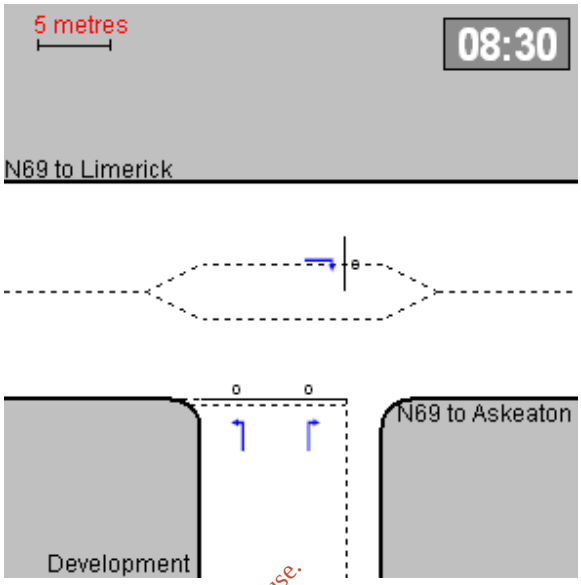


Demand Set: AM 2028
Modelling Period: 08:00-09:30
View Extent: 40m

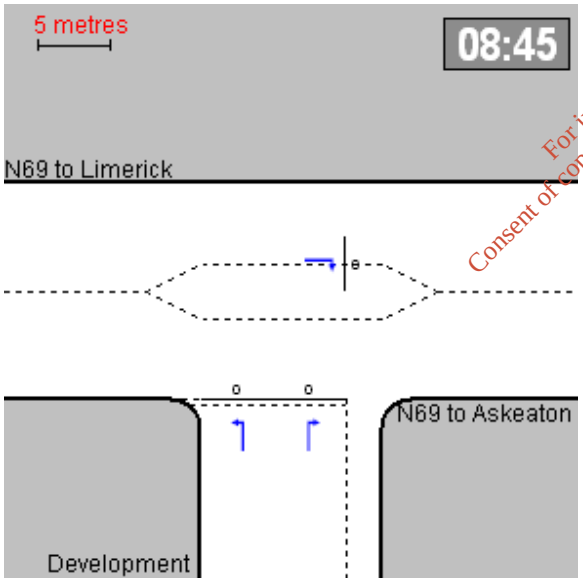
Queue Interval 1: 08:00-08:15



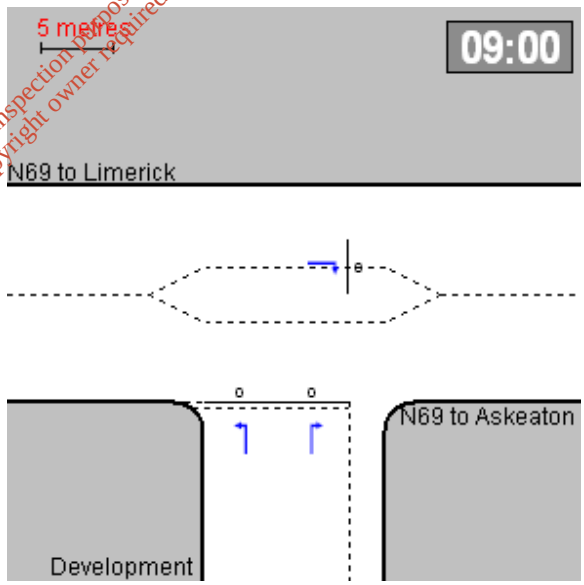
Queue Interval 2: 08:15-08:30

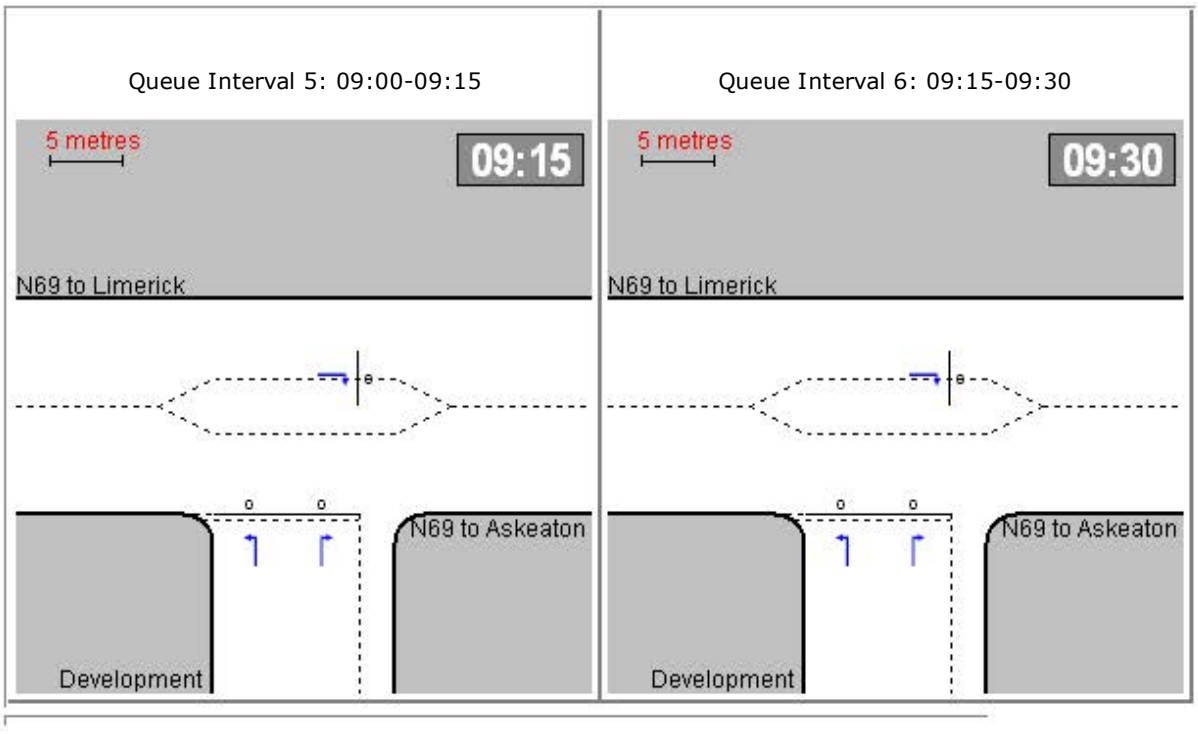


Queue Interval 3: 08:30-08:45

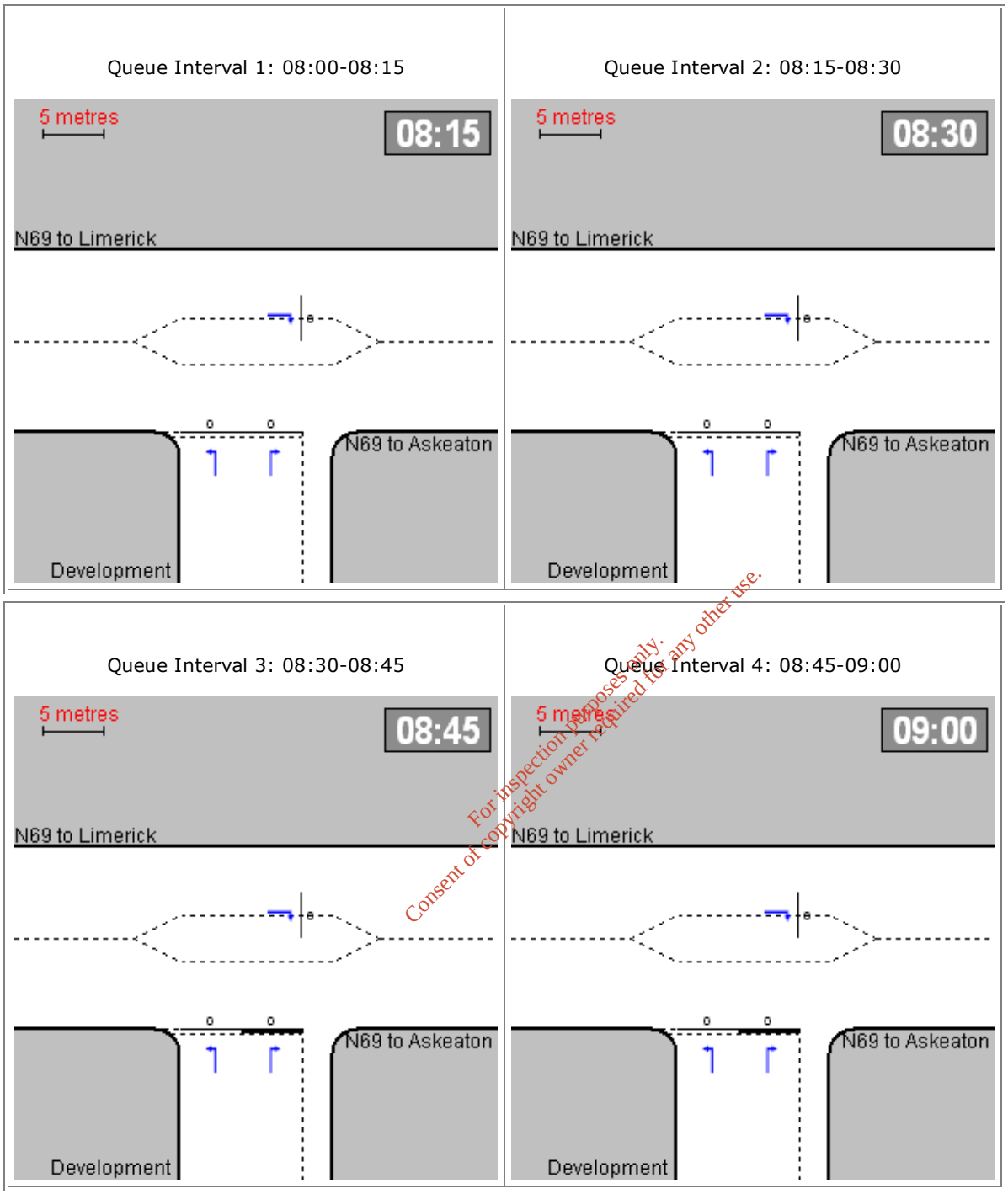


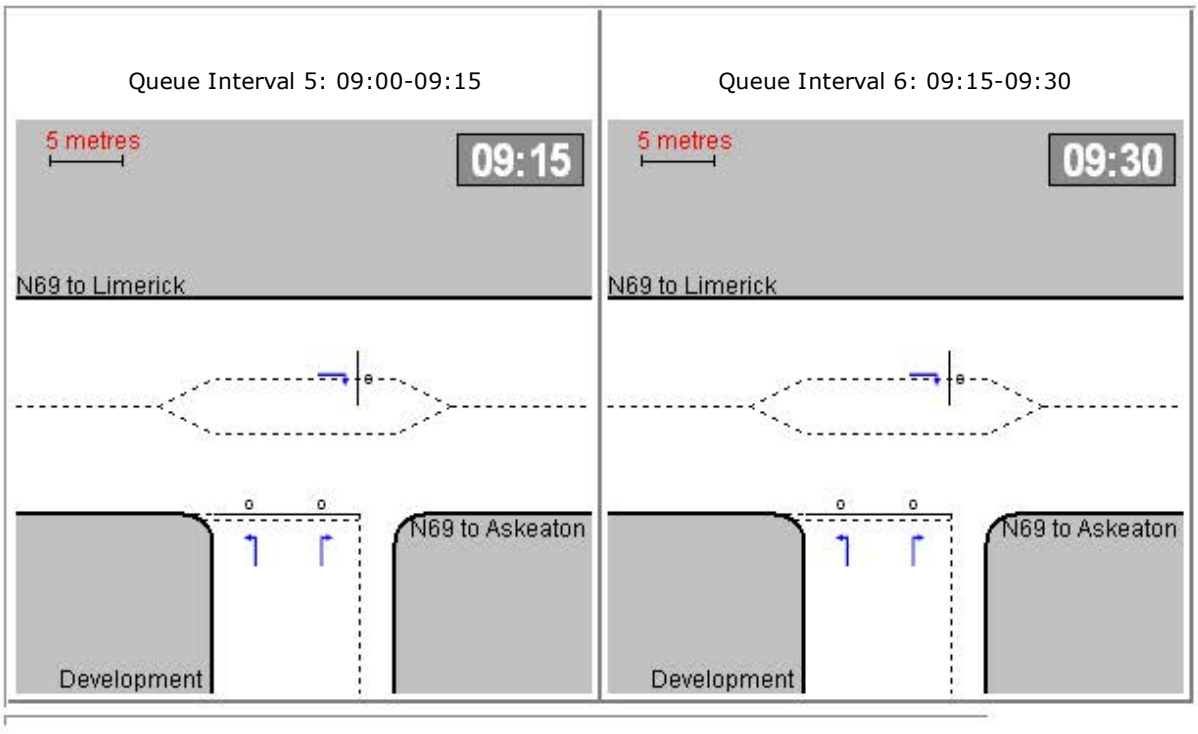
Queue Interval 4: 08:45-09:00





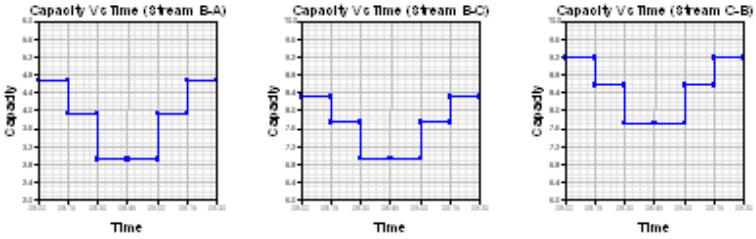
Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30
View Extent: 40m



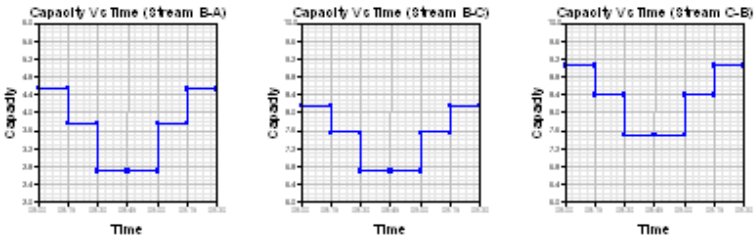


Capacity Graph

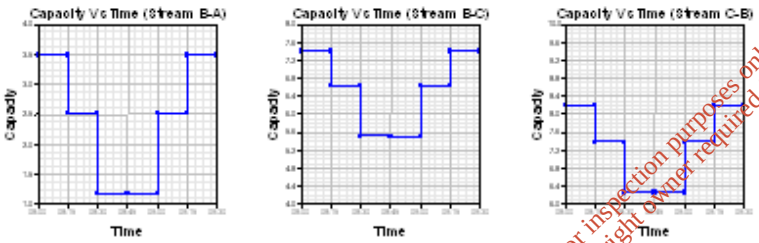
Demand Set: Existing AM
Modelling Period: 08:00-09:30



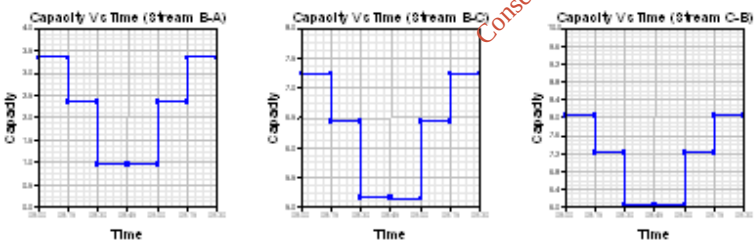
Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30



Demand Set: AM 2028
Modelling Period: 08:00-09:30

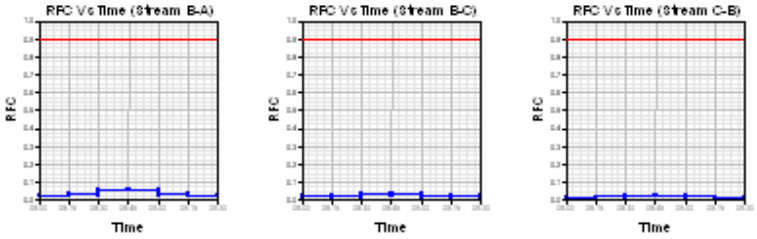


Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

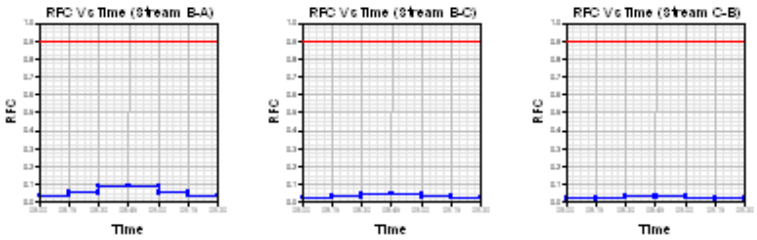


RFC Graph

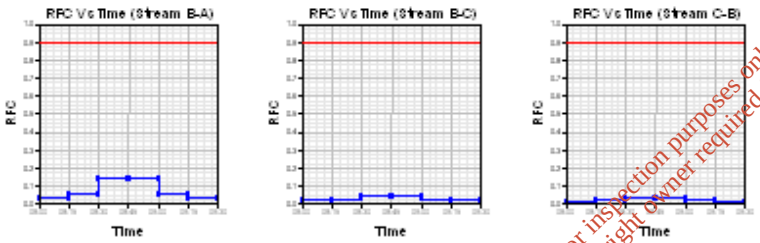
Demand Set: Existing AM
Modelling Period: 08:00-09:30



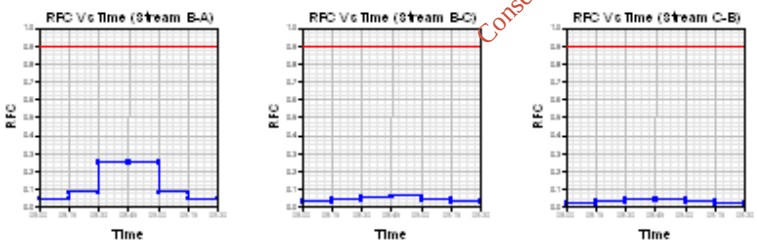
Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30



Demand Set: AM 2028
Modelling Period: 08:00-09:30

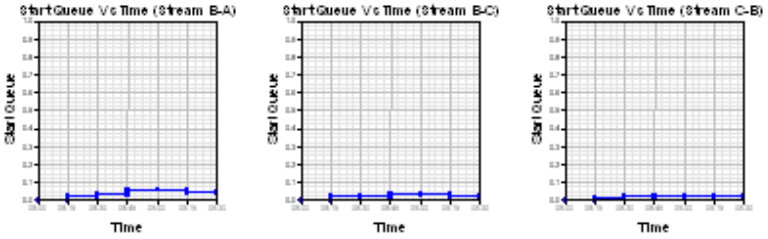


Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

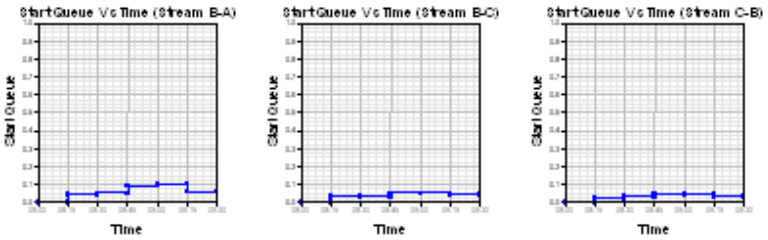


Start Queue Graph

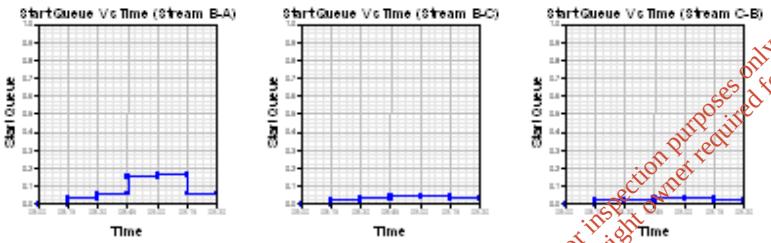
Demand Set: Existing AM
Modelling Period: 08:00-09:30



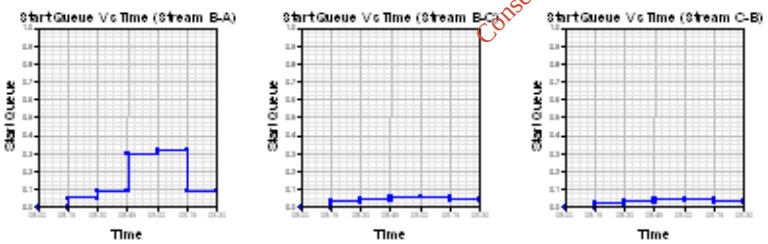
Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30



Demand Set: AM 2028
Modelling Period: 08:00-09:30

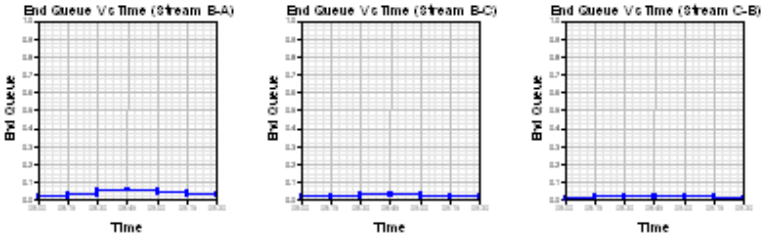


Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

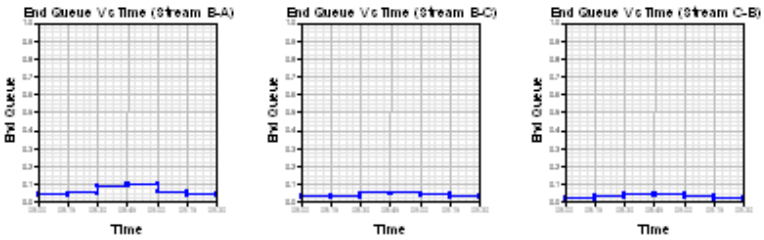


End Queue Graph

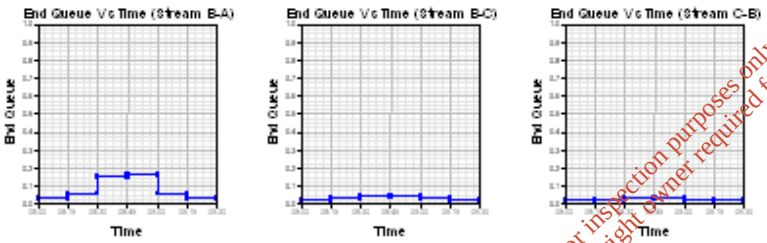
Demand Set: Existing AM
Modelling Period: 08:00-09:30



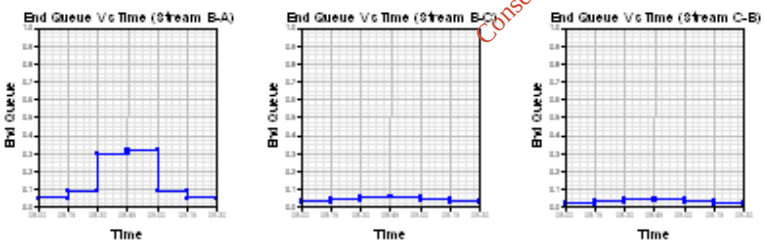
Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30



Demand Set: AM 2028
Modelling Period: 08:00-09:30

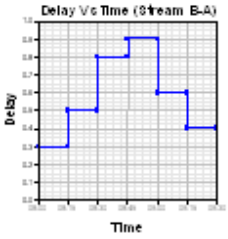


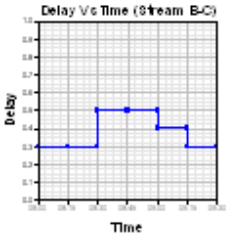
Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

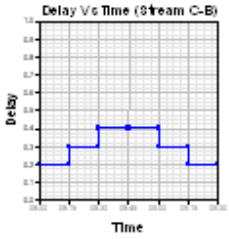


Delay Graph

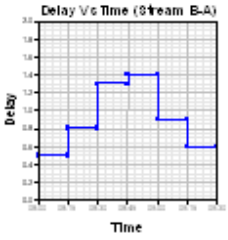
Demand Set: Existing AM
Modelling Period: 08:00-09:30

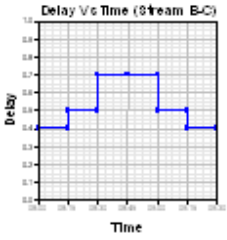


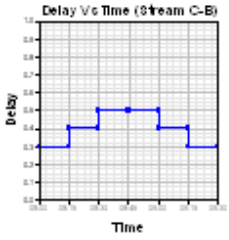




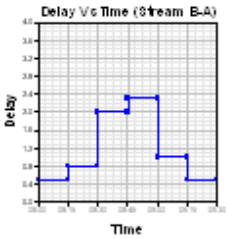
Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30

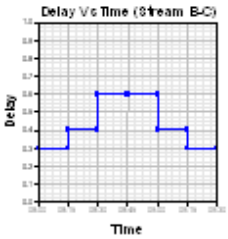


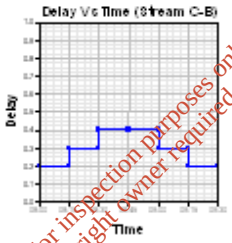




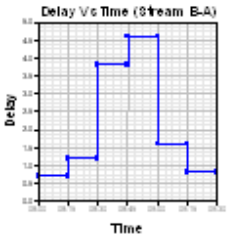
Demand Set: AM 2028
Modelling Period: 08:00-09:30

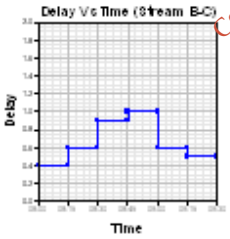


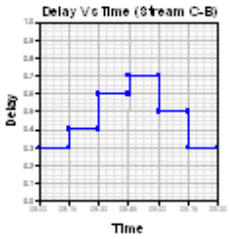




Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30







Queues & Delays

Demand Set: Existing AM
Modelling Period: 08:00-09:30

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:00-08:15	B-A	0.11	4.67	0.024	-	0.00	0.02	-	0.3	0.22
	B-C	0.15	8.31	0.018	-	0.00	0.02	-	0.3	0.12
	C-A	10.59	-	-	-	-	-	-	-	-
	C-B	0.13	9.18	0.014	-	0.00	0.01	-	0.2	0.11
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	14.14	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:15-08:30	B-A	0.13	3.93	0.034	-	0.02	0.03	-	0.5	0.26
	B-C	0.18	7.74	0.023	-	0.02	0.02	-	0.3	0.13
	C-A	12.65	-	-	-	-	-	-	-	-
	C-B	0.15	8.57	0.017	-	0.01	0.02	-	0.3	0.12
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	16.89	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:30-08:45	B-A	0.17	2.91	0.057	-	0.03	0.06	-	0.8	0.36
	B-C	0.22	6.93	0.032	-	0.02	0.03	-	0.5	0.15
	C-A	15.49	-	-	-	-	-	-	-	-
	C-B	0.18	7.71	0.024	-	0.02	0.02	-	0.4	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	20.68	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:45-09:00	B-A	0.17	2.91	0.057	-	0.06	0.06	-	0.9	0.36
	B-C	0.22	6.93	0.032	-	0.03	0.03	-	0.5	0.15
	C-A	15.49	-	-	-	-	-	-	-	-
	C-B	0.18	7.71	0.024	-	0.02	0.02	-	0.4	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	20.68	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:00-09:15	B-A	0.13	3.93	0.034	-	0.06	0.04	-	0.6	0.26
	B-C	0.18	7.74	0.023	-	0.03	0.02	-	0.4	0.13
	C-A	12.65	-	-	-	-	-	-	-	-
	C-B	0.15	8.57	0.017	-	0.02	0.02	-	0.3	0.12
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	16.89	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:15-09:30	B-A	0.11	4.67	0.024	-	0.04	0.03	-	0.4	0.22
	B-C	0.15	8.31	0.018	-	0.02	0.02	-	0.3	0.12
	C-A	10.59	-	-	-	-	-	-	-	-
	C-B	0.13	9.18	0.014	-	0.02	0.01	-	0.2	0.11
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	14.14	-	-	-	-	-	-	-	-

Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:00-08:15	B-A	0.16	4.54	0.036	-	0.00	0.04	-	0.5	0.23
	B-C	0.21	8.16	0.026	-	0.00	0.03	-	0.4	0.13
	C-A	10.83	-	-	-	-	-	-	-	-
	C-B	0.18	9.04	0.019	-	0.00	0.02	-	0.3	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	14.71	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:15-08:30	B-A	0.19	3.76	0.052	-	0.04	0.05	-	0.8	0.28
	B-C	0.25	7.55	0.034	-	0.03	0.03	-	0.5	0.14
	C-A	12.93	-	-	-	-	-	-	-	-
	C-B	0.21	8.40	0.025	-	0.02	0.03	-	0.4	0.12
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	17.56	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:30-08:45	B-A	0.24	2.69	0.089	-	0.05	0.09	-	1.3	0.41
	B-C	0.31	6.70	0.047	-	0.03	0.05	-	0.7	0.16
	C-A	15.84	-	-	-	-	-	-	-	-
	C-B	0.26	7.50	0.034	-	0.03	0.04	-	0.5	0.14
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	21.51	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:45-09:00	B-A	0.24	2.69	0.089	-	0.09	0.10	-	1.4	0.41
	B-C	0.31	6.69	0.047	-	0.05	0.05	-	0.7	0.16
	C-A	15.84	-	-	-	-	-	-	-	-
	C-B	0.26	7.50	0.034	-	0.04	0.04	-	0.5	0.14
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	21.51	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:00-09:15	B-A	0.19	3.76	0.052		0.10	0.06	-	0.9	0.28
	B-C	0.25	7.55	0.034		0.05	0.04	-	0.5	0.14
	C-A	12.93	-	-	-	-	-	-	-	-
	C-B	0.21	8.40	0.025	-	0.04	0.03	-	0.4	0.12
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	17.56	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:15-09:30	B-A	0.16	4.53	0.036	-	0.06	0.04	-	0.6	0.23
	B-C	0.21	8.16	0.026	-	0.04	0.03	-	0.4	0.13
	C-A	10.83	-	-	-	-	-	-	-	-
	C-B	0.18	9.04	0.019	-	0.03	0.02	-	0.3	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	14.71	-	-	-	-	-	-	-	-

Demand Set: AM 2028
Modelling Period: 08:00-09:30

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:00-08:15	B-A	0.11	3.49	0.032	-	0.00	0.03	-	0.5	0.30
	B-C	0.15	7.40	0.020	-	0.00	0.02	-	0.3	0.14
	C-A	13.92	-	-	-	-	-	-	-	-
	C-B	0.13	8.19	0.015	-	0.00	0.02	-	0.2	0.12
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	18.60	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:15-08:30	B-A	0.13	2.51	0.054	-	0.03	0.06	-	0.8	0.42
	B-C	0.18	6.64	0.027	-	0.02	0.03	-	0.4	0.15
	C-A	16.62	-	-	-	-	-	-	-	-
	C-B	0.15	7.38	0.020	-	0.02	0.02	-	0.3	0.14
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	22.20	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:30-08:45	B-A	0.17	1.17	0.141	-	0.06	0.15	-	2.0	0.98
	B-C	0.22	5.51	0.040	-	0.03	0.04	-	0.6	0.19
	C-A	20.35	-	-	-	-	-	-	-	-
	C-B	0.18	6.26	0.029	-	0.02	0.03	-	0.4	0.16
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	27.20	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:45-09:00	B-A	0.17	1.17	0.141	-	0.15	0.16	-	2.3	0.99
	B-C	0.22	5.50	0.040	-	0.04	0.04	-	0.6	0.19
	C-A	20.35	-	-	-	-	-	-	-	-
	C-B	0.18	6.26	0.029	-	0.03	0.03	-	0.4	0.16
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	27.20	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:00-09:15	B-A	0.13	2.51	0.054	-	0.16	0.06	-	1.0	0.42
	B-C	0.18	6.63	0.027	-	0.04	0.03	-	0.4	0.16
	C-A	16.62	-	-	-	-	-	-	-	-
	C-B	0.15	7.38	0.020	-	0.03	0.02	-	0.3	0.14
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	22.20	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:15-09:30	B-A	0.11	3.48	0.032	-	0.06	0.03	-	0.5	0.30
	B-C	0.15	7.40	0.020	-	0.03	0.02	-	0.3	0.14
	C-A	13.92	-	-	-	-	-	-	-	-
	C-B	0.13	8.19	0.015	-	0.02	0.02	-	0.2	0.12
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	18.60	-	-	-	-	-	-	-	-

Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:00-08:15	B-A	0.16	3.34	0.049	-	0.00	0.05	-	0.7	0.31
	B-C	0.21	7.24	0.029	-	0.00	0.03	-	0.4	0.14
	C-A	14.15	-	-	-	-	-	-	-	-
	C-B	0.18	8.05	0.022	-	0.00	0.02	-	0.3	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	19.16	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:15-08:30	B-A	0.19	2.34	0.083	-	0.05	0.09	-	1.2	0.46
	B-C	0.25	6.44	0.040	-	0.03	0.04	-	0.6	0.16
	C-A	16.90	-	-	-	-	-	-	-	-
	C-B	0.21	7.21	0.029	-	0.02	0.03	-	0.4	0.14
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	22.88	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:30-08:45	B-A	0.24	0.95	0.250	-	0.09	0.30	-	3.8	1.35
	B-C	0.31	5.16	0.060	-	0.04	0.06	-	0.9	0.21
	C-A	20.70	-	-	-	-	-	-	-	-
	C-B	0.26	6.06	0.042	-	0.03	0.04	-	0.6	0.17
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	28.02	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:45-09:00	B-A	0.24	0.95	0.250	-	0.30	0.32	-	4.6	1.40
	B-C	0.31	5.14	0.061	-	0.06	0.06	-	1.0	0.21
	C-A	20.70	-	-	-	-	-	-	-	-
	C-B	0.26	6.06	0.042	-	0.04	0.04	-	0.7	0.17
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	28.02	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:00-09:15	B-A	0.19	2.34	0.083		0.32	0.09	-	1.6	0.47
	B-C	0.25	6.43	0.040		0.06	0.04	-	0.6	0.16
	C-A	16.90	-	-	-	-	-	-	-	-
	C-B	0.21	7.21	0.029	-	0.04	0.03	-	0.5	0.14
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	22.88	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:15-09:30	B-A	0.16	3.34	0.049	-	0.09	0.05	-	0.8	0.32
	B-C	0.21	7.24	0.029	-	0.04	0.03	-	0.5	0.14
	C-A	14.15	-	-	-	-	-	-	-	-
	C-B	0.18	8.05	0.022	-	0.03	0.02	-	0.3	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	19.16	-	-	-	-	-	-	-	-

Entry capacities marked with an '(X)' are dominated by a pedestrian crossing in that time segment.
In time segments marked with a '(B)', traffic leaving the junction may block back from a crossing so impairing normal operation of the junction.
Delays marked with '##' could not be calculated.

Overall Queues & Delays

Queueing Delay Information Over Whole Period

Demand Set: Existing AM
Modelling Period: 08:00-09:30

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	12.4	8.3	3.5	0.3	3.5	0.3
B-C	16.5	11.0	2.2	0.1	2.2	0.1
C-A	1161.7	774.5	-	-	-	-
C-B	13.8	9.2	1.7	0.1	1.7	0.1
A-B	17.9	11.9	-	-	-	-
A-C	1551.2	1034.2	-	-	-	-
All	**2773.5**	**1849.0**	**7.4**	**0.0**	**7.4**	**0.0**

Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	17.9	11.9	5.5	0.3	5.5	0.3
B-C	23.4	15.6	3.3	0.1	3.3	0.1
C-A	1187.9	791.9	-	-	-	-
C-B	19.3	12.8	2.4	0.1	2.4	0.1
A-B	26.2	17.4	-	-	-	-
A-C	1613.2	1075.4	-	-	-	-
All	**2887.7**	**1925.2**	**11.2**	**0.0**	**11.2**	**0.0**

Demand Set: AM 2028
Modelling Period: 08:00-09:30

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	12.4	8.3	7.1	0.6	7.1	0.6
B-C	16.5	11.0	2.7	0.2	2.7	0.2
C-A	1526.5	1017.6	-	-	-	-
C-B	13.8	9.2	2.0	0.1	2.0	0.1
A-B	17.9	11.9	-	-	-	-
A-C	2039.9	1359.9	-	-	-	-
All	**3626.9**	**2417.9**	**11.8**	**0.0**	**11.8**	**0.0**

Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	17.9	11.9	12.8	0.7	12.8	0.7
B-C	23.4	15.6	4.0	0.2	4.0	0.2
C-A	1552.6	1035.1	-	-	-	-
C-B	19.3	12.8	2.9	0.1	2.9	0.1
A-B	26.2	17.4	-	-	-	-
A-C	2101.8	1401.2	-	-	-	-
All	**3741.1**	**2494.1**	**19.7**	**0.0**	**19.7**	**0.0**

Delay is that occurring only within the time period.
Inclusive delay includes delay suffered by vehicles which are still queuing after the end of the time period.
These will only be significantly different if there is a large queue remaining at the end of the time period.

PICADY 5 Run Successful

PICADY

GUI Version: 5.00 AC
Analysis Program Release: 3.0 INTERIM (MAR 2006)

For sales and distribution information, program advice and maintenance, contact:

TRL Limited
Crowthorne House
Nine Mile Ride
Wokingham, Berks.
RG40 3GA, UK

Tel: +44 (0)1344 770758
Fax:+44 (0)1344 770864
E-mail: softwarebureau@trl.co.uk
Web: www.trlsoftware.co.uk

Run Analysis

Parameter	Values
File Run	W:\Projects\7097 - TIA Limerick WMF\05-Design\01-Calculations\PICADY\7097-PM.vpi
Date Run	12 February 2013
Time Run	12:04:42
Driving Side	Drive On The Left

Arm Names and Flow Scaling Factors

Arm	Arm Name	Flow Scaling Factor (%)
Arm A	N69 to Askeaton	100
Arm B	Development	100
Arm C	N69 to Limerick	100

Stream Labelling Convention

Stream A-B contains traffic going from A to B etc.

