



Clare County Council

KILLALOE BYPASS, SHANNON BRIDGE CROSSING AND R494 IMPROVEMENT NATURA IMPACT STATEMENT



North Tipperary County Council



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KILLALOE BYPASS, SHANNON RIVER CROSSING AND R494 IMPROVEMENT

NATURA IMPACT STATEMENT

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1.0 INTRODUCTION

This report has been prepared by Roughan & O'Donovan Consulting Engineers (and is informed by the EIS for the project completed by Paul Murphy of EirEco Consultancy Services), to determine the potential effects, if any, of the proposed Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement Scheme on nearby sites with European conservation designations (i.e. Natura 2000 sites). It will accompany the Environmental Impact Statement. The purpose of this assessment is to determine the appropriateness, or otherwise, of the proposed scheme in the context of the conservation status of such sites.

1.1 Regulatory Context

The requirements for an Assessment under Article 6 of the Habitats Directive

The requirement for appropriate assessment is set out in the EU Habitats Directive (92/34/EEC) in Article 6.3 which states:

“Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans and projects, shall be subjected to appropriate assessment of its implications for the site in view of the site’s conservation objectives.”

1.2 The Aim of this Report

This Natura Impact Statement (NIS) has been prepared in accordance with current guidance and provides an ecological impact assessment for the proposed Killaloe Bypass, Shannon River Crossing and R494 Improvement.

The NIS provides the information required in order to establish whether or not the proposed development is likely to have a significant impact on the Natura sites in the context of their conservation objectives and specifically on the habitats and species for which the Natura 2000 sites have been designated.

By undertaking the ecological impact assessment in a step by step manner in relation to the habitats and species of the Natura 2000 sites, this report seeks to inform the screening process required as the first stage of the process pursuant to Article 6.3 of the EU Habitats Directive and also to provide full and detailed information for the second stage, that of Appropriate Assessment.

1.3 Background to the Project

The Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement is proposed by Clare County Council and North Tipperary County Council to provide the appropriate road infrastructure for Killaloe / Ballina towns whose historical character and community infrastructure is threatened by heavy traffic and a bridge serviced by a shuttle one lane traffic system. The scheme proposes to cater for the planned local, regional and national development in this area.

2.0 THE APPROPRIATE ASSESSMENT PROCESS

2.1 Introduction

As set out in 1.1 above, Article 6(3) of the EU Habitats Directive (92/43/EEC) defines the requirement for Appropriate Assessment of certain plans and projects. In order to

inform the requirements of this NIS the following guidance documents have been referred to:

- Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities (NPWS 2009, Revised February 2010);
- EU Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC (2007); and
- Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (2002).

In terms of what is required to allow the competent authority to undertake and complete the Appropriate Assessment, the Guidance for Planning Authorities (NPWS 2009, revised February 2010) states:

*'AA is an impact assessment process that fits within the decision making framework and tests of Article 6(3) and 6(4) and, for the purposes of this guidance, it comprises two main elements. Firstly a **Natura Impact Statement – i.e. a statement of the likely and possible impacts of the plan or project on a Natura 2000 site must be prepared. This comprises a comprehensive ecological impact assessment of a plan or project; it examines the direct and indirect impacts that the plan or project might have on its own or in combination with other plans and projects, on one or more Natura 2000 sites in view of the sites' conservation objectives. Secondly, the competent authority carries out the AA, based on the NIS and any other information it may consider necessary.'***

2.2 Stages of Article 6 Assessment

The European Commission's guidance promotes a staged process, as set out below, the need for each being dependent upon the outcomes of the proceeding stage.

- Stage 1 – Screening;
- Stage 2 – Appropriate Assessment;
- Stage 3 – Assessment of Alternative Solutions;
- Stage 4 – Consideration of Imperative Reasons of Overriding Public Interest;
- Stage 5 – Consideration of Compensatory Measures.

Stage 1 of the process is intended to identify whether the project is 'likely to have a significant effect' upon a European site, referred to as 'screening'. If the screening process identifies the potential for significant adverse impacts on Natura 2000 sites, stage two of the process needs to be completed. This considers any potential impacts in greater detail including whether further mitigation measures are required. If an adverse impact upon the site's integrity cannot be ruled out then stage 3 will need to be undertaken to assess whether alternative solutions exist. If no alternatives exist that have a lesser effect upon the Natura 2000 site/s in question, the project can only be implemented if there are 'imperative reasons of overriding public interest', as detailed in Article 6(4). In essence, the work at Stage 1 will determine whether further stages of the process are required.

This Natura Impact Statement (NIS) includes the ecological assessment and testing required under Stage One and Stage Two – Appropriate Assessment.

3.0 DESCRIPTION OF THE PROJECT

The proposed Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement Scheme will provide a western bypass of Killaloe, a new bridge crossing of the River Shannon and an upgrade of the existing R494 regional road from Ballina to the N7 at Bridhill. The entire scheme is approximately 6.2km and will cross the River Shannon approximately 1km to the south of the existing Killaloe Bridge and will cross the Kilmastulla River (a tributary of the River Shannon and part of the Lower River Shannon SAC) on the R494.

The proposed scheme has been broken down into three sections as follows:

1. Killaloe Bypass: This part of the Scheme aims to create a western bypass around the town of Killaloe which will connect the R463 to the north of town with the proposed Shannon Bridge Crossing section and R463 to the south of the town.
2. Shannon Bridge Crossing: This section of the Scheme will cross the River Shannon approximately 1km south of the existing Killaloe Bridge and will connect the proposed Killaloe Bypass with the R494.
3. R494 Upgrade: This section will involve widening, regrading and local realignment of the R494 from its junction with the R496 and proposed Shannon Bridge Crossing south of Ballina, as far as the junction with the R445 (previously known as N7) north of Birdhill.

The overall route of the proposed scheme is illustrated in **Figures 1 to 5**.

3.1 Shannon Bridge Construction

The proposed Shannon Bridge crosses the River Shannon where it is 143 metres wide. The land is moderately sloping on the east side, falling a height of 11.5 metres over a distance of 94 metres between the R494 and the east bank of the river. On the west side the terrain is gently sloping falling a height of 6 metres over a distance of 170 metres between the existing residential access road at Moys and the bank of the river. In addition there are the remains of an inundated canal running parallel to the river bank.

The proposed bridge structure consists of a slender reinforced concrete deck supported on a system of secondary steel beams at deck level connected to primary steel arches. (See **Figure 6**).

The superstructure is supported on four reinforced concrete piers in the river channel, and two reinforced concrete abutments at the river banks. The three interior span lengths are 42 metres and the two end spans are 21 metres.

For the safety of road users road lighting will be provided along the full length of the Shannon Bridge Crossing section of the scheme. Lighting is proposed to utilise columns no higher than 14 meters and to use high-pressure cut-off sodium lanterns.

Satellite Compound

A satellite compound will be required close to the River Shannon Bridge to facilitate construction. It is considered that there are sufficient lands available within the permanent land take on the western approach to the bridge location outside of the SAC for this purpose. By means of suitable construction programming, earthworks operations in this area will be delayed to facilitate access for plant and materials to the bridgeworks area.

The satellite compound will contain a set down area for materials used in bridge construction, crane and heavy machinery (heavy machinery will be stored at the main compound outside the SAC at night). Storage of fuels and other materials with potential to result in pollution of the river will not be permitted on site.

Any additional lands required by the contractor during the construction phase will not be permitted within the Lower River Shannon SAC.

Construction Sequence

The following represents the proposed methodology for the construction of the Shannon Bridge which is a critical part of the Scheme.

Stage 1: Establishment of bridge site compound

- This will be constructed at the western approach to the bridge within the lands made available.
- A working area will also be established adjacent to the east abutment location; land is available for this purpose within the lands made available and immediately to the north of the abutment location.

Stage 2: Foundation Construction- Abutments

- Both the east and west abutments require piled foundations; piling will be carried out using pile driving techniques; restrictions will be placed on working times (night time works will not be permitted outside of emergency works).
- The abutment pilecaps are of conventional reinforced concrete construction; it is likely that a mobile crane will be used for heavy lifts including shuttering and reinforcement cages; concrete will be delivered by road from an offsite readymix plant.

Stage 3: River Piers

- Piling for the piers can be carried out from floating plant mounted on Uniflote pontoons or similar; both raking and vertical piles will be required depending on pier position.
- Construction of reinforced pilecaps will be carried out using suspended shuttering techniques; once the formwork is in place dewatering will take place to allow concreting operations to take place in dry conditions.
- Construction of reinforced concrete piers will follow; dewatering techniques will be deployed as required for the parts of the piers which are below normal water level of the river.

Stage 3: Superstructure Construction

- Installation of the structural steel arches will be achieved by preassembly of either full-span or half-span units comprising the arch members, vertical struts, deck level steelwork and appropriate temporary cross-bracing. The units will be assembled in the works area on the west side of the Shannon, following delivery to site of the structural steel members by public road. This operation will be carried out on a phased basis as construction of the superstructure progresses on site.
- Installation of the arches (whether in whole spans or half spans) will progress from west to east in the following sequence:

- Install first full span assembly (Pier 1 to Pier 2) by land-based or barge-mounted crane.
 - Install end span assembly at west end (west abutment to Pier 1) by land-based or barge-mounted crane.
 - Install precast concrete deck slabs to end span (west end) and to span between Piers 1 and 2, progressing from west abutment.
 - Place in-situ concrete to make top slabs composite.
 - Install arch assembly for second full span (Pier 2 to Pier 3) using mobile crane located on deck span between Piers 1 and 2.
 - Install precast concrete deck slabs to second full span i.e. between Piers 2 and 3, and place in-situ concrete to make top slabs composite.
 - Install arch assembly for third full span (Pier 3 to Pier 4) using mobile crane located on deck between Piers 2 and 3.
 - Install precast concrete deck slabs to third full span i.e. between Piers 3 and 4, and place in-situ concrete to make top slabs composite.
 - Install half-arch assembly for west end-span (Pier 4 to East Abutment) using mobile crane located on deck between Piers 3 and 4.
 - Install precast concrete deck slabs to end span (east end) and to span between Piers 1 and 2, progressing from west abutment.
- Construct bridge parapet plinths.
 - Lay bridge deck waterproofing.
 - Install all deck finishes including road surfacing (except wearing course).
 - Install bridge parapet railings.
 - Install wearing course after completion of earthwork operations on R494 section.

As an alternative to the above sequence, the contractor may opt to assemble and install arch assemblies for the east end-span and the span between Piers 3 and 4 by working on and from the east bank of the Shannon.

3.2 Kilmastulla River Bridge Construction

A new bridge will be provided for over the Kilmastulla River. The construction of the Kilmastulla River Bridge will involve excavation for the foundations of the bridge on both banks of the river. No working in the river channel itself will be required for this purpose. Some dewatering of foundation excavations may be required due to ingress of water. Care will be taken to ensure there is no contamination of the water by the materials and equipment used in the construction. The bridge foundations are piled and a system of either bored or driven piles will be utilized for this purpose. These works will have minimal impact on the environment, though significant noise levels could be generated by the equipment used.

Following installation of the piling the reinforced concrete pilecaps will be constructed using conventional methods. The reinforced earth abutments will follow, followed by construction of the deck. This will comprise a composite system of precast concrete beams and infill reinforced concrete. A mobile crane will be used for installation of the precast beams.

3.3 Road Drainage System

The proposed Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement will be constructed within the catchment of the River Shannon. The road drainage system will ultimately discharge to the River Shannon. The sub - catchment traversed by the proposed road is predominantly rural and is characterised by steep falls on the Killaloe side where the scheme crosses 2 minor watercourses. The route of the R494 Improvement crosses the Kilmastulla River and five other watercourses, which are all part of the River Shannon Catchment system.

Carriageway Drainage

The proposed carriageway drainage system shall be designed in accordance with the NRA DMRB, NRA Addendum to HD 33/06 and the current best practice guidance for drainage i.e. "Sustainable Urban Drainage Systems" or SUDS.

A combination of kerb and gully systems with a carrier pipe, filter drains and over the edge drainage will be used to drain the carriageway.

Cut-off filter drains or channels are provided at the top of cuttings slopes where the adjoining land slopes towards the embankment. These cut-off drains will where possible discharge to existing watercourse and not to the road drainage system.

Where the road is in cut intersecting land drains and ditches are diverted into cut-off drains and taken to drainage outfalls.

Culvert Design

The Scheme will involve the culverting of a number of minor watercourses.

The design standards for culverts of OPW watercourses and the canal have been established in consultation with the Office of Public Works. The OPW's minimum requirements are:-

- Minimum Culvert Size of 900mm diameter;
- Culverts are to be designed to convey the 1 in 100yr design flow;
- Calculated flows are to be increased by a factor of 1.2 to allow for climate change, 1.6 to allow for maintained channels and the appropriate statistical error factor;
- Maximum allowable afflux of 300mm for Bridgeless (desirable on culverts);
- Minimum 300mm Freeboard on Bridge Structures (desirable on culverts); and
- Section 50 applications are required for all OPW watercourses.

