ENVIRONMENTAL IMPACT STATEMENT

for

PROPOSED VACCINE MANUFACTURING FACILITY & ASSOCIATED WORKS at MSD, Brinny, Innishannon, County Cork

prepared for

MSD Ireland (Brinny)

a branch of MSD International Gmbh

on behalf of

by

Environmental Impact Services
Second Floor
The Courtyard
25 Great Strand Street
Dublin 1

March 2017

Document Control	Author/Reviewer	Date
Prepared by	Paul Fingleton, Andrew Reynolds and other contributors listed in Table 1.1	various dates to 29th March 2017
Checked by	Paul Fingleton / Andrew Reynolds/ Conor Skehan / MSD	29th March 2017

Table of Contents

List of Figures

List of Tables

List of Appendices

The Appendices are contained in a separately bound volume.

APPENDIX TO SECTION 2. SCREENING & SCOPING

Appendix 2.1 Draft Scoping Report

APPENDIX TO SECTION 6. BIODIVERSITY

Appendix 6.1 Assessment of Impacts and Impact Significance Start Document
Appendix 6.2 Flora Species List

APPENDIX TO SECTION 7. SOILS, GEOLOGY & HYDROGEOLOGY

Appendix 7.1 Impacts Ratings and Assessment Criteria
Appendix 7.2 Well Logs

APPENDIX TO SECTION 8. WATER & HYDROLOGY

Appendix 8.1 EPA Guidance Criteria

APPENDIX TO SECTION 9. AIR QUALITY & CLIMATE

Appendix 9.1 Ambient Air Quality Standards
Appendix 9.2 Dust Minimisation Plan
Appendix 9.3 Air Quality

APPENDIX TO SECTION 15. ARCHAEOLOGY & ARCHITECTURAL HERITAGE

Appendix 15.1 Archaeological Field Inspection Record
Appendix 15.2 Relevant Legislation, Policies and Conventions on Archaeology and Cultural Heritage
Appendix 15.3 NIAH Structures Within 1km of the Proposed Development

COMPENDIUM OF MITIGATION MEASURES

6. Biodiversity
7. Land, Soils, Geology & Hydrogeology
8. Water & Hydrology
9 Air Quality & Climate
10. Noise & Vibration
11. Landscape & Visual Impact
13. Traffic & Transport
14. Waste Management
15. Archaeology & Architectural Heritage

1 INTRODUCTION

1.1 INTRODUCTION AND TERMS OF REFERENCE

1.1.1 BACKGROUND

Environmental Impact Services has been commissioned by MSD Ireland (Brinny) a branch of MSD International Gmbh (referred to as MSD hereafter) to prepare an Environmental Impact Statement (EIS) for a proposed new facility at MSD, Brinny, Innishannon, County Cork.

MSD products cover a range of areas including heart and lung health, care for women's health, cancer treatment, infectious diseases and many more disease areas. Every year, they invest millions of euro in research to bring new medicines to the world.

MSD's vision is to make a difference in the lives of people globally through our innovative medicines, vaccines, biological therapies and animal health products. They aspire to be the best healthcare company in the world and are dedicated to providing leading innovations and solutions for tomorrow.

Their mission is to discover, develop and provide innovative products and services that save and improve lives around the world.

In the past five decades MSD has invested over €2.2bn in Ireland and contributes significantly towards making the pharmaceutical industry the country's leading export sector.

Today MSD employs 2,300 people directly in Ireland and provides an additional 9,000 indirect jobs through its operations at its sites across Ireland.

The Brinny plant specialises in the fermentation, purification and sterile filling of biotech products, including two of the company's most successful treatments for hepatitis C and rheumatoid arthritis. The site also makes products used in clinical studies around the world.

Brinny also has a quality leadership role in MSD in Europe, and hosts a range of global support services including IT, customer services, planning and analytical testing.

Products produced in Brinny are exported to 90 countries and earn more than €2 billion in annual sales.

1.1.2 OVERVIEW OF THE PROPOSED DEVELOPMENT

The floor area on the existing site is approximately 25,000 m^2 in total. The application being submitted for planning permission provides for a vaccine manufacturing facility to be fitted out within the existing structure known as Building 21 (B21). The existing largely un-serviced shell building (footprint c. 1,800 m^2) was built circa 1993, but never fully fitted out.