Run Information

Parameter	Values
Run Title	7097-Dock Road
Location	Limerick
Date	08 February 2013
Enumerator	Brendan Ward [DUB-35LJ52J-BW]
Job Number	7097
Status	TIA
Client	Greenstar
Description	-

Errors and Warnings

Parameter	Values
Warning	No Errors Or Warnings

Geometric Data

Geometric Parameters

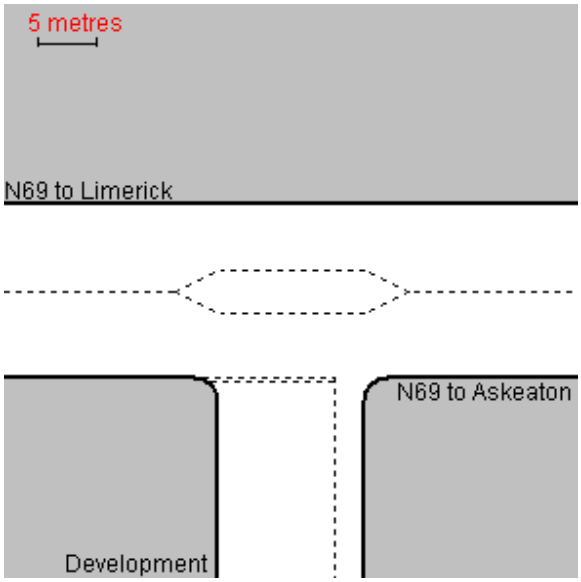
Parameter	Minor Arm B
Major Road Carriageway Width (m)	11.20
Major Road Kerbed Central Reserve Width (m)	0.00
Major Road Right Turning Lane Width (m)	3.80
Minor Road Width 0m Back from Junction (m)	10.00
Minor Road Width 5m Back from Junction (m)	8.00
Minor Road Width 10m Back from Junction (m)	6.00
Minor Road Width 15m Back from Junction (m)	3.00
Minor Road Width 20m Back from Junction (m)	3.00
Minor Road Derived Flare Length (PCU)	2.000
Minor Road Visibility To Right (m)	0
Minor Road Visibility To Left (m)	0
Major Road Right Turn Visibility (m)	100
Major Road Right Turn Blocks Traffic	No

Slope and Intercept Values

Stream	Intercept for Stream B-A	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	439.579	0.062	0.157	0.099	0.224
B-C	573.963	0.068	0.172	-	-
C-B	741.905	0.222	0.222	-	-

Note: Streams may be combined in which case capacity will be adjusted
These values do not allow for any site-specific corrections

Junction Diagram



Demand Data

Modelling Periods

Parameter	Period	Duration (min)	Segment Length (min)
First Modelling Period	16:30-18:00	90	15

ODTAB Turning Counts

Demand Set: Existing PM
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	0.0	13.0	809.0
Arm B	23.0	0.0	17.0
Arm C	1176.0	14.0	0.0

Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	0.0	19.0	856.0
Arm B	33.0	0.0	25.0
Arm C	1202.0	20.0	0.0

Demand Set: PM 2028
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	0.0	13.0	1064.0
Arm B	23.0	0.0	17.0
Arm C	1547.0	14.0	0.0

Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	0.0	19.0	1111.0
Arm B	33.0	0.0	25.0
Arm C	1573.0	20.0	0.0

ODTAB Synthesised Flows

Demand Set: Existing PM
Modelling Period: 16:30-18:00

Arm	Rising Time	Rising Flow (veh/min)	Peak Time	Peak Flow (veh/min)	Falling Time	Falling Flow (veh/min)
Arm A	16:45	10.275	16:45	15.412	17:15	10.275
Arm B	16:45	0.500	16:45	0.750	17:15	0.500
Arm C	16:45	14.875	16:45	22.313	17:15	14.875

Heavy Vehicles Percentages

Demand Set: Existing PM
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

Demand Set: PM 2028
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

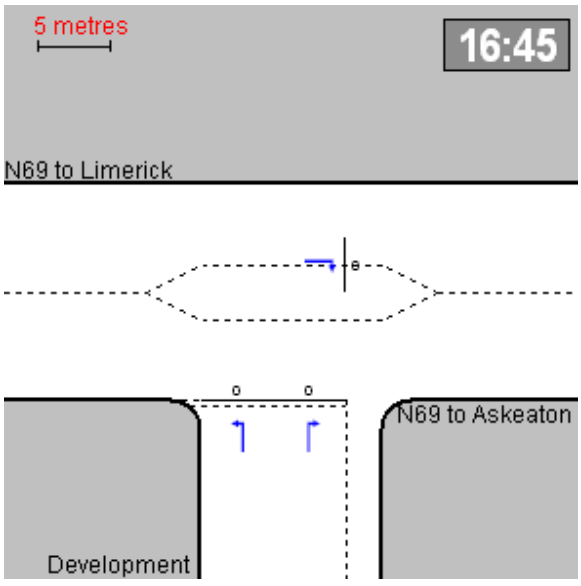
Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

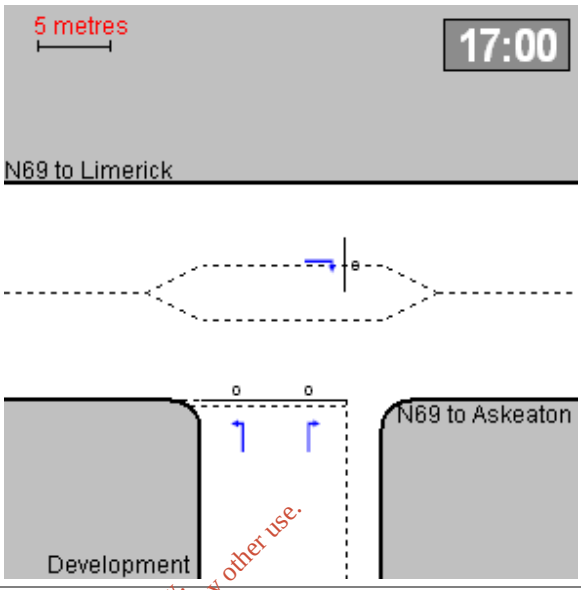
Queue Diagrams

Demand Set: Existing PM
Modelling Period: 16:30-18:00
View Extent: 40m

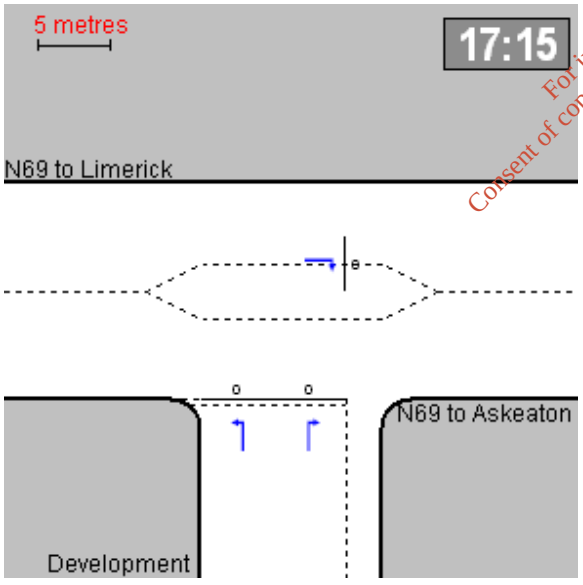
Queue Interval 1: 16:30-16:45



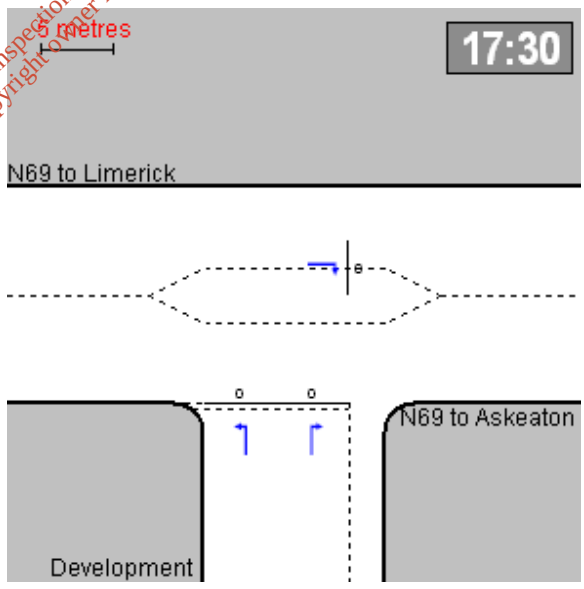
Queue Interval 2: 16:45-17:00

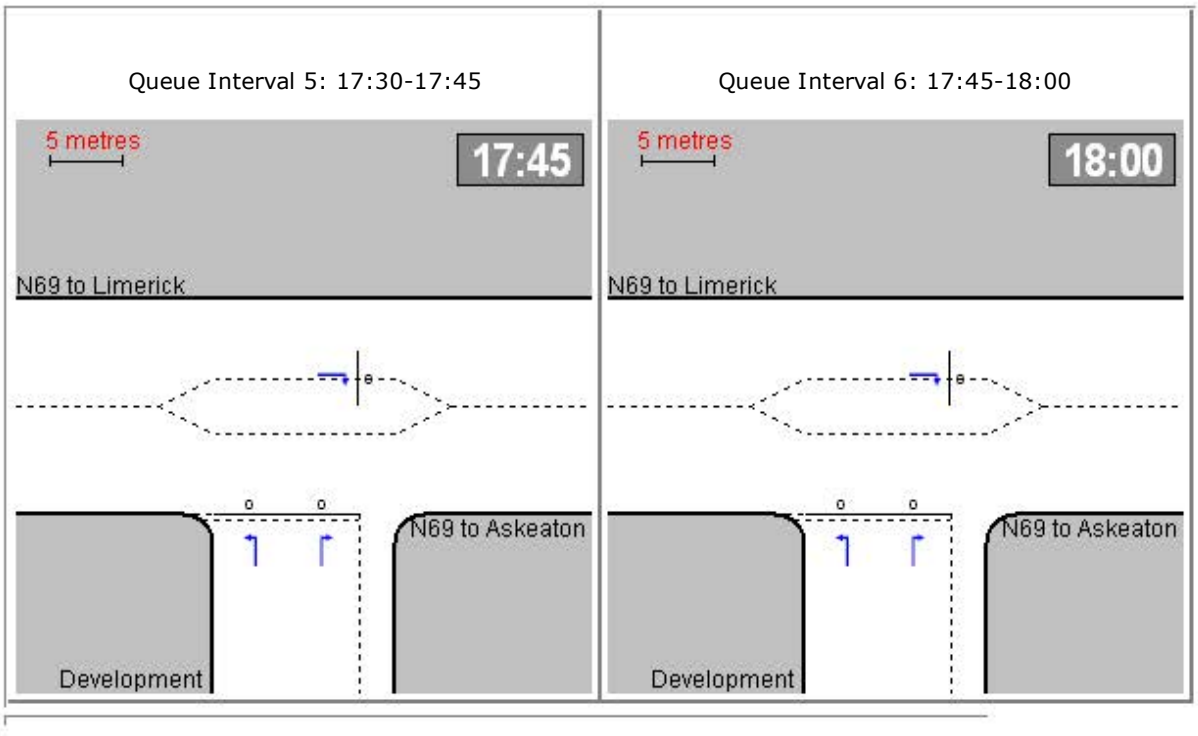


Queue Interval 3: 17:00-17:15



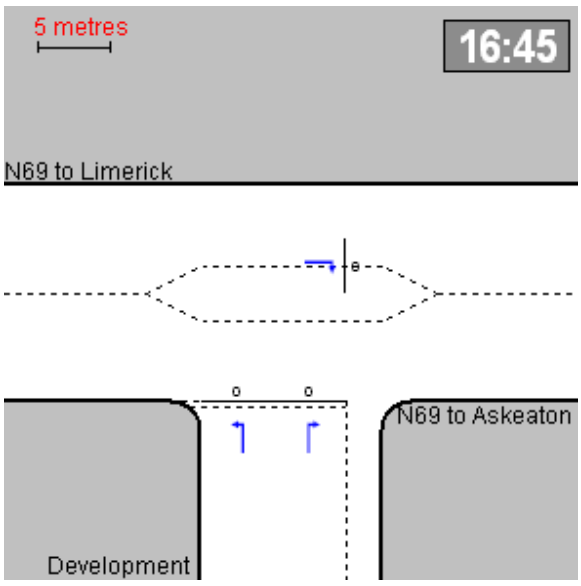
Queue Interval 4: 17:15-17:30



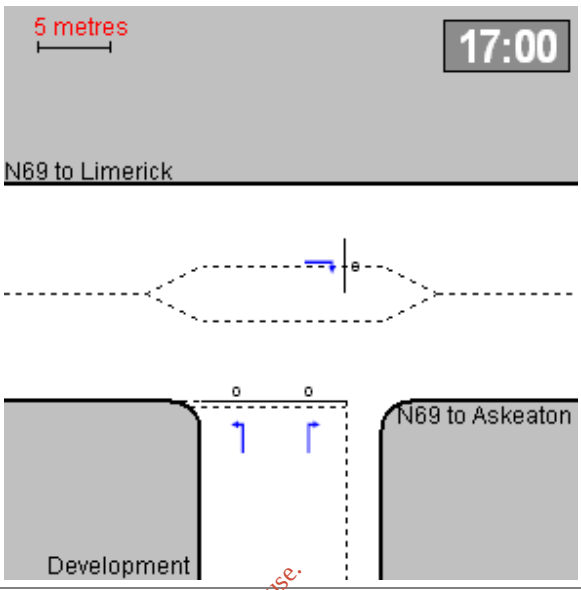


Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00
View Extent: 40m

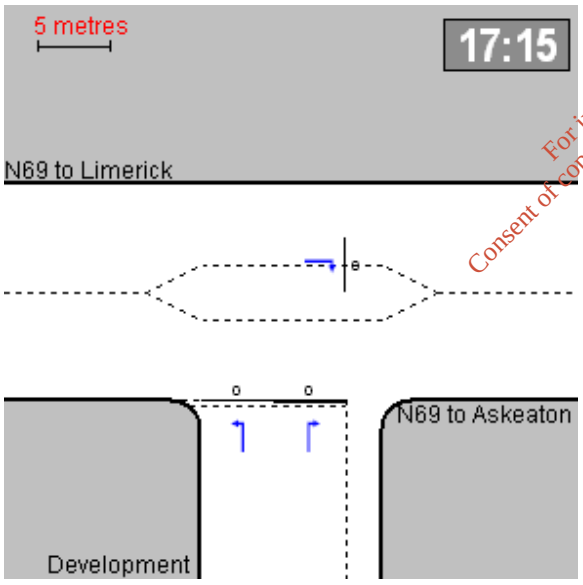
Queue Interval 1: 16:30-16:45



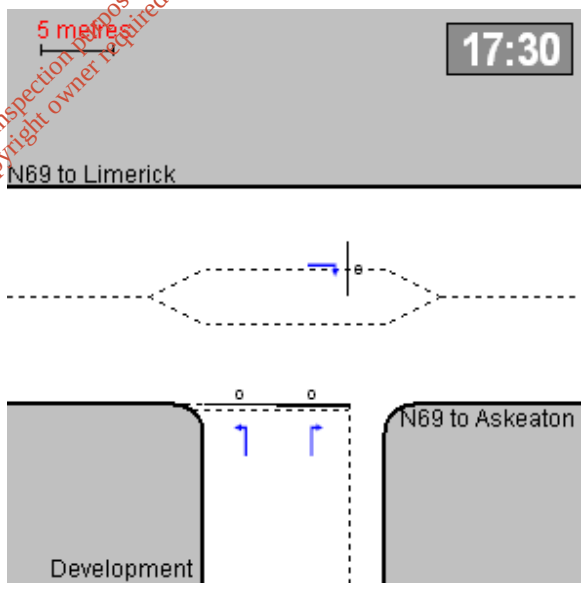
Queue Interval 2: 16:45-17:00

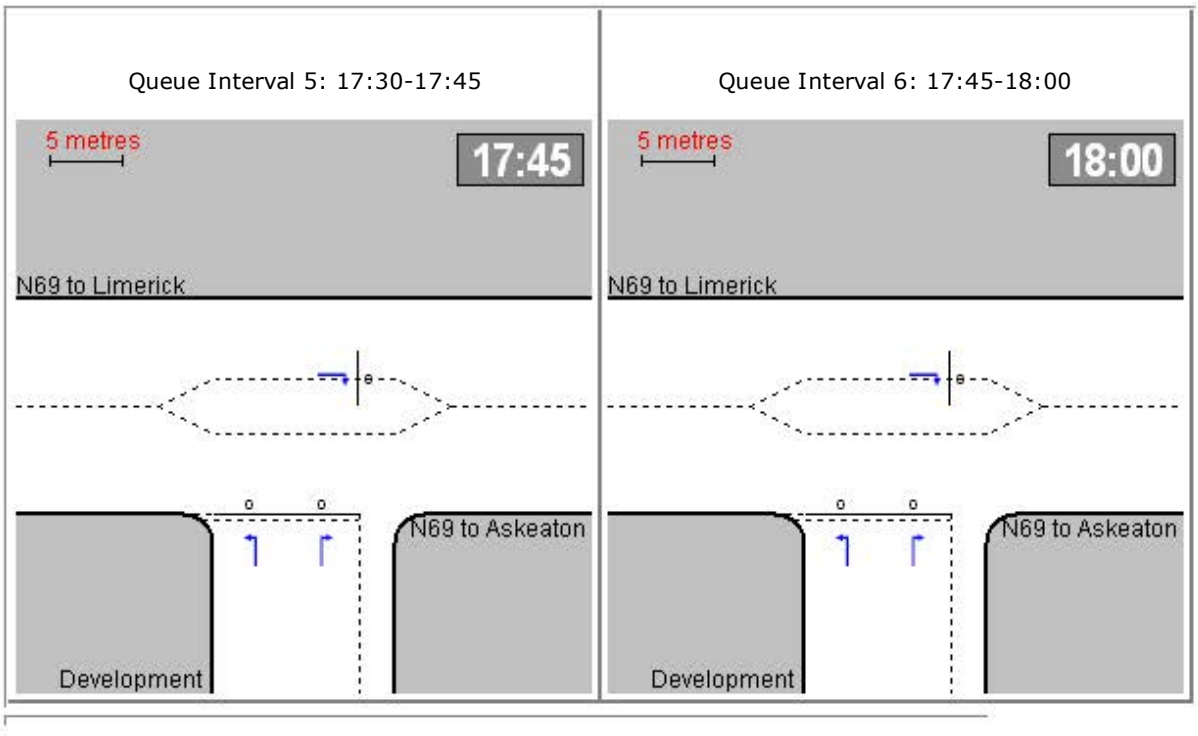


Queue Interval 3: 17:00-17:15



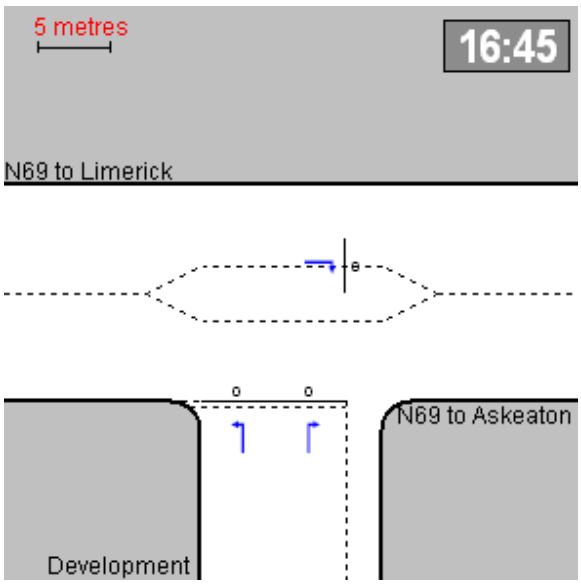
Queue Interval 4: 17:15-17:30



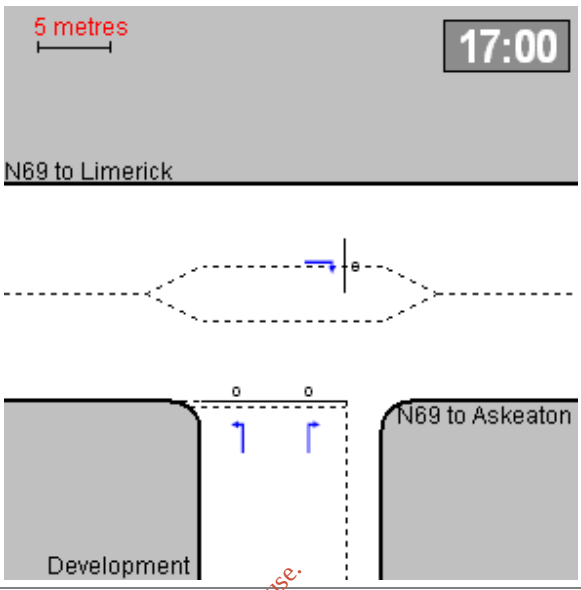


Demand Set: PM 2028
Modelling Period: 16:30-18:00
View Extent: 40m

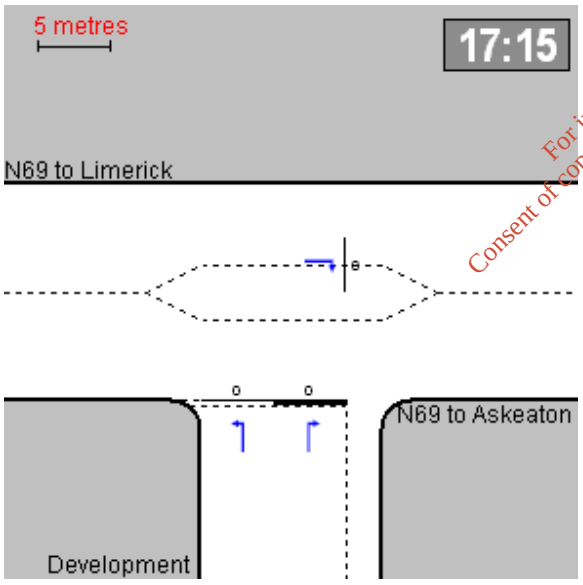
Queue Interval 1: 16:30-16:45



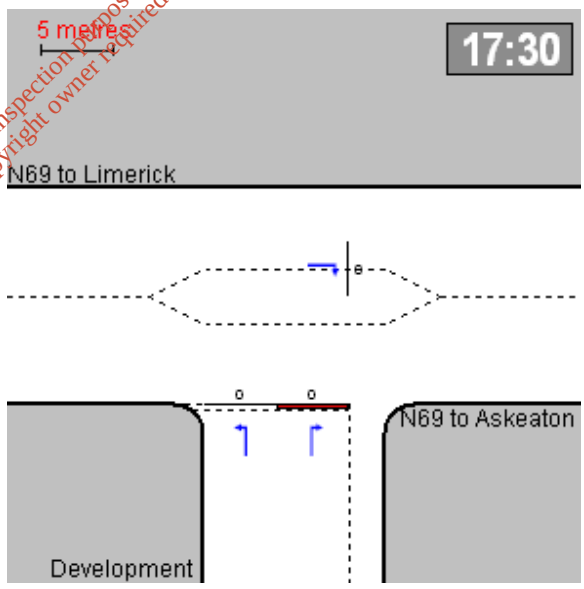
Queue Interval 2: 16:45-17:00

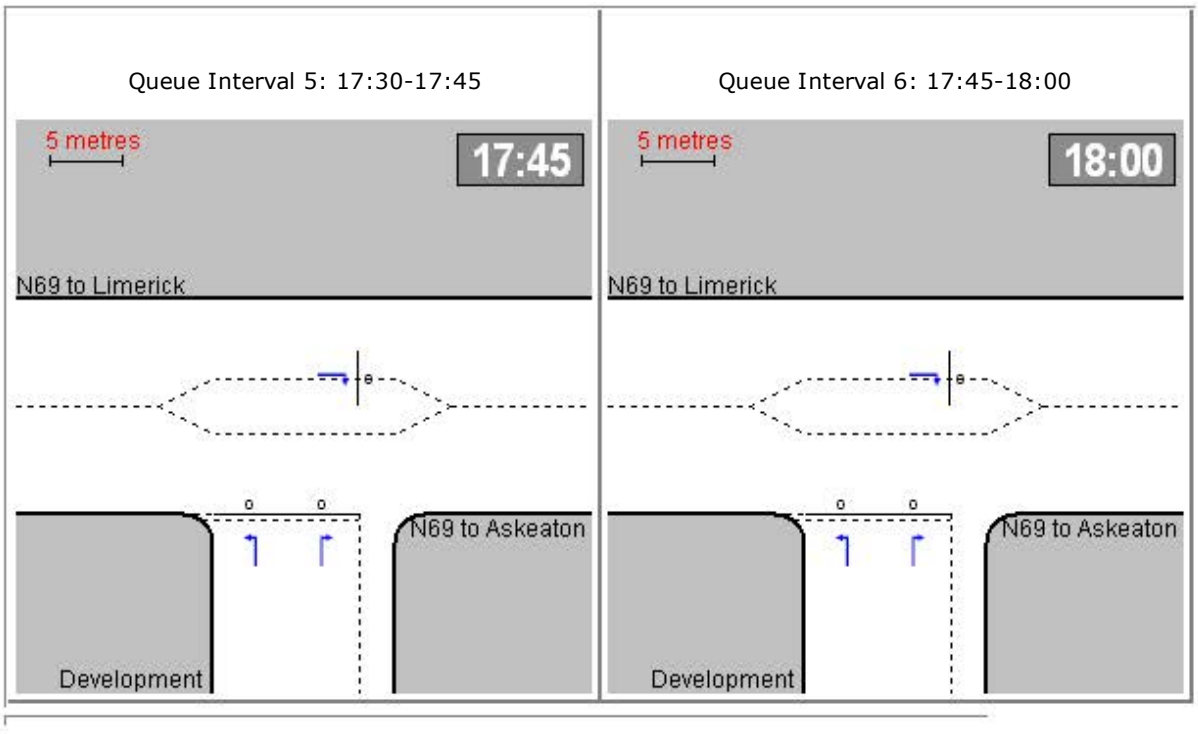


Queue Interval 3: 17:00-17:15



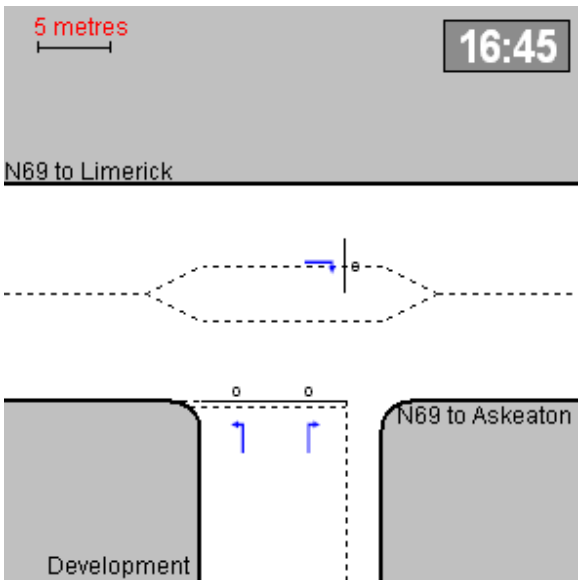
Queue Interval 4: 17:15-17:30



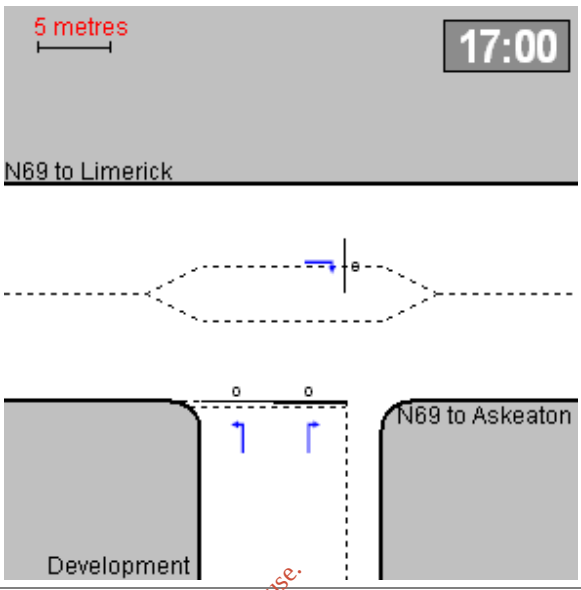


Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00
View Extent: 40m

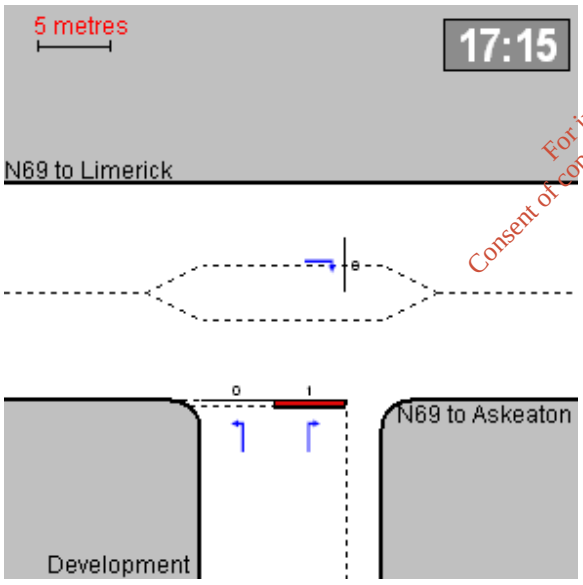
Queue Interval 1: 16:30-16:45



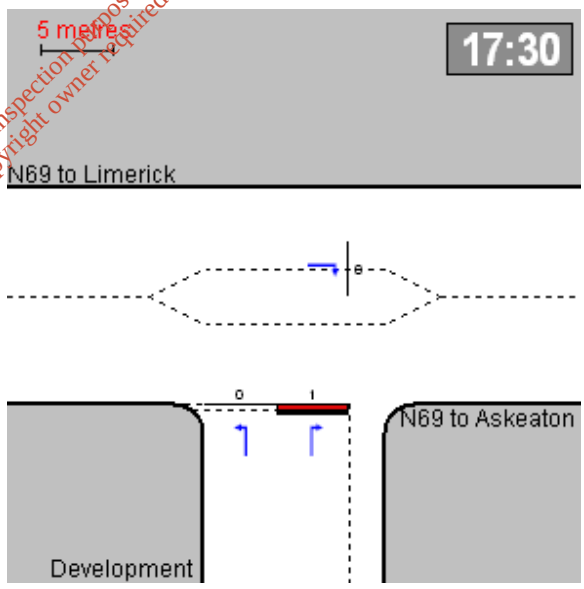
Queue Interval 2: 16:45-17:00

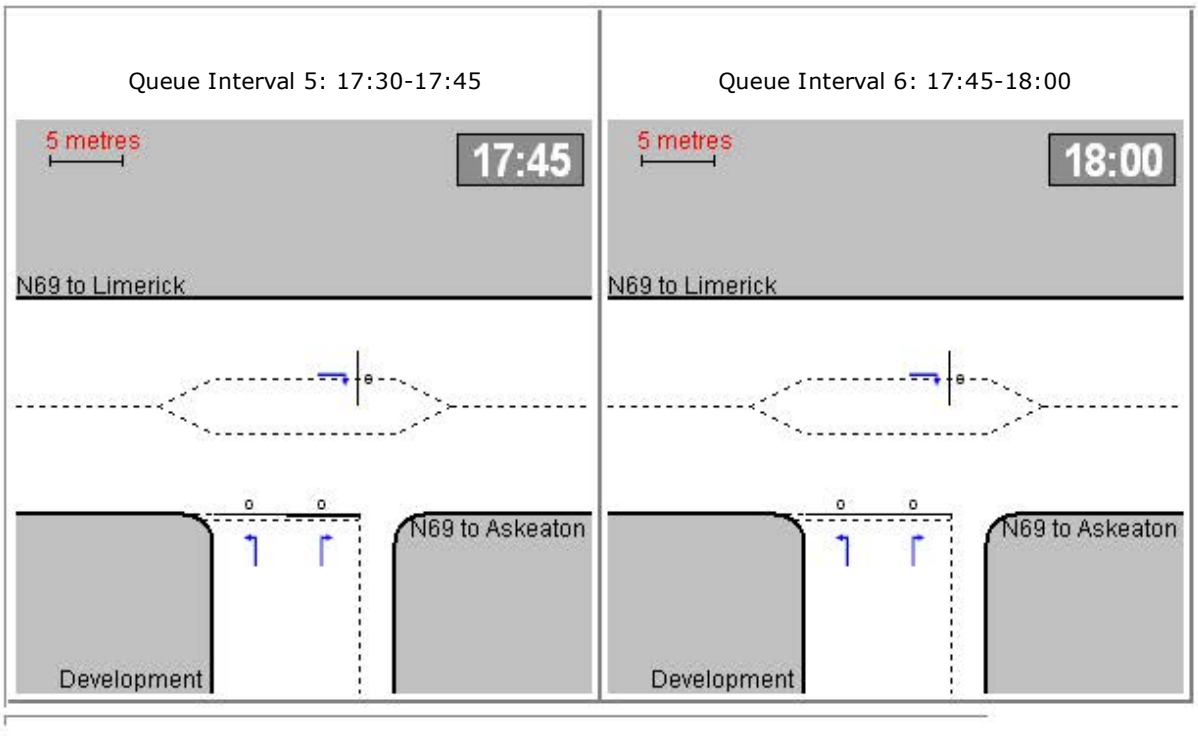


Queue Interval 3: 17:00-17:15



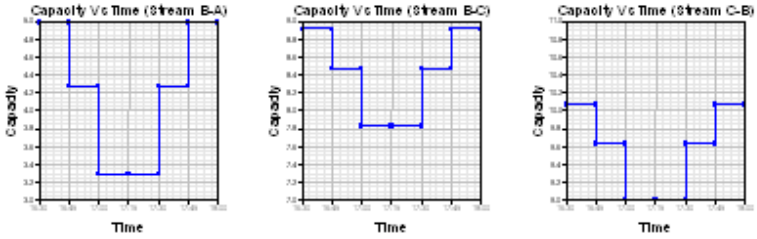
Queue Interval 4: 17:15-17:30



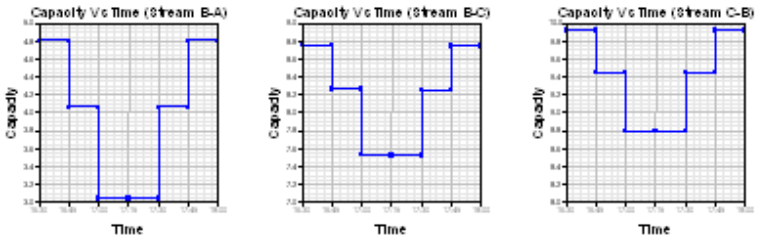


Capacity Graph

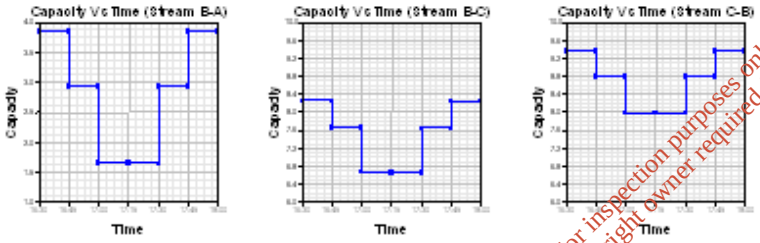
Demand Set: Existing PM
Modelling Period: 16:30-18:00



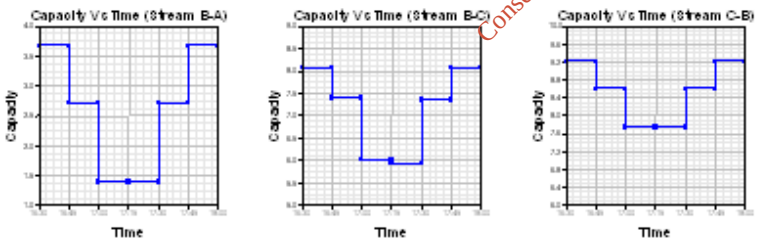
Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00



Demand Set: PM 2028
Modelling Period: 16:30-18:00

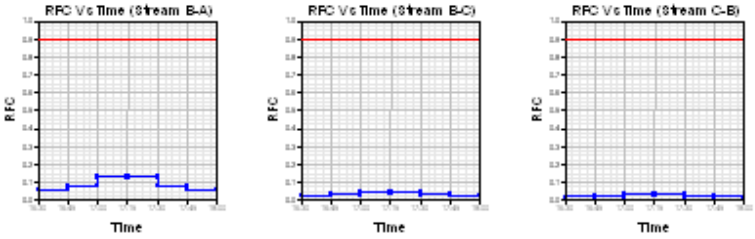


Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

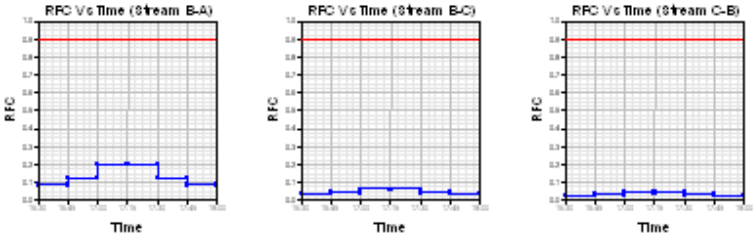


RFC Graph

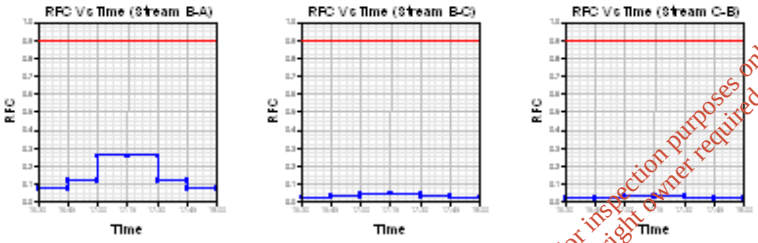
Demand Set: Existing PM
Modelling Period: 16:30-18:00



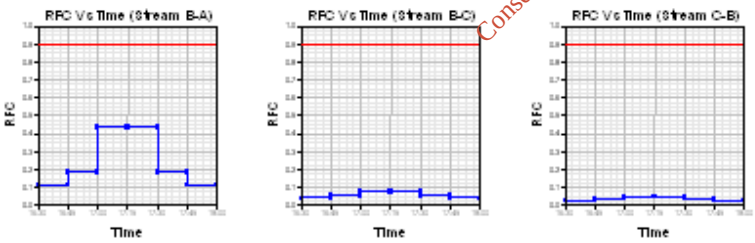
Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00



Demand Set: PM 2028
Modelling Period: 16:30-18:00

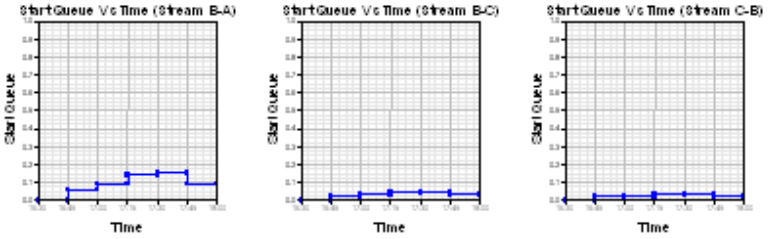


Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

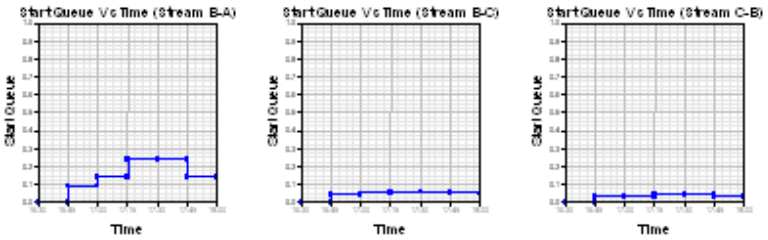


Start Queue Graph

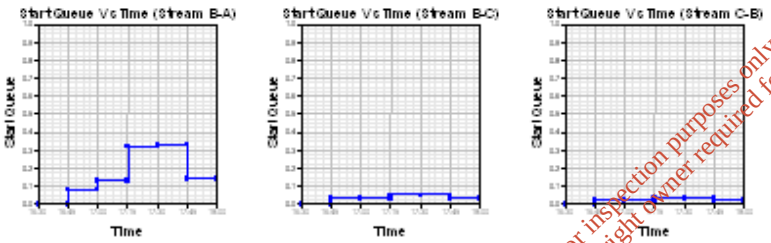
Demand Set: Existing PM
Modelling Period: 16:30-18:00



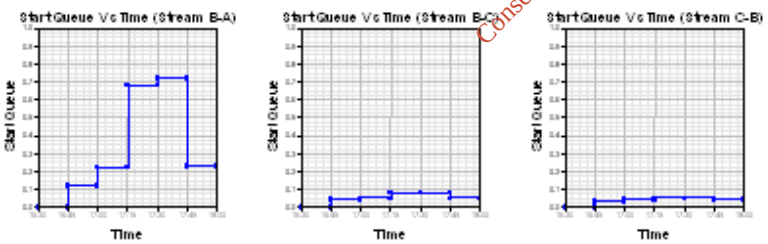
Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00



Demand Set: PM 2028
Modelling Period: 16:30-18:00

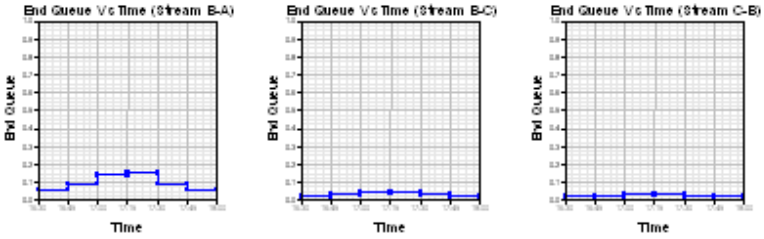


Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

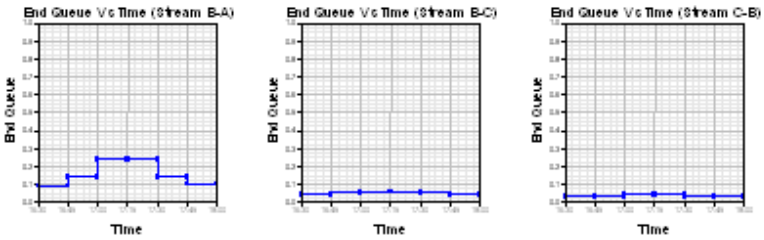


End Queue Graph

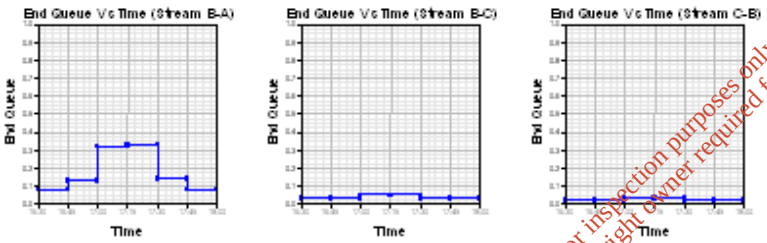
Demand Set: Existing PM
Modelling Period: 16:30-18:00



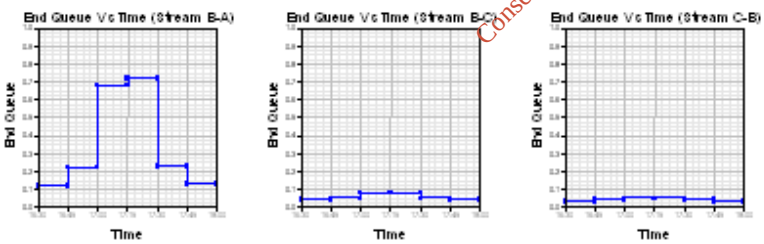
Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00



Demand Set: PM 2028
Modelling Period: 16:30-18:00

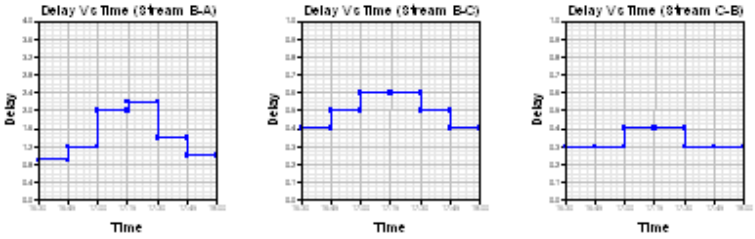


Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

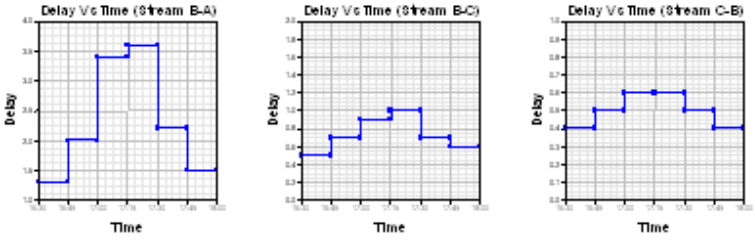


Delay Graph

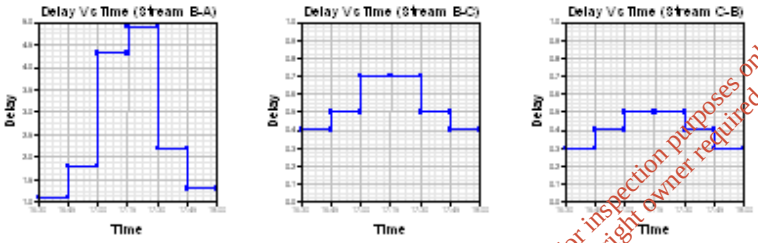
Demand Set: Existing PM
Modelling Period: 16:30-18:00



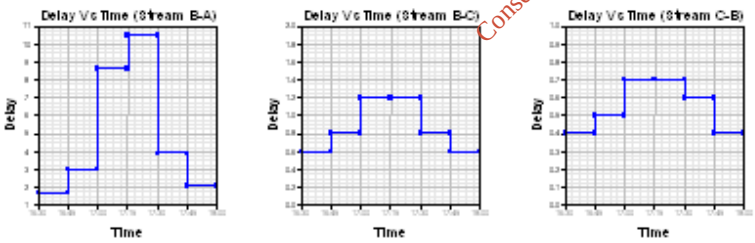
Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00