Culverts at watercourse that have been identified as being of importance to fisheries are provided with a low flow channel at the base. Such channels have a minimum effective depth of 500mm below the invert of the culvert and are 1m wide. Detailed design works and construction for such culverts shall be undertaken in conjunction with Inland Fisheries Ireland.

Generally culverts are constructed directly along the line of the watercourse being culverted and are not offset. However, where necessary, ditches and streams may have to be realigned. To prevent contamination of watercourses by silting, each watercourse will be temporarily diverted during the construction of the associated culvert and seasonal restrictions will be put in place.

The culverts on the scheme shall be designed to be inlet controlled in the 1 in 100 yr flood event using the methodology outline in CIRIA Report 168 – The Culvert Design Guide. Where required in order to achieve the required finished road level some minor stream re-grading works may be required. **Table 3.2** presents the 1 in 100 yr flow and size for culverts on the Scheme for the purpose of the preliminary design.

Table 3.1 Proposed Culvert Sizes

Culvert Ref.	Road & Chainage	1 in 100yr Flow	Culvert Size
KBP CA1	KB Ch 0	0.96 m ³	1.5m diameter
KBP CA2	KB Ch 1760	2.35m ³	1.2m high x 3.0m wide
KBP CB1	R463 North Ch 20	2.4m ³	1.2m high x 3.0m wide
R494 CC1	R494 Ch 980	3.6m ³	1.5m high x 3.3m wide
R494 CC2	R494 Ch 1120	7.3m ³	1.8m high x 4.5m wide
R494 CC2A	R494 Ch 1170		1.2m diameter
R494 CC3	R494 Ch 1720	1.8m ³	1.5m high x 1.5m wide/1.8m diameter
R494 CC3A	R494 Ch 1995		1.2m diameter
R494 CC4	R494 Ch 2300	1.3m ³	1.2m high x 1.8m wide
R494 CC5	R494 Ch 3270	1.9m ³	1.5m high x 2.1m wide

Note: flows and culvert sizes may be subject to refinement at detailed design stage.

Flow Attenuation

The design of this scheme has included provision for storm water attenuation. Storm water attenuation ponds will have adequate capacity to cater for the fifty year rainfall event. Flows will be restricted to greenfield runoff rates by a flow control device at the outlet. Ponds will permanently contain a 300mm depth of water to encourage plant life to develop over time which will also act as a water quality treatment facility.

Water Quality and Treatment

The following is proposed as a minimum level of treatment to the road runoff prior to discharge to watercourses:-

1. A Class 2 Bypass Petrol/Oil Interceptor is to be provided at each outfall;
2. Road runoff is to go through a stilling process to allow suspended solids to settle out (this may be in open ditches, ponds, hydrodynamic separators, etc).

With regard to the protection of watercourses from pollutants, Inland Fisheries Ireland requires that measures be implemented to minimise the risk of pollution of watercourses. The Department of the Marine and Natural Resources publication: '*Fishery Guidelines for Local Authority Works*' Section 8.2 suggests that soakaways or settlement ponds be installed on drains accepting runoff from heavily trafficked roads. In line with these recommendations and in an effort to minimize any impact on the receiving environment from runoff from road surfaces, pollution control is proposed at each proposed outfall location. In general, pollution control is proposed in the form of vegetative systems i.e. Infiltration Basins or Sedimentation Ponds as described in UK DMRB Vol. 4 Sect. 2 HA 103/01.

Many factors affect the selection of appropriate pollution control facilities including soil characteristics, traffic flows and characteristics, the sensitivity of the receiving environment and the expected constituents of the runoff.

Pollution control facilities that are not required to provide flow attenuation are sized based on the runoff from the first 10mm of rainfall event, often described as the 'first flush' effect of storm. This allows any build up of pollutants on a roadway that will be washed off in the early part of a storm are treated. Pollution control facilities are provided upstream of the outfall and are filled via a v-notch device that diverts the road surface run-off from the early stage of storm events and from insignificant storm events to the facility.

All pollution control facilities and attenuation areas are fitted with a penstock or similar restriction at the outfall to the receiving channel. Such devices are used to contain pollutants in the event of an accidental spillage.

A risk assessment to quantify the likelihood of a serious accidental spillage will be carried out in accordance with UK DMRB Annex III Volume 11 Section 3 Part 1.

Vehicular drainage maintenance access from the public road network to all pollution control facilities and attenuation ponds will be provided and boundary fencing for safety will also be incorporated. Similarly vehicular access will be provided around all such facilities and ponds. The areas containing attenuation ponds and pollution control facilities shall be securely fenced to prevent access by all with the exception of those responsible for maintenance.

See also Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement Environmental Impact Statement for detailed assessment and figures of the scheme.

4.0 NATURA 2000 SITES

4.1 Designated sites in the Vicinity of the Project

Section 3.2.3 of the Guidance for Planning Authorities states that the approach to screening can be different for plans and projects, depending on scale and on the likely effects. For the purpose of this screening exercise the likely zone of direct impact primarily relates to the zone immediately around the construction site (circa 1km radius) with the only potential impact outside of this zone relating to downstream water quality. The potential for indirect impact was considered within 10km downstream of the bridge crossing points.

The designated sites which the project could have an impact on are:

- Lower River Shannon Special Area of Conservation (site code 002165);
- Lough Derg Special Protection Area (site code 4058);
- Slieve Bernagh Bog (site code 002312).

4.2 Characteristics of Designated Sites

Lower River Shannon SAC (See Figure 7)

The river downstream of the existing Killaloe Bridge forms part of the Lower River Shannon SAC (site code no. 002165) which extends to include the entire Shannon Estuary as far as Kerry and Loop Head. The Lower River Shannon SAC is selected for a large number of habitats and species listed under the EU Habitats Directive.

Conservation Objectives for the Lower River Shannon SAC are as follows:

To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- *Margaritifera margaritifera*;
- *Petromyzon marinus*;
- *Lampetra planeri*;
- *Lampetra fluviatilis*;
- *Salmo salar* (only in fresh water);
- Sandbanks which are slightly covered by sea water all the time;
- Estuaries;
- Mudflats and sandflats not covered by seawater at low tide;
- Coastal lagoons;
- Large shallow inlets and bays;
- Reefs;
- Perennial vegetation of stony banks;
- Vegetated sea cliffs of the Atlantic and Baltic coasts;
- Salicornia and other annuals colonizing mud and sand;
- Atlantic salt meadows (*Glauco Puccinellietalia maritimae*);
- *Tursiops truncatus*;
- *Lutra lutra*;
- Mediterranean salt meadows (*Juncetalia maritimi*);
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche Batrachion vegetation;
- Molinia meadows on calcareous, peaty or clayey silt laden soils (*Molinion caeruleae*);
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno Padion*, *Alnion incanae*, *Salicion albae*).

The River Shannon supports populations of salmon (*Salmo salar*), sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*) and brook lamprey (*L. planeri*), all of which are listed in Annex II of the EU Habitats Directive and have been recorded from Lough Derg. The existence of a landlocked River Lamprey population within the lake is suspected; normally this species spends its adult life in estuarine waters before migrating upstream to spawn. The stretch of river within the vicinity of the proposed bridge does not provide suitable spawning conditions for salmon or lamprey species despite the presence of suitable substrate due to the depth and flow regime. Lamprey ammocoetes may however utilize the soft sediments along the eastern shore.

Salmon also occur in the Kilmastulla River and potential spawning conditions exist from approximately 100m downstream of the existing R494 bridge. The Kilmastulla may also support lamprey species.

On the island separating the Shannon and canal along its western shore, there is a cavity in the river bank which suitable as a holt for Otters. There were no spraints evident in the area during the survey but the potential of utilisation is high due to its isolation and proximity to the river.

An above ground lie-up (couch) is present approximately 42m upstream of the existing R494 Bridge over the Kilmastulla River. The site is regularly used and fresh spraint was present. There is evidence of otter crossing the existing road at the bridge, presumably during periods of flood when strong flow prevents them from moving upstream under the bridge. There is likely to be movement of otter along all watercourses in the study area including drainage ditches.

Lough Derg SPA (See Figure 7)

Lough Derg is a proposed Natural Heritage Area (pNHA) (Site code No. 000011) and a designated Special Protection Area (site code no. 4058), the boundaries of which commence upstream of the existing Killaloe Bridge. The site has been designated as an SPA as it supports important numbers of wintering wildfowl.

Conservation Objectives for the Lough Derg SPA are as follows:

To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.

Annex I species identified within the SPA are as follows:

- *Sterna hirundo*;
- *Cignus Cygnus*;
- *Anser albinfrons flavirostris*.

Regularly occurring migratory birds not listed on Annex I of Council Directive 79/409/EEC are as follows:

- *Phalacrocorax carbo*;
- *Anas crecca*;
- *Anas platyrhynchos*;
- *Aythya farina*;
- *Aythya fuligula*;
- *Fulica atra*;
- *Vanellus vanellus*;
- *Larus ridibundus*;
- *Bucephala clangula*;
- *Podiceps cristatus*;
- *Aythya fuligula*;
- *Larus ridibundus*.

Greenland white-fronted geese, whooper swan and terns are listed under Annex I of the Birds Directive. None of the listed species are expected to forage in the vicinity of the proposed crossing of the River Shannon with the exception of cormorant. Given the location of the proposed bridge downstream of Lough Derg, there will be no impact on water quality of the lake.

Slieve Bernagh Bog SAC (See Figure 7)

Slieve Bernagh Bog is situated to the west of Lough Derg and comprises the Slieve Bernagh mountain range and surrounding peatlands. Slieve Bernagh Bog is located over 3km from the proposed scheme.

Conservation Objectives for the Lower River Shannon SAC are as follows:

To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- North Atlantic wet heaths with *Erica tetralix*;
- European dry heaths;
- Blanket bog (*active only).

There is no direct impact on the bog as a result of the proposed scheme and no hydrological linkages to the scheme exist. Therefore there is no significant impact on the protected site.

5.0 SCREENING METHODOLOGY

5.1 Consideration of Significance

In terms of significance, the NPWS Guidance quotes an EC definition “any element of a plan or project that has the potential to affect the conservation objectives of a Natura 2000 site, including its structure and function, should be considered significant (EC, 2006)”.

In order to assess the likely impacts and ascertain whether a significant impact on the integrity of the Natura sites is likely to occur as a result of the proposed development it is necessary to consider what constitutes the integrity of a site as referred to in Article 6 (3) of the Habitats Directive. The document *Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitats Directive 92/43/EEC* gives clear guidance in this regard and states:

“The integrity of the site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site’s conservation objectives.”

5.2 Likelihood and Significance of Effects

There is no one measure of significance, but the EC guidance suggests the use of likelihood of changes to relevant indicators to establish changes in these conservation objectives. The indicators of most relevance to the identified SACs are the quality and extent of habitats, species present and their population size and vegetation characteristics.

For the assessment of significance of potential impacts upon the conservation objectives of each site identified, the following are considered:

- deterioration of habitats or the habitats of qualifying species;
- disturbance to qualifying species; and
- to ensure for the qualifying species that the following are maintained in the long term:
 - i. population of the species as a viable component of the site;
 - ii. distribution of the species within the site;

- iii. distribution and extend of habitats supporting the species;
 - iv. structure, function and supporting processes of habitats supporting the species; and
 - v. no significant disturbance of the species.
- to ensure for the qualifying habitat that the following are maintained in the long term:
 - i. extent of the habitat on the site;
 - ii. distribution of the habitat within the site;
 - iii. structure and function of the habitat;
 - iv. processes supporting the habitat;
 - v. distribution of typical species of the habitat;
 - vi. viability of typical species as components of the habitat; and
 - vii. no significant disturbance of typical species of the habitat.

6.0 STAGE 1 - SCREENING

6.1 Lower River Shannon SAC

The proposed scheme involves the crossing of the Lower River Shannon SAC and is in proximity of Lough Derg SPA.

The Lower River Shannon and Killmastulla Rivers are crossed by the proposed scheme. In addition there is potential for indirect impact from the scheme by watercourses that flow into the Lower River Shannon SAC. The scheme is a total length of approximately 6.2 km with a significant bridge crossing of approximately 168m. The Shannon Bridge has four reinforced concrete piers supported on steel arches located in the river channel. Given the nature and scale of works required there is potential for significant effect on the river system though the construction and operational phase of the scheme though risk of runoff off and pollution to the river.

There is a total permanent land take of 0.2ha within the SAC. This land is made up of the river channel and riparian woodland.

Given the nature and scale of the works it is determined that in the absence of mitigation there is potential for significant impact on the Lower River Shannon SAC and Stage 2 Assessment is required to assess the impact of the scheme and to provide appropriate mitigation.