A detailed project description is provided in Section 4 of this EIS.

In summary, the proposed project consists of a vaccine manufacturing facility as follows: Two independent process manufacturing suites on the first floor with a ring corridor surrounding the suites. A supervisor's office and technical chase will be located between the suites. The ground floor supports the process area with the following functions:

- Buffer Preparation
- Weigh & Dispensing
- Buffer Cold Room and Staging
- Storage (racked)
- Shipping/Receiving

- Waste Staging
- Utilities
- Locker Rooms
- Office Area

The works include car parking for an additional 320 new permanent car spaces in an extension to the existing main car park using the existing road entrance.

A permanent contractor compound to the south of the existing car park will be moved across the L2235 road and relocated to the south western side of the MSD site. This compound is to be laid out with two storey and single storey modular construction facilities including single storey modular workshops, two storey and single storey administration facilities, toilets, welfare facilities and laydown areas. It is approximately 5,000 m^2 in extent. It will be landscaped with berms and perimeter screen planting.

The works also include other landscaping, a surface water attenuation area, minor alterations to existing entrances, alterations and extensions to existing security fencing and gates, underground and overground utilities, yards, lighting, signage and associated site works.

A temporary contractor compound will be provided with offices, canteen, laydown and storage areas and other facilities. It will have a dedicated 300 space car park for construction related personnel

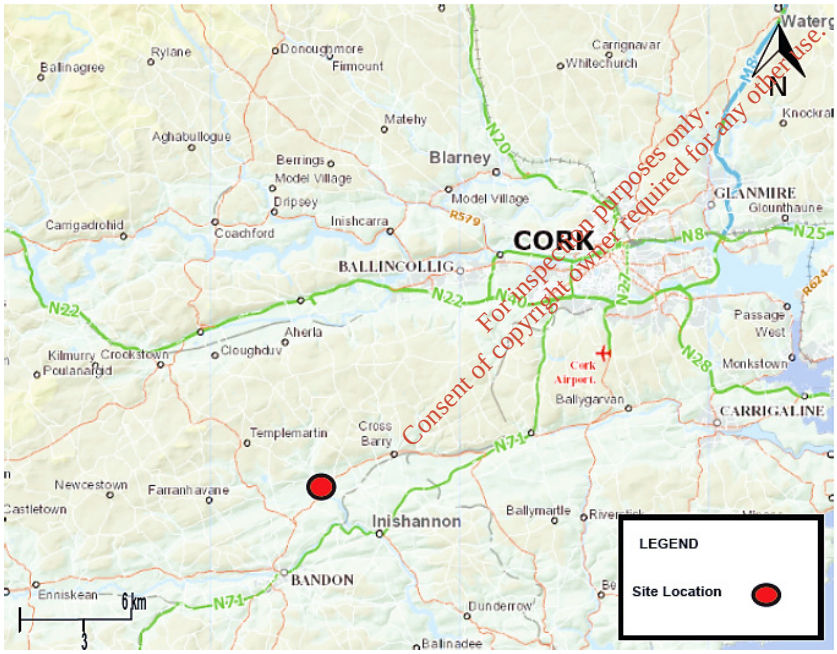

Figure 1.1 Site Location Map

1.1.3 OBJECTIVITIES OF THE EIS

The main objectives of this EIS are to predict any significant impacts of the proposed development on the environment and, where applicable, propose measures to avoid, reduce or remedy them.

It reports on the findings of the EIA process to date and informs the Planning Authority (Cork County Council), statutory consultees, other interested parties and the public in general about the likely effects of the project on the environment.

In doing this the EIS has been prepared in compliance with the EU Directive on EIA. Section 2 provides details of the Directive as well as the Irish legislation that has been followed and the guidelines that have been taken into account. The relationship between this EIS and other assessments prepared under separate legislation is also discussed in Section 2.

1.2 EIS FORMAT

This EIS follows a grouped format structure. Using this structure the EIS examines each environmental topic in a separate section. These sections generally cover:

- the proposed development;
- the receiving environment;
- likely significant impacts;
- mitigation measures; and
- residual impacts (where relevant).

Interactions between issues that arise in separate sections are assessed as they occur in each section. Cumulative effects are similarly assessed as appropriate in the relevant sections of the EIS. The final section of the EIS, Section 16, *Interactions & Cumulative Effects*, shows where interactions and cumulative effects have been identified and how they have been addressed.