Demand Set: PM 2028
Modelling Period: 16:30-18:00



Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00



Queues & Delays

Demand Set: Existing PM
Modelling Period: 16:30-18:00

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:30-16:45	B-A	0.29	4.98	0.058	-	0.00	0.06	-	0.9	0.21
	B-C	0.21	8.91	0.024	-	0.00	0.02	-	0.4	0.11
	C-A	14.76	-	-	-	-	-	-	-	-
	C-B	0.18	10.07	0.017	-	0.00	0.02	-	0.3	0.10
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	10.15	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:45-17:00	B-A	0.34	4.27	0.081	-	0.06	0.09	-	1.2	0.25
	B-C	0.25	8.47	0.030	-	0.02	0.03	-	0.5	0.12
	C-A	17.62	-	-	-	-	-	-	-	-
	C-B	0.21	9.63	0.022	-	0.02	0.02	-	0.3	0.11
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	12.12	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:00-17:15	B-A	0.42	3.29	0.128	-	0.09	0.14	-	2.0	0.35
	B-C	0.31	7.83	0.040	-	0.03	0.04	-	0.6	0.13
	C-A	21.58	-	-	-	-	-	-	-	-
	C-B	0.26	9.01	0.029	-	0.02	0.03	-	0.4	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	14.85	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:15-17:30	B-A	0.42	3.29	0.128	-	0.14	0.15	-	2.2	0.35
	B-C	0.31	7.83	0.040	-	0.04	0.04	-	0.6	0.13
	C-A	21.58	-	-	-	-	-	-	-	-
	C-B	0.26	9.01	0.029	-	0.03	0.03	-	0.4	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	14.85	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:30-17:45	B-A	0.34	4.27	0.081	-	0.15	0.09	-	1.4	0.26
	B-C	0.25	8.47	0.030	-	0.04	0.03	-	0.5	0.12
	C-A	17.62	-	-	-	-	-	-	-	-
	C-B	0.21	9.63	0.022	-	0.03	0.02	-	0.3	0.11
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	12.12	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:45-18:00	B-A	0.29	4.98	0.058	-	0.09	0.06	-	1.0	0.21
	B-C	0.21	8.91	0.024	-	0.03	0.02	-	0.4	0.12
	C-A	14.76	-	-	-	-	-	-	-	-
	C-B	0.18	10.07	0.017	-	0.02	0.02	-	0.3	0.10
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	10.15	-	-	-	-	-	-	-	-

Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:30-16:45	B-A	0.41	4.80	0.086	-	0.00	0.09	-	1.3	0.23
	B-C	0.31	8.75	0.036	-	0.00	0.04	-	0.5	0.12
	C-A	15.08	-	-	-	-	-	-	-	-
	C-B	0.25	9.92	0.025	-	0.00	0.03	-	0.4	0.10
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	10.74	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:45-17:00	B-A	0.49	4.06	0.122	-	0.09	0.14	-	2.0	0.28
	B-C	0.37	8.26	0.045	-	0.04	0.05	-	0.7	0.13
	C-A	18.01	-	-	-	-	-	-	-	-
	C-B	0.30	9.45	0.032	-	0.03	0.03	-	0.5	0.11
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	12.83	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:00-17:15	B-A	0.61	3.04	0.199	-	0.14	0.24	-	3.4	0.41
	B-C	0.46	7.53	0.061	-	0.05	0.06	-	0.9	0.14
	C-A	22.06	-	-	-	-	-	-	-	-
	C-B	0.37	8.79	0.042	-	0.03	0.04	-	0.6	0.12
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	15.71	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:15-17:30	B-A	0.61	3.04	0.199	-	0.24	0.24	-	3.6	0.41
	B-C	0.46	7.52	0.061	-	0.06	0.06	-	1.0	0.14
	C-A	22.06	-	-	-	-	-	-	-	-
	C-B	0.37	8.79	0.042	-	0.04	0.04	-	0.6	0.12
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	15.71	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:30-17:45	B-A	0.49	4.06	0.122		0.24	0.14	-	2.2	0.28
	B-C	0.37	8.25	0.045		0.06	0.05	-	0.7	0.13
	C-A	18.01	-	-	-	-	-	-	-	-
	C-B	0.30	9.45	0.032	-	0.04	0.03	-	0.5	0.11
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	12.83	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:45-18:00	B-A	0.41	4.80	0.086	-	0.14	0.10	-	1.5	0.23
	B-C	0.31	8.74	0.036	-	0.05	0.04	-	0.6	0.12
	C-A	15.08	-	-	-	-	-	-	-	-
	C-B	0.25	9.92	0.025	-	0.03	0.03	-	0.4	0.10
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	10.74	-	-	-	-	-	-	-	-

Demand Set: PM 2028
Modelling Period: 16:30-18:00

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:30-16:45	B-A	0.29	3.85	0.075	-	0.00	0.08	-	1.1	0.28
	B-C	0.21	8.25	0.026	-	0.00	0.03	-	0.4	0.12
	C-A	19.41	-	-	-	-	-	-	-	-
	C-B	0.18	9.36	0.019	-	0.00	0.02	-	0.3	0.11
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	13.35	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:45-17:00	B-A	0.34	2.92	0.118	-	0.08	0.13	-	1.8	0.39
	B-C	0.25	7.65	0.033	-	0.03	0.03	-	0.5	0.14
	C-A	23.18	-	-	-	-	-	-	-	-
	C-B	0.21	8.78	0.024	-	0.02	0.02	-	0.4	0.12
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	15.94	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:00-17:15	B-A	0.42	1.65	0.257	-	0.13	0.32	-	4.3	0.80
	B-C	0.31	6.67	0.047	-	0.03	0.05	-	0.7	0.16
	C-A	28.39	-	-	-	-	-	-	-	-
	C-B	0.26	7.97	0.032	-	0.02	0.03	-	0.5	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	19.52	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:15-17:30	B-A	0.42	1.64	0.257	-	0.32	0.33	-	4.9	0.82
	B-C	0.31	6.65	0.047	-	0.05	0.05	-	0.7	0.16
	C-A	28.39	-	-	-	-	-	-	-	-
	C-B	0.26	7.97	0.032	-	0.03	0.03	-	0.5	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	19.52	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:30-17:45	B-A	0.34	2.92	0.118	-	0.33	0.14	-	2.2	0.39
	B-C	0.25	7.64	0.033	-	0.05	0.03	-	0.5	0.14
	C-A	23.18	-	-	-	-	-	-	-	-
	C-B	0.21	8.78	0.024	-	0.03	0.02	-	0.4	0.12
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	15.94	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:45-18:00	B-A	0.29	3.85	0.075	-	0.14	0.08	-	1.3	0.28
	B-C	0.21	8.24	0.026	-	0.03	0.03	-	0.4	0.12
	C-A	19.41	-	-	-	-	-	-	-	-
	C-B	0.18	9.36	0.019	-	0.02	0.02	-	0.3	0.11
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	13.35	-	-	-	-	-	-	-	-

Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:30-16:45	B-A	0.41	3.67	0.113	-	0.00	0.12	-	1.7	0.31
	B-C	0.31	8.07	0.039	-	0.00	0.04	-	0.6	0.13
	C-A	19.74	-	-	-	-	-	-	-	-
	C-B	0.25	9.21	0.027	-	0.00	0.03	-	0.4	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	13.94	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:45-17:00	B-A	0.49	2.71	0.182	-	0.12	0.22	-	3.0	0.45
	B-C	0.37	7.39	0.051	-	0.04	0.05	-	0.8	0.14
	C-A	23.57	-	-	-	-	-	-	-	-
	C-B	0.30	8.60	0.035	-	0.03	0.04	-	0.5	0.12
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	16.65	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:00-17:15	B-A	0.61	1.39	0.435	-	0.22	0.68	-	8.6	1.19
	B-C	0.46	6.02	0.076	-	0.05	0.08	-	1.2	0.18
	C-A	28.87	-	-	-	-	-	-	-	-
	C-B	0.37	7.75	0.047	-	0.04	0.05	-	0.7	0.14
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	20.39	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:15-17:30	B-A	0.61	1.39	0.435	-	0.68	0.72	-	10.5	1.26
	B-C	0.46	5.93	0.077	-	0.08	0.08	-	1.2	0.18
	C-A	28.87	-	-	-	-	-	-	-	-
	C-B	0.37	7.75	0.047	-	0.05	0.05	-	0.7	0.14
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	20.39	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:30-17:45	B-A	0.49	2.71	0.182	-	0.72	0.23	-	3.9	0.46
	B-C	0.37	7.36	0.051	-	0.08	0.05	-	0.8	0.14
	C-A	23.57	-	-	-	-	-	-	-	-
	C-B	0.30	8.60	0.035	-	0.05	0.04	-	0.6	0.12
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	16.65	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:45-18:00	B-A	0.41	3.67	0.113	-	0.23	0.13	-	2.1	0.31
	B-C	0.31	8.06	0.039	-	0.05	0.04	-	0.6	0.13
	C-A	19.74	-	-	-	-	-	-	-	-
	C-B	0.25	9.21	0.027	-	0.04	0.03	-	0.4	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	13.94	-	-	-	-	-	-	-	-

Entry capacities marked with an '(X)' are dominated by a pedestrian crossing in that time segment.
In time segments marked with a '(B)', traffic leaving the junction may block back from a crossing so impairing normal operation of the junction.
Delays marked with '##' could not be calculated.

Overall Queues & Delays

Queueing Delay Information Over Whole Period

Demand Set: Existing PM
Modelling Period: 16:30-18:00

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	31.7	21.1	8.7	0.3	8.7	0.3
B-C	23.4	15.6	2.9	0.1	2.9	0.1
C-A	1618.7	1079.1	-	-	-	-
C-B	19.3	12.8	2.1	0.1	2.1	0.1
A-B	17.9	11.9	-	-	-	-
A-C	1113.5	742.4	-	-	-	-
All	**2824.4**	**1883.0**	**13.6**	**0.0**	**13.6**	**0.0**

Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	45.4	30.3	14.1	0.3	14.1	0.3
B-C	34.4	22.9	4.4	0.1	4.4	0.1
C-A	1654.5	1103.0	-	-	-	-
C-B	27.5	18.4	3.0	0.1	3.0	0.1
A-B	26.2	17.4	-	-	-	-
A-C	1178.2	785.5	-	-	-	-
All	**2966.2**	**1977.5**	**21.6**	**0.0**	**21.6**	**0.0**

Demand Set: PM 2028
Modelling Period: 16:30-18:00

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	31.7	21.1	15.8	0.5	15.8	0.5
B-C	23.4	15.6	3.3	0.1	3.3	0.1
C-A	2129.3	1419.6	-	-	-	-
C-B	19.3	12.8	2.3	0.1	2.3	0.1
A-B	17.9	11.9	-	-	-	-
A-C	1464.5	976.3	-	-	-	-
All	**3686.1**	**2457.4**	**21.3**	**0.0**	**21.3**	**0.0**

Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	45.4	30.3	29.9	0.7	29.9	0.7
B-C	34.4	22.9	5.2	0.2	5.2	0.2
C-A	2165.1	1443.4	-	-	-	-
C-B	27.5	18.4	3.4	0.1	3.4	0.1
A-B	26.2	17.4	-	-	-	-
A-C	1529.2	1019.5	-	-	-	-
All	**3827.8**	**2551.9**	**38.5**	**0.0**	**38.5**	**0.0**

Delay is that occurring only within the time period.
Inclusive delay includes delay suffered by vehicles which are still queuing after the end of the time period.
These will only be significantly different if there is a large queue remaining at the end of the time period.

PICADY 5 Run Successful

TOBIN
Patrick J. Tobin & Co. Ltd.

INTERNATIONAL NETWORK

Galway
Fairgreen House,
Fairgreen Road,
Galway.
Ph +353 (0)91 565211
Fax +353 (0)91 565398
E-mail galway@tobin.ie

Dublin
Block 10-3,
Blanchardstown Corporate Park,
Dublin 15.
Ph +353 (0)1 803 0406
Fax +353 (0)1 803 0409
E-mail dublin@tobin.ie

Castlebar
Market Square,
Castlebar,
Co. Mayo.
Ph +353 (0)94 902 1401
Fax +353 (0)94 902 1534
E-mail castlebar@tobin.ie

Poland
Ul. Cystersów 9
31-553 Kraków

Ph +48 12 353 8646
Fax +48 12 353 7329
E-mail biuro@tobin.pl

United Kingdom
CAB International,
Nosworthy Way,
Wallingford,
Oxfordshire OX10 8DE
Ph +44 1491 829327
Fax +44 1491 833508
E-mail brian.allum@tobin-uk.com

visit us @ www.tobin.ie

Appendix 4

Flood Risk Assessment

Granary House
Rutland Street
Cork

Tel. [021]4321521
Fax. [021]4321522

FLOOD RISK ASSESSMENT

GREENSTAR ENVIRONMENTAL SERVICES

DOCK ROAD

LIMERICK

Prepared For: -

Greenstar Environmental Services Ltd,
Dock Road,
Limerick.

Prepared By: -

O' Callaghan Moran & Associates,
Granary House,
Rutland Street,
Cork.

March 2013

Project	Flood Risk Assessment GES Limerick			
Client	GES			
Report No.	Date	Status	Prepared By	Reviewed By
12-4802202	25th March	Draft	Sean Moran, M.Sc. P.Geol	Jim O'Callaghan, MSc , CEnv
	4th April	RevA		

TABLE OF CONTENTS

PAGE

APPENDICES

1 INTRODUCTION

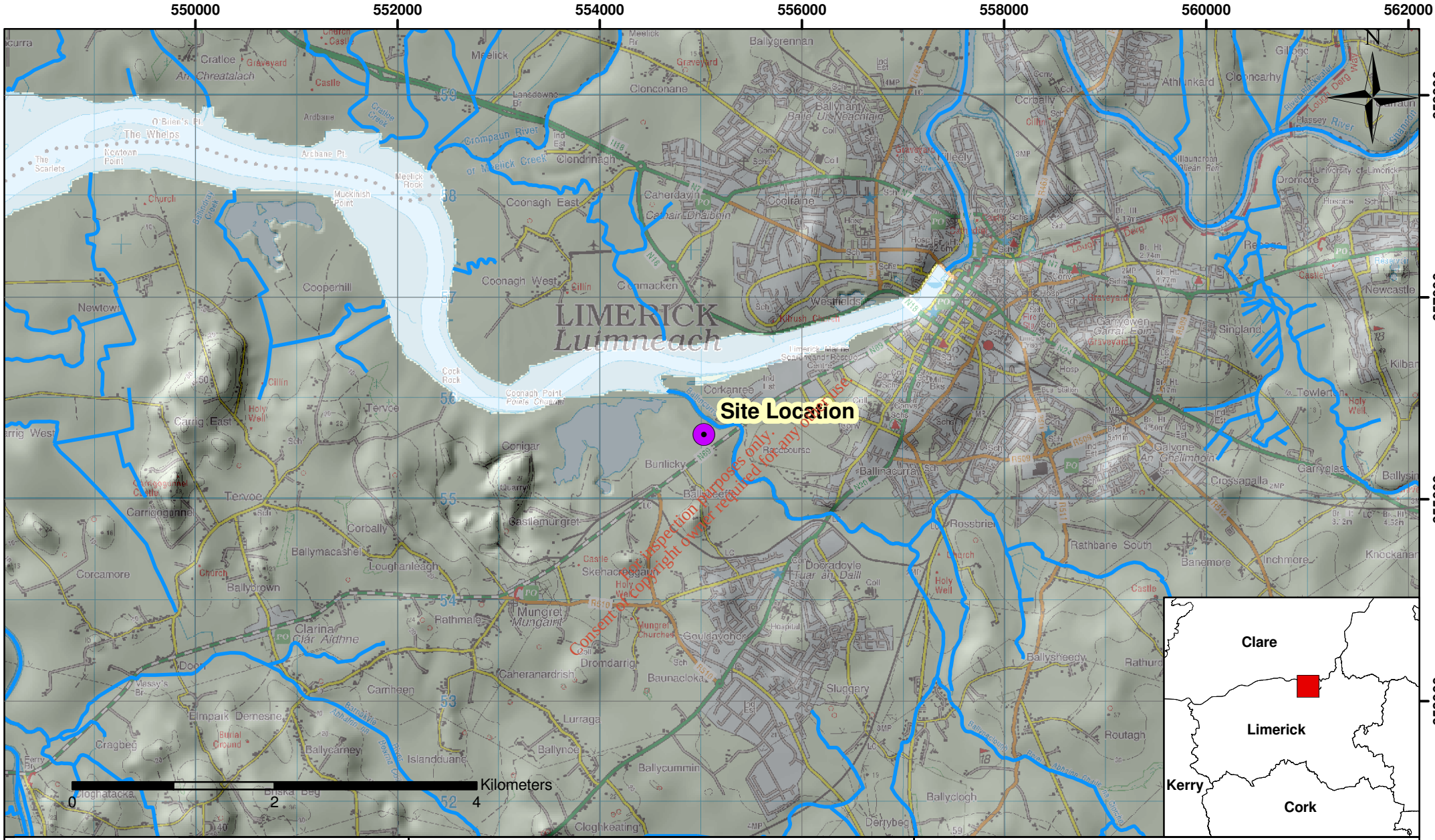
Greenstar Environmental Services Ltd (GES) intends to apply to for planning permission for its existing waste recovery and transfer facility in the townland of Ballykeefe, County Limerick whose location is shown on Figure 1. At a pre-application meeting with Limerick County Council, the Council requested that a flood risk assessment be prepared. GES commissioned O'Callaghan Moran & Associates (OCM) to prepare the assessment.

1.1 Methodology

The Flood Risk Assessment was undertaken in accordance with The Planning System and Flood Risk Management" Guidelines published by the Department of the Environment, Heritage and Local Government in November 2009

The Office of Public Works is currently working on the Shannon Catchment and Flood Risk Assessment and Management Study (CFRAM) which involves the production of Flood Maps. The study is due to be completed by 2015, with the Flood Maps produced by December 2103 that will identify all areas that are likely to be inundated at some point during a flood event.

The maps have not yet been produced and, pending their publication, the assessment was based on information contained in the Southern Environs Local Area Plan 2011-2017 (SELAP), Ordnance Survey of Ireland (OSI) historic maps, the OPW Flood Maps and information contained in a Preliminary Flood Risk Assessment Report prepared by Tobin Consulting Engineers for the Oil Depot on the lot to the south of the GES site.



O'Callaghan Moran & Associates.
Granary House, Rutland Street,
Cork, Ireland.
Tel. (021) 4321521 Fax. (022) 4321522
email: info@ocallaghanmoran.com

CLIENT
Greenstar Environmental Services

TITLE
Site Location

Details
Site Location
Rivers

Figure 4.1

2 SITE CONTEXT

2.1 Location

The site is located in the townland of Ballykeefe on lands that were reclaimed in the 1970's. It is in an industrially zoned area and is bounded to the south, southeast and southwest by industrial premises. To the east and north is the Ballinacurra Creek, which is where the Ballynaclough River joins the Shannon. The lands north of the Ballinacurra and between it and the Shannon are undeveloped. The Limerick City Council wastewater treatment plant is to the west of the site and separated from it by an open field. Further west is Bunlickey Lake. .

2.2 Site Layout

The facility is approximately 120m off the Dock Road and is accessed by a common access road serving the facility and other occupiers of the industrial estate. The site occupies an area of 1.8ha. There are two adjoining waste handling buildings, a separate office building and adjoining vehicle and plant maintenance workshop and an onsite sanitary wastewater treatment plant. The open yards are paved. The only unpaved area is in the vicinity of the on-site wastewater treatment plant.

The surface water and foul water drainage layout and site levels is shown on Drawing No IE 580-002A. Surface water run-off is generated by rainfall on the roof of the offices and workshop building, the waste handling buildings and the paved open yard areas. The run-off from the paved yards is collected and discharged to a perimeter man made drain at the north eastern site boundary via 2 No. three chamber oil interceptors.

Run-off from the roofs of the main buildings discharges to a manmade perimeter drain along the western boundary. The perimeter drains also receive run-off from other lots to the south of the GES site, but there are no other discharge points downstream of the site. Both perimeter drains connect to Bunlickey Lake. Foul water is treated in an on-site wastewater treatment plant and discharged to ground.

2.3 Hydrology

The facility is in the catchment of the Ballinaclough River, which rises to the south east of the site and flows northwest to confluence with the River Shannon via the Ballinacurra Creek. Both the Ballincurra Creek and the Shannon are tidally influenced. There are embankments along the southern bank of the Shannon and along western and eastern banks of the Ballinacurra Creek/Ballinaclough, extending from Rosbrien to its confluence with the Shannon.

Surface water run-off at the facility discharges to Bunlickey Lake, which is a man made feature. The lake covers an area of approximately 50ha and has an estimated catchment of approximately 257ha.

The lake was originally a borrow pit for alluvial clays used in the manufacture of cement at the Irish Cement Ltd plant in Castlemungret and was formed by the discharge of groundwater pumped from the quarry at the cement plant and surface water run-off from the plant into the worked out areas. The water in the lake discharges to the Shannon River Estuary via valves and sluices that prevent tidal inflow.

3 PREDICTIVE FLOOD ZONE MAPS

In 2010 Limerick County Council commissioned flood risk assessments based on predictive flood mapping to identify the flood risk zones as defined in the Planning System and Flood Risk Management Guidelines, which are.

Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);

Flood Zone B - where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and

Flood Zone C - where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding).

It is important to note that Flood Zone Map was prepared at a strategic scale using an automated mapping process ('bare earth' Digital Terrain Model), and minor or local features such as embankments, bridges, culverts, weirs and sluices are not explicitly modelled. The SELAP recognises that the Map is intended for guidance purposes and does not provide details for individual properties

The zones for the Southern Environs are shown on Map No 7 Predictive Flood Zone Map in the SELAP. The GES facility is located in an area designated as Flood Zone A, where the probability of flooding is greater than 1% for river flooding or 0.5% for coastal flooding. .

The Flood Risk Assessment completed as part of the SELAP states that in the case of the previously developed industrial zoning in Mungret the existing' limiting factors' (flood defences) assisted in the preventing water reaching development and one of the main mitigating factors in this location is Bunlickey Lake, which is a flood water receptor.

4 FLOOD RISK ASSESSMENT

4.1 Flood Data

Given its location, the site is potentially at risk of river and coastal flooding. The OS historic 6 "inch map shows the embankments along the southern bank of the Shannon and on western and eastern banks of the Ballinacurra Creek/Ballinaclough River, stretching from Rosbrien to the confluence with the Shannon.

The embankments were constructed to prevent flooding of the adjoining lands, primarily associated with tidal movements. The lands occupied by the facility are not identified on the map as being liable to flooding.

It is understood that following tidal floods in 1961 the height of the embankments was raised to 5.5m OD along the Shannon and to 4.96mOD between Bawney's Bridge on the N69 and Ballinacurra Bridge to the east.

The OPW Flood Zone Maps (Appendix 1) show that the site is not in an area designated as benefiting lands, i.e. lands that are subject to either flooding or poor drainage, which would benefit from drainage works. There is no record of any flooding either within the site boundary, or on the lands immediately adjoining the site.

There are no hydrometric stations on the Ballinaclough River and therefore flow data is not available. There is an OPW Hydrometric Station at Ball's Bridge on the River Shannon, approximately 4km north east of the site, where the flow data records extend back to 1957. The maximum water level recorded was 7.03 m AOD-Poolbeg (4 .37mOD-Malin Head) in 1961 and is attributed to a tidal peak.

The Preliminary Flood Risk Assessment prepared by Tobin Consulting Engineers for the Oil Depot on the lot immediately to the south of the GES site, estimates a 200 year tidal level of 4.80mOD and a 1000 year tidal level of 5.15mOD (Malin Head).

4.2 Surface Water Run-Off

Current Volumes

The buildings and paved areas site occupy an area of approximately 18,000m^2. In a rain fall event of 50mm/hr (one in 100 year return), the maximum discharge to the perimeter drains would be 250 litres/second (l/sec).

Future Volumes

The planning application relates solely to increasing the amount of waste that can be accepted at the facility and does not involve the construction of any new buildings, the alteration of any structures, provision of additional paving or changes to the existing drainage layout. This means there will be no encroachment into or reduction of the active flood plain.

There will be no reduction in the rainfall infiltration areas and no short to medium increase in the volume of surface water run-off from the facility. In the longer term (30-50 years), the amount of run-off may increase in response to climate change.

The OPW's draft guidance document 'Assessment of Potential Future Scenario for Flood Risk Management' (2009) recommends that the potential impacts of climate change be assessed using the Sensitivity Based Approach for two potential future scenarios, which are referred to as the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS).

The MRFS represents a 'likely' future scenario, based on the wide range of predictions available and with the allowances for increased rainfall events, sea level rise, landuse changes. within the bounds of widely accepted projections. The HEFS represents a more extreme potential future scenario, but one that is not significantly outside the range of accepted predictions available and. at the upper the bounds of widely accepted projections.

For 1:100 year rainfall events the MRFS for increase in rainfall is 20% and the HEFS is 30%. This would result in the run-off in a 1 in 100 year rainfall ranging between 300l/sec to 325l/sec. There are no other discharge points to the drain downstream of the GES facility

5 CONCLUSIONS

5.1 Conclusions

The site is in the catchment of the Ballinaclough River. The surface water drainage from the site enters perimeter drains that surround the Industrial Estate. These outfall to Bunlickey Lake, which connects to the River Shannon via sluices designed to prevent tidal inflow.

The site and surrounding lots are in Flood Zone A and are potentially at risk from coastal and river flooding. However, the area is extensively developed and there are existing 'limiting factors' including Bunlickey Lake and the flood embankments along the Ballinacurra Creek. There are no historic records that either the site, or the adjoining lands are liable to and have experienced flooding.

The proposed changes do not involve the provision of any additional hard surfaces that would increase the volume of rainfall run-off from the site and therefore will not increase the flood risk either within or outside the site boundaries.

Appendix 1

OPW Flood Risk Map

OPW National Flood Hazard Mapping

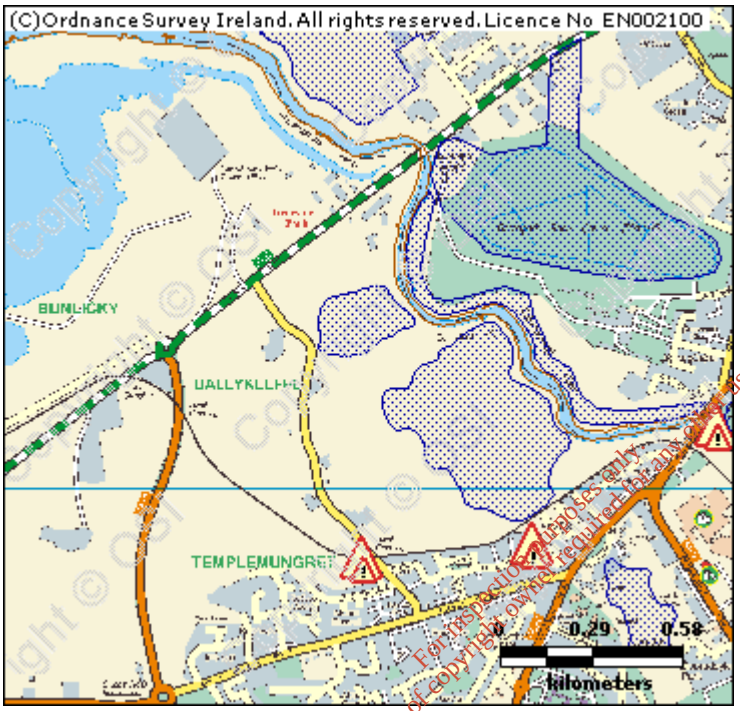
Summary Local Area Report

This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Limerick

NGR: R 552 550



Map Scale 1:24,220

Map Legend	
	Flood Points
	Multiple / Recurring Flood Points
	Areas Flooded
	Hydrometric Stations
	Rivers
	Lakes
	River Catchment Areas
	Land Commission *
	Drainage Districts *
	Benefiting Lands *

* Important: These maps do not indicate flood hazard or flood extent. Thier purpose and scope is explained in the Glossary.

20 Results

1. Shannon Dock Road Limerick Dec 1999 — Start Date: 25/Dec/1999
County: Limerick — Flood Quality Code:2
Additional Information: Reports (5) Press Archive (1) More Mapped Information

2. Shannon Westfields Limerick Dec 1999 — Start Date: 25/Dec/1999
County: Limerick — Flood Quality Code:2
Additional Information: Reports (3) Press Archive (2) More Mapped Information

3. Shannon Adjacent Dock Road Limerick Dec 1999 — Start Date: 25/Dec/1999
County: Limerick — Flood Quality Code:2
Additional Information: Reports (3) Press Archive (1) More Mapped Information

4. Greenfield Road Rossbrien Dec 1999 — Start Date: 25/Dec/1999
County: Limerick — Flood Quality Code:2
Additional Information: Reports (3) Press Archive (1) More Mapped Information

5. Shannon Condell Road Limerick Feb 2002 — Start Date: 11/Feb/2002
County: — Flood Quality Code:3

Report Produced: 25-Mar-2013 8:54

Additional Information: Reports (3) More Mapped Information

---

6. Limerick Condell Road Feb 1990 — Start Date: 01/Feb/1990
County: — Flood Quality Code:3

Additional Information: Photos (2) More Mapped Information

---

7. Ballynaclough River Limerick Dec 1999 — Start Date: 25/Dec/1999
County: Limerick — Flood Quality Code:3

Additional Information: Reports (3) More Mapped Information

---

8. Condell Road Limerick Feb 1997 — Start Date: 10/Feb/1997
County: — Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information

---

9. Ballyclogh River Rossbrien Limerick Feb 1995 — Start Date: 07/Feb/1995
County: Limerick — Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information

---

10. Limerick Dock Rd Jan 1995 — Start Date: 25/Jan/1995
County: Limerick — Flood Quality Code:3

Additional Information: Photos (1) More Mapped Information

---

11. Raheen Dooradoyle, Limerick Feb 1990 — Start Date: 01/Feb/1990
County: Limerick — Flood Quality Code:1

Additional Information: Reports (1) More Mapped Information

---

12. Ballynaclogh Rosbrien August 1986 — Start Date: 05/Aug/1986
County: Limerick — Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information

---

13. Turlough - Loughmore Common Limerick — Start Date:
County: Limerick — Flood Quality Code:3

Additional Information: Reports (3) More Mapped Information

---

14. Ballynaclogh Ballinacurra Recurring — Start Date:
County: Limerick — Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information

---

15. Ashbrook Gardens Limerick Recurring — Start Date:
County: Limerick — Flood Quality Code:4

Additional Information: Reports (1) More Mapped Information

---

16. South Circular Road St Mary's Limerick Recurring — Start Date:
County: Limerick — Flood Quality Code:4

Additional Information: Reports (1) More Mapped Information

---

17. Ballynaclogh Rosbrien Recurring — Start Date:
County: Limerick — Flood Quality Code:4

Additional Information: Reports (1) More Mapped Information

---

18. Dooradoyle-St Nessans/Fr Russell recurring — Start Date:
County: Limerick — Flood Quality Code:4

Additional Information: Reports (1) More Mapped Information

Report Produced: 25-Mar-2013 8:54

19. Dooradoyle Limerick recurring

Start Date:

County: Limerick

Flood Quality Code: 4

Additional Information: Reports (1) More Mapped Information

20. Mungret Village, Co. Limerick

Start Date:

County: Limerick

Flood Quality Code: 4

Additional Information: Reports (1) More Mapped Information

Appendix 2

OPW Hydrometric Data Ball's Bridge

Office of Public Works			
GENERAL STATION DETAILS			
Station Name: Ball's Bridge	Station No: 25061	Watercourse: Abbey Estuary	NGR: R 582 578
Catchment Area (km^2): -	Catchment: Shannon	Gauge Type: L	Datum: Poolbeg

HYDROMETRIC YEAR[1]	WATER LEVEL (mAOD-Poolbeg)	S.G. READING (m)	ESTIMATED FLOWS (m^3/s)	RELIABLE LIMIT[2] (m^3/s)	DATE	COMMENTS / NOTES
1957	6.02	4.16	-	-	**08/01/1958**	
1958	6.31	4.45	-	-	**12/12/1958**	
1959	6.57	4.71	-	-	**29/12/1959**	
1960	6.42	4.67	-		**02/11/1960**	Levels are Tidal peaks
1961	7.03	5.28	-	-	**22/10/1961**	Levels are Tidal peaks
1962	6.12	4.37	-	-	**09/12/1962**	Levels are Tidal peaks
1963	6.39	4.64	-	-	**18/11/1963**	Levels are Tidal peaks
1964	6.66	4.91	-	-	**17/01/1965**	Levels are Tidal peaks
1965	6.41	4.66	-	-	**09/12/1965**	Levels are Tidal peaks
1966	6.27	4.52	-	-	**01/12/1966**	Levels are Tidal peaks
1967	6.33	4.58	-	-	**01/11/1967**	Levels are Tidal peaks
1968	6.50	4.75	-	-	**22/12/1968**	Levels are Tidal peaks
1969	6.27	4.52	-	-	**07/02/1970**	Levels are Tidal peaks
1970	-	-	-	-	**-**	
1971	6.20	4.45	-	-	**02/02/1972**	Levels are Tidal peaks
1972	6.27	4.52	-	-	**20/01/1973**	Levels are Tidal peaks
1973	6.54	4.79	-	-	**11/01/1974**	Levels are Tidal peaks
1974	6.62	4.87	-	-	**30/01/1975**	Levels are Tidal peaks
1975	6.65	4.90	-	-	**01/01/1976**	Levels are Tidal peaks

1976	6.38	4.63	-	-	**21/01/1977**	Levels are Tidal peaks
1977	6.61	4.85	-	-	**11/11/1977**	Levels are Tidal peaks
1978	6.15	4.40	-	-	**27/03/1979**	Levels are Tidal peaks
1979	6.35	4.60	-	-	**06/10/1979**	Levels are Tidal peaks
1980	6.37	4.62	-	-	**08/03/1981**	Levels are Tidal peaks
1981	6.57	4.82	-	-	**14/12/1981**	Levels are Tidal peaks
1982	6.71	4.96	-	-	**31/01/1983**	Levels are Tidal peaks
1983	6.36	4.61	-	-	**21/01/1984**	Levels are Tidal peaks
1984	6.08	4.33	-	-	**23/11/1984**	Levels are Tidal peaks
1985	6.15	4.40	-	-	**11/01/1986**	Levels are Tidal peaks
1986	6.53	4.78	-	-	**01/01/1987**	Levels are Tidal peaks
1987	6.55	4.80	-	-	**09/02/1988**	Levels are Tidal peaks
1988	6.36	4.61	-	-	**09/03/1989**	Levels are Tidal peaks
1989	6.65	4.90	-	-	**27/02/1990**	Levels are Tidal peaks
1990	6.77	5.02	-	-	**05/01/1991**	Levels are Tidal peaks
1991	6.45	4.70	-	-	**17/12/1991**	Levels are Tidal peaks
1992	6.67	4.92	-	-	**26/10/1992**	Levels are Tidal peaks
1993	6.59	4.84	-	-	**12/01/1994**	Levels are Tidal peaks
1994	6.63	4.88	-	-	**17/01/1995**	Levels are Tidal peaks
1995	6.31	4.56	-	-	**28/09/1996**	Levels are Tidal peaks
1996	5.95	4.20	-	-	**10/02/1997**	Levels are Tidal peaks
1997	6.45	4.70	-	-	**07/09/1998**	Levels are Tidal peaks
1998	6.55	4.80	-	-	**02/01/1999**	Levels are Tidal peaks
1999	6.11	4.36	-	-	**25/12/1999**	Levels are Tidal peaks
2000	6.05	4.30	-	-	**28/03/2001**	Levels are Tidal peaks
2001	-	-	-	-	**01/01/1900**	Station removed 08/10/2001 to 07/08/2002 due to canal restoration

						works
2002	6.57	3.82	-	-	**01/12/2002**	Levels are Tidal peaks. Logger installed 16/09/02
2003	6.24	3.48	-	-	**19/03/2004**	Levels are Tidal Peaks
2004	6.39	3.63	-	-	**08/01/2005**	Levels are Tidal peaks
2005	6.47	3.72	-	-	**30/03/2006**	Levels are Tidal peaks
2006	6.41	3.67	-	-	**08/10/2006**	Levels are Tidal peaks
2007	6.49	3.74	-	-	**11/03/2008**	Levels are Tidal peaks
2008	6.21	3.46	-	-	**20/08/2009**	Levels are Tidal peaks
2009	6.37	3.62	-	-	**06/12/2009**	Levels are Tidal peaks
2010	6.31	3.56	-	-	**20/02/2011**	Levels are Tidal peaks
2011	-	-	-	-	**01/01/1900**	Levels are Tidal peaks

Note 1 : These are the highest recorded water levels or estimated flows in each available hydrometric year of record. A hydrometric year runs from 1st October in the given year to the 30th September the following year, i.e., the hydrometric year 2000 runs from 1st October 2000 to 30th September 2001.

Note 2 : Limit of Reliable Rating: Estimated flows greater than the values given have been derived from an extrapolation of the rating and should be treated with caution

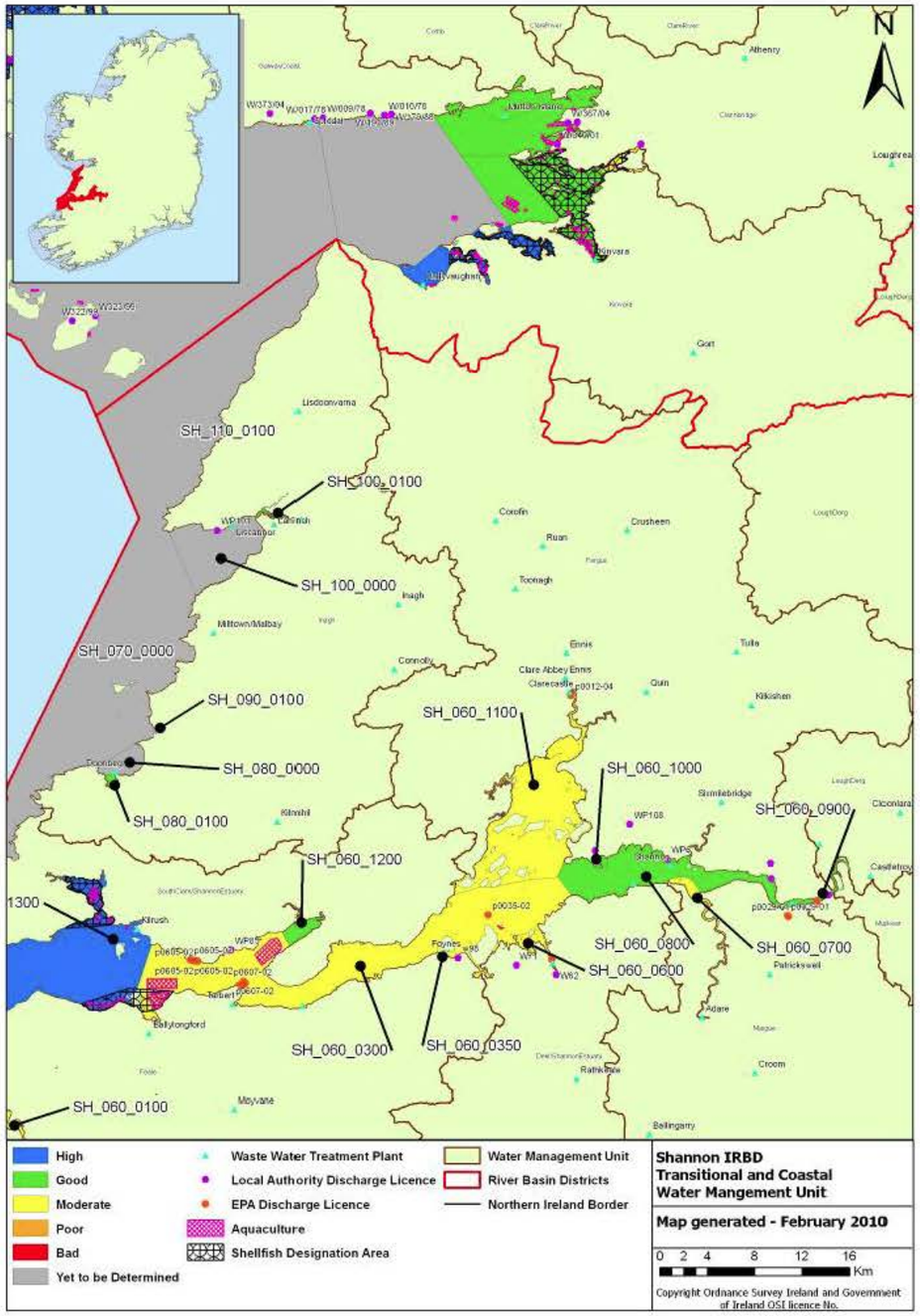
Appendix 5

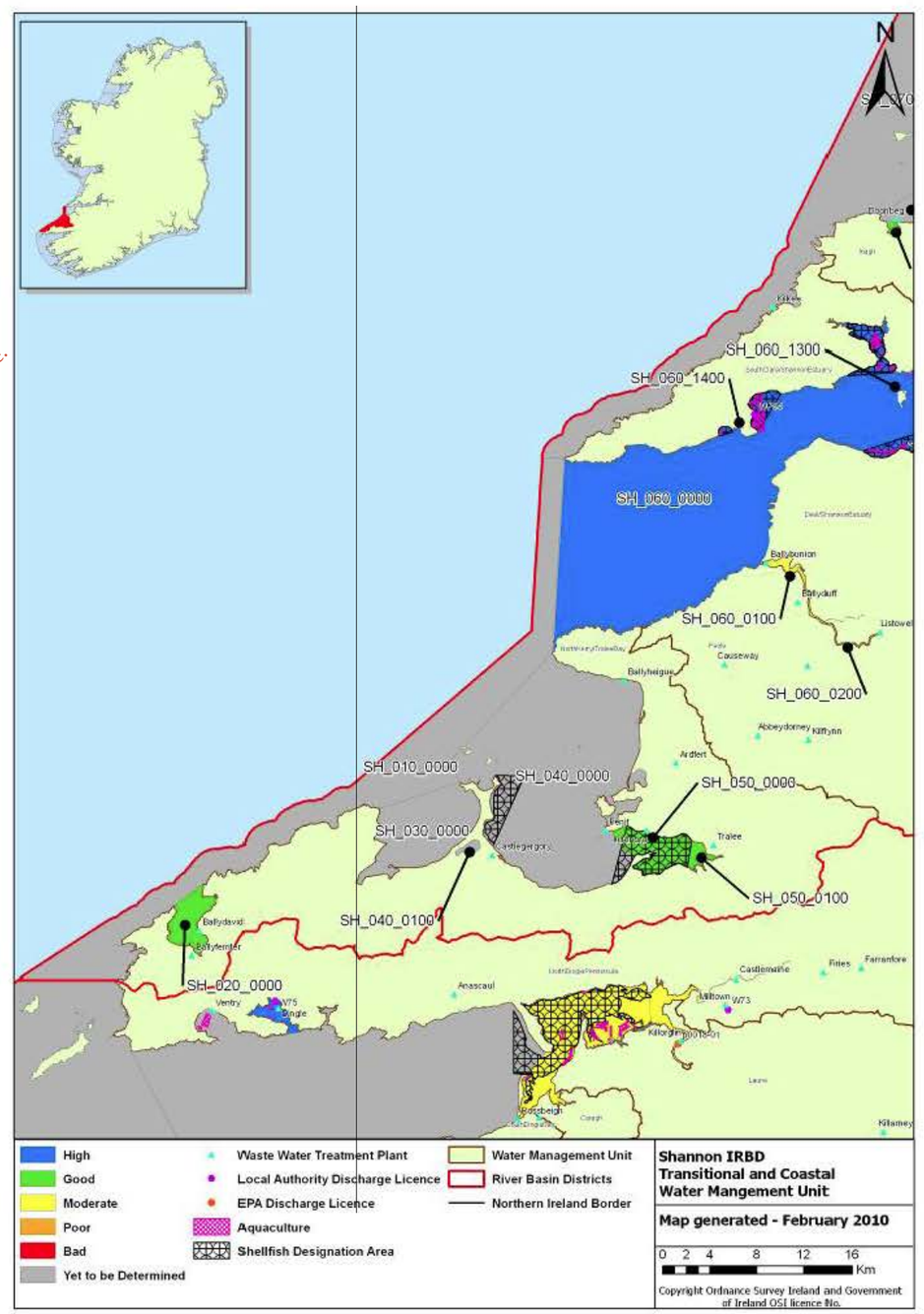
Surface Water Quality

Shannon RBD

Transitional and Coastal Waters

Action Programme





Name	Shannon RBD Transitional and Coastal Waters Action Plan
Length of Coastline	1004km, (Mainland), 178km (Islands)
Main Counties	Clare, Limerick, Westmeath. Longford, Roscommon.
Protected Areas	14 Bathing Water; Ballyheigue, Ballybunion South, Maharabeg, Ballybunion North, White Strand, Doonbeg, Lahinch, Castlegregory, Fenit, Banna Strand, Spanish Point, Kilkee, Fanore, White Strand, Miltown Malbay, Cappagh Pier, Kilrush. 6 Shellfish Water; Tralee Bay, West Shannon Poulnasherry Bay, West Shannon Carrigaholt, West Shannon Rinevella, West Shannon Ballylongford, Maharaees. 3 Nutrient Sensitive Water; Lee Estuary Upper (Tralee), Feale Estuary Upper, Cashen / Feale Estuary. 10 SPA; Akeragh, Banna and Barrow Harbour SPA, Cliffs of Moher SPA, Illaunonearaun SPA, Loop Head SPA, Lough Gill, Magharee Islands SPA, Mattle Island, Mutton Island (Clare), River Shannon and River Fergus Estuarary, Tralee bay. 11 SAC; Black Head-Poulsallagh Complex, Inagh River Estuary, Akeragh, Banna And Barrow Harbour, Mount Brandon, Carrowmore Point To SPAnish Point And Islands, Tralee Bay And Magharees Peninsula, West To Cloghane, Blasket Islands, Carrowmore Dunes, Magharee Islands, Kerry Head Shoal, Kilkee Reefs.