6.2 Lough Derg SPA

An extensive list of birds use Lough Derg SPA including Annex I species Greenland white-fronted geese, whooper swan and terns. None of the listed species are expected to forage in the vicinity of the proposed crossing of the River Shannon with the exception of cormorant. It is not expected that the bridge construction will impact on cormorant population in this area. Given the design (multiple arched bridge) and location of the proposed bridge it is not considered that there is a significant risk of bird strike. In addition given the location of the proposed bridge downstream of Lough Derg, there will be no impact on water quality on the lake which would have secondary impact on feeding birds.

Given the design of the bridge, the proximity of the scheme downstream of Lough Derg, and the nature of the Natura 2000 site, screening has determined that there is

no significant impact on Lough Derg SPA and therefore is not considered further in this assessment.

6.3 Slieve Bernagh Bog SAC

Slieve Bernagh Bog is designated for wet and dry heaths and blanket bog. There is no direct link between the scheme and the SAC and it has been determined that there will be no significant impact on the SAC. Slieve Bernagh Bog has been screened out of assessment and will not be considered further.

6.4 Screening Conclusion

Screening assessment of the proposed Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement has determined that the proposed scheme will not have a significant impact on the conservation interest of Lough Derg SPA and Slieve Bernagh Bog SAC. The proposed scheme has the potential in the absence of mitigation to impact on the Lower River Shannon SAC as a result of direct or indirect impact on qualifying species or their habitat. The Impact on the Lower River Shannon has therefore been further assessed.

7.0 STAGE 2 – ECOLOGICAL ASSESMENT ON THE LOWER RIVER SHANNON SAC

7.1 Surveys and Consultation

This assessment is based upon the surveys and the impact assessment detailed in Section 7.2 of the Environmental Impact Statement. The detailed survey results are available for review in Section 7.2 and the associated appendices of the EIS.

As an integral element of the ecological impact assessment consultation with the statutory bodies was undertaken. The specific bodies consulted with regard to the ecological assessment were:

- National Parks and Wildlife Service (NPWS);
- Inland Fisheries Ireland.

7.2 Guidance Documents

The evaluation of the ecological environment and the criteria used to assess the significance of impacts in the EIS have been derived from the following guidelines:

- *The Guidelines for Assessment of Ecological Impacts on National Road Schemes* (NRA, Rev. 2, 2009); and
- *UK DMRB Volume 11 Section 3 – Part 4. Assessment of Implications (of Highways and/or Roads Projects) on European Sites (Including Appropriate Assessment)*.

Mitigation proposals are based on the relevant National Roads Authority construction guidance documents pertaining to the natural environment including:

- Guidelines for Assessment of Ecological Impacts on National Road Schemes (2009);
- Ecological Surveying Techniques for Protected Flora and Fauna (2009);
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (2006);

- Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes) (2007);
- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, during and Post Construction of National Road Schemes (NRA 2007);
- Guidelines for the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (Rev 2010).

7.3 Methodology

Desk Study

A desk study was undertaken to determine the proximity of the route to designated areas for conservation utilising the National Parks and Wildlife Service (NPWS) website database. Site synopses were reviewed to identify qualifying interests. The NPWS database was also consulted regarding the occurrence of protected species of flora and fauna in the vicinity of the proposed route. Consultations were carried out with the NPWS and Inland Fisheries Ireland (Shannon Region) requesting information on protected species and habitats within the study area as well as comment on the proposed project in relation to survey, assessment and specific mitigation requirements.

A review of aerial photography (2004) over the entire route was undertaken to prepare a preliminary habitat map along the route and to identify potentially ecologically important habitats. The review also aimed to determine the proximity of the proposed route to ecologically important sites in the general vicinity that may be subject to indirect impacts through severance of connecting corridors, pollution run-off during construction, etc. Existing sources of information and records on ecological interests were sourced and reviewed. This included an earlier aquatic (dive) survey undertaken in 2008 looking specifically at the aquatic environment in the vicinity of the proposed Shannon Bridge Crossing.

Field Survey

Following on from the desk study, a series of site surveys were undertaken over the summer of 2009 to survey and map the habitats along the proposed route using the Heritage Council Classification (Fossitt, 2000) and using techniques as prescribed in *Ecological Survey Techniques for Protected Flora and Fauna* (NRA, 2008). While this did not entail compiling detailed species lists for each habitat type encountered, the suite of species characteristic to each habitat was recorded and checks were made for rare or unusual species, including any species noted in the NPWS database or listed as qualifying interest for the Lower River Shannon SAC.

Birds were assessed during the course of the main habitat surveys. A dedicated large mammal survey was carried out during the months of November and December using techniques as prescribed in *Ecological Survey Techniques for Protected Flora and Fauna* (NRA, 2008). Aquatic habitats crossed or in the vicinity of the route were surveyed for the presence of and suitability for otter, including holts and other signs of activity such as couches, trails and slides. The result of this survey is used to inform the location and detailed design of mitigation measures including mammal passage facilities and guide fencing.

7.4 Receiving Environment (See Figure 8 to 11)

The river downstream of the Killaloe Bridge forms part of the Lower River Shannon SAC which extends to include the entire Shannon Estuary as far as Kerry and Loop Head. Lough Derg is a proposed Natural Heritage Area (pNHA) and a designated Special Protection Area, the boundaries of which commence upstream of the existing Killaloe Bridge. The site is of significant ecological interest as it supports a number of habitats listed on Annex I of the EU Habitats Directive, four of which are priority habitats – alluvial woodland, yew woodland, Cladium fen and petrifying springs. These priority habitats are found mainly at the north and north east of the lake though alluvial woodland has a wider distribution around the lake. Other annexed habitats present include alkaline fen and Juniper scrub formations on heath and calcareous grasslands. The site has been designated as an SPA as it supports important numbers of wintering wildfowl including Greenland white-fronted geese (*Anser albifrons flavirostris*), common terns (*Sterna hirundo*) and cormorants (*Phalacrocorax carbo*).

Aquatic Species

A total of seven watercourses are crossed by the proposed scheme as detailed in **Table 7.2.3** below. The most significant of these is the River Shannon, an internationally important watercourse and a designated Special Area of Conservation (SAC). A canal runs along the western side of the Shannon leading to a lock bypassing the existing Killaloe Bridge. The Kilmastulla River is part of the River Shannon SAC. All the other watercourses crossed by the scheme are first or second order tributaries of the River Shannon.

Table 7.1 Watercourses crossed by the Killaloe Bypass Scheme

Chainage	Watercourse	Townland	Evaluation
0+000 K & 0+300 K	Un-named stream	Kincora	C
1+740 K & 0+140 S	Un-named stream	Shantraun	C
0+080 S to 0+790 S	River Shannon	Clarisford	A
0+650 S	Canal (Part of River Shannon)	Clarisford	A
0+990 R	Kilmaglasderry tributary	Kilmaglasderry	C
1+140 R	Kilmaglasderry River	Kilmaglasderry	C
2+630 R	Kilmastulla River	Coolnadornory	A
3+290 R	Un-named stream	Coolnadornory	C

River Shannon

An aquatic ecological assessment was undertaken for the proposed bridge crossing of the River Shannon in August 2008. The survey targeted specifically the presence or suitability of the river in the vicinity of the proposed bridge as spawning habitat for the internationally rare pollan (*Coregonus autumnalis*). As the Lower River Shannon is a Special Area of Conservation at the proposed crossing point, the survey also addressed the presence of or suitability for species or habitats listed as qualifying interests for the site including salmon, sea, river and brook lamprey and otter. The following results are derived from this study.

The flow regime in the vicinity of the proposed crossing point is comparatively uniform with strong glide conditions along the western half of the river. The western bank descends steeply from the tree-lined shore over boulder and cobble initially,

then over exposed bedrock from approximately 2m to 5m in depth after which the gradient slackens over a boulder, cobble and gravel matrix. At the base of this slope in a depth of 6-7 m of water, a swathe of gravel from 2-8m in width runs almost the entire length of the survey area (200m) as identified during the River Shannon Crossing Study. Along the centre of the river the substrate is comprised of a mixture of boulder and cobble with small pockets of gravel and sand. All hard substrates within the river are blanketed with the alien invasive zebra mussels (*Dreissena polymorpha*) which in places form extensive reefs. Towards the eastern half of the river, the flow reduces, especially downstream of the proposed bridge line and east of the old island. The slack flow has allowed accumulation of soft silts with extensive macrophyte and algae growth.

The River Shannon system supports an internationally important population of the Annex II listed salmon (*Salmo salar*). The river has a large run of grilse (single winter fish) along with significant numbers of spring salmon (multiple winter fish). The habitat in the vicinity of the proposed crossing point is not suited to spawning by salmon.

All three species of lamprey listed under Annex II of the EU Habitats Directive have been recorded from Lough Derg. The existence of a population of landlocked River Lamprey (*Lampetra fluviatilis*) within the lake is suspected; normally this species spends its adult life in estuarine waters before migrating upstream to spawn. Brook Lamprey (*L. planeri*) is known to be common in the lower Shannon catchment, as it indeed appears to be throughout the country. All three species of lamprey spawn in gravelly substrates (size dependant) and the larval stage burrow into soft sediments in which they spend a number of years. The areas of soft sediment along the eastern bank of the river in the vicinity of the proposed bridge may support lamprey ammocoetes. The habitat in the vicinity of the proposed crossing point however, is not suited to spawning by lamprey.

Other Watercourses

The Kilmastulla River is a first order tributary of the River Shannon and part of the Lower River Shannon SAC. The river supports spawning salmon and trout and potentially suitable spawning habitat occurs approximately 100m downstream of Cool Bridge on the R494. The river is also likely to support populations of brook lamprey.

A small stream that flows under the R494 immediately north of the R445 interchange (chainage 3+280 R) is a tributary of the Kilmastulla River. It is up to 2m in width and has a riffle flow over gravels immediately upstream and downstream of the R494, which appear suited to spawning by both trout and brook lamprey.

The Kilmaglasderry River is another first order tributary of the River Shannon and flows under the R494 at chainage 1+140 R. The river is approximately 3m in width and has good riffle habitat downstream of the crossing that may support spawning trout and brook lamprey. A minor tributary of the river is also crossed at chainage 0+990 R. This small slack-flowing stream is less than 1m in width at the R494 and flows through woodland downstream of the road until its confluence with the Kilmaglasderry. While it appears unsuited to spawning it may however provide nursery habitat for juvenile trout and lamprey ammocoetes, the latter especially in the vicinity of the confluence where there are deep silt beds.

The proposed road crosses a minor stream on the west of the River Shannon at Shantraud in two separate locations. The stream is crossed in its upper reaches at chainage 1+765 K on the edge of a conifer plantation where it is less than 1m in

width. It is crossed again at chainage 0+140 S where it runs adjacent to a mature treeline with associated scrub and has increased to c. 2m in width. There is stock access along the stream at this point and resultant siltation in the otherwise gravelly substrate. The stream has limited fisheries potential though it may support minnow, brook trout and possibly brook lamprey. The presence of fish may occasionally attract kingfisher and possibly otter to forage along it though it appears unsuited to regular use.

A second minor stream flows through the mixed woodland north of the proposed road alignment at Ballyvally Estate and then runs along its northern edge before crossing the R463 into a plantation of semi-mature alder (*Alnus glutinosa*) woodland on the east side of the road. This stream is crossed by the intersection with the R463 at chainage 0+000 K and higher up at chainage 0+300 K. This stream has no fisheries value and appears unsuited for any protected aquatic species.

Terrestrial Fauna

The otter (*Lutra lutra*) is common and widespread along the River Shannon in the vicinity of the proposed crossing. The River Shannon and Lough Derg are ideally suited to otter on account of the good water quality, abundant prey, suitable bank-side cover and generally low levels of human disturbance. Evidence of otter was noted during the site survey on the River Shannon and on the Kilmastulla River.

On the island separating the Shannon and canal along its western shore, there is a cavity in the river bank which is suitable as a holt. There were no spraints evident in the area during the survey but the potential of utilisation is high due to its isolation and proximity to the river.

An above ground lie-up (couch) is present approximately 42m upstream of the existing R494 Bridge over the Kilmastulla River. The site is regularly used and fresh spraint was present. There is evidence of otter crossing the existing road at the bridge, presumably during periods of flood when strong flow prevents them from moving upstream under the bridge.

Spraints were also recorded on the Kilmaglasderry River under a bridge immediately downstream of the confluence with its minor tributary. No suitable locations for a holt or couch were noted in the vicinity of the proposed R494.

There is likely to be movement of otter along all watercourses in the study area including drainage ditches and this will need to be accommodated in all bridge and culvert design.

Birds

The River Shannon and associated canal in the vicinity of the proposed crossing would be expected to support a breeding population of common waterfowl including mute swan, moorhen, mallard as well as passerines such as reed bunting, sedge warbler and long-tailed tit. Kingfisher, an Annex I listed species under the EU Birds Directive, was observed roosting under the mature trees on the western side of the River Shannon and the steep earthen bank at this point may offer potentially suitable nesting conditions. A nesting burrow was also identified approximately 150m downstream of the existing bridge on the R494 along the Kilmastulla River and an adult bird was observed in flight at this point in September 2009. Regular movement of the kingfisher is likely along the Kilmaglassderry River though no evidence of birds was recorded during the field survey.