The next section, *Section 2 Screening & Scoping*, gives more detail on how the issues addressed under each heading in this EIS were identified.

Separate reports are included in the planning application to address the following topics, in accordance with other (non-EIA) requirements:

- Appropriate Assessment (AA) Screening Report
- Flood Risk Assessment (FRA) Screening Report
- Traffic and Transportation Assessment Report (TTA)
- Civil Drainage Report
- Planning Application Report

Some of these reports are also relevant in the consideration of the prescribed EIA topics so these are referred to in the EIS, as and where appropriate. For example, the Water & Hydrology section refers to the FRA Screening Report, the Traffic & Transportation section refers to the TTA and the Biodiversity section refers to the AA Screening Report.

The mitigation measures proposed in an EIS constitute important and enforceable undertakings about how a project is developed and managed to mitigate adverse effects. For ease of comprehension – especially during the Environmental Impact Assessment process by Consenting Authorities – it has proven useful to have an overview of all of these measures that are proposed within the EIS. Appendix 16 provides a collection – or compendium – of all of the mitigation measures that are proposed.

1.3 STUDY TEAM

The study team engaged to prepare this EIS are all appropriately qualified, experienced and expert in their respective fields. The individual specialists are as listed below. Summaries of their expertise are given below the table.

Table 1.1 Study Team for this EIS

Role	Personnel	Company
Study Director	Conor Skehan	Environmental Impact Services
Study Manager	Paul Fingleton	Environmental Impact Services
Study Coordinator	Andrew Reynolds	Environmental Impact Services
Specialist Topics (Section 2.3 *Scoping* discusses the basis for selection of these topics)		
Population & Human Health	Tomás Glancy / Lara Gough	AOS Planning
Biodiversity	Andrew Torsney	Environmental Impact Services
Land, Soils, Geology & Hydrogeology	Dr. Teri Hayes	AWN Consulting
Water & Hydrology	Dr. Teri Hayes	AWN Consulting
Air Quality & Climate	Dr. Avril Challoner	AWN Consulting
Noise and Vibration	Niall Vaughan	AWN Consulting
Landscape & Visual Impact	Conor Skehan	Environmental Impact Services
Material Assets	Paul Fingleton	Environmental Impact Services
Traffic & Transportation	Colin Wyllie	Jacobs Engineering
Waste Management	Robert Hunt	AWN Consulting
Archaeology & Architectural Heritage	Miriam Carroll & Annette Quinn	Environmental Impact Services
Interactions & Cumulative Effects	Paul Fingleton & Andrew Reynolds	Environmental Impact Services

Study Director, Conor Skehan (BSC), (MLArch) Master of Landscape Architecture, University of Pennsylvania, 1983. Conor has been chartered by a number of professional Institutes including the International Association for Impact Assessment; the Irish Landscape Institute; the Royal Institute of the Architects of Ireland; and the Irish Planning Institute. He co-founded and served as President of the Irish Landscape Institute from 1993 to 1994. Environmental Impact Services is a Registered Assessor member of the Institute of Environmental Assessment (UK). Conor is an Architect, Landscape Architect, Strategic Planner, Impact Analyst, academic and writer.

He has worked for over 30 years in many countries providing strategic and spatial planning and environmental consultancy to a wide range of government, public and private clients on assignments varying in scale from very large-scale infrastructural and industrial projects to large urban renewal and tourism projects. He has made significant contributions to a wide range of complex Environmental Impact Statements, planning applications and environmental reports for Industry (ICT,

Bio-pharma) , Infrastructure (road, rail, airport, port, power, energy waste, drainage and water supply), Institutions (hospital, prison projects) as well as major urban renewal and extension projects

Study Manager, Paul Fingleton has an MSc in Rural and Regional Resources Planning (with specialization in EIA), University of Aberdeen, 1990. Paul is a member of the International Association for Impact Assessment as well as the Institute of Environmental Management and Assessment. Paul has over twenty years' experience working in the area of Environmental Assessment. Paul has been involved in a diverse range of projects including contributions to, and co-ordination of, a number of complex EISs, NISs and / or IPPCL Applications for projects.