STATUS/IMPACTS	
Overall status	There are 20 Transitional Waterbodies within this RBD; 7 good, 7 moderate (or less) and the remainder are unassigned. There are 11 Coastal Waterbodies within this RBD; 1 high, 2 good, and the remainder are unassigned. 2 Chemical status fails – Lower Shannon Estuary, Limerick Dock
Status elements	Moderate (or less) water bodies with monitoring data indicating the test determining below good status classification are as follows: Lee K Estuary - fish Cashen - BOD Upper Feale Estuary - DO, BOD, High Phytoplankton Counts, fish Lower Shannon Estuary - Specific pollutants Deel Estuary- MRP, fish Maigue Estuary - DO, fish Fergus Estuary - DO
Possible Impacts -	Nutrient input
PRESSURES/RISKS	
LAND BASED PRESSURES	Pressure Based Risk Assessment results (2008) identify the following waterbodies as at risk from land based point source pressures: **Transitional** — **Risk Test Identified as "at risk" or "probably at risk"** Cashan — Point Source - WWTPs Deel Estuary — Point Source - WWTPs Inagh Estuary — Point Source - WWTPs Limerick Dock — Point Source - Combined Sewer Overflows & Treatment Plant Overflows Maigue Estuary — Point Source - WWTPs Upper Shannon Estuary — Point Source - WWTPs Lower Shannon Estuary — Point Source - WWTPs **Coastal** — **Risk Test Identified as "at risk" or "probably at risk"** Outer Tralee Bay — Point Source - WWTPs Mouth of the Shannon — Point Source - WWTPs Shannon Plume — Point Source - WWTPs Pressure Based Risk Assessment results (2005) identifies the following waterbodies as at risk from land based diffuse pressures (nutrient input): **Transitional** — **Risk Test Identified as "at risk" or "probably at risk"** Lee K Estuary — Nutrient Input Upper Feale Estuary — Nutrient Input Deal Estuary — Point Source - WWTPs and Section 4 local authority licensed discharges and Nutrient Input

Limerick Dock	Point Source - WWTPs, Combined Sewer Overflows & Treatment Plant Overflows, IPPC and Section 4 local authority licensed discharges
Maigue Estuary	Point Source - WWTPs and Section 4 local authority licensed discharges and Nutrient Input
Lower Shannon Estuary	Point Source - WWTPs, IPPC and Section 4 local authority licensed discharges and Nutrient Input
Cashen	Point Source – WWTPs and Nutrient Input
Fergus Estuary	Point source- Section 4 Local Authority licensed discharges
Inagh Estuary	Point Source - WWTPs
Upper Shannon Estuary	Point Source - WWTPs and Section 4 local authority licensed discharges
Shannon Airport Lagoon	Point Source - WWTPs and Section 4 local authority licensed discharges
Foynes Harbour	Point Source - WWTPs

Further detail on the land based pressures which affect marine waters in this RBD, such as WWTP discharges, septic tanks, and agriculture are detailed in the following Water Management Unit Action Plans:

Transitional/Coastal Water Body	Relevant Water Management Unit Action Plan
Aille Clare Estuary	Inagh WMU
Clonderalaw Bay	South Clare Shannon Estuary WMU
Doonbeg Estuary	Inagh WMU
Inagh Estuary	Inagh WMU
Lough Donnell	Inagh WMU
Blennerville Lake East	North Kerry Tralee Bay WMU
Blennerville Lake West	North Kerry Tralee Bay WMU
Lough Gill	North Kerry Tralee Bay WMU
Poulaweala Lough / Quayfield Lough	Deel Shannon Estuary WMU
Shannon Airport Lagoon	Fergus WMU
Foynes Harbour	Feale WMU
Liscannor Bay	Inagh WMU
Smerwick Harbour	North Kerry Tralee Bay WMU
Brandon Bay	North Kerry Tralee Bay WMU
Outer Tralee Bay	North Kerry Tralee Bay WMU
Mouth of the Shannon (HAs 23;27)	South Clare Shannon Estuary / North Kerry Tralee Bay / Deel Shannon Estuary WMUs
Doonbeg Bay	Inagh WMU
Shannon Plume (HAs 27;28)	South Clare Shannon Estuary / Inagh WMUs
Cloonconeen Pool	South Clare Shannon Estuary WMU
Scattery Island Lagoon	--
Southwestern Atlantic Seaboard (HA 23)	North Kerry Tralee Bay WMU
Inner Tralee Bay	North Kerry Tralee Bay WMU
Lee K Estuary	North Kerry Tralee Bay WMU
Cashen	Feale WMU
Upper Feale Estuary	Feale WMU
Lower Shannon Estuary	South Clare Shannon Estuary / Feale WMUs
Deel Estuary	Deel Shannon Estuary WMU
Maigue Estuary	Maigue WMU
Upper Shannon Estuary	Deel Shannon Estuary / Maigue / Fergus WMUs

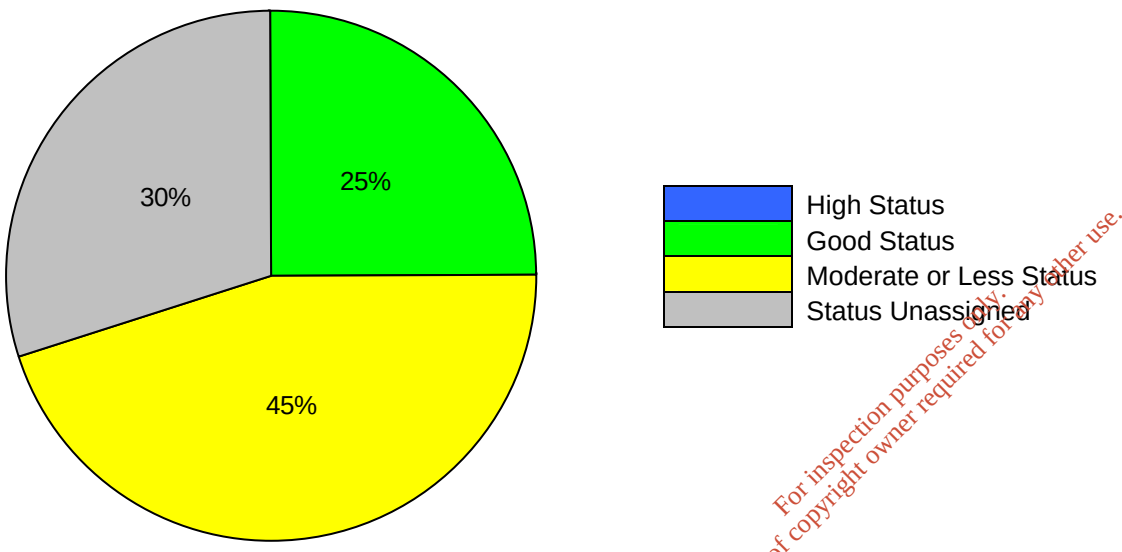
	Limerick Dock — Maigue / Fergus WMUs Fergus Estuary — South Clare Shannon Estuary / Fergus WMUs Transitional and coastal water bodies where Shellfish designations are located will also include more detail in the relevant Pollution Reduction Programmes: http://www.environ.ie/en/Environment/Water/WaterQuality/ShellfishWaterDirective/ShellfishWatersDraftCharacterisationReportsandPRPs/
MARINE PRESSURES	
Morphology	Pressure Based Risk Assessment results (2008) identify the following waterbodies as at risk from morphological pressures: Inner Tralee Bay: Embankments and shoreline reinforcement, along with port activities at Fenit Harbour. Lee K Esturay: Shoreline reinforcement. Upper Feale Estuary: Extensive subtidal embankments on both banks Cashen: Shoreline reinforcement. Limerick Dock: HMWB due to significant stretches of embankments Maigue Estuary: Embankments Foynes Harbour: HMWB due to hard defences and port activities
Aquaculture	There are 32 licensed aquaculture areas in the SHRBD. The waterbodies with aquaculture areas are: Outer Tralee Bay Mouth of the Shannon Lower Shannon Estuary

SELECTED ACTION PROGRAMME	
Bathing Waters	The Bathing Water Quality Regulations (SI 79 of 2008) which transposed the new Bathing Waters Directive (2006/7/EC) establishes a new classification system for bathing water quality and require monitoring and management plans to preserve, protect and improve the quality of bathing waters. Local Authority responsibilities are: Identify bathing waters. Monitor and classify bathing water quality status. Develop Bathing Waters Management Plans, including any necessary measures, to achieve bathing water quality standards. Disseminate bathing water quality information to the public. Guidance is being prepared in the preparation of management plans to minimise risk to bathers and human health. Where water quality problems exist, preventative and remedial action must be taken.
Shellfish Waters	Measures are included in the Pollution Reduction Programmes under the Quality of Shellfish Waters Regulations. DAFF licence shellfish growing areas under the under the Fisheries (Amendment) Act, 1997 Aquaculture: Aquaculture is regulated and licensed by the Department of Agriculture, Fisheries and Food; local authorities control discharge licenses for fin fish farms. The Department of the Environment, Heritage and Local Government makes shellfish pollution reduction programmes

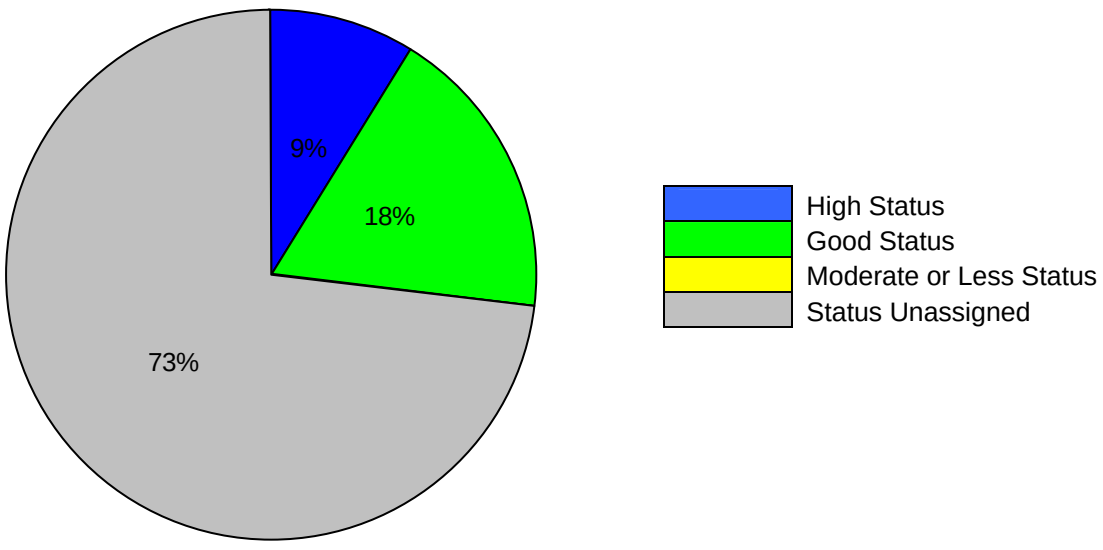
	which provide general water quality protection. A multi-department Marine Coordination Group has recently been established to ensure ongoing co-ordination of marine management activities and application of Appropriate Assessment through strengthened regulation; and coordination of biodiversity issues at an EU level.
Water Pollution Acts & Water Services Act & IPPC AND Foreshore	Local Authority Licensing of trade effluent to surface waters (under the Local Government (Water Pollution) Acts 1977 – 1990) include discharges to transitional and coastal waters IPPC licensed discharges under the integrated pollution prevention control directive and Environmental Protection Agency Acts Foreshore Acts – development under the mean High Water Mark within transitional and coastal waters are subject to control under the Foreshore Acts.
Birds and Habitats directive	Key provisions of the habitat regulations introduced under these directives allow for the DEHLG to control damaging activities within and outside designated sites. All planned projects not necessary for the management of the Natura 2000 network will be subject to appropriate assessment under Article 6 of the habitats Directive
Urban Wastewater Treatment	The Urban Waste Water Treatment Regulations (S.I No. 254 of 2001) deal with the collection, treatment and discharge of urban wastewater and wastewater from certain industrial sectors. Transitional and coastal waters receive direct discharges from Wastewater Treatment Plants and industry. Controls under these Regulations and the Environmental Objectives Regulations will provide the basis for deciding on appropriate treatment required to meet the objectives of the WFD. In addition Wastewater Discharge Authorisation Regulations (S.I. No. 684 of 2007) require Local Authorities to hold a licence from the EPA authorising a discharge for WWTPs >500pe (or a certificate in the case of agglomerations <500pe).
Morphology (Controls on Physical Modifications)	Marine morphological impacts can impact ecological standards. Ireland's existing planning and development controls and marine licensing systems provide a general level of control for new development. The DEHLG is considering the introduction of new regulations to control physical modifications in our surface waters which may involve an authorisation system where low risk activities may simply be registered and higher risk works would be subject to more detailed assessment and more prescriptive licences.

OBJECTIVES	
Protect / Restore 2015	8 Transitional, 3 coastal.
Alternative Objectives	Extended Deadlines – 6 Transitional. Remaining water bodies are yet to have objectives determined. New Modifications – Foynes - future flood relief measures (modifications) by OPW under the Floods Directive; and port expansion by Port of Foynes. Limerick Dock – Flow amelioration works Abbey River. HMWB – Limerick Dock. Foynes Harbour.

TRANSTIONAL



COASTAL



Transitional and Coastal Status

WATER BODY INFORMATION					GENERAL CONDITIONS				BIOLOGY						HYDRO-MORPHOLOGY			SPECIFIC POLLUTANTS[14]	ECOLOGICAL STATUS [15]	CHEMICAL STATUS [16]	Protected Areas				
									Phyto-plankton	Macroalgae[8]		Angio-sperms[9]													
MS_CD	RBD	TYPE	NAME	MONITORED (Y) EXTRAPOLATED (N)	DIN [1]	MRP [2]	DO [3]	BOD [4]	Phyto Biomass [7]	Oppor-tunistic	Reduced Species List	Seagrass	Benthos	Fish [11]	Hydrology[12]	Morph-ology[13]	HMWB	Annex VIII		Annex X	Bathing Waters	Shellfish Waters	Nutrient Sensitive Water	SAC	OBJECTIVES
SH_040_0100	SHIRBD	TW	Lough Gill	Y															ua					Yes	-
SH_050_0200	SHIRBD	TW	Blennerville Lake East	N															ua					Yes	-
SH_050_0300	SHIRBD	TW	Blennerville Lake West	N															ua					Yes	-
SH_060_0400	SHRBD	TW	Poulaweala Lough / Quayfield Lough	N															ua					Yes	-
SH_060_1000	SHIRBD	TW	Shannon Airport Lagoon	Y															ua					Yes	-
SH_090_0100	SHIRBD	TW	Lough Donnell	Y															ua					Yes	-
SH_050_0100	SHIRBD	TW	Lee K Estuary	Y	G	G	G	H	H					P					G			Yes	Yes	Yes	Protect
SH_060_0100	SHIRBD	TW	Cashen	Y	G	G	H	M	G					G		M			M				Yes	Yes	Restore 2021
SH_060_0200	SHIRBD	TW	Upper Feale Estuary	Y	G	G	M	M	M					M		M			M				Yes	Yes	Restore 2015
SH_060_0300	SHIRBD	TW	Lower Shannon Estuary	Y	G	G	H	H	H					H		G		Fail	M	Fail	Yes	Yes		Yes	Restore 2021
SH_060_0350	SHIRBD	TW	Foynes Harbour	N													Y		M					Yes	Restore 2021
SH_060_0600	SHIRBD	TW	Deel Estuary	Y	M	M	G	H	H					M		G			M					Yes	Restore 2021
SH_060_0700	SHIRBD	TW	Maigue Estuary	Y	M	G	M	H	H					M		M			M					Yes	Restore 2021
SH_060_0800	SHIRBD	TW	Upper Shannon Estuary	Y	G	H	H	H	H					G		G			G					Yes	Protect
SH_060_0900	SHIRBD	TW	Limerick Dock	Y	G	H	H	H	H					G		M	Y	Pass	G	Fail				Yes	Restore 2021
SH_060_1100	SHIRBD	TW	Fergus Estuary	Y	G	H	M	H	H					G		G			M					Yes	Restore 2015
SH_060_1200	SHIRBD	TW	Clonderalaw Bay	N															G					Yes	Protect
SH_080_0100	SHIRBD	TW	Doonbeg Estuary	N															G					Yes	Protect
SH_100_0100	SHIRBD	TW	Inagh Estuary	N															G					Yes	Protect
SH_110_0100	SHIRBD	TW	Aille Clare Estuary	N															G						Protect
SH_050_0000	SHIRBD	CW	Inner Tralee Bay	Y	G	M	H	H	H							M		Pass	G	G		Yes	Yes	Yes	Protect
SH_020_0000	SHIRBD	CW	Smerwick Harbour	N															G						Protect
SH_030_0000	SHIRBD	CW	Brandon Bay	N															ua					Yes	-
SH_040_0000	SHIRBD	CW	Outer Tralee Bay	N															ua		Yes	Yes		Yes	-
SH_080_0000	SHIRBD	CW	Doonbeg Bay	N															ua		Yes			Yes	-
SH_010_0000	SHIRBD	CW	Southwestern Atlantic Seaboard (HA 23)	N															ua					Yes	-
SH_060_0000	SHIRBD	CW	Mouth of Shannon (Has 23,27)	Y	H	G	H	H	H							H			H		Yes	Yes	Yes	Yes	Protect
SH_070_0000	SHIRBD	CW	Shannon Plume (HAs 27,28)	N															ua		Yes			Yes	-
SH_100_0000	SHIRBD	CW	Liscannor Bay	N															ua		Yes			Yes	-
SH_060_1300	SHIRBD	CW	Scattery Island Lagoon	N															ua					Yes	-
SH_060_1400	SHIRBD	CW	Cloonconeen Pool	N															ua					Yes	-

Glossary & Abbreviations

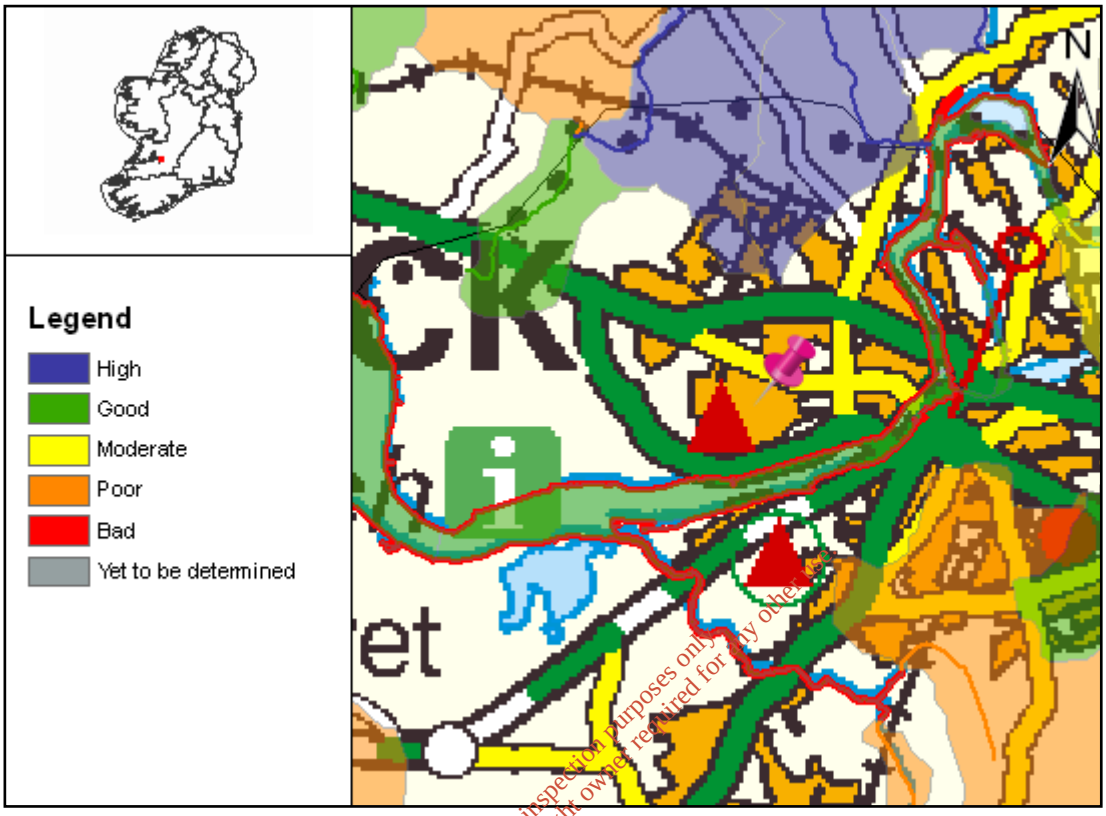
Biodiversity:	Word commonly used for biological diversity and defined as assemblage of living organisms from all habitats including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.
BOD	Biological Oxygen Demand
Coastal waters:	That area of surface water on the landward side of a line, every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters.
DAFF:	Department of Agriculture, Fisheries and Food.
DEHLG:	Department of Environment, Heritage and Local Government.
DETE:	Department of Enterprise, Trade and Employment.
Diffuse sources (of pollution):	Non-point sources primarily associated with run-off and other discharges related to different land uses such as agriculture and forestry, from septic tanks associated with rural dwellings and from the land spreading of industrial, municipal and agricultural wastes.
DO	Dissolved Oxygen
EC:	European Commission
Ecological status:	An expression of the structure and functioning of aquatic ecosystems associated with surface waters. Such waters are classified as being of good ecological status when they meet the requirements of the Water Framework Directive.
Ecology:	The study of the relationships among organisms and between those organisms and their non-living environment.
EPA:	Environmental Protection Agency.
EU:	European Union
Good status:	A collective term used to refer to the status achieved by a surface water body when both its ecological status and its chemical status are at least good or, for groundwater, when both its quantitative status and chemical status are at least good.
HMWB (Heavily modified water body):	A water body that has been changed substantially in character as a result of physical alterations by human activity.
Inland surface waters:	All standing or flowing water on the surface of the land (such as reservoirs, lakes, rivers) on the landward side of the baseline from which the breadth of territorial waters is measured.
Macroalgae	Multicellular algae such as seaweeds and filamentous algae.
Mitigation measures:	Measures to avoid, prevent, minimise, reduce or, as fully as possible, offset or compensate for any significant adverse effects on the environment, as a result of implementing a plan or programme.
On-site system:	Septic tank or other system for treating wastewater from unsewered properties.
Opportunistic	One of the elements used in classification of Ecological Status of

Macroalgae	transitional and coastal waters measured by spatial extent and biomass of macroalgae. While these algae are natural components of estuarine systems and play important roles in several estuarine processes, macroalgal blooms are of ecological concern because they can reduce the habitat quality.
Phytoplankton	Solitary and colonial unicellular algae and cyanobacteria that live in the water column, at least for part of their lifecycle.
Phytoplankton Biomass	One of the elements used in classification of Ecological Status of transitional and coastal waters measured by the total weight of phytoplankton, a free-floating flora, at a given time per unit area.
PRP	Pollution reduction programme
Programme of measures:	Those actions, defined in detail, which are required to achieve the environmental objectives of the Directive within a river basin district.
Protected area	Water protected by European legislation including drinking waters, shellfish waters, bathing waters, urban wastewater nutrient sensitive areas or sites designated as Special areas of Conservation or Special Protected Areas
River Basin District (RBD) & International River Basin District (IRBD):	Administrative area for coordinated water management, composed of multiple river basins (or catchments), with cross-border basins (i.e. those covering the territory of more than one Member State) assigned to an international RBD.
River basin	The area of land from which all surface water run-off flows, through a sequence of streams, rivers and lakes into the sea at a single river mouth, estuary or delta.
SERBD	South Eastern River Basin District
Special Area of Conservation (SAC):	Site designated according to the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora).
Special Protection Area (SPA):	Area designated under the European Directive on the Conservation of Wild Birds.
Statutory Instrument (SI):	Any order, regulation, rule, scheme or bye-law made in exercise of a power conferred by statute.
Surface water	Inland waters on the land surface (such as reservoirs, lakes, rivers, transitional waters, coastal waters) within a river basin.
Transitional waters	Bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their vicinity to coastal waters, but which are substantially influenced by freshwater flows.
Water body	A coherent sub-unit in the river basin (district) to which the environmental objectives of the directive must apply. Hence, the main purpose of identifying “water bodies” is to enable the status to be accurately described and compared to environmental objectives
Water Framework Directive (WFD)	The Water Framework Directive is European legislation that promotes a new approach to water management through river basin planning. It covers inland surface waters, estuarine waters, coastal waters and groundwater.
WMU	Water Management Unit – geographical sub unit of a river basin district

WWTP Waste Water Treatment Plant

water matters
'our Plan'

Full Report for Waterbody Limerick Dock



River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The WaterMaps viewer is an integral part of the River Basin Management Plan and provides access to information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland.

The following report provides summary plan information about the selected waterbody (indicated by the pin in the map above) relating to its status, risks, objectives, and measures proposed to retain status where this is adequate, or improve it where necessary. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters], and coastal waters), or to groundwaters. Other relevant information not included in this report can be viewed using the WaterMaps viewer, including areas listed in the Register of Protected Areas.

You will find brief notes at the bottom of some of the individual report sheets that will help you in interpreting the information presented. More detailed information can be obtained in relation to all aspects of the RBMPs at www.wfdireland.ie.

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

Summary Information:

Water Management Unit:	N/A
WaterBody Category:	Transitional Waterbody
WaterBody Name:	Limerick Dock
WaterBody Code:	IE_SH_060_0900
Overall Status:	Good
Overall Objective:	Restore 2021
Overall Risk:	1a At Risk
Heavily Modified:	Yes
	Report data based upon final RBMP, 2009-2015.

shannon river basin district

The information provided above is a summary of the principal findings related to the selected waterbody. Further details and explanation of individual elements of the report are outlined in the following pages.

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

Status Report

Water Management Unit:	N/A
WaterBody Category:	Transitional Waterbody
WaterBody Name:	Limerick Dock
WaterBody Code:	IE_SH_060_0900
Overall Status Result:	Good
Heavily Modified:	Yes

shannon river basin district

	Status Element Description	Result
	Status information	
DIN	Dissolved Inorganic Nitrogen status	Good
MRP	Molybdate Reactive Phosphorus status	High
DO	Dissolved oxygen as per cent saturation status	High
BOD	Biochemical Oxygen Demand (5-days) status	High
PHY	Macroalgae - phytobiomass status	High
OPP	Macroalgae - opportunistic algae status	N/A
RSL	Macroalgae - reduced species list status	N/A
ANG	Angiosperms - Seagrass and Saltmarsh status	N/A
BIN	Benthic Invertebrates status	N/A
FIS	Fish status	Good
HYD	Hydrology status	N/A
MOR	Morphology status	Less than Good (pHMWB)
SP	Specific Pollutant Status	Pass
PAS	Overall protected area status	At least good
ES	Ecological Status	Good
CS	Chemical Status	Fail
SWS	Surface Water Status	N/A
EXT	Extrapolated status	N/A
DON	Donor water bodies	N/A

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

n/a - not assessed

Status
By 'Status' we mean the condition of the water in the waterbody. It is defined by its chemical status and its ecological status, whichever is worse. Waters are ranked in one of 5 status classes: High, Good, Moderate, Poor, Bad. However, not all waterbodies have been monitored, and in such cases the status of a similar nearby waterbody has been used (extrapolated) to assign status. If this has been done the first line of the status report shows the code of the waterbody used to extrapolate.

You can read more about status and how it is measured in our RBMP Document Library at www.wfdireland.ie (Directory 15 Status).

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

Risk Report

Water Management Unit: N/A

WaterBody Category: Transitional Waterbody

WaterBody Name: Limerick Dock

WaterBody Code: IE_SH_060_0900

Overall Risk Result: 1a At Risk

Heavily Modified: Yes

shannon river basin district

	Risk Test Description		Risk
	Hydrology		
THY1	Water balance - Abstraction	2b	Not At Risk
	Marine Direct Impacts		
TMDI 1	Dangerous Substances		N/A
TMDI 2	OSPAR		N/A
TMDI 3	UWWT Regs Designations		N/A
TMDI O	Marine Direct Impacts Overall - Worst Case		N/A
	Morphological Risk Sources		
TM1	Channelisation		N/A
TM2	Deposition		N/A
TM3	Coastal Defences		N/A
TM4	Impoundments		N/A
TM5a	Built Structures - Port Tonnage		N/A
TM5b	Built Structures - Industrial Intakes		N/A
TM6	Intensive Landuse		N/A
TMO	Morphology Overall - Worst Case		N/A
TMO	Overall (MIMAS) Morphological Risk - Worst Case (2008)		N/A
	Overall Risk		
RA	Transitional Overall - Worst CaseOverall (MIMAS) Morphological Risk - Worst Case (2008)	1a	At Risk
	Point / MDI Worst Case		
TPOL	Worst case of Point Overall and MDI OverallOverall (MIMAS) Morphological Risk - Worst Case (2008)	1a	At Risk

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

	Point Risk Sources		
TP1	WWTPs (2008)	2b	Not At Risk
TP2	CSOs	1a	At Risk
TP3	IPPCs (2008)	2b	Not At Risk
TP4	Section 4s (2008)	2b	Not At Risk
TP5	WTPs/Mines/Quarries/Landfills		N/A
TPO	Overall Risk from Point Sources - Worst Case (2008)	1a	At Risk

Risk
By 'risk' we mean the risk that a waterbody will not achieve good ecological or good chemical status/potential at least by 2015. To examine risk the various pressures acting on the waterbody were identified along with any evidence of impact on water status. Depending on the extent of the pressure and its potential for impact, and the amount of information available, the risk to the water body was placed in one of four categories: 1a at risk; 1b probably at risk; 2a probably not at risk; 2b not at risk. Note that '2008' after the risk category means that the risk assessment was revised in 2008. All other risks were determined as part of an earlier risk assessment in 2005.

You can read more about risk assessment in our 'WFD Risk Assessment Update' document in the RBMP document library, and other documents at www.wfdireland.ie (Directory 31 Risk Assessments).

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

Objectives Report

Water Management Unit: N/A

WaterBody Category: Transitional Waterbody

WaterBody Name: Limerick Dock

WaterBody Code: IE_SH_060_0900

Overall Objective: Restore 2021

Heavily Modified: Yes

shannon river basin district

	Objectives Description	Result
	Extended timescale information	
E1	Extended timescales due to time requirements to upgrade WWTP discharges	No Status
E2	Extended timescales due to delayed recovery of chemical pollution and chemical status failures	2021
E3	Extended timescales due to winter dissolved nitrogen exceedances	No Status
E4	Extended timescales due to time requirements for status recovery	No Status
E5	Extended timescales from Northern Ireland Environment Agency	No Status
E0V	Overall extended timescale - combination of all extended timescales fields	2021
	Objectives information	
OB1	Prevent deterioration objective	No Status
OB2	Restore at least good status objective	No Status
OB3	Reduce chemical pollution objective	Restore 2021
OB4	Protected areas objective	Protect
OBO	Overall objectives	Restore 2021

Extended timescales
Extended timescales have been set for certain waters due to technical, economic, environmental or recovery constraints. Extended timescales are usually of one planning cycle (6 years, to 2021) but in some cases are two planning cycles (to 2027).

Objectives
In general, we are required to ensure that our waters achieve at least good status/potential by 2015, and that their status does not deteriorate. Having identified the status of waters (this is given earlier in this report), the next stage is to set objectives for waters. Objectives consider waters that require protection from deterioration as well as waters that require restoration and the timescales needed for recovery. Four default objectives have been set initially:-

Prevent Deterioration
Restore Good Status
Reduce Chemical Pollution
Achieve Protected Areas Objectives

These objectives have been refined based on the measures available to achieve them, the latter's likely effectiveness, and consideration of cost-effective combinations of measures. Where it is considered necessary extended deadlines have been set for achieving objectives in 2021 or 2027.

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

Measures Report

Water Management Unit: N/A

WaterBody Category: Transitional Waterbody

WaterBody Name: Limerick Dock

WaterBody Code: IE_SH_060_0900

Heavily Modified: Yes

shannon river basin district

	Measures Description	Applicable
BC	Total number of basic measures which apply to this waterbody	16
BW	Directive - Bathing Waters Directive	No
BIR	Directive - Birds Directive	Yes
HAB	Directive - Habitats Directive	Yes
MAE	Directive - Major Accidents and Emergencies Directive	Yes
EIA	Directive - Environmental Impact Assessment Directive	Yes
UWT	Directive - Urban Waste Water Treatment Directive	No
PPP	Directive - Plant Protection Products Directive	Yes
NIT	Directive - Nitrates Directive	Yes
IPC	Directive - Integrated Pollution Prevention Control Directive	Yes
POI	Other Stipulated Measure - Control of point source discharges	Yes
DIF	Other Stipulated Measure - Control of diffuse source discharges	Yes
PS	Other Stipulated Measure - Control of priority substances	Yes
MOD	Other Stipulated Measure - Controls on physical modifications to surface waters	Yes
OA	Other Stipulated Measure - Controls on other activities impacting on water status	Yes
AP	Other Stipulated Measure - Prevention or reduction of the impact of accidental pollution incidents	Yes
TP1	WSIP - Agglomerations with treatment plants requiring capital works	No
TP2	WSIP - Agglomerations with treatment plants requiring further investigation prior to capital works	No
TP3	WSIP - Agglomerations requiring the implementation of actions identified in Shellfish PRPs	No
TP4	WSIP - Agglomerations with treatment plants requiring improved operational performance	No
TP5	WSIP - Agglomerations requiring investigation of CSOs	No
TP6	WSIP - Agglomerations where exisitng treatment capacity is currently adequate but predicted loadings would result in overloading	No
OTS	On-site waste water treatment systems	Yes
SHE	Shellfish Pollution Reduction Plan	No
IPR	IPPC licences requiring review	Yes
WPR	Water Pollution Act licences requiring review	Yes

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

HQW	Protect high quality waters	No

Measures

Measures are necessary to ensure that we meet the objectives set out in the previous page of this report. Many measures are already provided for in national legislation and must be implemented. Other measures have been recently introduced or are under preparation. A range of additional potential measures are also being considered but require further development. Any agreed additional measures can be introduced through the update of Water Management Unit Action Plans during the implementation process.

You can read more about Basic Measures in 'River Basin Planning Guidance' and in other documents in our RBMP Document Library at www.wfdireland.ie.

Date Reported to Europe:July 2010

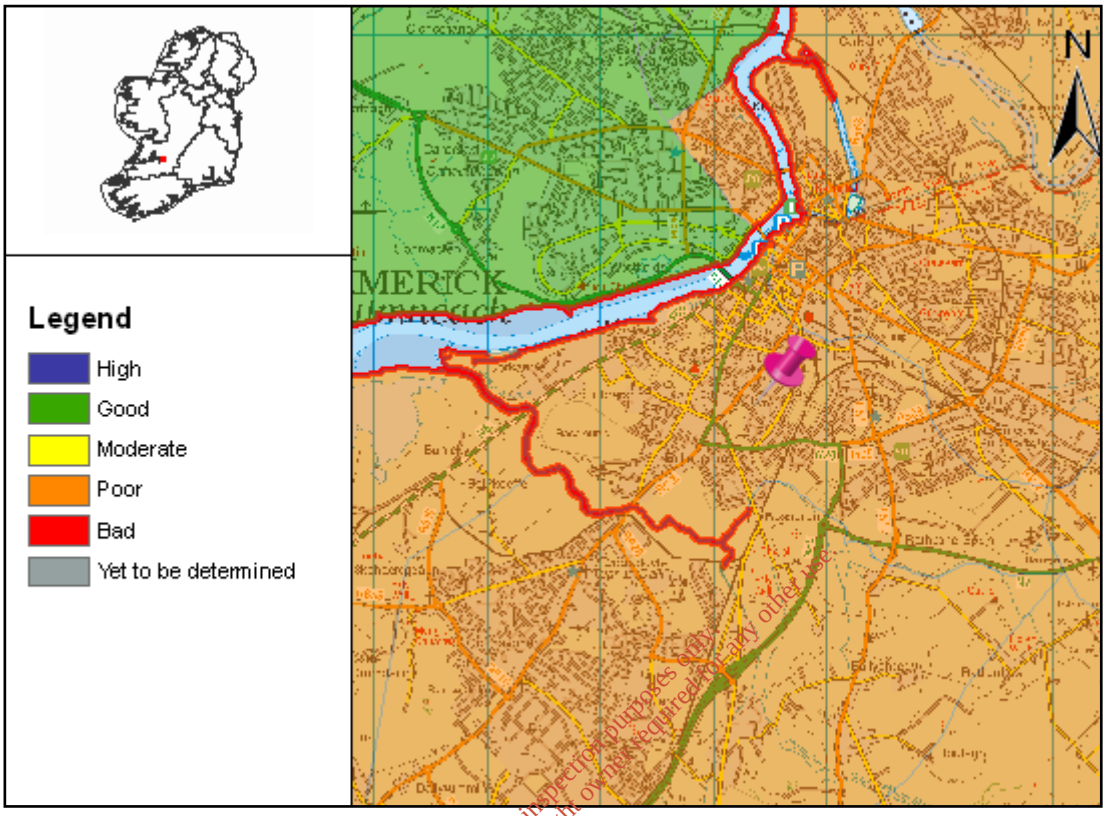
Date Report Created 11/07/2012

Appendix 6

Groundwater Quality

water matters
'our Plan'

Full Report for Waterbody Limerickurban_sw_1



River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The WaterMaps viewer is an integral part of the River Basin Management Plan and provides access to information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland.

The following report provides summary plan information about the selected waterbody (indicated by the pin in the map above) relating to its status, risks, objectives, and measures proposed to retain status where this is adequate, or improve it where necessary. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters], and coastal waters), or to groundwaters. Other relevant information not included in this report can be viewed using the WaterMaps viewer, including areas listed in the Register of Protected Areas.

You will find brief notes at the bottom of some of the individual report sheets that will help you in interpreting the information presented. More detailed information can be obtained in relation to all aspects of the RBMPs at www.wfdireland.ie.

Date Reported to Europe:July 2010

Date Report Created 18/07/2012

water matters
'our Plan'

Summary Information:

Water Management Unit:	N/A
WaterBody Category:	Groundwater Waterbody
WaterBody Name:	Limerickurban_sw_1
WaterBody Code:	IE_SH_G_143
Overall Status:	Poor
Overall Objective:	Restore_2021
Overall Risk:	1a At Risk
Heavily Modified:	No

shannon river basin district

Report data based upon final RBMP, 2009-2015.

The information provided above is a summary of the principal findings related to the selected waterbody. Further details and explanation of individual elements of the report are outlined in the following pages.

Date Reported to Europe:July 2010

Date Report Created 18/07/2012

water matters
'our Plan'

Chemical and Quantitative Status Report

Water Management Unit:	N/A
WaterBody Category:	Groundwater Waterbody
WaterBody Name:	Limerickurban_sw_1
WaterBody Code:	IE_SH_G_143
Overall Status Result:	Poor
Heavily Modified:	No

shannon river basin district

	Status Element Description	Result
	Status information	
INS	Status associated with saline intrusion into groundwater	GS-HC
DWS	Status associated with exceedances of water quality above specific standards	GS-HC
DS	Chemical status of groundwater due to pressure from diffuse sources of pollution	GS-HC
CLS	Chemical status of groundwater due to pressure from contaminated soil or land.	GS-LC
MS	Chemical status of groundwater due to pressure from mine sites (active or closed).	GS-HC
UAS	Chemical status of groundwater due to pressures from urban areas	GS-LC
GWS	General groundwater quality status	GS-LC
RPS	Status associated with MRP loading to rivers	Poor Stat
TNS	Status associated with nitrate loading to transitional and coastal waters	GS-HC
SWS	Overall status associated with nutrient loadings to rivers and transitional and coastal waters	Poor Stat
SQS	Status associated with dependant surface water quantitative status	GS-HC
GDS	Groundwater dependant terrestrial ecosystems status	GS-HC
QSO	Quantitative status overall	GS-HC
CSO	Chemical status overall	Poor
OS	Overall status	Poor

GS -HC : Good status High Confidence
GS- LC : Good status Low Confidence
n/a - not assessed

Status
By 'Status' we mean the condition of the water in the waterbody. It is defined by its chemical status and quantitative status, whichever is worse. Groundwaters are ranked in one of 2 status classes: Good or Poor.

You can read more about status and how it is measured in our RBMP Document Library at www.wfdireland.ie (Directory 15 Status).