Habitats

Hedgerows and Treelines

Immediately east of the Shannon crossing a treeline of mature oak and ash occur fringing an area of woodland along the river bank. On the west of the river and adjacent canal, a line of mature beech runs parallel to the river on slightly elevated land (possibly dredged spoil from the canal). Another significant treeline primarily comprised of mature beech occurs along the minor stream at chainage 0+140 S.

On the western banks of the River Shannon there are scattered deciduous trees (WD5) on the island between the river and the canal. The trees include occasional oak (*Quercus* spp.), chestnut (*Aesculus hippocastanum*), beech (*Fagus sylvatica*), alder (*Alnus glutinosa*) and willow (*Salix* spp.). At the midpoint of the crossing the river bank rises vertically to a height of approximately 3m with a sycamore and three mature beech trees over-hanging the river. The ground flora is dominated by bracken with abundant creeping bent, vetch (*Vicia* sp.), wild strawberry (*Fragaria vesca*), with occasional ferns (*Dryopteris* sp.). There are patches of expanding scrub (WS1) with blackthorn, briar, hazel and hawthorn.

Mixed Broadleaved Woodland

A belt of woodland on the eastern bank of the River Shannon is a mixture between oak-ash-hazel woodland (WN2) and scrub (WS1). There are scattered mature and semi-mature oak and ash protruding through a dense willow, elder, holly, blackthorn and briar understorey. Some areas are more open with dense briar, nettle and bracken. Ivy, male fern (*Dryopteris felix-mas*) and tutsan (*Hypericum androsaemum*) are dominant in the ground flora.

Wet woodland

A block of wet woodland (WN6) comprised of alder with some willow occurs on the western side of the River Shannon (chainage 0+520 S to 0+620 S). This is not within the SAC and does not conform to the Annex I Habitat type Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*. The woodland along the line of the proposed road is heavily infested with cherry laurel (*Prunus laurocerasus*) extending to c12m in height and resultantly has virtually no understorey vegetation. The woodland is separated from the canal by an elevated ridge which supports a tree-line of mature beech, with a small number of isolated alder and willow occurring along the canal bank in association with occasional sycamore and pheasant berry (*Leycesteria formosa*). The woodland extends to the south of the proposed road line where it is not infested by cherry laurel and supports a rich and typical ground flora for wet woodland including sedges, lady fern (*Dryopteris felix-femina*), creeping buttercup (*Ranunculus repens*), marsh bedstraw (*Galium palustre*), forget-me-not (*Myosotis* sp.).

On the eastern side of the Shannon between chainage 0+250 S and 0+330 S an area of woodland occurs on sloping ground between the R494 and the river. The woodland is ash dominated with frequent alder and willow (WN6) in the lower and wetter part of the woodland with a fern dominated understorey.

Wet woodland (WN6) also occurs in a narrow fringe along either side of the Kilmastulla River (chainage 2+600 R- 2+630 R).

Invasive Alien Species

A number of invasive alien species of plant and animal are present along the proposed route. Dominant amongst these is Japanese knotweed (*Reynoutria japonica*), which is present in large thickets at numerous locations throughout the

Killaloe and Ballina area (See **Figure 8 to Figure 11** Habitat Maps). This plant is readily spread as fragments and has proved very problematic to control.

Curly pondweed (*Lagorosiphon major*) is present at two artificial ponds (chainage 0+390 K and chainage 0+560 S). This plant has become a major problem in Lough Corrib due to prolific growth and though it is apparently not present in the Shannon system there is considerable risk of it establishing. A number of other invasive plants are recorded from Lough Derg notably American pondweed (*Elodea nuttallii*), water violet (*Hottonia palustris*), water soldier (*Stratiotes aloides*) and least duckweed (*Lemna minuta*).

Zebra mussel (*Dreissena polymorpha*) is established in Lough Derg and occur in high densities in the River Shannon in the vicinity of the proposed crossing point. Appropriate measures will be required to avoid the accidental transfer of mussels from the construction site to other waterways on machinery, boats, etc. Lough Derg also supports a number of other invasive alien species including the Caspian shrimp (*Hemimysis anomala*).

8.0 ASSESSMENT OF POTENTIAL IMPACTS

8.1 Introduction: Lower River Shannon SAC

This section considers the impacts of the proposed Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement upon the qualifying features of the Natura 2000 sites, as identified in Section 4.

8.2 Qualifying Habitats

Table 8.1 Lower River Shannon Qualifying Habitats at Project Location

Qualifying Habitat	Significance
Sandbanks which are slightly covered by sea water at all times	Coastal Habitats not of relevance to this scheme
Estuaries	
Mudflats and sandflats not covered by seawater at low tide	
Coastal lagoon	
Large shallow inlets and bays	
Reefs	
Perennial vegetation of stony banks	
Vegetated sea cliffs of the Atlantic and Baltic coast	
Salicornia and other annuals colonizing mud and sand	
Atlantic salt meadows (<i>Glauco Puccinellietalia maritimae</i>)	
Mediterranean salt meadows (<i>Juncetalia maritimi</i>);	
Water courses of plain to montane levels with the <i>Ranunculus fluitans</i> and <i>Callitriche Batrachion</i> vegetation;	Not present in proximity to project
<i>Molinia</i> meadows on calcareous, peaty or clayey silt laden soils (<i>Molinion caeruleae</i>);	Not present in proximity to project
Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>).	Not present in proximity to project

None of the above listed habitat occurs within the footprint or in the vicinity of the scheme, therefore it is considered that there will be no significant impact on qualifying habitats of the Lower River Shannon SAC.

8.3 Qualifying Species

Qualifying Species listed as part of the Lower River Shannon SAC include:

Table 8.2 Lower River Shannon Qualifying Species at Project Location

Qualifying Species	Significance
<i>Margaritifera margaritifera</i>	Not present in proximity to the project, no records for over 5km downstream of the project
<i>Petromyzon marinus</i>	Present, suitable habitat in River Shannon
<i>Lampetra planeri</i>	Present, suitable habitat in all watercourses
<i>Lampetra fluviatilis</i>	Present, suitable habitat present
<i>Salmo salar</i>	Present suitable habitat present
<i>Tursiops truncatus</i>	No suitable habitat present
<i>Lutra lutra</i>	Present, suitable habitat along all watercourses.

Of the above species list, Salmon, all three lamprey species and the otter are relevant as they occur within or in proximity to the study area.

Atlantic Salmon and Lamprey species

Direct Mortality and Harm

Direct mortality of salmon or lamprey has the potential to occur as a result of construction activities within and alongside watercourses, as a result of pier construction, dewatering, or creation of culverts. Construction work also has the potential to impact on habitat and mitigation.

There will be no direct impact to salmon populations as a result of the proposed scheme along the Shannon River or its tributaries. There is potential minor direct impact on lamprey as a result of works in watercourses. Mitigation will be required to remove lamprey ammocoetes prior to works being carried out. The impact on lamprey as a result of the bridge is not considered significant should mitigation be put in place.

Mortality may also occur as a result of noise and vibration. Mitigation to be incorporated in the construction procedures will include soft – start methodology involving a gradual increase in force and intensity of piling. Seasonal restriction will be put in place to prevent impact on spawning habitat between Oct and April.

With the adoption of detailed mitigation measures in conjunction with the design, there will be no direct mortality or harm to salmon and lamprey species of the Lower River Shannon SAC and its associated tributaries.

Habitat Loss

It is inevitable that there will be loss of some minor areas of open water habitat utilised by salmon and lamprey. However this has been reduced through the proposed scheme design as much as possible. For smaller watercourses bottomless-arch or box culverts are proposed and the culvert length has been minimised. For drainage ditches/minor streams with limited habitat potential (3 in total) piped culverts are proposed.

In smaller watercourses (excluding the River Shannon and the Kilmastulla River) where culverts are proposed, the adoption of detailed mitigation measures will ensure that in-stream habitat present prior to construction is retained or reinstated, including suitable substrate and water depths. This will reduce habitat loss within the channel, including potential spawning habitat with the inclusion of a suitable substrate matrix.

Marginal habitats with overhanging vegetation and reduced flows are important for migration as they provide areas of cover in which fish rest. These marginal areas also provide protection from predators and direct sunlight and consequently fish may remain in these areas for extensive periods of time. The ecological mitigation proposed for the scheme involves limiting the removal of significant riparian vegetation and provision of suitable backside planting upstream and downstream of culverts to enhance the habitat present and ensure free passage through the culvert. Therefore, considering the mitigation proposed and the short sections of permanent vegetation loss it is unlikely that the loss of marginal vegetation, both temporary and permanent will have a significant effect upon salmon and lamprey or their conservation objectives.

Habitat Fragmentation

The fragmentation of habitat can have significant impact upon salmon and lamprey with structures built within or across watercourses potentially inhibiting the migration of fish upstream, preventing adults reaching spawning habitats, and downstream preventing juveniles from reaching the sea. Insensitive structure design can result in habitat fragmentation.

The proposed scheme has designed significant structures over the Lower River Shannon and the Kilmastulla River which will avoid habitat fragmentation of the watercourse. Elsewhere bottomless arch or box culverts are proposed for streams, with the retention and reinstatement of natural substrate, the structure design has followed appropriate guidance and will be approved by OPW and Inland Fisheries Ireland (IFI).

Consequently considering the proposed scheme design and mitigation proposed, the impact on habitat fragmentation will not have significant effects on salmon and lamprey or their conservation objectives.

Disturbance

There is potential for disturbance due to noise, vibration and lighting. As discussed above, there is potential for direct mortality and harm due to noise and vibration in or close to watercourses. In addition disturbance can occur as a result of avoidance. Mitigation proposed ensures that construction activities are undertaken during daylight hours only and will ensure that there is potential for undisturbed passage at night, when main surges of migratory fish are more likely.

Artificial lighting at night has the potential to disrupt and disorientate fish and increase exposures to predation. The proposed scheme has incorporated directional cowed lighting over the River Shannon that will minimise any exposure to fish in this location. Lighting is not proposed at other watercourse crossing along the scheme. Lighting during the construction phase will avoid direct illumination of watercourses and will not be permitted at night time. For works during winter months certain limited activities may require lighting which will be cowed to minimise light spill onto the watercourse.

Disturbance impacts resulting from the proposed scheme, considering the design and mitigation proposed are not considered likely to cause significant impact on salmon or lamprey or their conservation objectives.

Pollution and Sub-lethal Pollution

Deterioration in water quality as a result of introduction of sediment and pollutant discharge has the potential to significantly impact on salmon and lamprey. Pollution can result in depletion of oxygen in watercourses and accumulation of deleterious matter in cells and through direct toxicity. Increase in sediments within the watercourse can result in the smothering of spawning beds, direct mortality through clogging of gills, decreased growth rates and decreased feeding efficiency.

The proposed scheme incorporates a number of mitigation measures including drainage collection and filtration and the identification of appropriate working methodologies, training of staff and incorporation of emergency response procedures within the Construction Management Plan (CMP). Road drainage has been put in place to ensure that there is no deterioration in water quality.

The Proposed Scheme design and mitigation proposed will not result in significant impacts upon Atlantic salmon or their conservation objectives.

Otter

Habitat loss

The proposed scheme will result in loss of riparian habitat utilised by otter. However the extent of loss is not likely to be significant when considering the extent of otter home ranges.

There are two locations where otter habitat was identified. One holt was identified along the River Shannon at the location of the bridge crossing while a second site, an otter couch was identified along the Kilmastulla River at the proposed crossing point. Otter are also likely to use all watercourses along the scheme. It is proposed as part of the scheme that the loss of resting sites will be compensated for by the provision of replacement artificial holts at both locations. Artificial holts will be constructed prior to the destruction of the existing holts and will take place under license from National Parks and Wildlife Service. With the provision of two artificial holts and because otters use a large number of potential resting sites along the River Shannon and its tributaries the impact on otters as a result of loss of sites is considered negligible.

Habitat Fragmentation

The fragmentation of habitats is common as a result of road schemes and can create great risk of mortality as a result of traffic strike and otter mortality. The proposed scheme incorporates otter ledges or underpasses across all watercourses that have been identified as potential otter habitats crossing the scheme. Mammal proof fencing will be provided throughout the Killaloe Bypass section of the scheme to prevent otter mortality due to traffic.

Disturbance

Otters are known to regularly habituate to disturbed areas and it is considered that the presence and operation of machinery is not likely to cause significant effects upon otter. Construction within the riparian habitat may cause disturbance if preventing their movement along the watercourse. However, the CMP will aim to minimise this through restricting working hours to daytime and the erection of fencing within the works area. The impact is not considered significant.

Construction in the vicinity of breeding sites may have an impact upon otter as it may lead to abandonment of cubs or relocation of the cubs at too young an age. Potential breeding holts will be monitored prior to construction and works will be delayed until the cubs have left them. This will be carried out by a suitably qualified clerk of works. Consequently the disturbance to otters is not significant.

Indirect Impacts

Impact from pollution directly or indirectly as a result of reduced prey availability are unlikely to be significant as a result of the proposed scheme. Mitigation measures in terms of drainage design and construction measures will ensure water quality is maintained within acceptable levels.

8.4 Non-qualifying / Unlisted Habitats and Species

An Environmental Impact Assessment has been carried out for the Killaloe Bypass, Shannon River Crossing and R494 improvement. Chapter 7.2 of the EIS details the potential impact and appropriate mitigation for both Qualifying Interest and all other species of conservation interest both within the SAC and throughout the scheme. Habitats and species assessed in the EIS include grassland, hedgerows, treelines and woodland, scrub, swamp and ponds, bats, badger, pollan, and kingfisher.

9.0 MITIGATION MEASURES

The following mitigation measures are considered as design control measures essential for the successful construction and operation of the proposed Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement. With these measures in place it is considered that there will be no significant impact on any of the Qualifying Species or Habitats, as outlined in the assessment.

Mitigation within the SAC:

- There will be no works permitted outside the identified land take area within the SAC;
- Design and construction method statements will be submitted to IFI and NPWS for approval prior to commencement of construction;
- Where site investigation (including archaeological works) is required in the vicinity of or adjacent to the SAC and outside of the lands made available, ministerial approval will be required and these works will be supervised by an appropriately qualified ecologist to ensure no accidental damage occurs;
- In the vicinity of the SAC the site boundary will be defined at the outset of construction using rigid timber or equivalent robust fencing. Within the site boundary fence, earth bunds will be constructed to contain surface water runoff and channel it to a silt trap before discharge. This will entail measures to ensure that suspended solids in any runoff (either direct or via small watercourses or field drains) into the River Shannon from the construction area, from machinery access routes or from any other source does not exceed 25mg/l. Amongst other measures this will require isolating the area where works are carried out from the river and pumping all runoff to sediment removal facilities;
- Prior to construction commencing, a detailed survey of the river bank in the vicinity of the proposed works will be undertaken to determine the status of the identified otter holt and couch and to check for any further potential features. Appropriate mitigation will be put in place under licence from the NPWS for

encountered holts or couches. Artificial holts will be provided in the vicinity of both the Shannon and Kilmastulla crossings at locations and to specifications agreed with the NPWS;

- The location of instream piers has been selected to minimise damage or disturbance to pollan spawning habitat in the vicinity of the bridge;
- Bridge and approach road design shall incorporate best environmental practice and design in the control of road run-off and accidental spillage. Run-off shall be channelled through a spill-containment facility and hydrocarbon interceptor prior to discharge to the river;
- A sustainable drainage system will be installed on the new road which will prevent significant pollution to surface receiving waters. The system installed will have a proven capability of achieving and sustaining at least the following percentage pollution reduction in runoff:

Total Suspended Solids	85%
Heavy Metals	50 – 80%
Chemical Oxygen Demand	50%
Hydrocarbons	90%

- An emergency-operating plan shall be established and included in the Construction Management Plan (CMP) to deal with incidents or accidents during construction that may give rise to pollution within the Lower River Shannon SAC. This will include means of containment in the event of accidental spillage of hydrocarbons or other pollutants (including oil booms and soakage pads);
- The design of lighting for the bridge will take into consideration the requirement to avoid unnecessary light spill into the river and the adjacent river banks in order to minimize disturbance to fish, mammals and bats in the area. This will be achieved by directional cowled lighting using high pressure cut-off sodium lanterns.
- Construction activities will be carried out during day time only; lighting will be limited and will be cowled to avoid watercourses.
- Piling operations during the construction phase will use a soft start methodology to minimise risk of injury or disturbance to fish species.

Terrestrial habitats

- Control of the movement of construction plant within the site, to ensure that the minimum area of ground would be disturbed outside the footprint of the works.
- Within the scheme, the number of trees to be removed will be minimised and all trees to be retained will be afforded protection in accordance with the NRA Guidelines on the Protection of Trees on National Road Schemes (NRA 2006). The erection of all protective fencing will be undertaken prior to the commencement of any site works.
- The loss of habitats along the route will be mitigated by the landscape design associated with the proposed road improvements. The landscape design will use primarily native species and aim to recreate mixed species of hedgerow and grasslands to compensate for the loss of these habitat types and will be undertaken in accordance with the NRA Guide to Landscape Treatments on National Road Schemes (NRA, 2006).

Invasive Alien Species:

- All soil imported for landscaping purposes will be screened and verified as free of noxious weeds and invasive non-native species such as Japanese Knotweed, Himalayan balsam and giant hogweed. Due care will be applied to ensure invasive alien species of plant and animal are not inadvertently spread during the landscaping works.
- In accordance with the NRA *Guidelines on The Management of Noxious Weeds and non-native plant Species on National Road Schemes* (2010) a pre-construction survey will be undertaken to map all locations of invasive alien species within or adjacent to the CPO. A specific management plan will be prepared detailing the various species distribution along the scheme, the treatment required during site clearance works, how to dispose of all material arising and an assessment of the risk of re-infestation from surrounding land.

Monitoring of the effectiveness of control measures will be undertaken post construction in accordance with the NRA guidelines referred to above.

Otter:

- Mitigation for otter will require the provision of safe passage along all watercourses. This will be achieved by the incorporation of suitable mammal passage facilities within all culverts in conjunction with otter-proof fencing along the road network to prevent animals from accessing the carriageway. The specification for otter passage and fencing design will be in accordance with the *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes* (NRA, 2007). The maintenance of water quality within the scheme is covered under mitigation for aquatic habitats. The movement of fish will be maintained on all watercourses by ensuring a minimum depth of water and flow velocity in all bridge and culvert designs (in accordance with *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes* (NRA, 2006) in order to retain their suitability for otter.
- The potential otter holt on the island at chainage 0+640 S and the couch on the Kilmastulla River at chainage 2+620 will be examined pre-construction for signs of activity and if active, will be excluded during the appropriate season under derogation from the NPWS. Consultation with the NPWS will be required to define the exclusion process.
- Artificial holts will be provided in the vicinity of both the Shannon and Kilmastulla crossings in locations and according to designs agreed with the NPWS.

Aquatic Habitats:

- Throughout all stages of the construction phase of the project the contractor shall ensure that good housekeeping is maintained at all times and that all site personnel are made aware of the importance of the freshwater environments and the requirement to avoid pollution of all types. This will be reflected in the Construction Management Plan for the site.
- All design, construction and operation shall be carried out in accordance with *Guidelines for the Crossing of Watercourse During the Construction of National Road Schemes* (NRA, 2006).
- The storage of oils, hydraulic fluids, etc will be undertaken in accordance with current best practice for oil storage (Enterprise Ireland, BPGCS005).

- The pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents, will be completed in the dry to avoid pollution of the freshwater environment.
- All machinery operating in-stream will be steam-cleaned in advance of works and routinely checked to ensure no leakage of oils or lubricants occurs. All fuelling of machinery will be undertaken on dry land.
- Instream works (including erection and dismantling of temporary bridges, pile driving, etc.), will be undertaken within appropriate protection such as a geotextile curtain suspended from a floating boom. This will reduce the risk of accidental damage or siltation of spawning beds.
- A Class 2 Bypass Petrol/Oil Interceptor is to be provided at each outfall.
- Road runoff is to go through a stilling process to allow suspended solids to settle out (this may be in open ditches, ponds, hydrodynamic separators).
- All pollution control facilities and attenuation areas shall be fitted with a penstock or similar restriction at the outfall to the receiving channel to contain pollutants in the event of an accidental spillage.
- Dredged spoil if arising, will be disposed of under appropriate licence or permissions to an authorised spoil depository location.
- The risk of accidental transfer of the non-native invasive species will require adherence to current best practice protocol for avoiding the spread or transfer of all invasive animals and plants including zebra mussel (*Dreissena polymorpha*). These measures will be enforced during construction to ensure accidental spread does not occur on machinery or materials from / to the site. The developers will also adopt any modified or updated approaches to invasive alien species control.
- Preservation of stream flows for movement of fish by ensuring a minimum depth of water would be maintained in the streams.
- Prior to any instream works being undertaken, the stretches of watercourse to be impacted will be surveyed for protected aquatic species (lamprey ammocoetes and freshwater crayfish) and appropriate salvage measures employed (under licence from the NPWS).
- A continuous bund will be built 10m from watercourses and its inflow to control suspended soils laden runoff from construction.
- Sediment collection mats will be placed in streams outflow in order to reduce the potential for discharge of silt laden runoff water to the streams.
- Work near surface water features will be carried out during drier months where possible.
- Works (outside of emergency works) will not be permitted outside of daytime hours.

10.0 DISCUSSION AND CONCLUSION

This Natura Impact Assessment has been completed in compliance with the relevant European Commission and national guidelines.

The potential impacts during the construction and operation of the proposed Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement have been considered in the context of the Natura 2000 sites, their Qualifying Interests and conservation objectives.

The evaluation undertaken has identified that with appropriate mitigation in place there will be no significant impact on any of the Qualifying Habitats or Species, either alone or in combination, of the Lower River Shannon Special Area of Conservation and its associated tributaries.

Therefore, it is considered that the conservation objectives for the Natura 2000 sites will not be compromised by the proposed development, nor will the proposed development have any significant impact on the designated site or the habitats or species for which it has been designated.

10.1 Cumulative Impacts

The Habitats Directive requires that the potential cumulative impacts on Natura 2000 sites be assessed in combination with other significant projects in the vicinity.

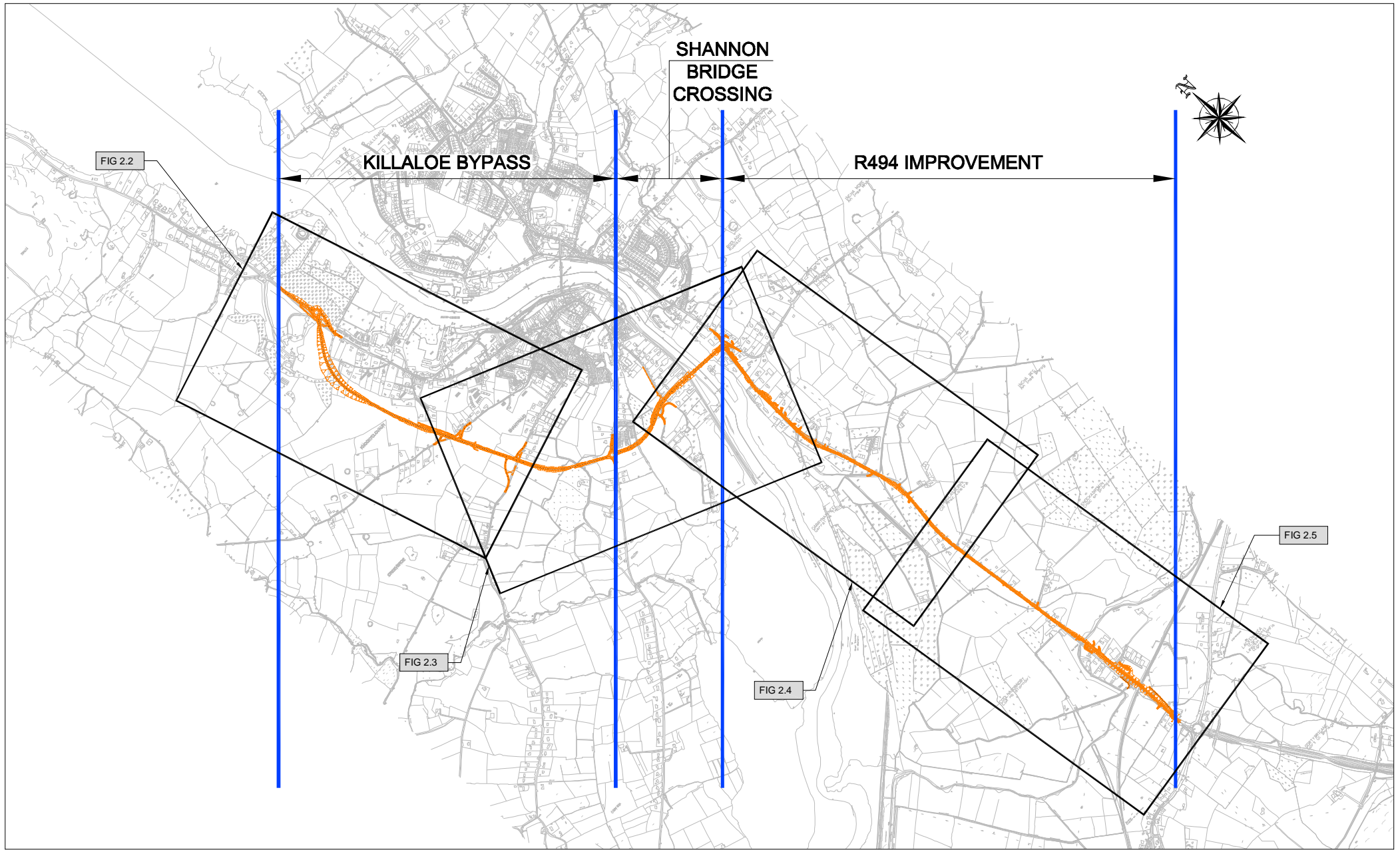
The proposed Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement Scheme will not have a significant adverse impact on any of the qualifying species or habitats of the Lower River Shannon SAC. As such it is concluded that no significant impact will arise as a consequence of in-combination effects on any of the qualifying species or habitats.