Date Reported to Europe:July 2010

Date Report Created 18/07/2012

water matters
'our Plan'

Risk Report

Water Management Unit: N/A

WaterBody Category: Groundwater Waterbody

WaterBody Name: Limerickurban_sw_1

WaterBody Code: IE_SH_G_143

Overall Risk Result: 1a At Risk

Heavily Modified: No

shannon river basin district

	Risk Test Description	Risk
	Groundwater Dependent Terrestrial Ecosystems	
TE	GWDTE Risk	N/A
	Groundwater Quality	
DIF	Diffuse Elements (General) Risk	N/A
DW	Drinking Waters Risk	N/A
INT	Intrusions Risk	N/A
WB	Water Balance Risk	N/A
	Groundwater Quality (General)	
GQ	General Groundwater Quality Risk	N/A
	Groundwater Quality (Point Risk)	
CL	Contaminated Land Risk	N/A
LF	Landfill Risk	N/A
MI	Mine Risk	N/A
QY	Quarry Risk	N/A
UR	Urban Risk	N/A
UW	UWWT Risk	N/A
	GW Diffuse Risk Sources	
WB3	Mobile Nutrients (NO3)	N/A
WB4	Mobile Chemicals	N/A
WB5	Clustered OSWTSs and leaking urban sewerage systems	N/A
	GW Hydrology	
WB1	Water balance - Abstraction	N/A
WB2	Abstraction - Intrusion	N/A

Date Reported to Europe:July 2010

Date Report Created 18/07/2012

water matters
'our Plan'

	GW Point Risk Sources		
WB10	Risk from Point sources of pollution - Contaminated Land		N/A
WB11	Risk from Point sources of pollution - Trade Effluent Discharges		N/A
WB12	Risk from Point sources of pollution - Urban Wastewater Discharges		N/A
WB6	Risk from Point sources of pollution - Mines		N/A
WB7	Risk from Point sources of pollution - Quarries		N/A
WB8	Risk from Point sources of pollution - Landfills		N/A
WB9	Risk from Point sources of pollution - Oil Industry Infrastructure		N/A
	Overall Risk		
RA	Groundwater Overall - Worst Case		N/A
	Risk information		
CLR	Contaminated land risk	2a	Probably Not At Risk
DR	Risk of groundwater due to pressure from diffuse sources of pollution	2a	Probably Not At Risk
DWR	Risk associated with exceedances of water quality above specific standards	2b	Not At Risk
GDR	Groundwater dependant terrestrial ecosystems risk	2b	Not At Risk
GWR	General groundwater quality risk	1b	Probably At Risk
INR	Risk associated with saline intrusion into groundwater	2b	Not At Risk
LR	Risk due to landfills sites/old closed dump sites	1b	Probably At Risk
MR	Mines risk	2b	Not At Risk
NULL	Diffuse nitrates from agriculture risk		N/A
QR	Risk due to quarries	2b	Not At Risk
RA	Revised risk assessment	1a	At Risk
RPR	Risk associated with MRP loading to rivers	1a	At Risk
SQR	Risk associated with dependant surface water quantitative status	2b	Not At Risk
SWR	Overall risk associated with nutrient loadings to rivers and transitional and coastal waters	1a	At Risk
TNR	Risk associated with nitrate loading to transitional and coastal waters	2b	Not At Risk
UAR	Risk of groundwater due to pressures from urban areas	1b	Probably At Risk
UWR	Risk due to direct discharges of urban wastewater	2b	Not At Risk

Risk
By 'risk' we mean the risk that a waterbody will not achieve good ecological or good chemical status/potential at least by 2015. To examine risk the various pressures acting on the waterbody were identified along with any evidence of impact on water status. Depending on the extent of the pressure and its potential for impact, and the amount of information available, the risk to the water body was placed in one of four categories: 1a at risk; 1b probably at risk; 2a probably not at risk; 2b not at risk. Note that '2008' after the risk category means that the risk assessment was revised in 2008. All other risks were determined as part of an earlier risk assessment in 2005.

You can read more about risk assessment in our 'WFD Risk Assessment Update' document in the RBMP document library, and other documents at www.wfdireland.ie (Directory 31 Risk Assessments).

Date Reported to Europe:July 2010

Date Report Created 18/07/2012

water matters
'our Plan'

Objectives Report

Water Management Unit: N/A

WaterBody Category: Groundwater Waterbody

WaterBody Name: Limerickurban_sw_1

WaterBody Code: IE_SH_G_143

Overall Objective: Restore_2021

Heavily Modified: No

shannon river basin district

	Objectives Description	Result
	Extended timescale information	
E1	Extended deadlines due to agricultural P	2021
E2	Extended deadlines due to agricultural N	No Status
E3	Extended deadlines due to mines	No Status
E4	Extended deadlines due to urban areas	No Status
E5	Extended deadlines due to contaminated lands	No Status
EO	Extended deadlines - overall	2021
	Objectives information	
OB1	Prevent deterioration objective	No Status
OB2	Restore at least good status objective	Restore_2021
OB3	Reduce chemical pollution objective	No Status
OB4	Protected areas objective	No Status
OBO	Overall objectives - objective	Restore_2021

Extended timescales
Extended timescales have been set for certain waters due to technical, economic, environmental or recovery constraints. Extended timescales are usually of one planning cycle (6 years, to 2021) but in some cases are two planning cycles (to 2027).

Objectives
In general, we are required to ensure that our waters achieve at least good status/potential by 2015, and that their status does not deteriorate. Having identified the status of waters (this is given earlier in this report), the next stage is to set objectives for waters. Objectives consider waters that require protection from deterioration as well as waters that require restoration and the timescales needed for recovery. Four default objectives have been set initially:-

Prevent Deterioration
Restore Good Status
Reduce Chemical Pollution
Achieve Protected Areas Objectives

These objectives have been refined based on the measures available to achieve them, the latter's likely effectiveness, and consideration of cost-effective combinations of measures. Where it is considered necessary extended deadlines have been set for achieving objectives in 2021 or 2027.

Date Reported to Europe:July 2010

Date Report Created 18/07/2012

water matters
'our Plan'

Measures Report

Water Management Unit: N/A

WaterBody Category: Groundwater Waterbody

WaterBody Name: Limerickurban_sw_1

WaterBody Code: IE_SH_G_143

Heavily Modified: No

shannon river basin district

	Measures Description	Applicable
BC	Total number of basic measures which apply to this waterbody	24
BW	Directive - Bathing Waters Directive	No
BIR	Directive - Birds Directive	Yes
HAB	Directive - Habitats Directive	Yes
DW	Directive - Drinking Waters Directive	Yes
MAE	Directive - Major Accidents and Emergencies Directive	Yes
EIA	Directive - Environmental Impact Assessment Directive	Yes
SS	Directive - Sewage Sludge Directive	Yes
UWT	Directive - Urban Waste Water Treatment Directive	Yes
PPP	Directive - Plant Protection Products Directive	Yes
NIT	Directive - Nitrates Directive	Yes
IPC	Directive - Integrated Pollution Prevention Control Directive	Yes
CR	Other Stipulated Measure - Cost recovery for water use	Yes
SUS	Other Stipulated Measure - Promotion of efficient and sustainable water use	Yes
DWS	Other Stipulated Measure - Protection of drinking water sources	Yes
ABS	Other Stipulated Measure - Control of abstraction and impoundment	Yes
POI	Other Stipulated Measure - Control of point source discharges	Yes
DIF	Other Stipulated Measure - Control of diffuse source discharges	Yes
GW	Other Stipulated Measure - Authorisation of discharges to groundwaters	Yes
PS	Other Stipulated Measure - Control of priority substances	Yes
MOD	Other Stipulated Measure - Controls on physical modifications to surface waters	Yes
OA	Other Stipulated Measure - Controls on other activities impacting on water status	Yes
AP	Other Stipulated Measure - Prevention or reduction of the impact of accidental pollution incidents	Yes
OTS	On-site waste water treatment systems	Yes
FPM	Freshwater Pearl Mussel sub-basin plan	No
SHE	Shellfish Pollution Reduction Plan	No
IPR	IPPC licences requiring review	Yes
WPR	Water Pollution Act licences requiring review	No
FOR	Forestry guidelines and regulations	Yes

Date Reported to Europe:July 2010

Date Report Created 18/07/2012

HQW	Protect high quality waters	No

Measures

Measures are necessary to ensure that we meet the objectives set out in the previous page of this report. Many measures are already provided for in national legislation and must be implemented. Other measures have been recently introduced or are under preparation. A range of additional potential measures are also being considered but require further development. Any agreed additional measures can be introduced through the update of Water Management Unit Action Plans during the implementation process.

You can read more about Basic Measures in 'River Basin Planning Guidance' and in other documents in our RBMP Document Library at www.wfdireland.ie.

Date Reported to Europe:July 2010

Date Report Created 18/07/2012

Appendix 7

Natura Impact Statement

APPROPRIATE ASSESSMENT

STAGE 1 SCREENING

PROPOSED INCREASE IN WASTE ACCEPTANCE

MATERIALS RECOVERY FACITLIY

GREENSTAR ENVIRONMENTAL SERVICES LTD

DOCK ROAD

LIMERICK

Prepared For: -

Greenstar Environmental Services Ltd,
Dock Road,
Limerick.

Prepared By: -

O' Callaghan Moran & Associates,
Granary House,
Rutland Street,
Cork.

25th April 2013

Project	Stage 1 Screening Assessment GES Limerick			
Client	GES			
Report No.	Date	Status	Prepared By	Reviewed By
12-4802203	25th March	Draft	Jim O'Callaghan, MSc , CEnv	Micahel Watson, MA
	5th April	Draft RevA		
	25th April	Final		

TABLE OF CONTENTS

PAGE

1. INTRODUCTION

Greenstar Environmental Services Ltd (GES) intends to apply to for planning permission for its existing waste recovery and transfer facility in the townland of Ballykeefe, County Limerick. At a pre-application meeting with Limerick County Council, the Council requested that a Screening Assessment be prepared to inform the Appropriate Assessment of the application. GES appointed O'Callaghan Moran & Associates to carry out the assessment.

The European Union (EU) Habitats Directive (92/43/EC) and the EU Birds Directive (2009/147/EC) identify designated areas (Special Areas of Conservation (SAC) and Special Protection Areas (SPA) respectively) that are collectively known as Natura 2000 Sites. The Habitats Directive, which is implemented under the European Communities Birds and Natural Habitats) Regulations 2011 (S.I. No 477 of 2011), requires an "appropriate assessment" of the potential impacts any proposed development that may have an impact on the conservation objectives of any Natura 2000 site.

Article 6(3) of the Directive stipulates that *any plan or project not directly connected with or necessary to the management of a Natura 2000 site, but likely to have a significant effect thereon…shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.*

Guidance documents issued by Department of Environment, Heritage and Local Government and the National Parks and Wildlife Services recommend that the assessment be completed in a series of Stages, which comprise:

Stage 1: Screening

The purpose of this Stage is to determine, on the basis of a preliminary assessment and objective criteria, whether a plan or project, alone and in combination with other plans or projects, could have significant effects on a Natura 2000 site in respect of the site's conservation objectives.

Stage 2: Appropriate Assessment

This Stage is required if the Stage 1 Screening exercise identifies that the project is likely to have a significant impacts on a Natura 2000 site.

Stage 3 : Assessment of Alternative Solutions.

If Stage 2 determines that the project will have an adverse impact upon the integrity of a Natura 2000 site, despite the implementation of mitigation measures, it must be objectively concluded that no alternative solutions exist before the plan can proceed.

Stage 4 : Compensatory Measures:

Where no alternative solutions are feasible and where adverse impacts remain but imperative reasons of overriding public interest require the implementation of a project an assessment of compensatory measures that will effectively offset the damage to the Natura site 2000 is required.

1.1 Methodology

The Screening Assessment was based on a site inspection and the proposed changes to facility operations. It followed the guidance presented in the "Assessment of Plans and Projects significantly affecting Natura 2000 sites, Methodological Guidance on the provisions of Articles 6(3) and 6(4) of the Habitats Directive 92/43/EEC" (2001); The DEHLG (2009, revised February 2010) Appropriate Assessment of Plans and Projects in Ireland and the NPWS (2010) Circular NPW 1/10 & PSSP 2/10 Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities.

2. DESCRIPTION OF PROJECT

2.1 Site Location

The GES facility is located in the townland of Ballykeefe, off the main N69 Limerick to Tralee road on Dock Road (Figure 2.1). It is in the northern end of an industrially zoned area and is bounded to the south, southeast and southwest by warehousing units, oil distribution centres and truck sales and repair and Cussen Crane Hire.

To the east and north is the Ballinacurra Creek, which is where the Ballynaclough River joins the Shannon. The lands north of the Ballinacurra and between it and the Shannon are undeveloped. The Limerick City Council wastewater treatment plant is to the west of the site and separated from it by an open field. Further west is Bunlickey Lake. .

2.2 Site Layout

The site layout is shown on Drawing No 002. The facility is accessed off the Dock Road by a private road common access road serving the facility and other occupiers of the industrial estate. The site encompasses 1.8ha, the vast majority of which is either paved or occupied by buildings.

There are two adjoining waste handling buildings (Building 1 and 2). Building 1 is currently used for sorting and compacting recyclables (paper, cardboard, plastics etc.) recovered from the incoming wastes. Building 2 is currently used for compacting and wrapping the mixed municipal solid wastes. There is a separate office building and adjoining vehicle and plant maintenance workshop near the site entrance. An electrical substation along the south-western boundary wall is owned by Electric Ireland.

The open yards are paved and are used for external waste storage bays (C&D, glass, metals, timber and baled waste), skip storage, truck parking and a vehicle wash area. There is palisade

security fence on the north, east and west boundaries, with block work walls along the south-western boundary south of Building 1 and west of the site offices and workshop.

2.3 Site Operations

There are currently 20 full time employees based at the facility, including management, administration, general operatives and maintenance staff. The facility is authorised to operated seven days per week twenty four hours per day. At present, there are two eight hour shifts operating from 06:00 – 14:00 and 14:00 to 22:00.

The facility accepts and processes non hazardous mixed municipal solid waste and mixed and source segregated dry recyclables that are primarily collected in the Mid West Region.

The waste processing includes sorting of the mixed dry recyclables into separate categories (paper, plastic, cardboard), which are then compacted; the baling of the source segregated dry recyclables and the baling of the mixed municipal solid waste. The baled recyclables are sent to off-site recovery facilities for further processing, while the baled mixed municipal solid waste is sent to overseas waste to energy plants

2.4 Drainage

2.4.1 Surface Water

Surface water run-off is generated by rainfall on the roof of the offices and workshop building, the waste handling buildings and the paved open yard areas. The run-off from the paved yards is collected and directed through 2 No. three chamber oil interceptors before being discharged to a man made drain at the north-eastern site boundary. There is a shut off valve at the outlet from the last oil interceptor that can be closed in the event of an incident that has the potential to impact on surface water quality and contain the surface water within the site boundary.

Run-off from the main buildings discharges to manmade perimeter drain along the western boundary. The drainage layout is shown on Drawing No IE 580-002A.

The perimeter drains, which also take run-off from other occupants in the industrial estate, discharge to Bunlickey Lake. The water in the lake discharges to the Shannon River Estuary via valves and sluices that prevent tidal inflow.

The lower reaches of the Shannon are tidal and are part of the Shannon Transitional and Coastal Water Management Unit (WMU) designated in the Shannon River Basin District (ShIRBD) Management Plan prepared under the EU Water Framework Directive (WFD). The WMU comprises twenty Water Bodies and the stretch of the river to the north of the site is in the Limerick Dock Water Body.

Reports have been prepared on the 'Status' of each water body. Status means the condition of the water in a watercourse and is defined by its ecological status and chemical status, whichever is worse. Waters are ranked in one of five status classes, High, Good, Moderate, Poor and Bad. The WFD requires measures to ensure waters achieve at least 'Good Status' by specified period and that their current status does not deteriorate

The Limerick Dock Water Body Status Report, a copy of which is in Appendix 1, states that the water overall status of is 'Good', with a High status for Biochemical Oxygen Demand, nutrients (phosphate and nitrogen) and dissolved oxygen. However, the overall chemical status is classified as 'Fail' and the water body is 'At Risk' of not achieving its restoration objective of reducing chemical pollution by 2021.

The risk assessment was prepared in 2008 and at that time the primary pressure on water quality identified in the Shannon Transitional and Coastal WMU Plan was combined sewer overflows and wastewater treatment plant overflows. Since then, the completion of the Limerick Main Drainage Scheme has significantly reduced the pressures on the Limerick Dock Water Body

The Waste Licence requires GES to monitor the quality of the surface water at specified locations monthly. These include the outlet from the interceptors (FE 1A) and in the receiving drain up (WS-9) and downstream (WS-10) of the discharge point. The locations

are shown on Figure 2.2 As the discharge is dependant on rainfall it is not always possible to collect samples at monthly intervals.

The monitoring parameters include pH, electrical conductivity, total suspended solids (TSS), ammonia, biochemical oxygen demand (BOD), Fats Oils and Grease (FOG), Mineral Oil, Total Organic Carbon (TOC) and dissolved metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc).

The Waste Licence does not specify any emission limit values (ELVs) for the discharge, GES developed proposed ELVs for ammonia, BOD Mineral Oil and TSS, however these have not yet been agreed by the EPA. The monitoring results for 2012 are presented in Table 2.1

Table 2.1 Water Quality Range 2012

Parameter	Units	WS9	FE1A	WS10	ELV	EQS
pH	pH units	7.24-8.28	6.41-7.76	6.82-8.24	-	
BOD	mg/l	1-7	37-176	2-89	*25*	*1.5*
TSS	mg/l	1-12	50-130	2-51	*60*	
Ammonia	mg/l	0.27-1	0.14-3.64	0.04-<1	*4*	*0.065*
FOG	mg/l	<0.01-<1	0.29-17.2	<0.01,3.3	-	-
Mineral Oils	mg/l	<0.01-<1	<0.01-2.03	<0.01-<7	*5*	
TOC	mg/l	3.57-18	22.63-48	4.25-20	-	-
Arsenic	ug/l	0.001-3	0.002-5	0.001<3		*25*
Cadmium	ug/l	<0.03-0.5	>0.03-0.02	0-<1	-	*5*
Chromium	ug/l	<1.5-2	0.5-2.4	0.2-<1.5	-	*30*
Copper	ug/l	<0.2-13	<0.2-16	<0.2-13	-	*30*
Mercury	ug/l	<0.0001-1	<0.0001-<1	<0.0001-<1	-	*1*
Nickel	ug/l	<0.2-2	<0.2-14.1	<0.2-2.4	-	*20*
Lead	ug/l	0.2-<2	0.2-<5	<0.2-<5	-	*10*
Zinc	ug/l	<0.2-11	<0.2-47.5	<0.2-15	-	*100*

For those parameters for which ELVs have not been established the Environmental Quality Standards (EQS) specified for 'Good Status' in the Environmental Objectives (Surface Water) Regulations 2009 (S.I. No.272 of 2009) are provided. The EQS are not emission

limit values, but are the concentrations that must be achieved in a water body, taking into consideration the available assimilative capacity, if the water body is to meet the objectives set for the water body.

The monitoring indicates that, with the exception of BOD and TSS, all of the parameters are below the proposed ELV and significantly below the EQS. In particular mineral oils have never been detected. It is noted that the BOD and ammonia levels in the drain upstream of the discharge point exceed the EQS.

In 2012, GES conducted an extensive CCTV survey of the surface water drainage system. The survey identified a number of defects in the surface water lines, some small cracks in the first chamber of the interceptor and further cracks in the pipeline connecting the final chamber of the interceptors to the discharge point. These defects were repaired in May 2012.

2.4.2 Foul Water

Sanitary wastewater and wastewater from the vehicle wash area is treated in to the on-site Klargester Biodisc wastewater treatment plant. The vehicle wastewater passes through a grit trap and oil interceptor before connecting to the Klargester. Sanitary wastewater from the neighbouring Cussen Crane Hire Yard is also connected to the Kalrgester. The treated effluent discharges to a percolation area and the quality of the discharge is monitored in accordance with the requirements of the Waste Licence.

In 2012 GES commissioned a detailed assessment of the operation of the treatment plant. The assessment established that the average daily discharge to the percolation area is 0.4m3/day. Taking into consideration rainfall on the percolation area, the total hydraulic loading is 0.483m3/day. The effluent quality monitoring has established that the quality meets the recommended minimum performance standards set by the EPA and are within the manufacturer's design standards.

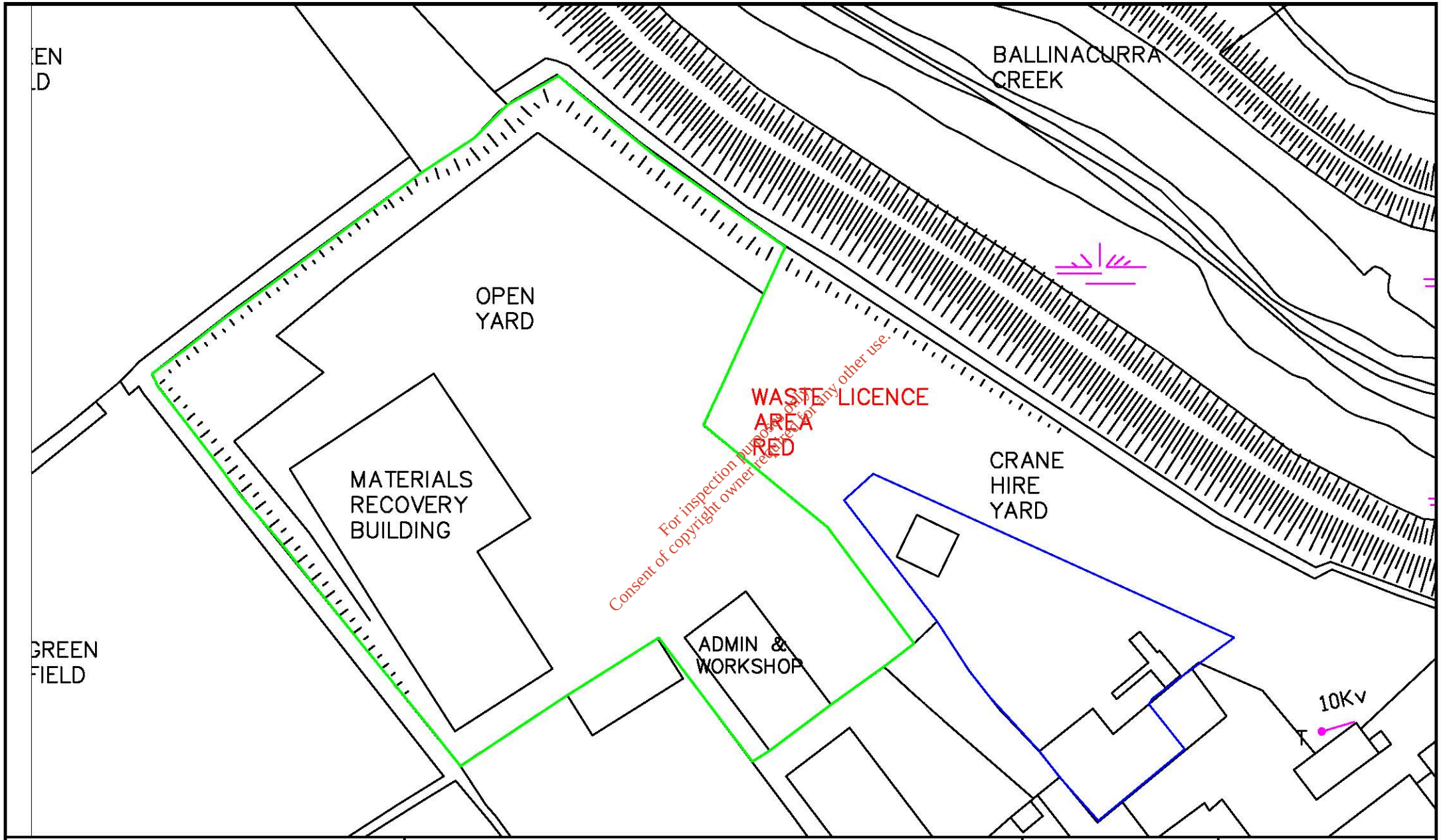
It is a condition of the waste licence that discharge foul water and sewage from the site must be to the Council's foul sewer, following the completion of the Limerick Main Drainage Scheme, subject to the approval of the Sanitary Authority-Limerick City Council.

In 2009, the City Council gave its approval in principle to the connection to the municipal wastewater treatment plant, however due to difficulties in obtaining way leaves to install the sewer line, the connection could not be completed at that time. GES is currently engaged with both the City and County Councils regarding the connection and the necessary wayleaves and it is expected that the connection will be completed by ??? Following this the on-site wastewater treatment plant will be decommissioned.

2.5 Proposed Development

GES intends to increase the amount of waste that can be accepted to 130,000 tonnes/year. The proposed increase is to allow GES compete for business in domestic and commercial waste collection market and offer waste treatment services to authorised waste collectors in the Mid West and adjoining Regions.

There will be no change to either the types of waste accepted, or the way the waste is handled, processed and stored. The only change will be an increase in the number of vehicles that bring the unprocessed waste to the site and remove the processed materials.



O' Callaghan Moran & Associates.
Granary House, Rutland Street,
Cork, Ireland.
Tel. (021) 4321521 Fax. (021) 4321522
email : info@ocallaghanmoran.com

CLIENT

Greenstar Environmnetal Services Ltd

TITLE

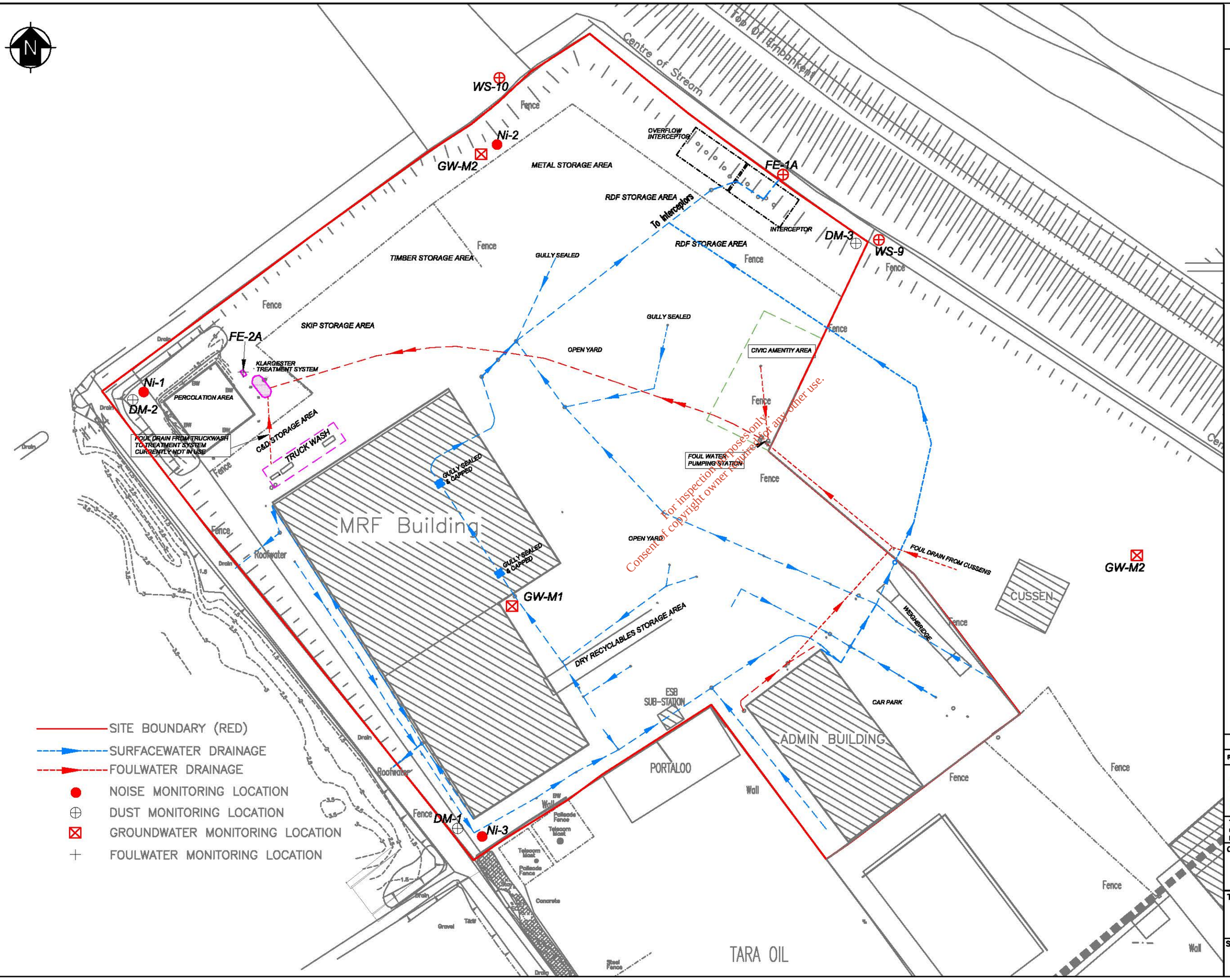
WASTE LICENCE AREA

details

Figure No.

2.1

SCALE	REV.
1:750 A4	A



NOTES

Monitoring locations
Grid references
Eastings Northings

DM-1	*154913, 155617*
DM-2	*154842, 155714*
DM-3	*155003, 155750*
Ni-1	*154840, 155712*
Ni-2	*154920, 155745*
Ni-3	*154910, 155618*
FE-1A	*154974, 155769*
WS-9	*155003, 155750*
WS-10	*154922, 155776*
FE-2A	*154858, 155720*
GW-M1	*154923, 155667*
GW-M2	*154920, 155770*
GW-M3	*155049, 155684*

REV	DATE	DESCRIPTION	DRN	CHKD	APP
A	02/05/13	PRELIMINARY ISSUE	MW	JOC	**

O' Callaghan Moran & Associates.
Granary House, Rutland Street,
Cork, Ireland.
Tel. (021) 4321521 Fax. (021) 4321522
email : ocm@indigo.ie

CLIENT

GES Ltd

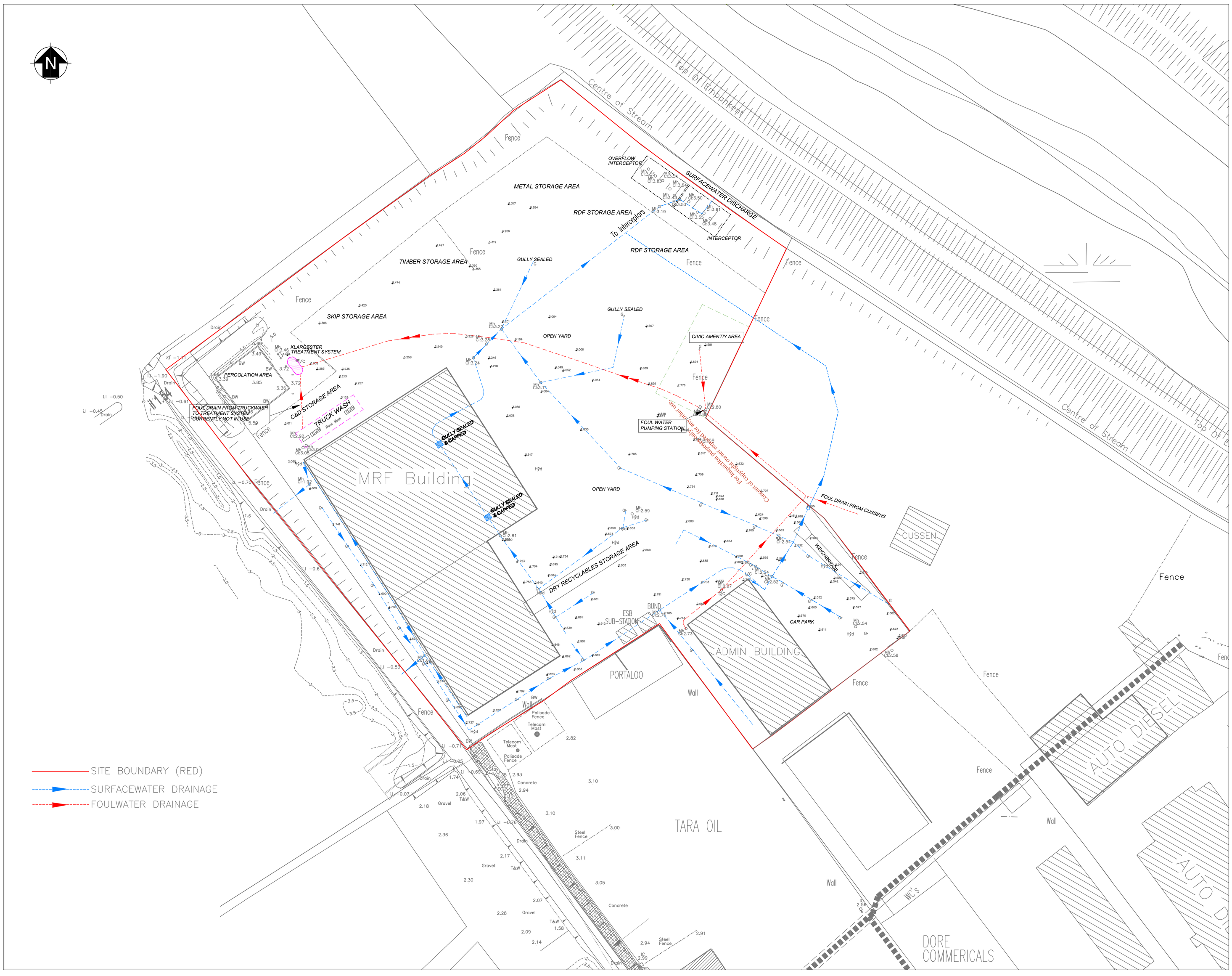
TITLE

GES Limerick
Monitoring LocationS
W0082-02

SCALE	DRAWING No.	REV.
NTS A3	2.2	A

DOS Filename : *********

A1



NOTES

REV	DATE	DESCRIPTION	DRN	CHKD	APP
A	01/05/13	PRELIMINARY ISSUE	MW	JOC	**

O' Callaghan Moran & Associates.
Granary House, Rutland Street,
Cork, Ireland.
Tel. (021) 4321521 Fax. (021) 4321522
email : info@ocallaghanmoran.com

CLIENT

GES Limerick

TITLE

SITE LAYOUT & DRAINAGE

SCALE	DRAWING No.	REV.
1:500 A1	002	A

DOS Filename : ********

3. NATURA 2000 SITES

SACs are selected for the conservation and protection of habitats listed on Annex I and species (other than birds) listed on Annex II of the Habitats Directive, and their habitats. The habitats on Annex I require special conservation measures. SPAs are selected for the conservation and protection of bird species listed on Annex I of the Birds Directive and regularly occurring migratory species, and their habitats, particularly wetlands. The selected habitats and species are termed Qualifying Interests

A statement of Conservation Objectives is prepared for each designated site which identifies the qualifying interests or conservation features. The Conservation Objectives are intended to ensure that the relevant habitats and species present on a site are maintained, and where necessary restored, at a Favourable Conservation Status.

Favourable Conservation Status of a habitat, as defined in 2011 Birds and Natural Habitats Regulations, is when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable

Conservation Status of a species is when:

- the Favourable population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats,
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

A list of designated Natura 2000 sites within 15 km of the facility is given in Table 3.1

Table 3.1. Natura 2000 Sites Within 15 km of the AES Facility

Site	Code	Distance
SAC		
Lower River Shannon	002165	400m to the north of the site.
Glenorma Wood	1013	11.4 km to the north east
Ratty River Cave	2316	14.5 km to the north east
Danes Hole Poulnalecka	0030	15 km to the north
Tory Hill	0439	13 km to the south
Askeaton Fen Complex	002279	14km to the south west
SPA		
River Shannon & River Fergus	004077	400 m to the north of the site

3.1 Natura 2000 Sites Potentially Affected by the Project

The facility is not located in or immediately adjacent to a Natura 2000 Site. The closest Natura 2000 Sites are the Lower River Shannon SAC and the River Shannon & River Fergus SPA, which are 400m to the north.

Stormwater run-off from the site discharges to Bunlickey Lake which is in the River Shannon & River Fergus SPA and is hydraulically connected to the River Shannon. The remaining Sites are between 10 and 15 km from the facility and there is no pathway by which the current and proposed site activities can impact on these Sites

3.2 Lower Shannon SAC

The Site Synopsis for the Lower Shannon SAC that lists the full Qualifying Interests are in Appendix 2, and the Conservation Objective are in Appendix 3 and the information is summarised below.

Qualifying Interests

The Lower Shannon SAC is selected for the following habitats listed in Annex 1 of the Habitats Directive: lagoons and alluvial wet woodlands, floating river vegetation, *Molinia* meadows, estuaries, tidal mudflats, Atlantic salt meadows, Mediterranean salt meadows, *Salicornia* mudflats, sand banks, perennial vegetation of stony banks, sea cliffs, reefs and large shallow inlets and bays all habitats

The site is also selected for the following species listed in Annex II of the Directive – Bottle Nosed Dolphin, Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Atlantic Salmon and Otter.

Conservation Objectives

The conservation objectives are t maintain or restore the favorable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected??

- [1029] Freshwater pearl mussel *Mrgaritifera margaritifera*
- [1095] sea lamprey *Pertromyzon marinus*
- [1096] Brook Lamprey *lampretra planeri*
- [1099] River Lamprey *Lampetra fluviatilis*
- [1106] Atlantic Salmon *Salmo salar* (only in freah water)
- [1110] sandbanks which are slightly covered by sea water all the time
- [1130] Estuaries
- [1140] Mudflats and sandflats not covered by seawater at low tide
- [1150] *Coastal lagoons
- [1160] Large shallow inlets and bays

- [1170] Reefs
- [1220] Perennial vegetation of stony banks
- [1230] vegetated sea cliffs of the atlantic and Baltic coasts
- [1310] *Salicornia* and other annuals colonizing mud and sand
- [1330] Atlantic salt meadows (*glauco-puccinellietalia maritimae)*
- [1349] Bottlenose Dolphin *Tursiops truncatas*
- [1355] Otter *lutra lutra*
- [1410] Mediterranean salt meadows (*Juncetalia maritime)*
- [3260] water courses of plain to montane levels with the *ranunculion fluitantis* and *Callitricho- Batrachion vegetation*
- [91EO] *Alluvial forests with Alnus gutinosa and Fraxinus excelsior (Alno-padion, alnion incanae, salicion albae)

3.3 River Shannon & River Fergus SPA

The Site Synopsis and for the River Shannon & River Fergus SPA listing the Qualifying Interests and the Conservation Objective are in Appendix 2 and are summarised below.

Qualifying Interests

The Shannon and Fergus Estuaries SPA comprises the entire estuarine habitat west of Limerick City and south of Ennis extending approximately 25 km west to Killadysert and Foynes on the north and south shores of the Shannon.

The Site is the most important coastal wetland site in the country and regularly supports in excess of 50,000 wintering waterfowl. Other species occurring include Common Cockle (*Cerastoderma edule*), Lugworm (*Arenicola marina*), polychaete *Nepthys hombergii*, gastropod *Hydrobia ulvae* and the crustacean *Corophium volutator*. Eelgrass (*Zostera* spp.) is present in places, along with green algae (e.g. *Ulva* spp. and *Enteromorpha* spp.). The Site also has extensive intertidal flats, which is a listed habitat in Annex 1 of the Habitats Directive.

Conservation Objectives

The conservation objectives are to maintain or restore the favorable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SPA has been selected:

- [A017] Cormorant *phalacrocorax carba*
- [A038] Whooper swan *Cygnus Cygnus*
- [A046] Light-bellied Brent Goose *Branta bernicla hrota*
- [A048] Shelduck *Tadorna tadorna*
- [A050] Wigeon *Anas Penelope*
- [A052] Teal *Anas crecca*
- [A054] Pintail *Anas acuta*
- [A056] Shovelor *Anas clypeata*
- [A062] Scaup *Aythya marila*
- [A137] Ringed Plover *chahrius hiaticula*
- [A140] golden plover *pluvialis apricaria*
- [A141] Grey plover *pluvialis apricaria*
- [A142] Lapwing *Vanellus vanellus*
- [A143] Knot *Calidris canuts*
- [A149] Dunlin *Calidris alpine*
- [A156] Blacktailed Godwit *Limosa limosa*
- [A157] Bar-tailed godwit *limosa lapponica*
- [A160] Curlew *Numenius arquata*
- [A162] Redshank *Tringa tetanus*
- [A164] Greenshank *Trina nebularia*
- [A179] Black headed Gull *Chroicocephalus ridibundus*
- [A999] Wetlands

4. LIKELY EFFECTS

4.1 Proposed Development

The proposed increase in the annual waste throughput will not require the expansion of the site, the construction/provision of any new buildings/structures, or any alteration to the existing site layout and operations.

There will be no change to the waste acceptance and operational hours and it will not require the use of any new raw materials that have the potential to cause contamination. It will not result in any new or additional abstraction from groundwater or surface water. It will not give rise to any new emissions to surface water or sewer, nor will it contribute to increased noise, dust and odour emissions or illumination.

4.2 Direct Impacts

The GES facility is not located within any designated Natura 2000 Site and therefore the proposed changes will not result in any direct habitat loss or fragmentation of either the Lower River Shannon SAC or the River Shannon and River Fergus Estuaries SPA.

These Natura 2000 Sites are approximately 400m to the north and west of the GES facility. The facility is extensively developed and almost entirely covered with paving and buildings, which means it does not support the species for which the Natura 2000 sites were selected.

Based on the above, the project does not present any risk of a direct adverse affect on either the habitats or species for which the Natura 2000 Sites were selected.

4.3 Indirect Impacts

There is the potential for indirect impacts on the Natura 2000 Sites, as surface water run-off from the yards and roofs discharges to the Bunlickey Lake, which is part of the River Shannon & Fergus SPA and hydraulically connected to the River Shannon via sluices. However, the project will not result in any changes to either the volume or quality of the surface water run-off from the facility and therefore will have no impact of the Natural 2000 Sites.

Disturbance impacts are considered with regard to the potential for effects on the Annex II species for which the Lower River Shannon SAC is designated and the bird species listed as special conservation interests of the River Shannon and River Fergus Estuaries SPA.

The GES facility is located within an industrial estate and is 2km west of Limerick Docks. There are extensive and ongoing traffic movements, artificial lighting and noise emissions associated with both areas. It must be noted that the presence of the listed species of conservation interest within the environs of Limerick City indicates they have become acclimatised to the background levels of disturbance.

The project does not require the provision of any new plant and equipment or changes to the operational hours therefore there will be no additional sources of disturbance to the listed species present in both the SAC and SPA.

4.4 Cumulative Effects

Recent projects completed within the SAC include the River Fergus Lower (Ennis) Drainage Scheme and maintenance works carried out by the OPW on upstream of Limerick City and on the River Maigue at Adare in 2010. Maintenance works are being undertaken in the Abbey River corridor which will include dredging from the Park Canal confluence to the confluence with the Shannon.