10.2 Conclusion

The proposed development will have no adverse effect on the integrity on any of the Natura 2000 sites listed and as such this report returns a conclusion that there is no potential for significant effects on the Natura 2000 sites.

Appendix 1

Figures



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**KILLALOE BYPASS, SHANNON BRIDGE CROSSING
 & R494 IMPROVEMENT**

ENVIRONMENTAL IMPACT STATEMENT

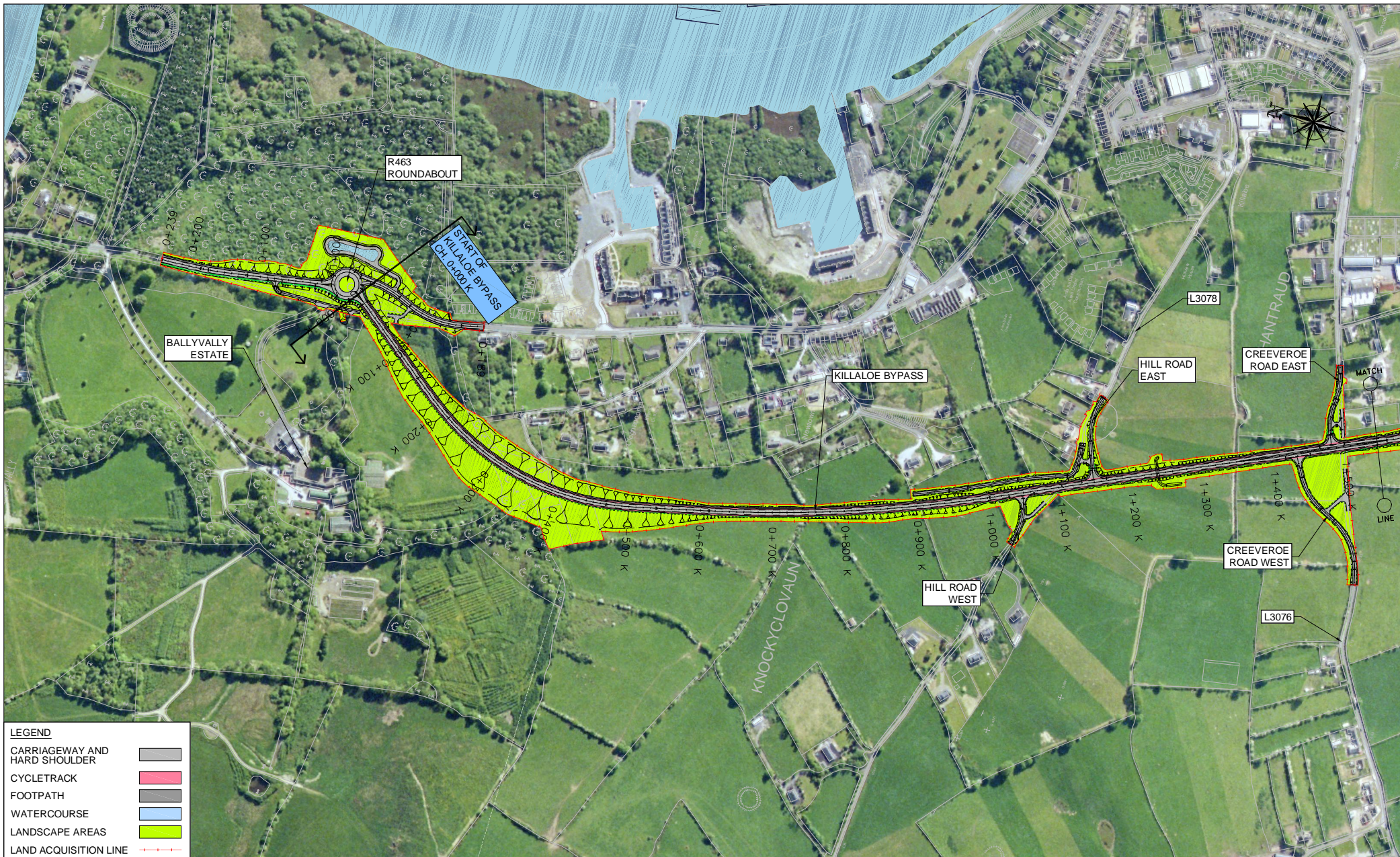
Roughan & O'Donovan
 Consulting Engineers
Civil - Structural - Transportation - Environmental

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 Sandymount, Dublin 18.
 Tel : +353 1 294 0800
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 e-mail : info@rod.ie
 www.roughanodonovan.com

Drawing Title

INDEX PLAN

Drawn: LA	Job No: 07.527	Drawing No: FIG 1	Rev:
Scale: (A4) 1:20 000	Date: JAN '12		



LEGEND

- CARRIAGEWAY AND HARD SHOULDER
- CYCLETRACK
- FOOTPATH
- WATERCOURSE
- LANDSCAPE AREAS
- LAND ACQUISITION LINE



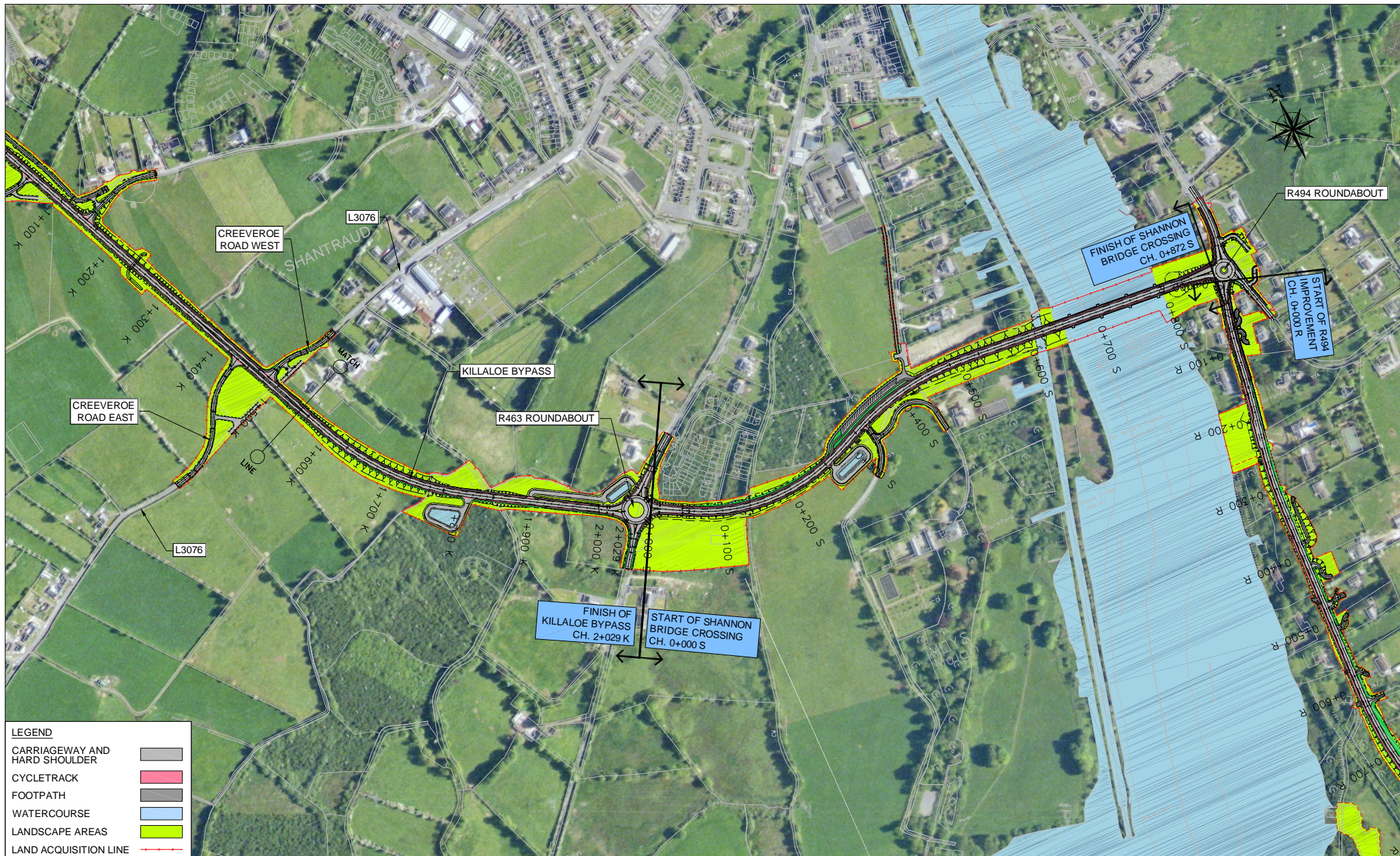
KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

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Drawing Title			
KILLALOE BYPASS & SHANNON BRIDGE CROSSING SHEET 1 OF 2			
Drawn:	LA	Job No:	07.527
Scale:	1:5000	Date:	JAN '12
Drawing No:		Rev:	
FIG 2			



LEGEND

CARRIAGEWAY AND HARD SHOULDER	
CYCLETRACK	
FOOTPATH	
WATERCOURSE	
LANDSCAPE AREAS	
LAND ACQUISITION LINE	



KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

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Drawing Title			
KILLALOE BYPASS & SHANNON BRIDGE CROSSING SHEET 2 OF 2			
Drawn:	LA	Job No:	07.527
Scale:	1:5000	Date:	JAN '12
		Drawing No:	FIG 3
		Rev:	

LEGEND

CARRIAGEWAY AND HARD SHOULDER	
CYCLETRACK	
FOOTPATH	
WATERCOURSE	
LANDSCAPE AREAS	
LAND ACQUISITION LINE	



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 Tourism and Sport

**KILLALOE BYPASS, SHANNON BRIDGE CROSSING
& R494 IMPROVEMENT**

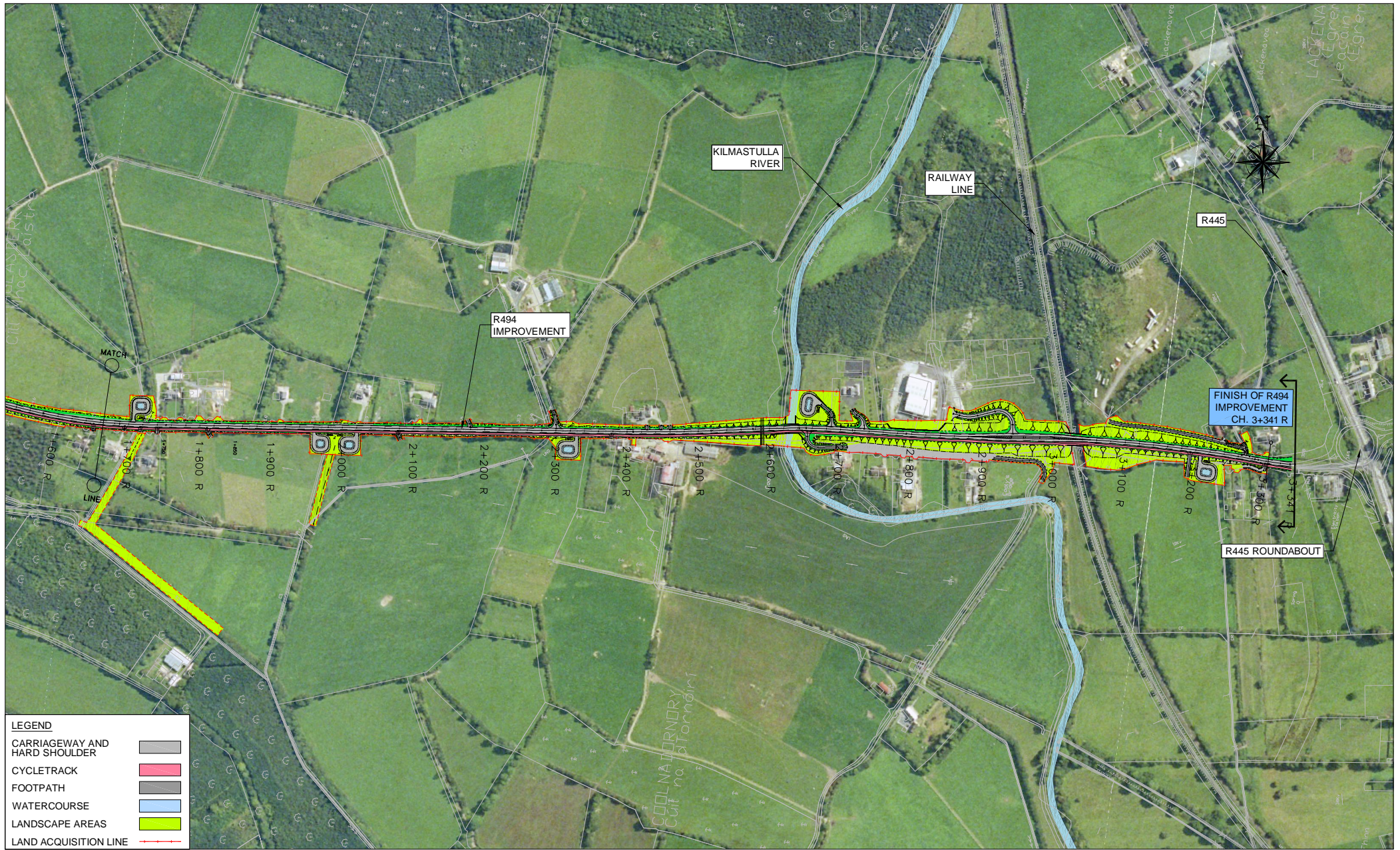
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Drawing Title		R494 IMPROVEMENT SHEET 1 OF 2	
Drawn:	LA	Job No:	07.527
Scale:	1:5000	Date:	JAN '12
		Drawing No:	FIG 4
		Rev:	

Designed:	SG	Checked:	MC	Approved:	GPS	Status:	NIS
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LEGEND

CARRIAGEWAY AND HARD SHOULDER	
CYCLETRACK	
FOOTPATH	
WATERCOURSE	
LANDSCAPE AREAS	
LAND ACQUISITION LINE	

KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

ENVIRONMENTAL IMPACT STATEMENT

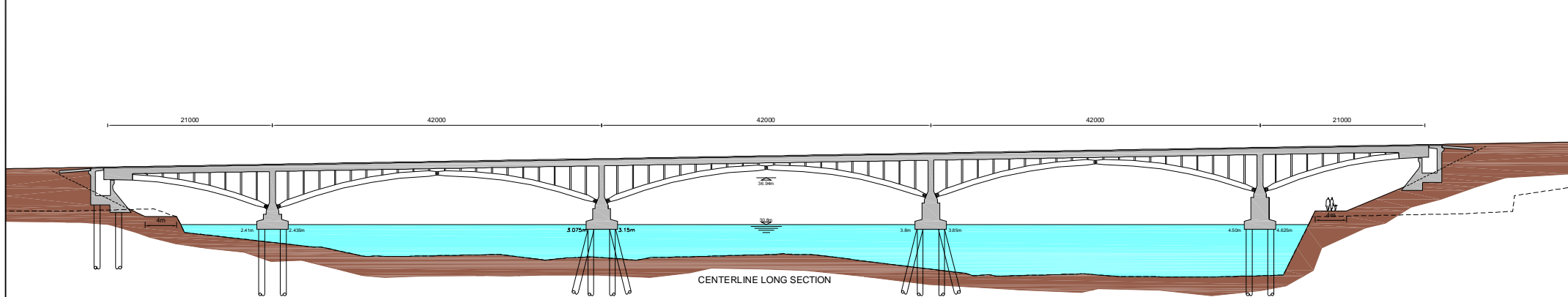
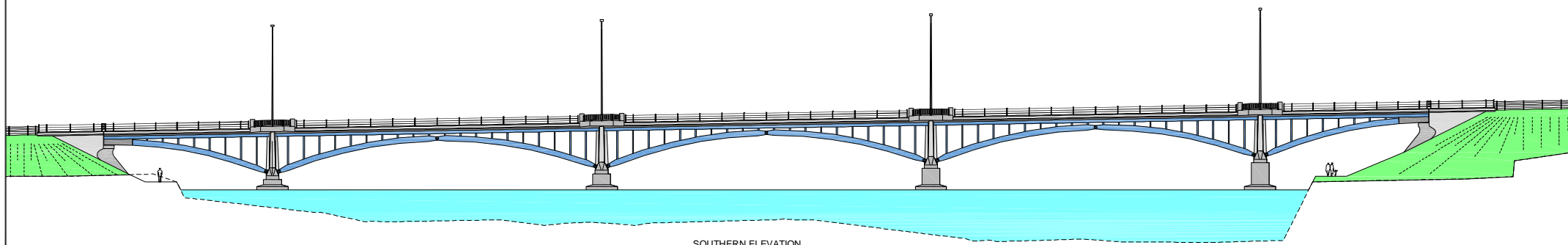
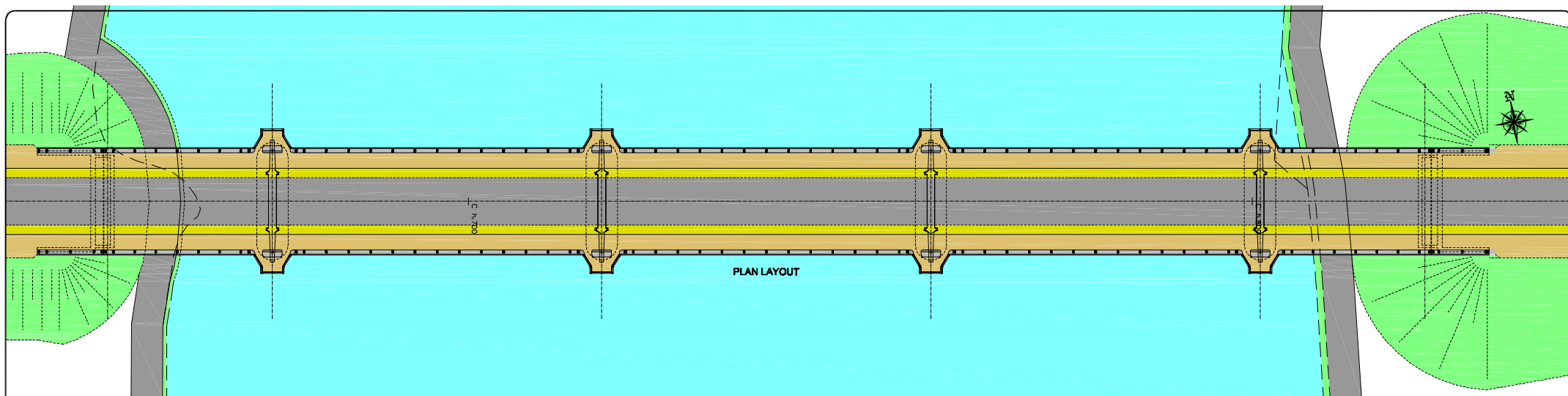
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Drawing Title		R494 IMPROVMENT	
		SHEET 2 OF 2	
Drawn:	LA	Job No:	07.527
Scale:	1:5000	Date:	JAN '12
		Drawing No:	FIG 5
		Rev:	



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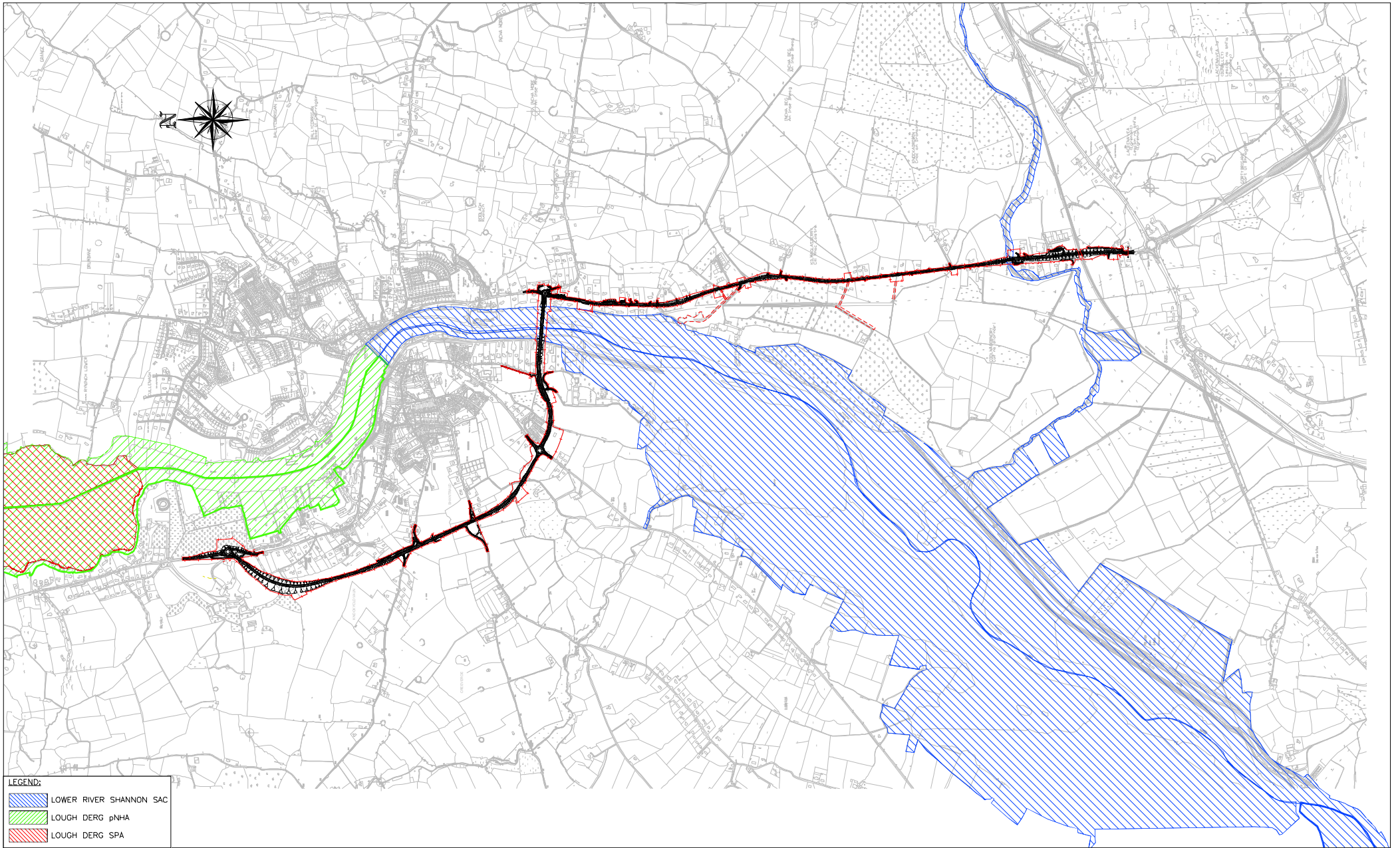
**KILLALOE BYPASS, SHANNON BRIDGE CROSSING
& R494 IMPROVEMENT**

ENVIRONMENTAL IMPACT STATEMENT






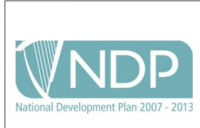
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Drawing Title			
SHANNON BRIDGE MULTIPLE ARCH BRIDGE OPTION			
Drawn: LA	Job No: 07.527	Drawing No:	Rev:
Scale: (A4)	N.T.S.	Date: JAN '12	FIG 6



LEGEND:

	LOWER RIVER SHANNON SAC
	LOUGH DERG pNHA
	LOUGH DERG SPA



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**KILLALOE BYPASS, SHANNON BRIDGE CROSSING
 & R494 IMPROVEMENT**

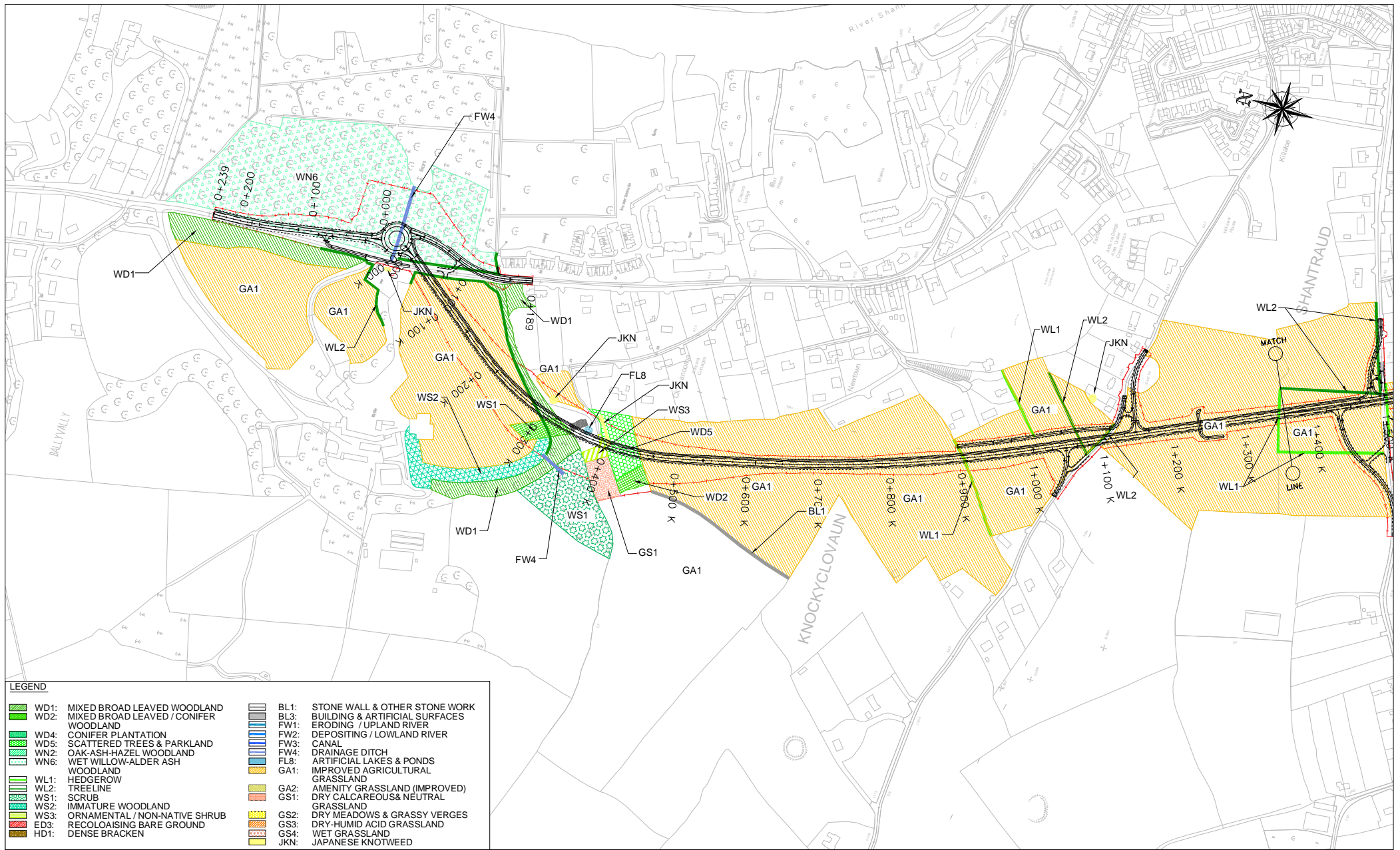
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Drawing Title			
CONSERVATION DESIGNATIONS			
Drawn:	LA	Job No:	07.527
Scale:	1:5000	Date:	JAN '12
Drawing No:	FIG 7	Rev:	

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KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

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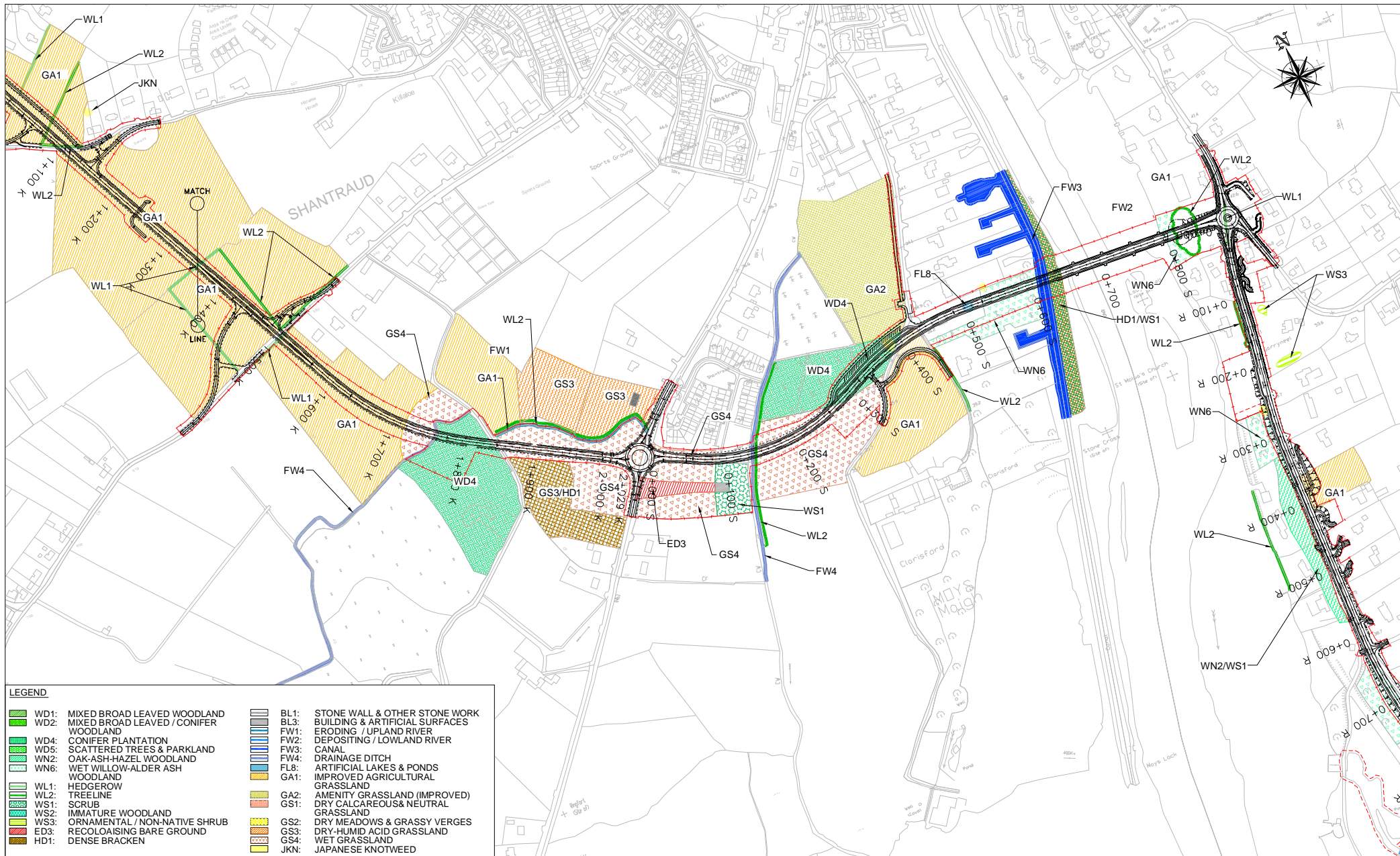


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Drawing Title

**HABITAT MAP
SHEET 1 OF 4**

Designed: SG	Checked: BC	Approved: RTP	Status: NIS	Scale: 1:5000	Date: JAN '12	Drawing No: FIG 8	Rev:
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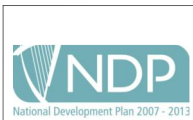
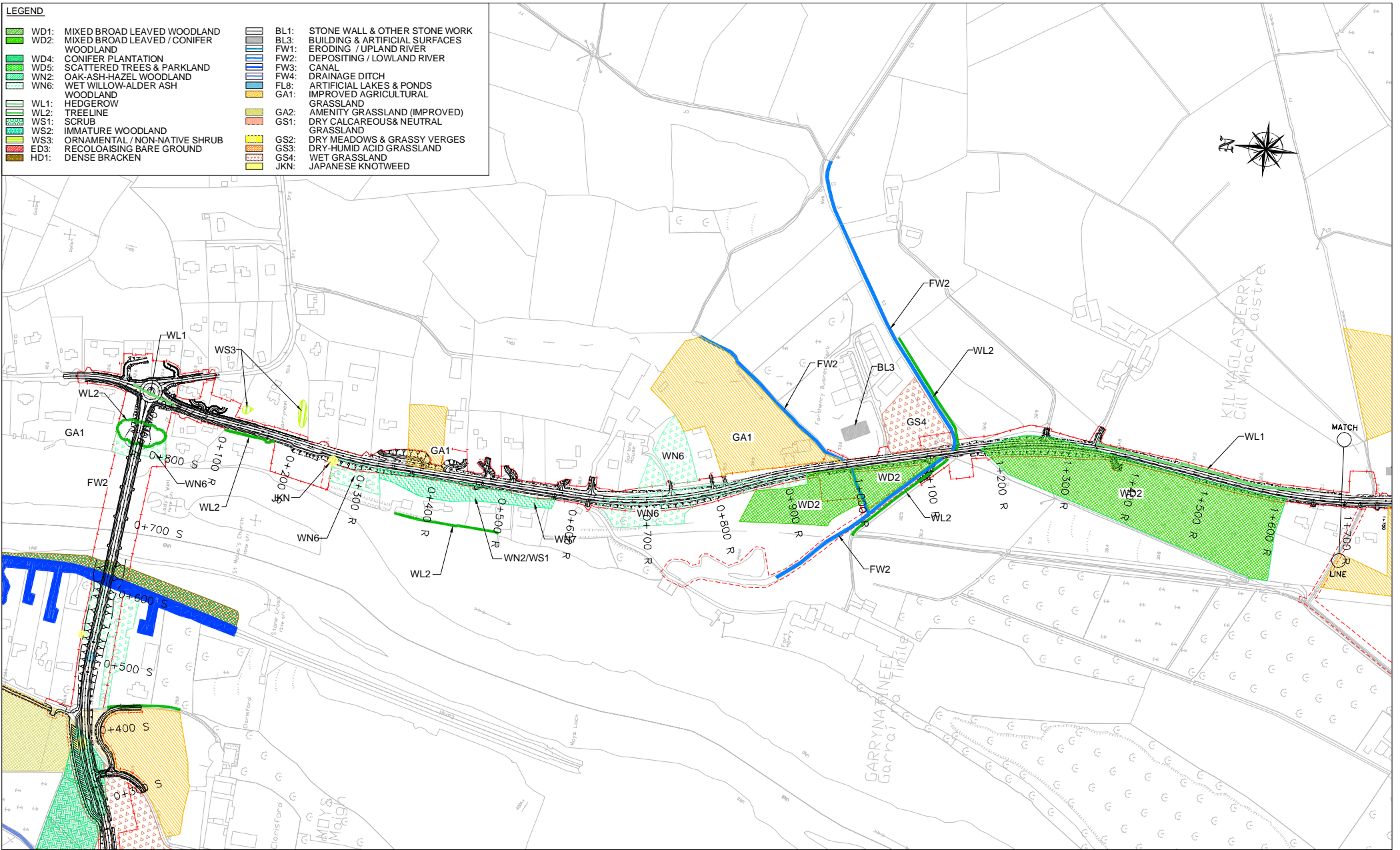
Drawing Title

**HABITAT MAP
SHEET 2 OF 4**

Designed: SG	Checked: BC	Approved: RTP	Status: NIS	Drawn: LA	Job No: 07.527	Drawing No: FIG 9	Rev:
				Scale: 1:5000	Date: JAN 12		

LEGEND

- | | | | |
|--|--|--|---|
| | WD1: MIXED BROAD LEAVED WOODLAND | | BL1: STONE WALL & OTHER STONE WORK |
| | WD2: MIXED BROAD LEAVED / CONIFER WOODLAND | | BL3: BUILDING & ARTIFICIAL SURFACES |
| | WD4: CONIFER PLANTATION | | FW1: ERODING / UPLAND RIVER |
| | WD5: SCATTERED TREES & PARKLAND | | FW2: DEPOSITING / LOWLAND RIVER |
| | WN2: OAK-ASH-HAZEL WOODLAND | | FW3: CANAL |
| | WN6: WET WILLOW-ALDER ASH WOODLAND | | FW4: DRAINAGE DITCH |
| | WL1: WOODLAND | | FL8: ARTIFICIAL LAKES & PONDS |
| | WL2: HEDGEROW | | GA1: IMPROVED AGRICULTURAL GRASSLAND |
| | WL3: TREE LINE | | GA2: GRASSLAND AMENITY GRASSLAND (IMPROVED) |
| | WS1: SCRUB | | GS1: DRY CALCAREOUS & NEUTRAL GRASSLAND |
| | WS2: IMMATURE WOODLAND | | GS2: DRY MEADOWS & GRASSY VERGES |
| | WS3: ORNAMENTAL / NON-NATIVE SHRUB | | GS3: DRY-HUMID ACID GRASSLAND |
| | ED3: RECOLONISING BARE GROUND | | GS4: WET GRASSLAND |
| | HD1: DENSE BRACKEN | | JKN: JAPANESE KNOTWEED |



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Drawing Title			
HABITAT MAP SHEET 3 OF 4			
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Rev:			