Point and diffuse sources of water pollution in the urban area comprise a cumulative pressure on the conservation interests of the SAC, where Annex II aquatic species are considered to be under stress due to poor background water quality. The proposed increase in the amount of waste accepted will not result in any changes to either the volume or quality of the surface water run-off

that therefore and will not contribute to any significant cumulative impact on the Natura 2000 Sites

The proposed changes does not involve the construction of new buildings, the introduction of new plant an equipment or the changes to the operational hours, and therefore will not add to the cumulative disturbance effects on the Natura 2000 Sites.

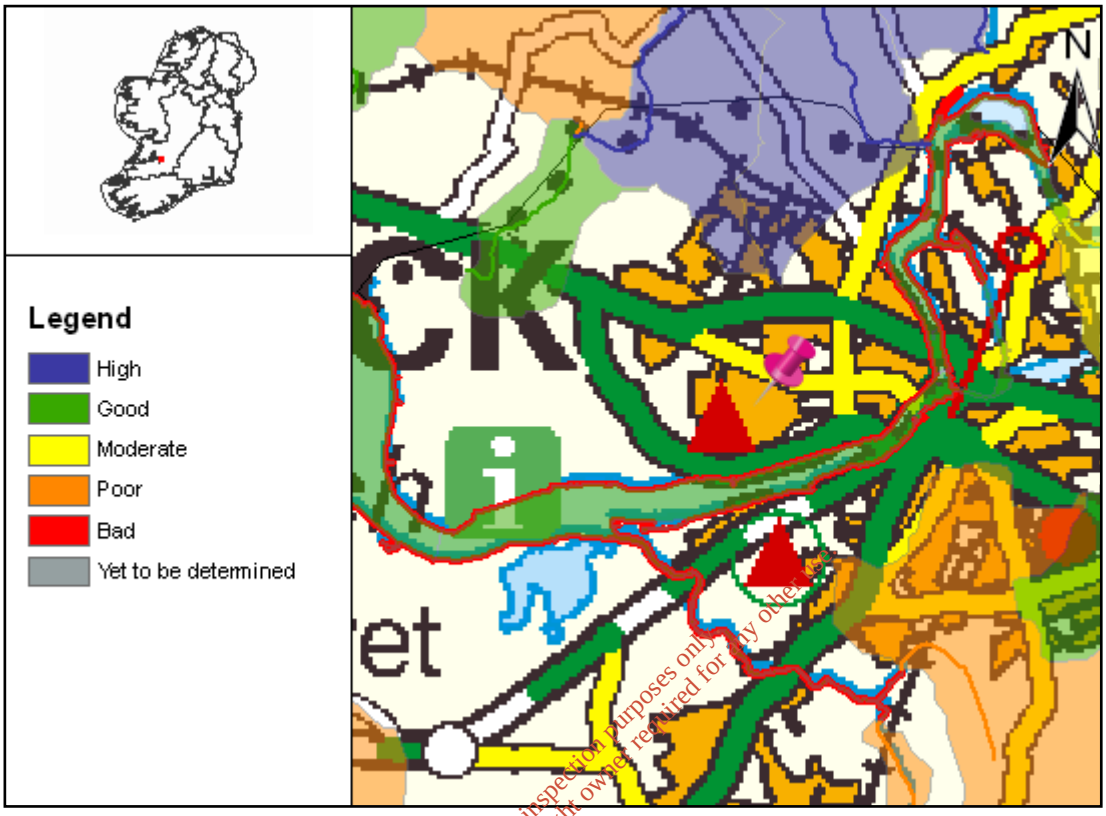
5. SCREENING CONCLUSION & STATEMENT

The proposed increase in the annual waste throughput will not result in any new or additional emissions/disturbance that could present a significant risk to the Qualifying Interests and Conservation Objectives of either the Lower Shannon SAC or the Shannon and Fergus Estuaries SPA. Therefore a Natura Impact Statement is not required.

APPENDIX 1

water matters
'our Plan'

Full Report for Waterbody Limerick Dock



River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The WaterMaps viewer is an integral part of the River Basin Management Plan and provides access to information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland.

The following report provides summary plan information about the selected waterbody (indicated by the pin in the map above) relating to its status, risks, objectives, and measures proposed to retain status where this is adequate, or improve it where necessary. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters], and coastal waters), or to groundwaters. Other relevant information not included in this report can be viewed using the WaterMaps viewer, including areas listed in the Register of Protected Areas.

You will find brief notes at the bottom of some of the individual report sheets that will help you in interpreting the information presented. More detailed information can be obtained in relation to all aspects of the RBMPs at www.wfdireland.ie.

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

Summary Information:

Water Management Unit:	N/A
WaterBody Category:	Transitional Waterbody
WaterBody Name:	Limerick Dock
WaterBody Code:	IE_SH_060_0900
Overall Status:	Good
Overall Objective:	Restore 2021
Overall Risk:	1a At Risk
Heavily Modified:	Yes
	Report data based upon final RBMP, 2009-2015.

shannon river basin district

The information provided above is a summary of the principal findings related to the selected waterbody. Further details and explanation of individual elements of the report are outlined in the following pages.

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

Status Report

Water Management Unit:	N/A
WaterBody Category:	Transitional Waterbody
WaterBody Name:	Limerick Dock
WaterBody Code:	IE_SH_060_0900
Overall Status Result:	Good
Heavily Modified:	Yes

shannon river basin district

	Status Element Description	Result
	Status information	
DIN	Dissolved Inorganic Nitrogen status	Good
MRP	Molybdate Reactive Phosphorus status	High
DO	Dissolved oxygen as per cent saturation status	High
BOD	Biochemical Oxygen Demand (5-days) status	High
PHY	Macroalgae - phytobiomass status	High
OPP	Macroalgae - opportunistic algae status	N/A
RSL	Macroalgae - reduced species list status	N/A
ANG	Angiosperms - Seagrass and Saltmarsh status	N/A
BIN	Benthic Invertebrates status	N/A
FIS	Fish status	Good
HYD	Hydrology status	N/A
MOR	Morphology status	Less than Good (pHMWB)
SP	Specific Pollutant Status	Pass
PAS	Overall protected area status	At least good
ES	Ecological Status	Good
CS	Chemical Status	Fail
SWS	Surface Water Status	N/A
EXT	Extrapolated status	N/A
DON	Donor water bodies	N/A

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

n/a - not assessed

Status
By 'Status' we mean the condition of the water in the waterbody. It is defined by its chemical status and its ecological status, whichever is worse. Waters are ranked in one of 5 status classes: High, Good, Moderate, Poor, Bad. However, not all waterbodies have been monitored, and in such cases the status of a similar nearby waterbody has been used (extrapolated) to assign status. If this has been done the first line of the status report shows the code of the waterbody used to extrapolate.

You can read more about status and how it is measured in our RBMP Document Library at www.wfdireland.ie (Directory 15 Status).

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

Risk Report

Water Management Unit: N/A

WaterBody Category: Transitional Waterbody

WaterBody Name: Limerick Dock

WaterBody Code: IE_SH_060_0900

Overall Risk Result: 1a At Risk

Heavily Modified: Yes

shannon river basin district

	Risk Test Description		Risk
	Hydrology		
THY1	Water balance - Abstraction	2b	Not At Risk
	Marine Direct Impacts		
TMDI 1	Dangerous Substances		N/A
TMDI 2	OSPAR		N/A
TMDI 3	UWWT Regs Designations		N/A
TMDI O	Marine Direct Impacts Overall - Worst Case		N/A
	Morphological Risk Sources		
TM1	Channelisation		N/A
TM2	Deposition		N/A
TM3	Coastal Defences		N/A
TM4	Impoundments		N/A
TM5a	Built Structures - Port Tonnage		N/A
TM5b	Built Structures - Industrial Intakes		N/A
TM6	Intensive Landuse		N/A
TMO	Morphology Overall - Worst Case		N/A
TMO	Overall (MIMAS) Morphological Risk - Worst Case (2008)		N/A
	Overall Risk		
RA	Transitional Overall - Worst CaseOverall (MIMAS) Morphological Risk - Worst Case (2008)	1a	At Risk
	Point / MDI Worst Case		
TPOL	Worst case of Point Overall and MDI OverallOverall (MIMAS) Morphological Risk - Worst Case (2008)	1a	At Risk

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

	Point Risk Sources		
TP1	WWTPs (2008)	2b	Not At Risk
TP2	CSOs	1a	At Risk
TP3	IPPCs (2008)	2b	Not At Risk
TP4	Section 4s (2008)	2b	Not At Risk
TP5	WTPs/Mines/Quarries/Landfills		N/A
TPO	Overall Risk from Point Sources - Worst Case (2008)	1a	At Risk

Risk
By 'risk' we mean the risk that a waterbody will not achieve good ecological or good chemical status/potential at least by 2015. To examine risk the various pressures acting on the waterbody were identified along with any evidence of impact on water status. Depending on the extent of the pressure and its potential for impact, and the amount of information available, the risk to the water body was placed in one of four categories: 1a at risk; 1b probably at risk; 2a probably not at risk; 2b not at risk. Note that '2008' after the risk category means that the risk assessment was revised in 2008. All other risks were determined as part of an earlier risk assessment in 2005.

You can read more about risk assessment in our 'WFD Risk Assessment Update' document in the RBMP document library, and other documents at www.wfdireland.ie (Directory 31 Risk Assessments).

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

Objectives Report

Water Management Unit: N/A

WaterBody Category: Transitional Waterbody

WaterBody Name: Limerick Dock

WaterBody Code: IE_SH_060_0900

Overall Objective: Restore 2021

Heavily Modified: Yes

shannon river basin district

	Objectives Description	Result
	Extended timescale information	
E1	Extended timescales due to time requirements to upgrade WWTP discharges	No Status
E2	Extended timescales due to delayed recovery of chemical pollution and chemical status failures	2021
E3	Extended timescales due to winter dissolved nitrogen exceedances	No Status
E4	Extended timescales due to time requirements for status recovery	No Status
E5	Extended timescales from Northern Ireland Environment Agency	No Status
E0V	Overall extended timescale - combination of all extended timescales fields	2021
	Objectives information	
OB1	Prevent deterioration objective	No Status
OB2	Restore at least good status objective	No Status
OB3	Reduce chemical pollution objective	Restore 2021
OB4	Protected areas objective	Protect
OBO	Overall objectives	Restore 2021

Extended timescales
Extended timescales have been set for certain waters due to technical, economic, environmental or recovery constraints. Extended timescales are usually of one planning cycle (6 years, to 2021) but in some cases are two planning cycles (to 2027).

Objectives
In general, we are required to ensure that our waters achieve at least good status/potential by 2015, and that their status does not deteriorate. Having identified the status of waters (this is given earlier in this report), the next stage is to set objectives for waters. Objectives consider waters that require protection from deterioration as well as waters that require restoration and the timescales needed for recovery. Four default objectives have been set initially:-

Prevent Deterioration
Restore Good Status
Reduce Chemical Pollution
Achieve Protected Areas Objectives

These objectives have been refined based on the measures available to achieve them, the latter's likely effectiveness, and consideration of cost-effective combinations of measures. Where it is considered necessary extended deadlines have been set for achieving objectives in 2021 or 2027.

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

water matters
'our Plan'

Measures Report

Water Management Unit: N/A

WaterBody Category: Transitional Waterbody

WaterBody Name: Limerick Dock

WaterBody Code: IE_SH_060_0900

Heavily Modified: Yes

shannon river basin district

	Measures Description	Applicable
BC	Total number of basic measures which apply to this waterbody	16
BW	Directive - Bathing Waters Directive	No
BIR	Directive - Birds Directive	Yes
HAB	Directive - Habitats Directive	Yes
MAE	Directive - Major Accidents and Emergencies Directive	Yes
EIA	Directive - Environmental Impact Assessment Directive	Yes
UWT	Directive - Urban Waste Water Treatment Directive	No
PPP	Directive - Plant Protection Products Directive	Yes
NIT	Directive - Nitrates Directive	Yes
IPC	Directive - Integrated Pollution Prevention Control Directive	Yes
POI	Other Stipulated Measure - Control of point source discharges	Yes
DIF	Other Stipulated Measure - Control of diffuse source discharges	Yes
PS	Other Stipulated Measure - Control of priority substances	Yes
MOD	Other Stipulated Measure - Controls on physical modifications to surface waters	Yes
OA	Other Stipulated Measure - Controls on other activities impacting on water status	Yes
AP	Other Stipulated Measure - Prevention or reduction of the impact of accidental pollution incidents	Yes
TP1	WSIP - Agglomerations with treatment plants requiring capital works	No
TP2	WSIP - Agglomerations with treatment plants requiring further investigation prior to capital works	No
TP3	WSIP - Agglomerations requiring the implementation of actions identified in Shellfish PRPs	No
TP4	WSIP - Agglomerations with treatment plants requiring improved operational performance	No
TP5	WSIP - Agglomerations requiring investigation of CSOs	No
TP6	WSIP - Agglomerations where exisitng treatment capacity is currently adequate but predicted loadings would result in overloading	No
OTS	On-site waste water treatment systems	Yes
SHE	Shellfish Pollution Reduction Plan	No
IPR	IPPC licences requiring review	Yes
WPR	Water Pollution Act licences requiring review	Yes

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

HQW	Protect high quality waters	No

Measures

Measures are necessary to ensure that we meet the objectives set out in the previous page of this report. Many measures are already provided for in national legislation and must be implemented. Other measures have been recently introduced or are under preparation. A range of additional potential measures are also being considered but require further development. Any agreed additional measures can be introduced through the update of Water Management Unit Action Plans during the implementation process.

You can read more about Basic Measures in 'River Basin Planning Guidance' and in other documents in our RBMP Document Library at www.wfdireland.ie.

Date Reported to Europe:July 2010

Date Report Created 11/07/2012

APPENDIX 2

SITE SYNOPSIS

SITE NAME : LOWER RIVER SHANNON

SITE CODE : 002165

This very large site stretches along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of some 120 km. The site thus encompasses the Shannon, Feale, Mulkear and Fergus Estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. The Shannon and Fergus flow through Carboniferous limestone as far as Foynes, but west of Foynes Namurian shales and flagstones predominate (except at Kerry Head, which is formed from Old Red Sandstone). The eastern sections of the Feale catchment flow through Namurian Rocks and the western stretches through Carboniferous Limestone. The Mulkear flows through Lower Palaeozoic Rocks in the upper reaches before passing through Namurian Rocks, followed by Lower Carboniferous Shales and Carboniferous Limestone. The Mulkear River itself, immediately north of Pallas Green, passes through an area of Rhyolites, Tuffs and Agglomerates. Rivers within the sub-catchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Breanagh and Glenacarney. Rivers within the sub-catchment of the Mulkear include the Killeenagarriff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.

The site is a candidate SAC selected for lagoons and alluvial wet woodlands, both habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for floating river vegetation, *Molinia* meadows, estuaries, tidal mudflats, Atlantic salt meadows, Mediterranean salt meadows, *Salicornia* mudflats, sand banks, perennial vegetation of stony banks, sea cliffs, reefs and large shallow inlets and bays all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive – Bottle-nosed Dolphin, Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Atlantic Salmon and Otter.

The Shannon and Fergus Estuaries form the largest estuarine complex in Ireland. They form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon estuary (considered to be a line across the narrow strait between Kilcredaun Point and Kilconly Point). Within this main unit there are several tributaries with their own 'sub-estuaries' e.g. the Deel River, Mulkear River, and Maigue River. To the west of Foynes, a number of small estuaries form indentations in the predominantly hard coastline, namely Poulnasherry Bay, Ballylongford Bay, Clonderalaw Bay and the Feale or Cashen River Estuary.

Both the Fergus and inner Shannon estuaries feature vast expanses of intertidal mudflats, often fringed with saltmarsh vegetation. The smaller estuaries also feature mudflats, but have their own unique characteristics, e.g. Poulnasherry Bay is stony and unusually rich in species and biotopes. Plant species are typically scarce on the mudflats, although there are some Eel-grass beds (*Zostera* spp.) and patches of green

algae (e.g. *Ulva* sp. and *Enteromorpha* sp.). The main macro-invertebrate community, which has been noted from the inner Shannon and Fergus estuaries, is a *Macoma-Scrobicularia-Nereis* community.

In the transition zone between mudflats and saltmarsh, specialised colonisers of mud predominate: swards of Common Cord-grass (*Spartina anglica*) frequently occur in the upper parts of the estuaries. Less common are swards of Glasswort (*Salicornia europaea* agg.). In the innermost parts of the estuaries, the tidal channels or creeks are fringed with species such as Common Reed (*Phragmites australis*) and Club-rushes (*Scirpus maritimus, S. tabernaemontani* and *S. triquetrus*). In addition to the nationally rare Triangular Club-rush (*Scirpus triquetrus*), two scarce species are found in some of these creeks (e.g. Ballinacurra Creek): Lesser Bulrush (*Typha angustifolia*) and Summer Snowflake (*Leucojum aestivum*).

Saltmarsh vegetation frequently fringes the mudflats. Over twenty areas of estuarine saltmarsh have been identified within the site, the most important of which are around the Fergus Estuary and at Ringmoylan Quay. The dominant type of saltmarsh present is Atlantic salt meadow occurring over mud. Characteristic species occurring include Common Saltmarsh Grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea-milkwort (*Glaux maritima*), Sea Plantain (*Plantago maritima*), Red Fescue (*Festuca rubra*), Creeping Bent (*Agrostis stolonifera*), Saltmarsh Rush (*Juncus gerardi*), Long-bracted Sedge (*Carex extensa*), Lesser Sea-spurrey (*Spergularia marina*) and Sea Arrowgrass (*Triglochin maritima*). Areas of Mediterranean salt meadows, characterised by clumps of Sea Rush (*Juncus maritimus*) occur occasionally. Two scarce species are found on saltmarshes in the vicinity of the Fergus Estuary: a type of robust Saltmarsh-grass (*Puccinellia foucaudii*), sometimes placed within the compass of Common Saltmarsh-grass (*Puccinellia maritima*) and Hard-grass (*Parapholis strigosa*).

Saltmarsh vegetation also occurs around a number of lagoons within the site. The two which have been surveyed as part of a National Inventory of Lagoons are Shannon Airport Lagoon and Cloonconeen Pool. Cloonconeen Pool (4-5 ha) is a natural sedimentary lagoon impounded by a low cobble barrier. Seawater enters by percolation through the barrier and by overwash. This lagoon represents a type which may be unique to Ireland since the substrate is composed almost entirely of peat. The adjacent shore features one of the best examples of a drowned forest in Ireland. Aquatic vegetation in the lagoon includes typical species such as Beaked Tasselweed (*Ruppia maritima*) and green algae (*Cladophora* sp.). The fauna is not diverse, but is typical of a high salinity lagoon and includes six lagoon specialists (*Hydrobia ventrosa, Cerastoderma glaucum, Lekanesphaera hookeri, Palaemonetes varians, Sigara stagnalis* and *Enochrus bicolor*). In contrast, Shannon Airport Lagoon (2 ha) is an artificial saline lake with an artificial barrier and sluiced outlet. However, it supports two Red Data Book species of Stonewort (*Chara canescens* and *Chara cf. connivens*).

Most of the site west of Kilcredaun Point/Kilconly Point is bounded by high rocky sea cliffs. The cliffs in the outer part of the site are sparsely vegetated with lichens, Red Fescue, Sea Beet (*Beta vulgaris*), Sea Campion (*Silene maritima*), Thrift and Plantains (*Plantago* spp.). A rare endemic Sea Lavender (*Limonium recurvum* subsp.

pseudotranswallinum) occurs on cliffs near Loop Head. Cliff-top vegetation usually consists of either grassland or maritime heath. The boulder clay cliffs further up the estuary tend to be more densely vegetated, with swards of Red Fescue and species such as Kidney Vetch (*Anthyllis vulneraria*) and Bird's-foot Trefoil (*Lotus corniculatus*).

The site supports an excellent example of a large shallow inlet and bay. Littoral sediment communities in the mouth of the Shannon Estuary occur in areas that are exposed to wave action and also in areas extremely sheltered from wave action. Characteristically, exposed sediment communities are composed of coarse sand and have a sparse fauna. Species richness increases as conditions become more sheltered. All shores in the site have a zone of sand hoppers at the top and below this each of the shores has different characteristic species giving a range of different shore types in the pcSAC.

The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. Known sites are steeply sloping and show a good zonation down the shore. Well developed lichen zones and littoral reef communities offering a high species richness in the sublittoral fringe and strong populations of *Paracentrotus lividus* are found. The communities found are tolerant to sand scour and tidal streams. The infralittoral reefs range from sloping platforms with some vertical steps to ridged bedrock with gullies of sand between the ridges to ridged bedrock with boulders or a mixture of cobbles, gravel and sand. Kelp is very common to about 18m. Below this it becomes rare and the community is characterised by coralline crusts and red foliose algae.

Other coastal habitats that occur within the site include the following:

- stony beaches and bedrock shores - these shores support a typical zonation of seaweeds (*Fucus* spp., *Ascophyllum nodosum* and kelps).
- shingle beaches - the more stable areas of shingle support characteristic species such as Sea Beet, Sea Mayweed (*Matricaria maritima*), Sea Campion and Curled Dock (*Rumex crispus*).
- Sandbanks which are slightly covered by sea water at all times – there is a known occurrence of sand/gravel beds in the area from Kerry Head to Beal Head.
- sand dunes - a small area of sand dunes occurs at Beal Point. The dominant species is Marram Grass (*Ammophila arenaria*).

Flowing into the estuaries are a number of tidal rivers.

Freshwater rivers have been included in the site, most notably the Feale and Mulkear catchments, the Shannon from Killaloe to Limerick (along with some of its tributaries, including a short stretch of the Kilmastulla River), the Fergus up as far as Ennis, and the Cloon River. These systems are very different in character: the Shannon being broad, generally slow-flowing and naturally eutrophic; the Fergus being smaller and alkaline; while the narrow, fast-flowing Cloon is acid in nature. The Feale and Mulkear catchments exhibit all the aspects of a river from source to mouth. Semi-natural habitats, such as wet grassland, wet woodland and marsh occur by the rivers, however, improved grassland is most common. One grassland type of

particular conservation significance, *Molinia* meadows, occurs in several parts of the site and the examples at Worldsend on the River Shannon are especially noteworthy. Here are found areas of wet meadow dominated by rushes and sedges and supporting a diverse and species-rich vegetation, including such uncommon species as Blue-eyed Grass (*Sisyrinchium bermudiana*) and Pale Sedge (*Carex pallescens*).

Floating river vegetation characterised by species of Water-crowfoot (*Ranunculus* spp.), Pondweeds (*Potamogeton* spp.) and the moss *Fontinalius antipyretica* are present throughout the major river systems within the site. The rivers contain an interesting bryoflora with *Schistidium alpicola* var. *alpicola* recorded from in-stream boulders on the Bilboa, new to county Limerick.

Alluvial woodland occurs on the banks of the Shannon and on islands in the vicinity of the University of Limerick. The woodland is up to 50m wide on the banks and somewhat wider on the largest island. The most prominent woodland type is gallery woodland where White Willow (*Salix alba*) dominates the tree layer with occasional Alder (*Alnus glutinosa*). The shrub layer consists of various willow species with sally (*Salix cinerea* ssp. *oleifolia*) and what appear to be hybrids of *S. alba* x *S. viminalis*. The herbaceous layer consists of tall perennial herbs. A fringe of Bulrush (*Typha* sp.) occurs on the riverside of the woodland. On slightly higher ground above the wet woodland and on the raised embankment remnants of mixed oak-ash-alder woodland occur. These are poorly developed and contain numerous exotic species but locally there are signs that it is invading open grassland. Alder is the principal tree species with occasional Oak (*Quercus robur*), Elm (*Ulmus glabra, U. procera*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and the shrubs Guelder-rose (*Viburnum opulus*) and willows. The ground flora is species-rich.

Woodland is infrequent within the site, however Cahiracon Wood contains a strip of old Oak woodland. Sessile Oak (*Quercus petraea*) forms the canopy, with an understorey of Hazel and Holly (*Ilex aquifolium*). Great Wood-rush (*Luzula sylvatica*) dominates the ground flora. Less common species present include Great Horsetail (*Equisetum telmeteia*) and Pendulous Sedge (*Carex pendula*).

In the low hills to the south of the Slievefelim mountains, the Cahernahallia River cuts a valley through the Upper Silurian rocks. For approximately 2km south of Cappagh Bridge at Knockanavar, the valley sides are wooded. The woodland consists of Birch (*Betula* spp.), Hazel, Oak, Rowan (*Sorbus aucuparia*), some Ash (*Fraxinus excelsior*) and Willow (*Salix* spp.). Most of the valley is not grazed by stock, and as a result the trees are regenerating well. The ground flora feature prominent Greater wood-rush and Bilberry (*Vaccinium myrtillus*) with a typical range of woodland herbs. Where there is more light available, Bracken (*Pteridium aquilinum*) features.

The valley sides of the Bilboa and Gortnageragh Rivers, on higher ground north east of Cappamore, support patches of semi-natural broadleaf woodland dominated by Ash, Hazel, Oak and Birch. There is a good scrub layer with Hawthorn, Willow, Holly and Blackthorn (*Prunus spinosa*) common. The herb layer in these woodlands is often open with a typically rich mixture of woodland herbs and ferns. Moss species diversity is high. The woodlands are ungrazed. The hazel is actively coppiced in places.

There is a small area of actively regenerating cut away raised bog at Ballyrorheen. It is situated approx. 5km north west of Cappamore Co. Limerick. The bog contains some wet areas with good moss (*Sphagnum*) cover. Species of particular interest include the Cranberry (*Vaccinium oxycoccos*) and the White Sedge (*Carex curta*) along with two other regionally rare mosses including *S. fimbriatum*. The site is being invaded by Birch (*Betula pubescens*) scrub woodland. Both commercial forestry and the spread of rhododendron has greatly reduced the overall value of the site.

A number of plant species that are Irish Red Data Book species occur within the site - several are protected under the Flora (Protection) Order, 1999:

- Triangular Club-rush (*Scirpus triquetrus*) - in Ireland this protected species is only found in the Shannon Estuary, where it borders creeks in the inner estuary.
- Opposite-leaved Pondweed (*Groenlandia densa*) - this protected pondweed is found in the Shannon where it passes through Limerick City.
- Meadow Barley (*Hordeum secalinum*) - this protected species is abundant in saltmarshes at Ringmoylan and Mantlehill.
- Hairy Violet (*Viola hirta*) - this protected violet occurs in the Askeaton/Foynes area.
- Golden Dock (*Rumex maritimus*) - noted as occurring in the River Fergus Estuary.
- Bearded Stonewort (*Chara canescens*) - a brackish water specialist found in Shannon Airport lagoon.
- Convergent Stonewort (*Chara connivens*) - presence in Shannon Airport Lagoon to be confirmed.

Overall, the Shannon and Fergus Estuaries support the largest numbers of wintering waterfowl in Ireland. The highest count in 1995-96 was 51,423 while in 1994-95 it was 62,701. Species listed on Annex I of the E.U. Birds Directive which contributed to these totals include: Great Northern Diver (3; 1994/95), Whooper Swan (201; 1995/96), Pale-bellied Brent Goose (246; 1995/96), Golden Plover (11,067; 1994/95) and Bar-tailed Godwit (476; 1995/96). In the past, three separate flocks of Greenland White-fronted Goose were regularly found but none were seen in 1993/94.

Other wintering waders and wildfowl present include Greylag Goose (216; 1995/96), Shelduck (1,060; 1995/96), Wigeon (5,976; 1995/96); Teal (2,319; 1995-96); Mallard (528; 1995/96), Pintail (45; 1995/96), Shoveler (84; 1995/96), Tufted Duck (272; 1995/96), Scaup (121; 1995/96), Ringed Plover (240; 1995/96), Grey Plover (750; 1995/96), Lapwing (24,581; 1995/96), Knot (800; 1995/96), Dunlin (20,100; 1995/96), Snipe (719, 1995/96), Black-tailed Godwit (1062; 1995/96), Curlew (1504; 1995/96), Redshank (3228; 1995/96), Greenshank (36; 1995/96) and Turnstone (107; 1995/96). A number of wintering gulls are also present, including Black-headed Gull (2,216; 1995/96), Common Gull (366; 1995/96) and Lesser Black-backed Gull (100; 1994/95). This is the most important coastal site in Ireland for a number of the waders including Lapwing, Dunlin, Snipe and Redshank. It also provides an important staging ground for species such as Black-tailed Godwit and Greenshank.

A number of species listed on Annex I of the E.U. Birds Directive breed within the site. These include Peregine Falcon (2-3 pairs), Sandwich Tern (34 pairs on Rat Island, 1995), Common Tern (15 pairs: 2 on Sturamus Island and 13 on Rat Island, 1995), Chough (14-41 pairs, 1992) and Kingfisher. Other breeding birds of note include Kittiwake (690 pairs at Loop Head, 1987) and Guillemot (4010 individuals at Loop Head, 1987)

There is a resident population of Bottle-nosed Dolphin in the Shannon Estuary consisting of at least 56-68 animals (1996). This is the only known resident population of this E.U. Habitats Directive Annex II species in Ireland. Otter, a species also listed on Annex II of this directive, is commonly found on the site.

Five species of fish listed on Annex II of the E.U. Habitats Directive are found within the site. These are Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Twaite Shad (*Allosa fallax fallax*) and Salmon (*Salmo salar*). The three lampreys and Salmon have all been observed spawning in the lower Shannon or its tributaries. The Fergus is important in its lower reaches for spring salmon while the Mulkear catchment excels as a grilse fishery though spring fish are caught on the actual Mulkear River. The Feale is important for both types. Twaite Shad is not thought to spawn within the site. There are few other river systems in Ireland which contain all three species of Lamprey.

Two additional fish of note, listed in the Irish Red Data Book, also occur, namely Smelt (*Osmerus eperlanus*) and Pollan (*Coregonus autumnalis pollan*). Only the former has been observed spawning in the Shannon.

Freshwater Pearl-mussel (*Margaritifera margaritifera*), a species listed on Annex II of the E.U. Habitats Directive, occurs abundantly in parts of the Cloon River.

There is a wide range of landuses within the site. The most common use of the terrestrial parts is grazing by cattle and some areas have been damaged through over-grazing and poaching. Much of the land adjacent to the rivers and estuaries has been improved or reclaimed and is protected by embankments (especially along the Fergus Estuary). Further, reclamation continues to pose a threat as do flood relief works (e.g. dredging of rivers). Gravel extraction poses a major threat on the Feale.

In the past, Cord-grass (*Spartina* sp.) was planted to assist in land reclamation. This has spread widely, and may oust less vigorous colonisers of mud and may also reduce the area of mudflat available to feeding birds.

Domestic and industrial wastes are discharged into the Shannon, but water quality is generally satisfactory - except in the upper estuary, reflecting the sewage load from Limerick City. Analyses for trace metals suggest a relatively clean estuary with no influences by industrial discharges apparent. Further industrial development along the Shannon and water polluting operations are potential threats.

Fishing is a main tourist attraction on the Shannon and there are a large number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. The River Feale is a designated Salmonid Water under the

E.U. Freshwater Fish Directive. Other uses of the site include commercial angling, oyster farming, boating (including dolphin-watching trips) and shooting. Some of these may pose threats to the birds and dolphins through disturbance. Specific threats to the dolphins include underwater acoustic disturbance, entanglement in fishing gear and collisions with fast moving craft.

This site is of great ecological interest as it contains a high number of habitats and species listed on Annexes I and II of the E.U. Habitats Directive, including the priority habitat lagoon, the only known resident population of Bottle-nosed Dolphin in Ireland and all three Irish lamprey species. A good number of Red Data Book species are also present, perhaps most notably the thriving populations of Triangular Club-rush. A number of species listed on Annex I of the E.U. Birds Directive are also present, either wintering or breeding. Indeed, the Shannon and Fergus Estuaries form the largest estuarine complex in Ireland and support more wintering wildfowl and waders than any other site in the country. Most of the estuarine part of the site has been designated a Special Protection Area (SPA), under the E.U. Birds Directive, primarily to protect the large numbers of migratory birds present in winter.

6.10.2006

SITE SYNOPSIS

SITE NAME: RIVER SHANNON AND RIVER FERGUS ESTUARIES SPA

SITE CODE: 004077

The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The site comprises all of the estuarine habitat west from Limerick City and south from Ennis, extending west as far as Killadysert and Foynes on the north and south shores respectively of the River Shannon (a distance of some 25 km from east to west). Also included are several areas in the outer Shannon estuary, notably Clonderalaw Bay and Poulnasherry Bay, as well as the intertidal areas on the south shore of the Shannon between Tarbert and Beal Point.

The site has vast expanses of intertidal flats. The main macro-invertebrate community present is a *Macoma-Scrobicularia-Nereis* community which provides a rich food resource for the wintering birds. Other species occurring include Common Cockle (*Cerastoderma edule*), Lugworm (*Arenicola marina*), the polychaete *Nepthys hombergii*, the gastropod *Hydrobia ulvae* and the crustacean *Corophium volutator*. Eelgrass (*Zostera* spp.) is present in places, along with green algae (e.g. *Ulva* spp. and *Enteromorpha* spp.). Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Characteristic species occurring include Common Saltmarsh-grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea-milkwort (*Glaux maritima*), Sea Plantain (*Plantago maritima*), Red Fescue (*Festuca rubra*) and Saltmarsh Rush (*Juncus gerardi*). In the innermost parts of the estuaries, the tidal channels or creeks are fringed with species such as Common Reed (*Phragmites australis*) and club-rushes (*Scirpus maritimus, S. lacustris* subsp. *tabernaemontani)*. Also found is the nationally rare Triangular Club-rush (*Scirpus triqueter*). Elsewhere in the site the shoreline comprises stony or shingle beaches.

The site is the most important coastal wetland site in the country and regularly supports in excess of 50,000 wintering waterfowl (mean of 59,183 for the 4 seasons 1996-97 to 1999/00), a concentration easily of international importance. The site has internationally important populations of Dunlin (14,987), Black-tailed Godwit (706) and Redshank (1,983) - all figures are average peaks for 3 of the 5 seasons in the 1995/96-1999/00 period. A further 16 species have populations of national importance, i.e. Cormorant (148), Whooper Swan (141), Greylag Goose (88), Shelduck (895), Wigeon (3,025), Teal (1,558), Pintail (40), Shoveler (56), Scaup (76), Golden Plover (4,073), Grey Plover (564), Lapwing (13,007), Knot (686), Bar-tailed Godwit (481), Curlew (1,231) and Greenshank (33). The site is among the most important in the country for several of these species, notably Dunlin (11% of national total), Grey Plover (7.5% of total), Lapwing (6.5% of total), Redshank (6% of total) and Shelduck (6.0% of total). The site is also used by Oystercatcher (363), Ringed Plover (70), Brent Goose (135), Great Crested Grebe (47), Red-breasted Merganser (14), Mallard (247), Turnstone (71), Mute Swan (54), Grey Heron (25), Black-headed Gull (1,233) and Common Gull (194).

The Shannon / Fergus system was formerly frequented by a Greenland White-fronted Goose population but this declined during the 1980s and 1990s and the birds now appear appear to have abandoned the area. The site provides both feeding and roosting areas for the wintering birds. Habitat quality for most of the estuarine habitats is good. Some species, particularly Whooper Swan and Greylag Goose, utilise areas outside of the site for feeding.

Apart from the wintering birds, large numbers of some species also pass through the site whilst on migration in spring and/or autumn. Regular species include Black-tailed Godwit, Whimbrel and Greenshank.

Much of the land adjacent to the rivers and estuaries has been reclaimed and improved for agriculture and is protected by embankments (especially along the River Fergus estuary). Further reclamation, especially near to the urbanised and industrial areas continues to pose a threat. The site receives pollution from several sources, including industry and agriculture, but it is not known if this has any significant impacts on the wintering birds. Aquaculture occurs in some areas of the site – future increases in this activity could cause disturbance to the habitats and the associated birds. Common Cord-grass (*Spartina anglica*) is well-established and may threaten some of the estuarine habitats. Some disturbance occurs from boating activities.

This site is of great ornithological interest, being of international importance on account of the numbers of wintering birds it supports. It also supports internationally important numbers of three species, i.e. Dunlin, Black-tailed Godwit and Redshank. In addition, there are 16 species that have populations of national importance. For several of the bird species, it is the top site in the country. Also of note is that three of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Golden Plover and Bar-tailed Godwit. The site is most effectively censused from the air and this is carried out in most winters.

1.4.2005

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Lower River Shannon SAC 002165

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,
7 Ely Place, Dublin 2, Ireland.
Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2012) Conservation Objectives: Lower River Shannon SAC 002165. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002165 Lower River Shannon SAC

1029	Freshwater Pearl Mussel *Margaritifera margaritifera*
1095	Sea Lamprey *Petromyzon marinus*
1096	Brook Lamprey *Lampetra planeri*
1099	River Lamprey *Lampetra fluviatilis*
1106	Atlantic Salmon *Salmo salar* (only in fresh water)
1110	Sandbanks which are slightly covered by sea water all the time
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1150	*Coastal lagoons
1160	Large shallow inlets and bays
1170	Reefs
1220	Perennial vegetation of stony banks
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts
1310	*Salicornia* and other annuals colonizing mud and sand
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
1349	Bottlenose Dolphin *Tursiops truncatus*
1355	Otter *Lutra lutra*
1410	Mediterranean salt meadows (*Juncetalia maritimi*)
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
91E0	*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

Please note that this SAC overlaps with River Shannon and River Fergus Estuaries SPA (004077), Loop Head SPA (004119), Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161), Slievefelim to Silvermines Mountains SPA (004165) and Kerry Head SPA (004189). It is also adjacent to Clare Glen SAC (00930). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title: Aspects of brook lamprey (*Lampetra planeri* Bloch) spawning in Irish waters

Year: in press

Author: Rooney, S.M.; O'Gorman, N.M.; Green, F.; King, J.J.

Series: Biology and Environment

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Coastal lagoons [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Marine habitats and species [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Coastal habitats [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Woodland habitats [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Intertidal Hard and Soft Bottom Investigations in Lower River Shannon cSAC (Site Code: IE002165)/Shannon Fergus Estuary SPA (Site Code: IE004077)

Year: 2011c

Author: Aquafact

Series: Unpublished Report to NPWS

Title: Reef Investigations in Lower River Shannon cSAC (cSAC Site Code: IE002165)

Year: 2011b

Author: Aquafact

Series: Unpublished Report to NPWS

Title: Subtidal Benthic Investigations in Lower River Shannon cSAC (cSAC Site Code: IE002165)

Year: 2011a

Author: Aquafact

Series: Unpublished Report to NPWS

Title: National survey and assessment of the conservation status of Irish sea cliffs

Year: 2011

Author: Barron, S.J.; Delaney, A.; Perrin, P.M.; Martin, J.; O'Neill, F.

Series: Irish Wildlife Manuals No. 53

Title: Comparison of field- and GIS-based assessments of barriers to Atlantic salmon migration: a case study in the Nore Catchment, Republic of Ireland

Year: 2011

Author: Gargan, P. G.; Roche, W. K.; Keane, S.; King, J.J.; Cullagh, A.; Mills, P.; O'Keeffe, J.

Series: J. Appl. Ichthyol. 27 (Suppl. 3), 66–72

Title: Fine-scale population genetic structuring of bottlenose dolphins in Irish coastal waters

Year: 2011

Author: Mirimin, L.; Miller, R.; Dillane, E.; Berrow, S.D.; Ingram, S.; Cross, T.F.; Rogan, E.

Series: Animal Conservation 2011: 1–12

Title: The use of Cork Harbour by bottlenose dolphins (*Tursiops truncatus* (Montagu, 1821))

Year: 2011

Author: Ryan, C.; Cross, T.F.; Rogan, E.

Series: Irish Naturalists' Journal 31(1): 1-9

Title: Irish cetacean review (2000-2009)

Year: 2010

Author: Berrow, S.D.; Whooley, P.; O'Connell, M.; Wall, D.

Series: Irish Whale and Dolphin Group

Title: Bottlenose Dolphin SAC Survey 2010

Year: 2010

Author: Berrow, S.D.; O'Brien, J.; Groth, L.; Foley, A.; Voigt, K.

Series: Unpublished Report to NPWS

Title: Otter tracking study of Roaringwater Bay

Year: 2010

Author: De Jongh, A.; O'Neill, L.

Series: Unpublished Draft Report to NPWS

Title: Second Draft Cloon (Shannon Estuary) Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015)

Year: 2010

Author: DEHLG

Series: Unpublished Report to NPWS

Title: Social structure within the bottlenose dolphin (*Tursiops truncatus*) population in the Shannon Estuary, Ireland

Year: 2010

Author: Foley, A.; McGrath, D.; Berrow, S.D.; Gerritsen, H.

Series: Aquatic Mammals 36(4): 372-381

Title: Irish Semi-natural Grasslands Survey. Annual report no. 3: Counties Donegal, Dublin, Kildare & Sligo

Year: 2010

Author: O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; McNutt, K.E.; Perrin, P.M. ; Delaney, A.

Series: Unpublished Report to NPWS

Title: A provisional inventory of ancient and long-established woodland in Ireland

Year: 2010

Author: Perrin, P.M.; Daly, O.H.

Series: Irish Wildlife Manuals No. 46

Title: Monitoring and Assessment of Irish Lagoons for the purpose of the EU Water Framework Directive

Year: 2010

Author: Roden, C.M,; Oliver, G.

Series: EPA

Title: Report of the standing scientific committee to the DCENR. The status of Irish salmon stocks in 2010 and precautionary catch advice for 2011

Year: 2010

Author: SSC

Series: Unpublished Report to DCENR

Title: The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. [S.I. 296 of 2009]

Year: 2009b

Author: Government of Ireland

Series: Irish Statute Book

Title: The European Communities Environmental Objectives (Surface Water) Regulations 2009. [S.I. 272 of 2009]

Year: 2009a

Author: Government of Ireland

Series: Irish Statute Book

Title: Winter distribution of bottle-nosed dolphins (*Tursiops truncatus* (Montagu)) in the inner Shannon Estuary

Year: 2009

Author: Berrow, S.D.

Series: Irish Naturalists' Journal 30(1): 35-39

Title: Towards a bottlenose dolphin whistle ethogram from the Shannon Estuary, Ireland

Year: 2009

Author: Hickey, R.; Berrow, S.D.; Goold, J.

Series: Biology and Environment: Proceedings of the Royal Irish Academy 109B (2), 89–94

Title: Saltmarsh Monitoring Report 2007-2008

Year: 2009

Author: McCorry, M.; Ryle, T.

Series: Unpublished Report to NPWS

Title: Cetaceans in Irish waters: A review of recent research

Year: 2009

Author: O'Brien, J.; Berrow, S.D.; McGrath, D.; Evans, P.G.H.

Series: Biology and Environment: Proceedings of the Royal Irish Academy 109B (2): 63-88

Title: A note on long-distance matches of bottlenose dolphins (*Tursiops truncatus*) around the Irish coast using photoidentification

Year: 2009

Author: O'Brien, J.; Berrow, S.D.; Ryan, C.; McGrath, D.; O'Connor, I.; Pesante, G.; Burrows, G.; Massett, N.; Klotzer, V.; Whooley, P.

Series: Journal Cetacean Res. Mgmt. 11: 69–74

Title: An updated population status report for bottlenose dolphins using the Lower River Shannon SAC in 2008

Year: 2008

Author: Englund, A.; Ingram, S.; Rogan, E.

Series: Unpublished Report to NPWS

Title: National Survey of Native Woodlands 2003-2008

Year: 2008

Author: Perrin, P.; Martin, J.; Barron, S.; O'Neill, F.; McNutt, K.; Delaney, A.

Series: Unpublished Report to NPWS

Title: Rapid Assessment of *Margaritifera margaritifera* (L.) populations in Ireland: Rivers assessed in 2007

Year: 2008

Author: Ross, E.D.

Series: Unpublished Report to NPWS

Title: Marine surveys of two Irish sandbank cSACs

Year: 2007

Author: Aquafact

Series: Unpublished Report to NPWS

Title: Population status report for bottlenose dolphins using the Lower River Shannon SAC, 2006-2007

Year: 2007

Author: Englund, A.; Ingram, S.; Rogan, E.

Series: Unpublished Report to NPWS

Title: Evolutionary history of lamprey paired species *Lampetra fluviatilis* (L.) and *Lampetra planeri* (Bloch) as inferred from mitochondrial DNA variation

Year: 2007

Author: Espanhol, R.; Almeida, P.R.; Alves, M.J.

Series: Molecular Ecology 16, 1909-1924

Title: Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents, Article 17 forms and supporting maps

Year: 2007

Author: NPWS

Series: Unpublished Report to NPWS

Title: A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments

Year: 2007

Author: O'Connor, W.

Series: Irish Wildlife Manuals No. 26

Title: Inventory of Irish coastal lagoons

Year: 2007

Author: Oliver, G.

Series: Unpublished Report to NPWS

Title: Using T-PODs to investigate the echolocation of coastal bottlenose dolphins

Year: 2007

Author: Philpott, E.; Englund, A.; Ingram, S.; Rogan, E.

Series: Journal of Marine Biological Association, UK. 87: 11-17

Title: Otter Survey of Ireland 2004/2005

Year: 2006

Author: Bailey, M.; Rochford, J.

Series: Irish Wildlife Manuals No. 23

Title: Whistle Production by Bottlenose Dolphins *Tursiops truncatus* in the Shannon Estuary

Year: 2006

Author: Berrow, S.D.; O'Brien, J.; Holmes, B.

Series: Irish Naturalists' Journal. 28(5): 208-213

Title: The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams

Year: 2006

Author: Geist, J.; Porkka, M.; Kuehn, R.

Series: Aquatic Conservation: Marine and Freshwater Ecosystems 16, 251–266

Title: Otters - ecology, behaviour and conservation

Year: 2006

Author: Kruuk, H.

Series: Oxford University Press

Title: A survey of rare and scarce vascular plants in County Limerick

Year: 2006

Author: Reynolds, S.; Conaghan, J.; Fuller, J.

Series: Unpublished Report to NPWS

Title: National Inventory of sea cliffs and coastal heaths

Year: 2005

Author: Browne, A.

Series: Unpublished Report to NPWS

Title: Developing sustainable whalewatching in the Shannon estuary

Year: 2003

Author: Berrow, S.D.

Series: p198-203; In Marine Ecotourism: Issues and Experiences. Garrod, B and Wilson. J. (Eds.) Channel View Publications

---

Title: Identifying lamprey. A field key for sea, river and brook lamprey

Year: 2003

Author: Gardiner, R.

Series: Conserving Natura 2000 rivers, Conservation techniques No. 4. English Nature, Peterborough

---

Title: Monitoring the river, sea and brook lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus*

Year: 2003

Author: Harvey, J.; Cowx, I.

Series: Conserving Natura 2000 Rivers Monitoring Series No. 5. English Nature, Peterborough

---

Title: Bottlenose dolphins (*Tursiops truncatus*) in the Shannon Estuary and selected areas of the west-coast of Ireland

Year: 2003

Author: Ingram, S.; Rogan, E.

Series: Unpublished Report to NPWS

Title: The ecology of seabirds and marine mammals in a fluctuating marine environment

Year: 2003

Author: Rogan, E.; Kelly, T.; Ingram, S.; Roycroft, D.

Series: Unpublished Report to Higher Education Authority of Ireland

---

Title: Irish Whale and Dolphin Group cetacean sighting review (1991-2001)

Year: 2002

Author: Berrow, S.D.; Whooley, P.; Ferriss, S.

Series: Irish Whale and Dolphin Group

Title: Organochlorine concentrations in resident bottlenose dolphins (*Tursiops truncatus*) in the Shannon estuary, Ireland

Year: 2002

Author: Berrow, S.D.; McHugh, B.; Glynn, D.; McGovern, E.; Parsons, K.; Baird, R.W.; Hooker, S.D.

Series: Marine Pollution Bulletin 44: 1296-1313

Title: Identifying critical areas and habitat preferences of bottlenose dolphins (*Tursiops truncatus*)

Year: 2002

Author: Ingram, S.; Rogan, E.

Series: Marine Ecology Progress Series 244: 247-255

Title: Reversing the habitat fragmentation of British woodlands

Year: 2002

Author: Peterken, G.

Series: WWF-UK, London

Title: An extensive survey of bottlenose dolphins (*Tursiops truncatus*) on the west coast of Ireland

Year: 2001

Author: Ingram, S.; Englund, A.; Rogan, E.

Series: Unpublished Report to the Heritage Council

Title: The ecology and conservation of bottlenose dolphins in the Shannon Estuary, Ireland

Year: 2000

Author: Ingram, S.

Series: Unpublished PhD thesis, University College Cork

Title: A survey of bottlenose dolphins (*Tursiops truncatus*) in the Shannon Estuary

Year: 2000

Author: Rogan, E.; Ingram, S.; Holmes, B.; O'Flanagan, C.

Series: Marine Institute Marine Resource Series No. 9

Title: Tour boats and dolphins: A note on quantifying the activities of whale watching boats in the Shannon estuary, Ireland

Year: 1999

Author: Berrow, S.D.; Holmes, B.

Series: Journal of Cetacean Research and Management 1(2): 199-200

Title: Diet of Otters *Lutra lutra* on Inishmore, Aran Islands, west coast of Ireland

Year: 1999

Author: Kingston, S.; O'Connell, M.; Fairley, J.S.

Series: Biol & Environ Proc R Ir Acad B 99B:173–182

Title: National Shingle Beach Survey of Ireland 1999

Year: 1999

Author: Moore, D.; Wilson, F.

Series: Unpublished Report to NPWS

Title: The saltmarshes of Ireland: an inventory and account of their geographical variation

Year: 1998

Author: Curtis, T.G.F.; Sheehy-Skeffington, M.J.

Series: Biology and Environment, Proceedings of the Royal Irish Academy 98B: 87-104

Title: A survey of intertidal sediment biotopes in estuaries in Ireland

Year: 1997

Author: Falvey, J.P.; Costello, M.J.; Dempsey, S.

Series: Unpublished Report

Title:	Distribution and Abundance of Bottle-nosed Dolphins *Tursiops truncatus* (Montagu) in the Shannon Estuary, Ireland
Year:	1996
Author:	Berrow, S.D.; Holmes, B.; Kiely, O.
Series:	Biology and Environment: Proceedings of the Royal Irish Academy 96B (1), 1-9

Title:	The spatial organization of otters (*Lutra lutra*) in Shetland
Year:	1991
Author:	Kruuk, H.; Moorhouse, A.
Series:	J. Zool, 224: 41-57

Title:	Otter survey of Ireland
Year:	1982
Author:	Chapman, P.J.; Chapman, L.L.
Series:	Unpublished Report to Vincent Wildlife Trust

Spatial data sources

Year:	Interpolated 2012
Title:	Sandbank Survey 2007
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1110 (map 3)
Year:	Interpolated 2012
Title:	Sandbank survey 2007; subtidal benthic survey 2010; reef survey 2010; intertidal hard and soft bottom survey 2010
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used for:	Marine community types, 1110, 1140, 1170 (maps 3, 5, 8, 9)
Year:	2010
Title:	EPA WFD transitional waterbody data
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1130 (map 4)
Year:	Revision 2011
Title:	Inventory of Irish Coastal Lagoons. Version 3
GIS operations:	Clipped to SAC boundary
Used for:	1150 (map 6)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. EPA WFD transitional waterbody data erased from extent. Expert opinion used as necessary to resolve any issues arising
Used for:	1160 (map 7)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; EU Annex I Saltmarsh and Coastal data erased out if present
Used for:	Marine community types base data (map 9)
Year:	Revision 2012
Title:	National Shingle Beach Survey
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1220 (map 10)
Year:	2011
Title:	National Survey and assessment of the conservation status of Irish sea cliffs
GIS operations:	Clipped to SAC boundary
Used for:	1230 (map 11)

Year:	Revision 2010
Title:	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary; overlapping regions with Coastal CO data investigated and resolved with expert opinion used
Used for:	1310, 1330, 1410 (map 12)
Year:	Derived 2012
Title:	Internal NPWS files
GIS operations:	Dataset created from spatial references supplied by NPWS experts. Expert opinion used as necessary to resolve any issues arising
Used for:	3260 (map 13)
Year:	Revision 2010
Title:	National Survey of Native Woodlands 2003-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	91E0 (map 14)
Year:	2012
Title:	NPWS rare and threatened species database
GIS operations:	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used for:	1029 (map 15)
Year:	Revision 2012
Title:	Margaritifera Sensitive Areas data
GIS operations:	Relevant catchment boundaries identified. Expert opinion used as necessary to resolve any issues arising
Used for:	1029 (map 15)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Low Water Mark (LWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1349 (map 16)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the terrestrial side of the river banks data; creation of 20m buffer applied to canal centreline data. These datasets are combined with the derived EPA WFD Waterbodies data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on marine side of HWM to highlight potential commuting points
Used for:	1355 (map 17)

Year:	2010
Title:	EPA WFD Waterbodies data
GIS operations:	Creation of a 20m buffer applied to river and stream centreline data; creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets are combined with the derived OSi data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1355 (no map)

Year:	Revision 2011
Title:	Inventory of Irish Coastal Lagoons. Version 3
GIS operations:	Creation of 80m buffer on the aquatic side of lagoon data; creation of 10m buffer on the terrestrial side of lagoon data. These datasets are combined with the derived OSi data and EPA WFD Waterbodies data for the 1355 CO. Overlapping regions are investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1355 (no map)

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	Maintain at 7km. See map 15	This conservation objective applies to the freshwater pearl mussel population in the Cloon River, Co. Clare only (see also the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (Government of Ireland, 2009b)). The Cloon population is confined to the main channel and is distributed from Croany Bridge to approx. 1.5km upstream of Clonderalaw Bridge (Ross, 2008; DEHLG, 2010)
Population size	Number of adult mussels	Restore to 10,000 adult mussels	The Cloon population was estimated as less than 10,000 in 2009 (DEHLG, 2010)
Population structure: recruitment	Percentage per size class	Restore to least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. No juvenile or young mussels were found in the Cloon in 2007, with the smallest mussel measuring 80.3mm (Ross, 2008). A single 'young mussel' measuring 61.3mm was recorded in 2009 (DEHLG, 2010)
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses. The Cloon failed the target for dead shells in 2009, with 31% dead shells across the single transect counted. There were no previous data on the number of live adults (DEHLG, 2010)

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat extent	Kilometres	Restore suitable habitat in more than 3.3km (see map 15) and any additional stretches necessary for salmonid spawning	The species' habitat covers stretches of a short coastal river; and is a combination of 1) the area of habitat adult and juvenile mussels can occupy and 2) the area of spawning and nursery habitats the host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only those salmonid spawning areas that could regularly contribute juvenile fish to the areas occupied by adult mussels should be considered. The availability of mussel habitat and fish spawning and nursery habitats are determined by flow and substratum conditions. The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles (DEHLG, 2010). The target is based on the stretches of river identified, from a combination of dedicated survey and incidental records, as having habitat for the species
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality-macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93	These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). The habitat in the Cloon failed both standards during 2009 sampling for the Sub-basin Management Plans (DEHLG, 2010). See also The European Communities Environmental Objectives (Surface Water) Regulations 2009 (Government of Ireland, 2009a)
Substratum quality: filamentous algae (macroalgae), macrophytes (rooted higher plants)	Percentage	Restore substratum quality-filamentous algae: absent or trace (<5%); macrophytes: absent or trace (<5%)	The habitat in the Cloon failed both standards during 2009 sampling for the Sub-basin Management Plans, with cover abundance values of up to 50% recorded for filmentous algae and 80% for macrophytes (DEHLG, 2010). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrata

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Substratum quality: sediment	Occurrence	Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The habitat for the species is currently unsuitable for the recruitment of juveniles owing to sedimentation of the substratum. In many locations, it is also unsuitable for the survival of adult mussels (DEHLG, 2010). Significant sedimentation has been recorded during all recent mussel monitoring surveys (Ross, 2008; DEHLG, 2010). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. Redox potential measurements in 2009 yielded losses of 32.3 - 43.5% (average of 39%) at 5cm depth (DEHLG, 2010)
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval form of the freshwater pearl mussel and, thus, they are essential to the completion of the life cycle. 0+ and 1+ fish are typically used, both because of the habitat overlaps and the development of immunity with age in the fish. Fish presence is considered sufficient, as higher densities and biomass of fish are indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for pearl mussels and a lack of pearl mussel recruitment, while significantly lower densities and biomass of host fish were associated with high numbers of juvenile mussels. Fish movement patterns must be such that 0+ fish in the vicinity of the mussel habitat remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. The Cloon freshwater pearl mussel population appears to favour native brown trout, with 17.2% of 1+ and older trout caught in 2009 hosting glochidia (DEHLG, 2010). Therefore, it is particularly important that trout are not out-competed by stocked fish

1095 Sea Lamprey *Petromyzon marinus*

To restore the favourable conservation condition of Sea Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. See Gargan et al. (2011). Specific barriers serve to constrain the up-river migration of sea lamprey. The upper extent of the SAC in the R. Fergus is delineated by a barrier to migration. Barriers are also present in the Mulkear and Feale
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007)
Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003)
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Lampreys spawn in clean gravels. Surveys by Inland Fisheries ireland (IFI) commonly indicated accumulations of redds downstream of major weirs. (See also Gargan et al., 2011)
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Despite observed spawning activity, sampling for ammocoetes consistently fails to find these in many samplling stations and never in any great numbers

1096 Brook Lamprey *Lampetra planeri*

To maintain the favourable conservation condition of Brook Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to brook lampreys' migration, both up- and downstream, thereby possibly limiting the species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Spawning site and redd attributes established by IFI (Rooney et al., in press)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King et al., unublished data)

1099 River Lamprey *Lampetra fluviatilis*

To maintain the favourable conservation condition of River Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to river lampreys' migration, both up- and downstream, thereby possibly limiting species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between river and brook lamprey juveniles in the field (Gardiner 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of river/brook lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King et al., unpublished data)

1106 Atlantic Salmon *Salmo salar* (only in fresh water)

To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. The large hyrdo-electric station at Ardnacrusha and the Parteen regulating weir present considerable obstructions to upstream passage of salmon on the Shannon main channel. While both have fish passes installed, upstream migration of salmon is still problematical. Further weirs upstream on the Shannon also restrict access to spawning habitat. No such obstacles, causing significant fish passage issues for salmon are present on the Feale and Mulkear rivers
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	A conservation limit is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee of the National Salmon Commission's annual model output of CL attainment levels. See SSC (2010). Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The salmon stocks in the Shannon above the impoundments are significantly below their Conservation Limits. Salmon stocks in the Feale and Mulkear rivers are above CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL). The abundance of salmon fry at monitored sites on the Shannon main channel, above the hydro-electric station, is significantly below this target
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*). On the Shannon main channel, salmon smolt abundance may be significantly affected by mortality passing through hydro-electric turbines
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. Artificial barriers are currently preventing salmon from accessing suitable spawning habitat on the Shannon main channel

1106 Atlantic Salmon *Salmo salar* (only in fresh water)

To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

1110 Sandbanks which are slightly covered by sea water all the time

To maintain the favourable conservation condition of Sandbanks which are slightly covered by sea water all the time in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	The distribution of sandbanks is stable, subject to natural processes. See map 3	Distribution established using the Valentia Island to River Shannon Admiralty Chart (no. 1819_0)
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated as 1,353ha using the Valentia Island to River Shannon Admiralty Chart (no. 1819_0)
Community distribution	Hectares	Conserve the following community type in a natural condition: Subtidal sand to mixed sediment with *Nephtys* spp. community complex. See map 9	The likely area of the community was derived from a sandbank survey in 2007 (Aquafact, 2007) and a subtidal survey in 2010 (Aquafact, 2011a). See marine supporting document for further details

1130 Estuaries

To maintain the favourable conservation condition of Estuaries in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 4	Habitat area was estimated as 24,273ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Estuarine subtidal muddy sand to mixed sediment with gammarids community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys* spp. community complex; Fucoid-dominated intertidal reef community complex; Faunal turf-dominated subtidal reef community; and Anemone-dominated subtidal reef community. See map 9	The likely area of these communities was derived from intertidal and subtidal surveys undertaken in 2010 (Aquafact, 2011a and c). See marine supporting document for further details

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 5	Habitat area was estimated using OSi data as 8,808ha
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community; and Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex. See map 9	The likely area of these communities was derived from an intertidal survey in 2010 (Aquafact, 2011c). See marine supporting document for further details

1150 *Coastal lagoons

To restore the favourable conservation condition of Coastal lagoons in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes. Favourable reference area 33.4ha- Shannon Airport Lagoon 24.2ha; Cloonconeen Pool 3.9ha; Scattery Lagoon 2.8ha; Quayfield and Poulaweala Loughs 2.5ha. See map 6	Areas calculated from spatial data derived from Oliver, 2007. Site codes IL031- IL034. See lagoon supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6	Sites IL031-IL034 in Oliver, 2007. See lagoon supporting document for further details
Salinity regime	practical salinity units (psu)	Median annual salinity and temporal variation within natural ranges	The lagoons in the site vary from oligohaline to euhaline. See lagoon supporting document for further details
Hydrological regime	Metres	Annual water level fluctuations and minima within natural ranges	Lagoons listed for this site are all considered to be shallow. See lagoon supporting document for further details
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management	The lagoons within this site exhibit a variety of barrier types including cobble/shingle, karst and artificial embankment. See lagoon supporting document for further details
Water quality: chlorophyll a	µg/L	Annual median chlorophyll a within natural ranges and less than 5µg/L	Target based on Roden and Oliver (2010). See lagoon supporting document for further details
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural ranges and less than 0.1mg/L	Target based on Roden and Oliver (2010). See lagoon supporting document for further details
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Annual median DIN within natural ranges and less than 0.15mg/L	Target based on Roden and Oliver, 2010). See lagoon supporting document for further details
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to maximum depth of lagoons	As these lagoons are all shallow, it is expected the macrophytes should extend to their deepest points. See lagoon supporting document for further details
Typical plant species	number and m^2	Maintain number and extent of listed lagoonal specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoon supporting document for further details
Typical animal species	number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoon supporting document for further details
Negative indicator species	Number and % cover	Negative indicator species absent or under control	Low salinity, shallow water and elevated nutrient levels increase the threat of un-natural encroachment by reedbeds

1160 Large shallow inlets and bays

To maintain the favourable conservation condition of Large shallow inlets and bays in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 7	Habitat area was estimated as 35,282ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community; Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys* spp. community complex; Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and *Laminaria*-dominated community complex. See map 9	The likely area of these communities was derived from intertidal and subtidal surveys in 2010 (Aquafact, 2011a and c). See marine supporting document for further details

1170 Reefs

To maintain the favourable conservation condition of Reefs in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	The distribution of Reefs is stable, subject to natural processes. See map 8	Distribution is established from intertidal and subtidal reef surveys in 2010 (Aquafact, 2011b and c)
Habitat area	Hectares	The permanent habitat area is stable, subject to natural processes. See map 8	Habitat area was estimated as 21,421ha from the 2010 intertidal and subtidal reef survey (Aquafact 2011b and c)
Community distribution	Hectares	Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and *Laminaria*-dominated community complex. See map 9	Based on the 2010 intertidal and subtidal reef survey (Aquafact, 2011b and c). See marine supporting document for further details

1220 Perennial vegetation of stony banks

To maintain the favourable conservation condition of Perennial vegetation of stony banks in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession	Current area unknown. It was recorded to be present but extent was not mapped from nine sub-sites during the National Shingle Beach Survey (Moore and Wilson, 1999): Ross Bay, Kilbaha Bay, Cloonconeen Lough and Rinevella Bay, Carrigholt Bay, Ballymacrinan Bay, Bunaclugga Bay, Corcas and Sandhills, Bromore and Ballybunnion. NB further unsurveyed areas maybe present within the site
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 10 for recorded locations	Full distribution currently unknown. An excellent array of shingle beaches is known to occur, including three that are ranked of high interest (Ross Bay, Bunaclugga Bay and Cloonconeen Lough and Rinevella), the last of which is associated with a lagoonal system (Moore and Wilson, 1999). Habitat likely to be more widespread. See coastal habitats supporting document for further details. See also the conservation objective for coastal lagoons (1150)
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Moore and Wilson (1999). Shingle features are relatively stable in the long-term and shingle beaches within this SAC appear to be functioning naturally with few artifical restrictions to beach dynamics (Moore and Wilson, 1999). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Moore and Wilson (1999). Lichens are present at Ross Bay and Cloonconeen and Rinevella Bay indicating a degree of stability. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain the typical vegetated shingle flora including the range of sub-communities within the different zones	The Carrigaholt sub-site is a small site with a diverse flora. The Bunaclugga Bay sub-site supports yellow horned-poppy (*Glaucium flavum*), which contributes to the site's high interest ranking. Based on data from Moore and Wilson (1999). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Moore and Wilson (1999). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See coastal habitats supporting document for further details

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat length	Kilometres	Area stable or increasing, subject to natural processes, including erosion. For sub-sites mapped: Kilbaha- 4.1km; Ladder Rock- 1.0km; Moyarta- 0.9km; Lisheencrony- 1.1km; Burrane- 0.2km; Kerry Head- 33.4km; Ballybunion- 15.6km; Kilclogher- 4.9km; Loop Head- 6.1km. See map 11	Based on data from the Irish Sea Cliff Survey (ISCS) (Barron et al., 2011). Nine sub-sites were identified using a combination of aerial photos and the DCENR helicopter viewer. The length of each cliff was measured (in some cases the cliff was measured in sections) to give a total estimated area of 67.3km within the SAC. Cliffs are linear features and are therefore measured in kilometres. Length of cliff likely to be underestimated. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 11	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). Most of the SAC west of Kilcredaun Point and Kilconly Point is bounded by high rocky sea cliffs. Both hard and soft cliffs occur in this SAC (ISCS; Browne, 2005). See coastal habitats supporting document for further details
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). Maintaining natural geomorphological processes including natural erosion is important for the health of vegetated sea cliff. Hydrological processes maintain flushes and in some cases tufa formations that can be associated with sea cliffs. Freshwater seepage was noted from the cliffs at Loop Head and Kilclogher. Stream or cascade was noted from Kerry Head. Sea coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). At Loop Head sub-site the zones recorded were: splash, crevice ledge and ungrazed coastal grassland on hard cliffs. At Kerry Head sub-site the zones recorded were: splash, pioneer, crevice ledge, ungrazed/grazed coastal grassland on hard cliffs and coastal grassland on soft cliffs. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in the Irish Sea cliff survey (Barron et al., 2011)	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation composition: bracken and woody species	Percentage	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath to be less than 10%. Cover of woody species on grassland and/or heath to be less than 20%	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle - 0.005ha; Inishdea, Owenshere - 0.003ha; Knock - 0.029ha; Querin - 0.185ha; Rinevilla Bay - 0.001ha. See map 12	Based on data from Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Habitat recorded at five of the ten sub-sites surveyed and mapped, giving a total estimated area of 0.223ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 12 for known distribution	Based on data from McCorry and Ryle (2009). Habitat recorded at six out of ten sub-sites by McCorry and Ryle (2009). NB further unsurveyed areas maybe present within the site. *Salicornia* is an annual species, so its distribution can vary significantly from year to year. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Sediment supply is particularly important for this pioneer saltmarsh community, as the distribution of this habitat depends on accretion rates. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks deliver sediment throughout saltmarsh system. Creeks and pan structures well developed in the larger sections of the marsh at Carrigafoyle, Shepperton/Fergus Estuary and Inishdea/Owenshere. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	This pioneer saltmarsh community requires regular tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: typical species and sub-communities	Percentage cover	Maintain the presence of species-poor communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	Based on data from McCorry and Ryle (2009). Species of local distinctiveness recorded include sea wormwood (*Seriphidium maritimum*), meadow barley (*Hordeum secalinum*) and hard grass (*Parapholis strigosa*) (McCorry and Ryle, 2009; internal NPWS files). See coastal habitats supporting document for further details
Vegetation structure: negative indicator species-*Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* was recorded at all sub-sites and is considered a significant threat to the habitat. See coastal habitats supporting document for further details

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 6.774ha; Barrigone, Aughinish- 10.288ha; Beagh- 0.517ha; Bunratty- 26.939ha; Shepperton, Fergus Estuary- 37.925ha; Inishdea, Owenshere- 18.127ha; Killadysert, Inishcorker- 2.604ha; Knock- 0.576ha; Querin- 3.726ha; Rinevilla Bay- 11.883ha. See map 12	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle 2009). Ten sub-sites that supported Atlantic salt meadow were mapped (119.36ha) and additional areas of potential saltmarsh (376.07ha) were identified from an examination of aerial photographs, giving a total estimated area of 495.43ha. Saltmarsh habitat also occurs at 11 other sub-sites within the SAC (Curtis and Sheehy-Skeffington, 1998). NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 12 for mapped distribution	Based on data from McCorry and Ryle (2009). Within the sites surveyed by the SMP, estuary type saltmarsh over a mud substrate is most common and ASM is the dominant saltmarsh habitat. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). Embankments along much of the shoreline are a feature of this SAC. These embankments were erected in the past and much of the site has been remodelled and large areas of land reclaimed as a result. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks and pan structures well developed at the larger sections of ASM in the Carrigafoyle sub-site. At the ASM at Shepperton, Fergus Estuary, the larger patches still retain a natural creek and salt pan structure. At Inishdea, Owenshere sub-site within some of the intact saltmarsh, there is a complex network of creeks, salt pans and depressions. At Killadysart, Inishcorker and Querin, creek and pan development is generally poor. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). Zonations to other saltmarsh habitats as well as brackish and terrestrial habitats were recorded at all sub-sites. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). All of the sub-sites are grazed to some extent. Overgrazing was noted from Carrigafoyle, Shepperton, Fergus Estuary and Knock sub-sites. See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of the saltmarsh area vegetated	Based on data from McCorry and Ryle (2009). Some poaching was noted from most of the sub-sites. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species-*Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* is a major element of the vegetation at all sub-sites in this SAC. See coastal habitats supporting document for further details

1349 Bottlenose Dolphin *Tursiops truncatus*

To maintain the favourable conservation condition of Bottlenose Dolphin in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use. See map 16 for suitable habitat	See marine supporting document for further details
Habitat use: critical areas	Location and hectares	Critical areas, representing habitat used preferentially by bottlenose dolphin, should be maintained in a natural condition. See map 16	Attribute and target based on Ingram and Rogan (2002), Englund et al. (2007), Englund et al. (2008), Berrow (2009), Berrow et al. (2010) and review of data from other studies. See marine supporting document for further details
Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site	See marine supporting document for further details

1355 Otter *Lutra lutra*

To restore the favourable conservation condition of Otter in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in Shannon catchment estimated at 70.5% (Bailey and Rochford 2006)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 596.8ha above high water mark (HWM); 958.9ha along river banks/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 4,461.6ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometers	No significant decline. Length mapped and calculated as 500.1km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 125.6ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston et al., 1999)
Barriers to connectivity	Number	No significant increase. For guidance, see map 17	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 4.193ha; Barrigone, Aughinish- 2.407ha; Bunratty- 0.865ha; Inishdea, Owenshere- 11.609ha; Killadysert, Inishcorker- 0.705ha; Knock- 0.143ha, Querin- 0.008ha; Rinevilla Bay- 2.449ha. See map 12	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Eight sub-sites that support Mediterranean salt meadow were mapped (22.379ha) and additional areas of potential saltmarsh (25.646ha) were identified from an examination of aerial photographs, giving a total estimated area of 48.025ha. Saltmarsh habitat also occurs at 11 other sub-sites within the SAC (Curtis and Sheehy-Skeffington, 1998). NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 12 for known distribution	Based on data from McCorry and Ryle (2009). Within the sites surveyed by the SMP, estuary type saltmarsh over a mud substrate is most common. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). Embankments along much of the shoreline are a feature of this SAC. These embankments were erected in the past and much of the site has been remodelled and large areas of land reclaimed because of them. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). The MSM at Carrigafoyle contains some large salt pans. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Mediterranean salt meadow is found high up in the saltmarsh but requires occasional tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). Zonations to other saltmarsh habitats as well as brackish and terestrial habitats were recorded at most sub-sites. See coastal habitats supporting document for further details

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). All of the sub-sites are grazed to some extent. Overgrazing was noted from Inishdea, Owenshere and Knock sub-sites. See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). Some poaching was noted from most of the sub-sites. See coastal habitats supporting document for further details
Vegetation composition: typical species	Percentage cover	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* is a major element of the vegetation at all sub-sites in this SAC. See coastal habitats supporting document for further details

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	Three sub-types of high conservation value are know to occur in the site. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details. **Note: rooted macrophytes should be absent or trace (< 5% cover) in freshwater pearl mussel (*Margaritifera margaritifera*) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in the Cloon River within this SAC, because the mussel requires environmental conditions closer to natural background levels**
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 13	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: tidal influence	Daily water level fluctuations - metres	Maintain natural tidal regime	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: freshwater seepages	Metres per second	Maintain appropriate freshwater seepage regimes	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Substratum composition: particle size range	Millimetres	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles)	Although many of the high-conservation-value sub-types are dominated by coarse substrata, for certain sub-types, notably triangular club-rush (*Schoenoplectus triqueter*) and opposite-leaved pondweed (*Groenlandia densa*), fine substrata are required. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Water quality: nutrients	Milligrammes per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	The specific targets may vary among sub-types. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Floodplain connectivity	Area	The area of active floodplain at and upstream of the habitat should be maintained	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Riparian habitat	Area	The area of riparian woodland at and upstream of the bryophyte-rich sub-type should be maintained	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details. See also the conservation objective for Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (91E0)

6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Full extent of this habitat in this site is currently unknown- see distribution below
Habitat distribution	Occurrence	No decline, subject to natural processes	This habitat has been recorded on the eastern bank of the Shannon, just north of Castleconnell, Co. Limerick (NPWS internal files). Full distribution of this habitat in this site is currently unknown and it almost certainly occurs elsewhere. The Irish semi-natural grasslands survey will cover Co. Limerick in 2012 and additional information is likely to be available following this survey
Vegetation structure: broadleaf herb: grass ratio	Percentage	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2010)
Vegetation structure: sward height	Percentage	30-70% of sward between 10 and 80cm high	Attribute and target based on O'Neill et al. (2010)
Vegetation composition: typical species	Number	At least 7 positive indicator species present, including 1 "high quality" species	List of positive indicator species, including high quality species, identified by O'Neill et al. (2010). Note that purple moor-grass (*Molinia caerulea*) is a positive indicator species, but not necessarily an essential component of the habitat
Vegetation composition: notable species	Number	No decline, subject to natural processes	A number of notable species have been recorded in this habitat at this site including smooth brome (*Bromus racemosus*), pale sedge (*Carex pallescens*) and blue-eyed grass (*Sisyrinchium bermudiana*) (Reynolds et al., 2006)
Vegetation composition: negative indicator species	Percentage	Negative indicator species collectively not more than 20% cover, with cover by an individual species less than 10%. Non-native invasive species, absent or under control	List of negative indicator species identified by O'Neill et al. (2010)
Vegetation composition: negative indicator moss species	Percentage	Bog mosses (*Sphagnum* spp.) not more than 10% cover; hair mosses (*Polytrichum* spp.) not more than 25% cover	Attribute and target based on O'Neill et al. (2010)

6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: woody species and bracken (*Pteridium aquilinum*)	Percentage	Cover of woody species and bracken not more than 5% cover	Attribute and target based on O'Neill et al. (2010)
Physical structure: bare ground	Percentage	Not more than 10% bare ground	Attribute and target based on O'Neill et al. (2010)

91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

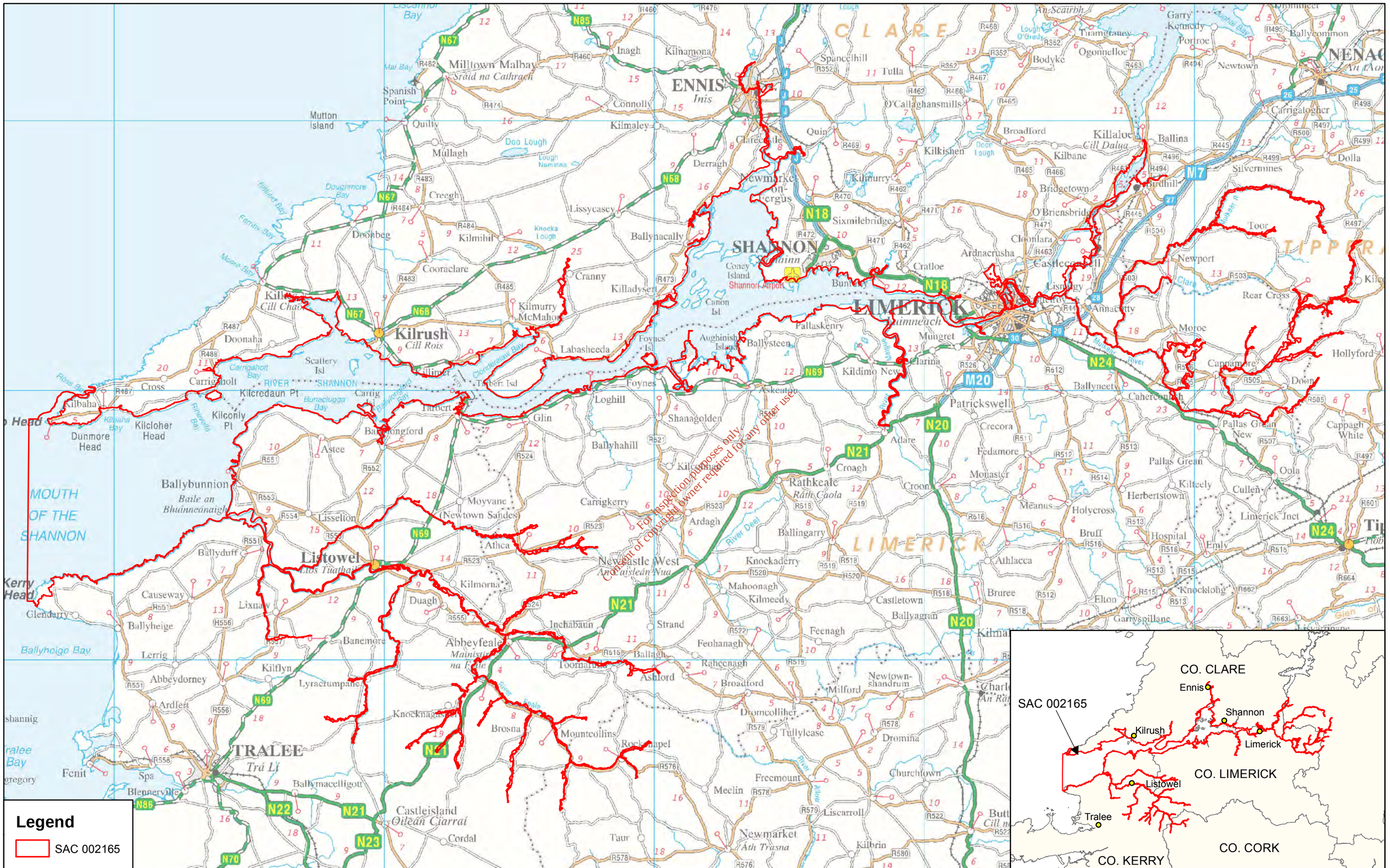
To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least c.8.5ha for sites surveyed. See map 14	Minimum area, based on 5 sites surveyed by Perrin et al. (2008) - site codes 1286, 1577, 1857, 1861, 1995. See woodland habitats supporting document for further details. NB further areas are likely to be present within the SAC
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 14	Distribution based on Perrin et al. (2008). NB further areas are likely to be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size	The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring ‘deep’ woodland conditions (Peterken, 2002). Topographical and land-ownership constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder and oak regenerate poorly. Ash often regenerates in large numbers although few seedlings reach pole size
Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river floodplains
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem

91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-data and other rare or localised species. Perrin and Daly (2010) list four sites as containing potential ancient/long established woodland. See woodland habitats supporting document for further details
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix* spp) and, locally, oak (*Quercus robur*) and ash (*Fraxinus excelsior*)	Species reported in Perrin et al. (2008). See woodland habitats supporting document for further details
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common invasive species in this woodland type: Himalayan balsam (*Impatiens glandulifera*), giant hogweed (*Heracleum mantegazzianum*), sycamore (*Acer pseudoplatanus*)



Legend

SAC 002165

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1: LOWER RIVER SHANNON SAC CONSERVATION OBJECTIVES SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 20 km

N

Map Version 1
Date: June 2012

SPA 004119

SAC 002165

SPA 004189

SPA 004077

SPA 004161

SAC 000930

SPA 004165

Legend

- 002165 Lower River Shannon SAC
- 000930 Clare Glen SAC
- 004077 River Shannon and River Fergus Estuaries SPA
- 004119 Loop Head SPA
- 004161 Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA
- 004165 Slievefelim to Silvermines Mountains SPA
- 004189 Kerry Head SPA
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2:
LOWER RIVER SHANNON SAC CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

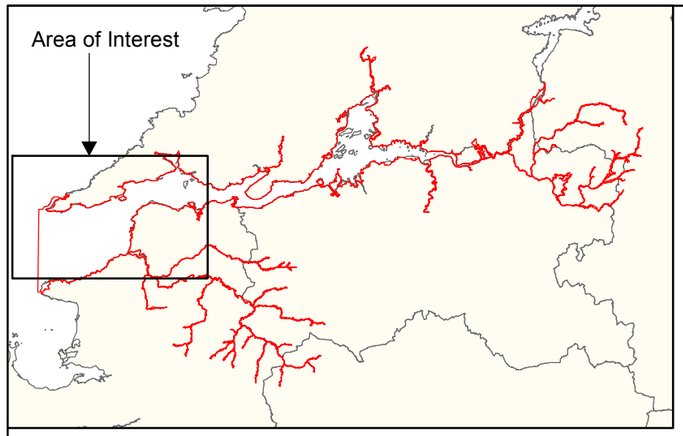
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002165 CO. CLARE; v1.2, CO. CORK; v1.01, CO. KERRY; v1.11, CO. LIMERICK; v1.11, CO. TIPPERARY; v1.05/SAC 000930 CO LIMERICK; v1, CO. TIPPERARY; v1
SPA 004077 CO CLARE; v 1.03, CO KERRY; v1.02, CO LIMERICK; v1.03/SPA 004119 CO CLARE; v1.02
SPA 004161 CO CORK; v2.12, CO KERRY; v2.17, CO LIMERICK; v2.14
SPA 004165 CO LIMERICK; v2.05, CO TIPPERARY; v2.09/SPA 004189 CO KERRY; v2.01

0 5 10 15 20 km

N

Map Version 1
Date: June 2012



Legend

- SAC 002165
- 1110 Sandbanks which are slightly covered by sea water all the time
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 3:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
SANDBANKS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

N

Map Version 1
Date: June 2012

Legend

- SAC 002165
- 1130 Estuaries
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 4:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
ESTUARIES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 2 4 6 8 10 km

N

Map Version 1
Date: June 2012

Legend

- SAC 002165
- 1140 Mudflats and sandflats not covered by sea water at low tide
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 5:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

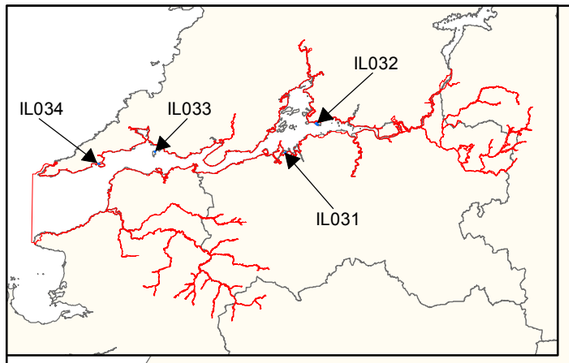
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

N

Map Version 1
Date: June 2012



Quayfield and Poulaweala Loughs
IL031

Shannon Airport Lagoon
IL032

Scattery Lagoon
IL033

Cloonconeen Pool
IL034

Legend

- SAC 002165
- 1150 Coastal lagoons
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 6:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
COASTAL LAGOONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 100 200 300 400 500 m

N

Map Version 1
Date: June 2012

Legend

- SAC 002165
- 1160 Large shallow inlets and bays
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 7:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS AND BAYS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

N

Map Version 1
Date: June 2012

Legend

- SAC 002165
- 1170 Reefs
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 8: LOWER RIVER SHANNON SAC CONSERVATION OBJECTIVES REEFS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

N

Map Version 1
Date: June 2012

Legend

- SAC 002165
- OSi Discovery Series County Boundaries

Marine Community Types

- Anemone-dominated subtidal reef community
- Estuarine subtidal muddy sand to mixed sediment with gammarids community complex
- Faunal turf-dominated subtidal reef community
- Fucoid-dominated intertidal reef community complex
- Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex
- Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community
- *Laminaria*-dominated community complex
- Mixed subtidal reef community complex
- River
- Subtidal sand to mixed sediment with *Nephtys* spp. community complex
- Subtidal sand to mixed sediment with *Nucula nucleus* community complex

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 9:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

N

Map Version 1
Date: June 2012

Carrigaholy Bay

Ballymacrinan Bay

Ross Bay

Kilbaha Bay

Cloonconeen Lough and Rinevella Bay

Bunaclugga Bay

Corcas and Sandhills

Bromore

Ballybunion

Area of Interest

Legend

- SAC 002165
- 1220 Perennial vegetation of stony banks
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 10:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
PERENNIAL VEGETATION OF STONY BANKS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

N

Map Version 1
Date: June 2012

Loop Head
Site Id: 01006

Kilclogher
Site Id: 01007

Kilbaha

Moyarta

Lisheencrony

Ladder Rock

Burrane

Ballybunion
Site Id: 06001

Kerry Head
Site Id: 06002

Legend

- SAC 002165
- 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- Undocumented 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- OSi Discovery Series County Boundaries

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

MAP 11:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
VEGETATED SEA CLIFFS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

N

Map Version 1
Date: June 2012

SMP 0083

SMP 0082

SMP 0081

SMP 0084

SMP 0086

SMP 0085

SMP 0080

SMP 0079

SMP 0087

SMP 0078

Legend

SAC 002165

OSi Discovery Series County Boundaries

SMP 0078 Saltmarsh Monitoring Project Site Codes

Saltmarsh Habitats

Qualifying Interests

1310 *Salicornia* and other annuals colonising mud and sand

1310 / 1330 *Salicornia* and other annuals colonising mud and sand / Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)

1410 Mediterranean salt meadows (Juncetalia maritimi)

Potential 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

Potential 1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)

Potential 1410 Mediterranean salt meadows (Juncetalia maritimi)

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 12:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
SALTMARSH HABITATS

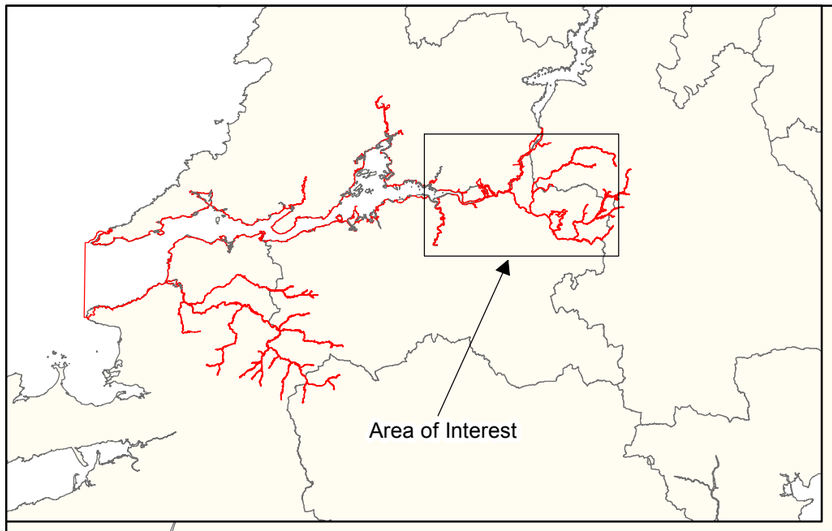
Map to be read in conjunction with the NPWS Conservation Objectives Document.

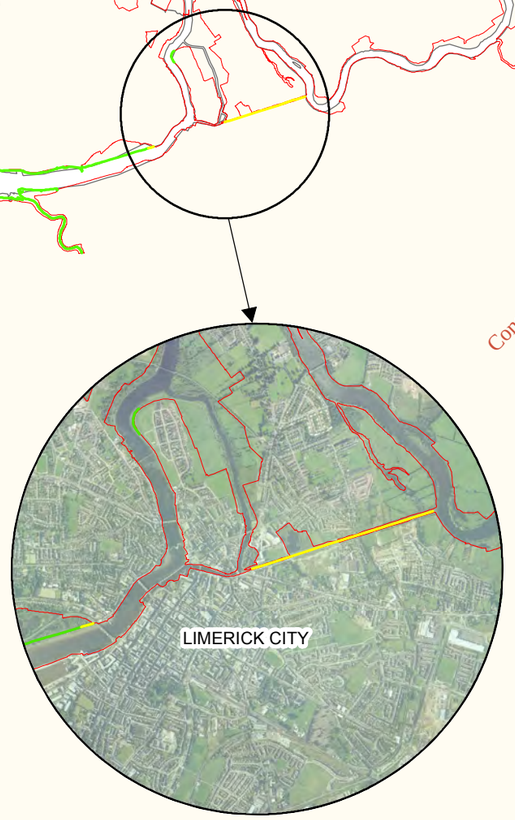
SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 2 4 6 8 10 km

N

Map Version 1
Date: June 2012





Legend

- SAC 002165
- OSi Discovery Series County Boundaries

3260 Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation

- *Groenlandia densa*
- *Schoenoplectus triqueter*
- Bryophyte-rich streams and rivers sub-type

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 13:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
FLOATING RIVER VEGETATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

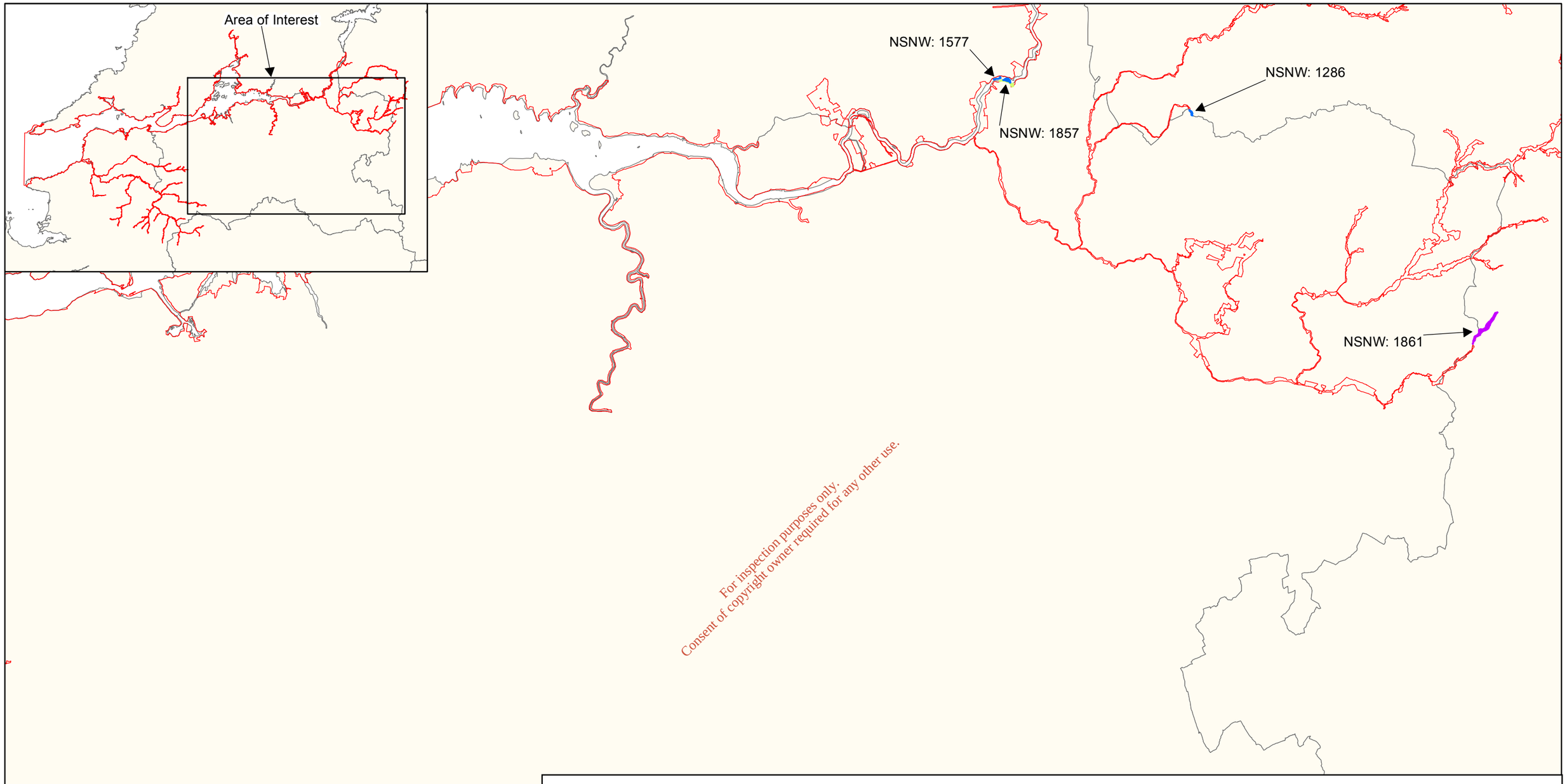
SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059208)

N

Map Version 1
Date: June 2012



Legend

- SAC 002165
- OSi Discovery Series County Boundaries
- NSNW: 1857 National Survey of Native Woodland Site Codes

Woodland Habitats

- 91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) Qualifying Interest
- 91A0 / 91E0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles / *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) Qualifying Interest
- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- WN2 Oak-ash-hazel woodland

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 14:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

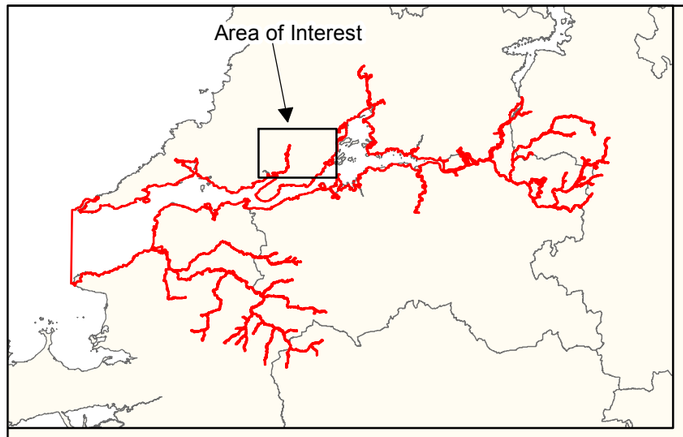
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 2 4 6 8 10 km

N

Map Version 1
Date: June 2012



Legend

- SAC 002165
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Suitable Habitat
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Distribution
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Catchment
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 15:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
FRESHWATER PEARL MUSSEL

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 0.5 1 1.5 2 km

N

Map Version 1
Date: June 2012

Legend

- SAC 002165
- 1349 Bottlenose Dolphin - *Tursiops truncatus* Critical Habitat
- 1349 Bottlenose Dolphin - *Tursiops truncatus* Habitat
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 16:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
BOTTLENOSE DOLPHIN

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

N

Map Version 1
Date: June 2012

Legend

- SAC 002165
- 1355 Otter - *Lutra lutra* 250m Commuting Buffer
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 17: LOWER RIVER SHANNON SAC CONSERVATION OBJECTIVES OTTER COMMUTING

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

N

Map Version 1
Date: June 2012

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

River Shannon and River Fergus Estuaries SPA 004077

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,
7 Ely Place, Dublin 2, Ireland.
Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2012) Conservation Objectives: River Shannon and River Fergus Estuaries SPA 004077. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

004077 River Shannon and River Fergus Estuaries SPA

A017	Cormorant *Phalacrocorax carbo*	breeding + wintering
A038	Whooper Swan *Cygnus cygnus*	wintering
A046	Light-bellied Brent Goose *Branta bernicla hrota*	wintering
A048	Shelduck *Tadorna tadorna*	wintering
A050	Wigeon *Anas penelope*	wintering
A052	Teal *Anas crecca*	wintering
A054	Pintail *Anas acuta*	wintering
A056	Shoveler *Anas clypeata*	wintering
A062	Scaup *Aythya marila*	wintering
A137	Ringed Plover *Charadrius hiaticula*	wintering
A140	Golden Plover *Pluvialis apricaria*	wintering
A141	Grey Plover *Pluvialis squatarola*	wintering
A142	Lapwing *Vanellus vanellus*	wintering
A143	Knot *Calidris canutus*	wintering
A149	Dunlin *Calidris alpina*	wintering
A156	Black-tailed Godwit *Limosa limosa*	wintering
A157	Bar-tailed Godwit *Limosa lapponica*	wintering
A160	Curlew *Numenius arquata*	wintering
A162	Redshank *Tringa totanus*	wintering
A164	Greenshank *Tringa nebularia*	wintering
A179	Black-headed Gull *Chroicocephalus ridibundus*	wintering
A999	Wetlands	

Please note that this SPA overlaps with Lower River Shannon SAC (002165). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title:	BirdLife International Seabird Ecology and Foraging Range Database
Year:	2012
Author:	BirdLife International
Series:	http://seabird.wikispaces.com

Title:	Seabird Monitoring Programme (SMP) Database
Year:	2012
Author:	JNCC
Series:	http://jncc.defra.gov.uk/smp/Default.aspx

Title:	River Shannon and River Fergus Estuaries SPA (004077). Conservation objectives supporting document. [Version 1]
Year:	2012
Author:	NPWS
Series:	Unpublished Report to NPWS

Title:	Seabird Populations of Britain and Ireland
Year:	2004
Author:	Mitchell, P.I.; Newton, S.F.; Ratcliffe, N.; Dunn, T.E.
Series:	Poyser, London

Title:	Seabird monitoring handbook for Britain and Ireland: a compilation of methods for survey and monitoring of breeding seabirds.
Year:	1995
Author:	Walsh, P.; Halley, D.J.; Harris, M.P.; del Nevo, A.; Sim, I.M.W.; Tasker, M.L.
Series:	JNCC, Peterborough

A017 Cormorant *Phalacrocorax carbo*

To maintain the favourable conservation condition of Cormorant in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	This attribute applies to breeding cormorant. Measure based on standard survey methods (see Walsh et al., 1995). Mitchell et al. (2004) provides summary population information. The Seabird Monitoring Programme (SMP) online database (JNCC, 2012) provides population data for this species
Productivity rate	Mean number	No significant decline	This attribute applies to breeding cormorant. Measure based on standard survey methods (see Walsh et al., 1995). The Seabird Monitoring Programme (SMP) online database (JNCC, 2012) provides population data for this species
Distribution: breeding colonies	Number; location; area (hectares)	No significant decline	This attribute applies to breeding cormorant. Cormorant colonies are usually sited on flat or rocky islets or sea stack tops, less often on cliffs but they can also nest in trees (Walsh et al., 1995)
Prey biomass available	Kilogrammes	No significant decline	This attribute applies to breeding cormorant. Key prey items: fish (mostly benthic), some crustaceans. Key habitats: populations use sandy areas, rocky and vegetated substrate. Foraging range: max. 50km, mean max. 31.67km, mean 8.46km (BirdLife International Seabird Database (Birdlife International, 2012))
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	This attribute applies to breeding cormorant. Seabird species can make extensive use of the marine waters adjacent to their breeding colonies. Foraging range: max. 50km, mean max. 31.67km, mean 8.46km (BirdLife International Seabird Database (Birdlife International, 2012))
Disturbance at the breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding cormorant population	This attribute applies to breeding cormorant. Cormorant colonies are usually sited on flat or rocky islets or sea stack tops, less often on cliffs but they can also nest in trees (Walsh et al., 1995)
Population trend	Percentage change	Long term population trend stable or increasing	This attribute applies to non-breeding cormorant. Waterbird population trends are presented in part four of the conservation objectives supporting document

A017 Cormorant *Phalacrocorax carbo*

To maintain the favourable conservation condition of Cormorant in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by cormorant other than that occurring from natural patterns of variation	This attribute applies to non-breeding cormorant. As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A038 Whooper Swan *Cygnus cygnus*

To maintain the favourable conservation condition of Whooper Swan in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by whooper swan other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A046 Light-bellied Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Goose in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by light-bellied brent goose other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A048 Shelduck *Tadorna tadorna*

To maintain the favourable conservation condition of Shelduck in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by shelduck other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A050 Wigeon *Anas penelope*

To maintain the favourable conservation condition of Wigeon in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by wigeon other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A052 Teal *Anas crecca*

To maintain the favourable conservation condition of Teal in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by teal other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A054 Pintail *Anas acuta*

To maintain the favourable conservation condition of Pintail in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by pintail other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A056 Shoveler *Anas clypeata*

To maintain the favourable conservation condition of Shoveler in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by shoveler other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A062 Scaup *Aythya marila*

To maintain the favourable conservation condition of Scaup in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by scaup other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A137 Ringed Plover *Charadrius hiaticula*

To maintain the favourable conservation condition of Ringed Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by ringed plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

APPENDIX 3

A140 Golden Plover *Pluvialis apricaria*

To maintain the favourable conservation condition of Golden Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by golden plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A141 Grey Plover *Pluvialis squatarola*

To maintain the favourable conservation condition of Grey Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by grey plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A142 Lapwing *Vanellus vanellus*

To maintain the favourable conservation condition of Lapwing in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by lapwing other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A143 Knot *Calidris canutus*

To maintain the favourable conservation condition of Knot in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by knot other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A149 Dunlin *Calidris alpina*

To maintain the favourable conservation condition of Dunlin in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by dunlin other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A156 Black-tailed Godwit *Limosa limosa*

To maintain the favourable conservation condition of Black-tailed Godwit in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by black-tailed godwit other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A157 Bar-tailed Godwit *Limosa lapponica*

To maintain the favourable conservation condition of Bar-tailed Godwit in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by bar-tailed godwit other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A160 Curlew *Numenius arquata*

To maintain the favourable conservation condition of Curlew in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by curlew other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A162 Redshank *Tringa totanus*

To maintain the favourable conservation condition of Redshank in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by redshank other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A164 Greenshank *Tringa nebularia*

To maintain the favourable conservation condition of Greenshank in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by greenshank other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A179 Black-headed Gull *Chroicocephalus ridibundus*

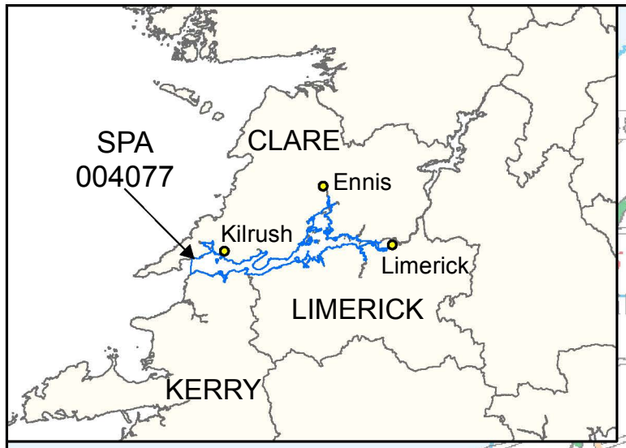
To maintain the favourable conservation condition of Black-headed Gull in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by black-headed gull other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A999 Wetlands

To maintain the favourable conservation condition of the wetland habitat in the River Shannon and River Fergus Estuaries SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:

Attribute	Measure	Target	Notes
Wetland habitat area	hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 32,261ha, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 32,261ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document



Legend

SPA 004077

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

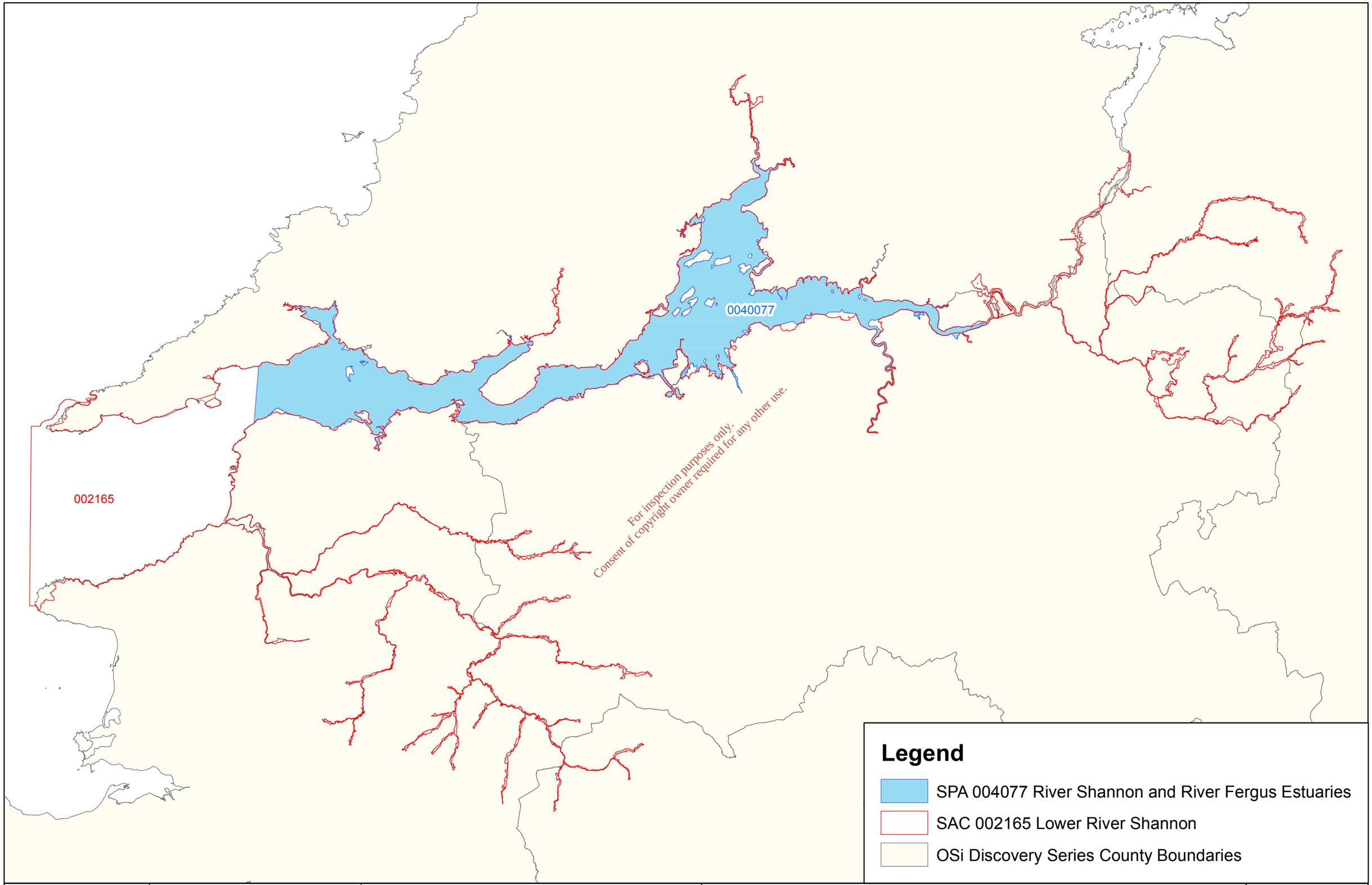
MAP 1:
RIVER SHANNON AND RIVER FERGUS ESTUARIES
CONSERVATION OBJECTIVES
SPA DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

0 2 4 6 8 10 km

N

Site Code
SPA 004077
Version: CL 1.03 / LI 1.03 / KE 1.02
Map Version 1
Date: May 2012



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2:
RIVER SHANNON AND RIVER FERGUS ESTUARIES
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING
DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives SPA Document.

0 5 10 15 20 km

N

Site Code
SPA 004077
Version: CL 1.03 / LI 1.03 / KE 1.02
Map Version 1
Date: May 2012

Appendix 8

Noise Survey

DixonBrosnan

noise & ecology specialists

dixonbrosnan.com

Project

2012 waste licence noise compliance survey at Greenstar waste management facility, Dock Road, Limerick
EPA waste licence W0082-02

Client

O'Callaghan Moran & Associates

Project no	No pages	Client reference
1148	10	W0082-02

DixonBrosnan Shronagreehy Kealkil Bantry Co Cork
Tel 086 813 1195 | damian@dixonbrosnan.com | www.dixonbrosnan.com

Report no	Date	Edit	Prepared by	Chkd
1148.2.1	02.07.12	Release 1	Damian Brosnan	CD

1 Introduction

1.1 DixonBrosnan was instructed by O'Callaghan Moran & Associates, on behalf of their client Greenstar, to undertake the 2012 annual environmental noise survey at the latter's waste management facility at Dock Road, Limerick. The survey is a requirement of waste licence W0082-02 issued by the Environmental Protection Agency (EPA) in respect of the facility. Several noise conditions attached to the licence are presented in **appendix 1**.

1.2 The noise survey was carried out on Thursday 24.05.12 at four stations specified in licence W0082-02 and shown in **appendix 2**. As the facility does not currently operate by night, the survey was confined to daytime hours. Survey methodology, equipment specifications and weather conditions are outlined in **appendix 3**.

1.3 Operations proceeded at the Greenstar facility throughout the survey. Noise emissions arose from the following sources:

- Front end loader in buildings.
- Clamp truck x2 in buildings and on yards.
- Tracked excavator with grab in limited use on yard.
- Cardboard baler and associated conveyor.
- Skips being manoeuvred onsite.
- Occasional truck movements onsite.
- Tracked excavator in almost continuous use near northeast corner associated with temporary onsite construction works.

2 Results

2.1 Noise data recorded are presented in **appendix 4**. $L_{Aeq\ 30\ min}$ levels measured at the three onsite stations NI1, NI2 and NI3, were 57, 61 and 54 dB respectively. Facility operations dominated the noise environment at all three, although only at NI2 was the $L_{Aeq\ 30\ min}$ level considered entirely representative of site emissions. At NI1 and NI3, extraneous noise sources such as traffic and bird calls contributed to the $L_{Aeq\ 30\ min}$ level. The contribution attributable to site operations was estimated at 55 dB at NI1 and 53 dB at NI3.

2.2 Greenstar emissions were not audible at the only offsite station, NI4, situated at the junction of Dock Road and the commercial park roadway which serves several premises including Greenstar. Site emissions were therefore significantly lower than the 70 dB $L_{Aeq\ 30\ min}$ level which was derived entirely from road traffic noise.

2.3 Schedule C.1 of waste licence W0082-02 specifies a daytime noise emission limit of 55 dB at the measurement stations. Most waste licences currently issued by the EPA state that specified noise limits are to apply to noise sensitive locations (NSLs) only. As there are no NSLs in proximity to the Greenstar facility, it is considered impractical to enforce limits at the site boundary. The absence of NSLs outside the facility boundary is evident in **appendix 2**. Furthermore, the facility's location in an industrial area adjacent to a busy urban roadway results in relatively high ambient noise levels, regardless of Greenstar operations. It is therefore considered that W0082-02 noise limits are relevant to offsite NSLs only, and that levels measured are not relevant to limits set out in schedule C.1 of the licence.

2.4 During the survey, brief inspections were carried out at the nearest NSLs to the facility, consisting of a halting site 460 m to the east, a farmhouse 520 m to the south, and dwelling clusters approximately 1200 m to the north and northeast. No emissions were audible from the Greenstar facility at these receptors, and ambient levels were dominated by local and distant road traffic. Greenstar emissions are highly unlikely to have breached the 55 dB daytime noise limit at these or any other NSLs. It is therefore considered that site emissions were satisfactory and in compliance with applicable noise limits.

2.5 Condition 5.6 of licence W0082-02 prohibits any clearly audible tones or impulses at NSLs. None were noted at the receptors described in **paragraph 2.4**. Tones detected in the 25 and 1600 Hz bands at NI1, and in the 1600 Hz band at NI2, were traced to onsite operations. These tones were not audible offsite. Frequency spectra are presented in **appendix 5**.

3 Conclusions

3.1 $L_{Aeq\ 30\ min}$ levels measured at the three onsite stations were 54-61 dB, and dominated by site emissions. At the fourth station offsite, where Greenstar emissions were inaudible, the $L_{Aeq\ 30\ min}$ level was 70 dB. The 55 dB daytime limit specified in waste licence W0082-02 is not considered relevant to these stations due to the absence of sensitive receptors here.

3.2 Noise limits set out in the waste licence are considered applicable to NSLs. An inspection of the nearest NSLs during the survey indicated that facility operations were not audible, and thus lower than the 55 dB daytime noise limit.

3.3 No tones or impulses were noted at offsite NSLs, thus complying with condition 5.6 of the licence.

Appendix 1: W0082-02 noise conditions

1.6. Waste Acceptance Hours and Hours of Operation

The facility may operate and accept waste on a twenty-four hour basis, seven days per week.

5.6 There shall be no clearly audible tonal component or impulsive component in the noise emissions from the activity at the noise sensitive locations.

C.1 Noise Emissions: (Measured at the monitoring points indicated in Table D.1.1).

Day dB(A) L_{Aeq}(30 minutes)	Night dB(A) L_{Aeq}(30 minutes)
55	45

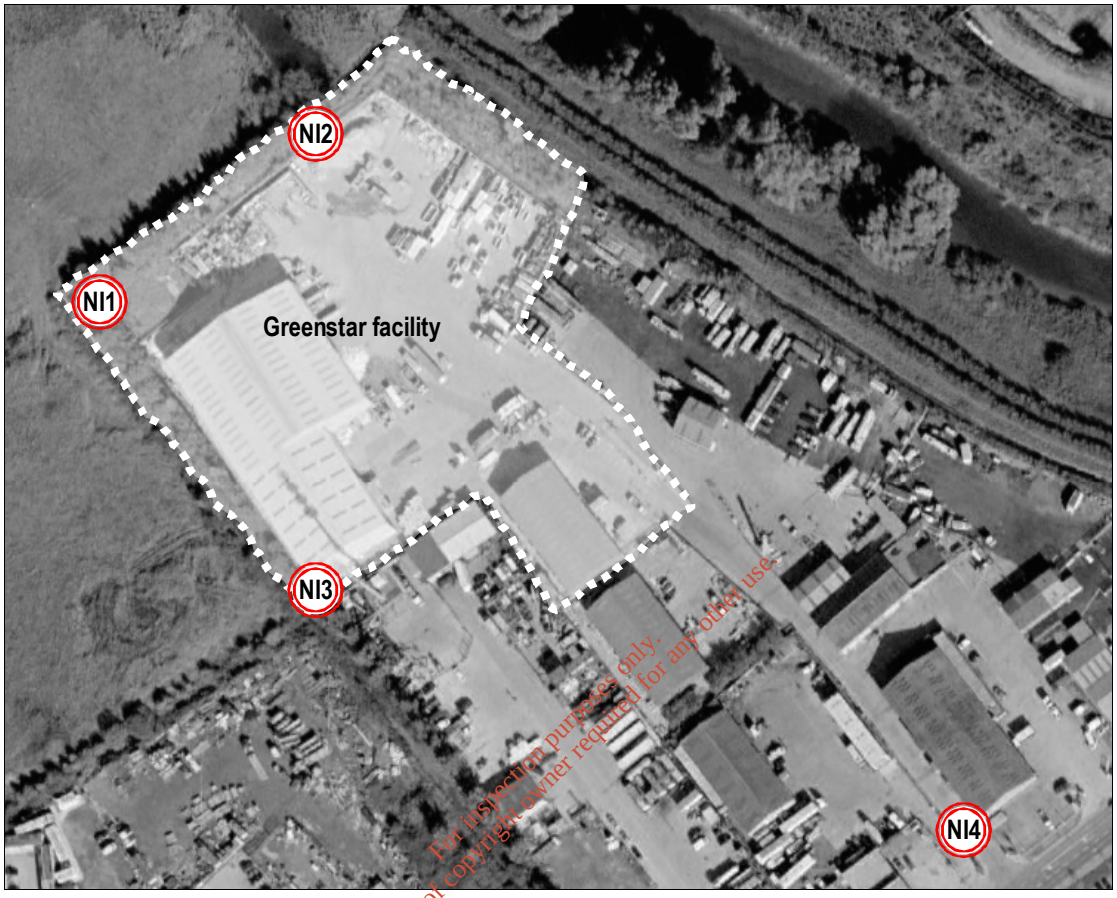
Table D.1.2 Emissions to Atmosphere Monitoring Locations

DUST	NOISE
STATIONS	STATIONS
DM1	NI1
DM2	NI2
DM3	NI3
	NI4

Table D.3.1 Noise Monitoring Frequency and Technique

Parameter	Monitoring Frequency	Analysis Method/Technique
$L(A)_{EQ}$ [30 minutes]	Annual	Standard [Note 1]
$L(A)_{10}$ [30 minutes]	Annual	Standard [Note 1]
$L(A)_{90}$ [30 minutes]	Annual	Standard [Note 1]
Frequency Analysis(1/3 Octave band analysis)	Annual	Standard [Note 1]

Note 1: "International Standards Organisation. ISO 1996. Acoustics - description and Measurement of Environmental noise. Parts 1, 2 and 3."



Appendix 3: Survey details

File	Project ref.	1148
	Client	O'Callaghan Moran & Associates
	Location	Greenstar, Dock Road, Limerick
	Stations	NI2 NI4
	Purpose	2012 waste licence compliance survey
	Comment	Facility operating **SLM x2 used**
Event	Date	24.05.12
	Day	Thursday
	Time	0815-1015
	Operator	Damian Brosnan BSc MIOA MIEI MIEnvSc
Conditions	Cloud cover	20 %
	Precipitation	0 mm
	Temperature	16 ^{0}C
Wind	Direction	SE
	Speed	0-1 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250
	Instrument serial no.	2506594
	Microphone serial no.	2529531
	Application	BZ7224 Version 2.5
	Bandwidth	Broadband
	Max input level	141.16 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA-1650
	Sound Field correction	Free-field
	UKAS calibration	17.01.12
	Calibration certificate	Available on request
Onsite calibration	Time	24/05/2012 08:23:27
	Calibration type	External
	Sensitivity	47.92 mV/Pa
	Post measurement check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	1723667
	UKAS calibration	16.01.12
	Calibration certificate	Available on request
Methodology	Standard	ISO 1996 Acoustics: Description and measurement of environmental noise - Part 1 (2003) & Part 2 (2007)
	Exceptions	-
	Intervals	30 min

File	Project ref.	1148
	Client	O'Callaghan Moran & Associates
	Location	Greenstar, Dock Road, Limerick
	Stations	NI1 NI3
	Purpose	2012 waste licence compliance survey
	Comment	Facility operating **SLM x2 used**
Event	Date	24.05.12
	Day	Thursday
	Time	0815-1015
	Operator	Damian Brosnan BSc MIOA MIEI MIEnvSc
Conditions	Cloud cover	20 %
	Precipitation	0 mm
	Temperature	16 ^{0}C
Wind	Direction	SE
	Speed	0-1 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250-L
	Instrument serial no.	2566801
	Microphone serial no.	2571655
	Application	BZ7130 Version 3.0
	Bandwidth	Broadband
	Max input level	142.66 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA1404 outdoor kit
	Sound Field correction	Free-field
	UKAS calibration	14.10.10
	UKAS calibration certificate	Available on request
Onsite calibration	Time	24/05/2012 08:16:21
	Calibration type	External
	Sensitivity	41.78 mV/Pa
	Post measurement check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	1723667
	UKAS calibration	16.01.12
	UKAS calibration certificate	Available on request
Methodology	Standard	ISO 1996 Acoustics: Description and measurement of environmental noise - Part 1 (2003) & Part 2 (2007)
	Exceptions	-
	Intervals	30 min

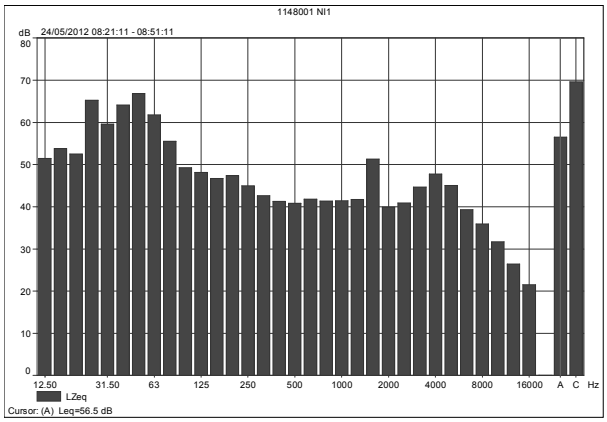
Appendix 4: Noise data

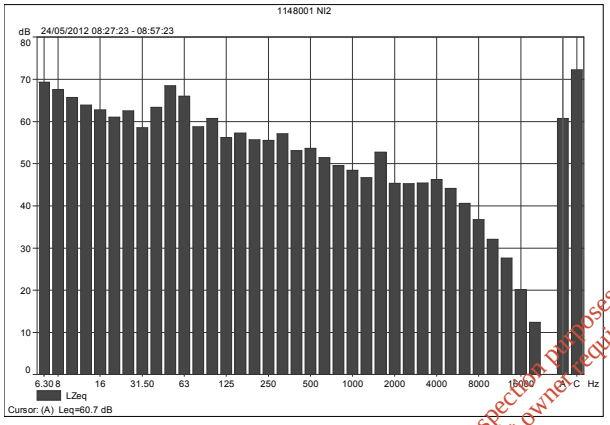
Survey date: 24.05.12

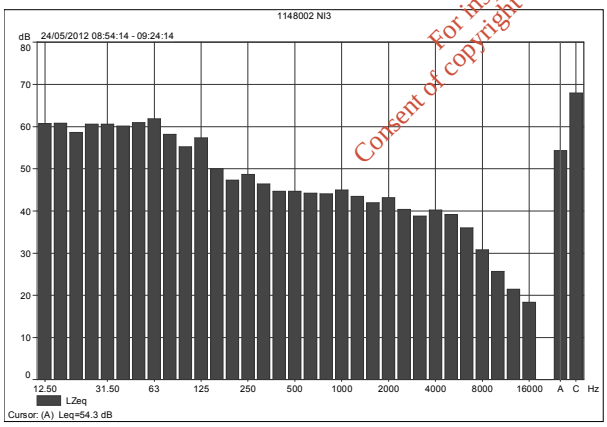
Station	Time	$L_{Aeq\ 30\ min}$ dB	$L_{AF10\ 30\ min}$ dB	$L_{AF90\ 30\ min}$ dB	Specific level* dB	Noise audible
NI1	0821-0851	57	58	48	55	Occasional loader and clamp truck movements audible at low level in main yard. Loader also slightly audible when in building. Loader dominant on sporadic occasions when entering N yard area. Starlings on NW boundary continuously dominant. Road traffic to E continuously significant in background.
NI2	0827-0857	61	62	50	61	Loader and clamp truck operations dominant around yard and in building. Tracked excavator on construction activity near NE corner slightly audible continuously, significantly screened by intervening structures. Tracked excavator with grab operating at 40 m from 0853. Bird calls and offsite road traffic significant.
NI3	0854-0924	54	56	51	53	Clamp truck operating almost continuously in main yard audible at low level. Baler and conveyor in nearest corner of building also continuously audible at low level. Distant road traffic to SW continuously audible at low level. Bird song/calls and rustling vegetation.
NI4	0933-1003	70	73	61	<<61	No site emissions audible, apart from sporadic trucks using access road. Dock Road traffic continuously intrusive. No other noise audible.

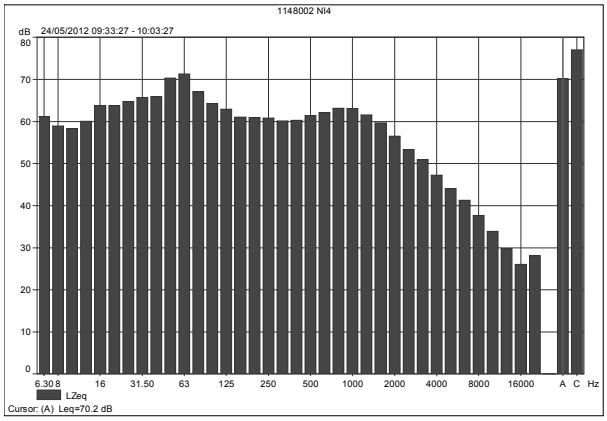
*Specific level: Sound pressure level contribution considered attributable to facility, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra, near field correction if applicable, and other parameters.

Appendix 5: Frequency spectra









Appendix 6: Glossary

Ambient	Total noise environment at a location, including all sounds present.
A-weighting	Weighting or adjustment applied to sound level to approximate non-linear frequency response of human ear. Denoted by suffix A in parameters such as $L_{Aeq\,T}$, $L_{AF10\,T}$, etc.
Background level	$L_{AF90\,T}$. A-weighted sound pressure level of residual noise exceeded for 90 % of time interval T.
Decibel	Shortened to dB. Unit of noise measurement scale. Based on logarithmic scale so cannot be simply added or subtracted. 3 dB difference is smallest change perceptible to human ear. 10 dB difference is perceived as doubling or halving of sound level. **Throughout this report noise levels are presented as decibels relative to 20 µPa**. Examples of decibel levels are as follows: 20 dB: very quiet room; 30-35 dB: night-time rural environment; 55-65 dB: conversation; 80 dB: busy pub; 100 dB: nightclub.
Fast response	0.125 seconds response time of sound level meter to changing noise levels. Denoted by suffix F in parameters such as $L_{AF10\,T}$, $L_{AF90\,T}$, etc.
Frequency	Number of cycles per second of a sound or vibration wave. Low frequency noise may be perceived as hum, while whine represents higher frequency. Range of human hearing approaches 20-20,000 Hertz.
Hertz	Shortened to Hz. Unit of frequency measurement.
Impulse	Noise which is of short duration, typically less than one second, sound pressure level of which is significantly higher than background.
Interval	Time period T over which noise monitoring is conducted. Denoted by T in $L_{Aeq\,T}$, $L_{AF90\,T}$, etc.
$L_{Aeq\,T}$	Equivalent continuous sound level during interval T, effectively representing average A-weighted noise level.
L_{AF}	Sound pressure level averaged over one second, and changing each second in fluctuating noise environment.
$L_{AF10\,T}$	Sound pressure level exceeded for 10% of interval T, usually used to quantify traffic noise.
$L_{AF90\,T}$	Sound pressure level exceeded for 90% of interval T, usually used to quantify background noise. May also be used to describe noise level from continuous steady or almost-steady source, particularly where local noise environment fluctuates.
$L_{Req\,T}$	Rating noise level, derived from $L_{Aeq\,T}$ plus specified adjustments for tonal and impulsive characteristics. Equivalent to $L_{Ar\,T}$ used by EPA.
Near field	Noise levels recorded near walls or other surfaces, artificially increased due to reflections. Levels near walls may be increased by up to 3 dB, and up to 6 dB near corners. Free field conditions may be achieved by maintaining separation distance of at least 3.5 m from walls.
Noise sensitive location	Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.
1/3 octave band	Frequency spectrum may be divided into octave bands. Upper limit of each octave is twice lower limit. Each octave may be subdivided into thirds, allowing greater analysis of tones.
Residual level	Noise level remaining when specific source is absent or does not contribute to ambient.
Specific level	Sound pressure level contribution arising from specific noise source, measured directly or by estimation or calculation.
Tone	Character of noise caused by dominance of one or more frequencies which may result in increased noise nuisance.
Z-weighting	Standard weighting applied by sound level meters to represent linear scale.

Appendix 9

Visual Impact

Photo 1- site access

Photo 2 – Site Entrance

Photo 3 – Buildings 1 & 2

Photo 4 – Admin & Maintenance Building

Photo 5 – External Storage of RDF Bales

Photo 6 – External Storage of C&D Waste

Photo 7- External Storage of Plastic and Metals

Photo 8- Skip Storage

Photo 9 – Security Fence along Southern Boundary

Photo – 10 Embarkment on Ballinacurra Creek