Study Coordinator, Andrew Reynolds has a BSc in Environmental Planning and Management, Dublin Institute of Technology, 2015. Andrew has contributed to a number of complex Environmental Impact Statements, planning applications and environmental reports. He has experience working as part of team projects and in the preparation of EIA documents on behalf of multi-nationals and infrastructural providers for a diverse range of projects

Population & Human Health, Lara Gough has a (MTRP) – Masters in Town & Regional Planning, 1994. Lara is a member of the Irish Planning Institute (IPI). Lara hash has over 20 years' experience of working in project management, strategic and policy planning, development management, site appraisals and feasibility studies. Lara has significant international and multi-sectoral experience – having worked as a planner in South Africa, the UK, Ireland and Northern Ireland – and encompassing at a local and community level from Development and Local Area Plans, Masterplans, to housing estates, commercial retail parks and office buildings, pharmaceutical and data centre industrial developments and major regional infrastructure

Population & Human Health, Tomás Glancy has a BSc in Spatial Planning, Dublin Institute of Technology, 2015. Tomás is a member of the Irish Planning Institute (IPI). Tomás experience working as part of team projects and in the preparation of planning and EIA documents on behalf of multi-nationals and infrastructural providers.He also liaises with the various government agencies and local authorities in order to assimilate the environmental baseline information that is used in SEAs and EIAs and assists in the preparation of the various SEA and EIA related documentation.

Biodiversity, Andrew Torsney has a MRes in in Biodiversity and Conservation from the University of Leeds. Andrew is a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). Andrew has over five years' experience working as an Ecologist on both national and local scale projects. His experience ranges from academic research which has been implemented by practical management to extensive consultancy work. Andrew has designed and coordinated ecological elements of Environmental Impact Assessments (EIA) for multiple large scale projects.

Land, Soils, Geology & Hydrogeology and Water & Hydrology, Dr. Teri Hayes BSc MSc in Hydrogeology, 1990. Teri is a member of the International Association of Hydrogeologists (Irish Group) – former president and the Institute of Geologists of Ireland – Professional Member. Teri is a Director with AWN with 22 years of experience in water resource management and environmental assessment and remediation. She has contributed to numerous environmental impact assessments and design of appropriate mitigation measures, acted as an expert witness at public hearings, lectured in EIA and providing expert advice on EIA sections for planning authorities.

Air Quality & Climate, Dr. Avril Challoner BE (hon) Environmental Engineering, NUIG, 2009 and PhD (Air Quality) Trinity College Dublin, 2012. Avril is a member of the Institute of Air Quality Management and an associate member of the institute of Environmental Sciences. Avril has a PhD in air quality and worked in air quality consultancy in both Dublin and London since 2012. She specialises in the fields of air quality, EIA and air dispersion modelling and has experience in the use of software packages such as AAQuIRE, DMRB and AERMOD for the air quality assessments of major infrastructural and industrial projects.

Noise and Vibration , Niall Vaughan BSc in Environmental Science from University of Bradford (1997), is a Senior Acoustic Consultant. Niall has worked as an Acoustic Consultant for over fifteen years and he is a member of the Institute of Acoustics. He has provided acoustic consultancy services for numerous EIS statements, planning applications and regularly carries out environmental noise surveys in support of AERs.

Traffic &Transportation, Colin Wyllie has a BEng (Hons) in Civil and Transportation Engineering, Napier University, 1998 and has over eighteen years' experience providing transport planning advice on a wide range of complex, large scale development and infrastructure projects. Colin is a member of the Chartered Institution of Highways & Transportation and the Society of Road Safety Auditors. Colin has advised on numerous planning applications across the UK and Ireland in terms of traffic impact analysis relevant to TTAs and Environmental Impact Statements.

Waste Management, Robert Hunt is a Senior Consultant with AWN Consulting Ltd, with over 6 years' experience in environmental consultancy and waste management. Robert Hunt has an BEng from UCD and a Masters in Environmental Engineering and has worked on many industrial pharmaceutical project developments over the last 6 years.

Archaeology & Architectural Heritage, Miriam Carroll and Annette Quinn are the directors of Tobar Archaeological Services and both graduated from University College Cork in 1998 with a Masters degree in Methods and Techniques in Irish Archaeology. Both directors are licensed by the Department of Arts, Heritage and the Gaeltacht to carry out excavations and are members of the Institute of Archaeologists of Ireland. Annette Quinn and Miriam Carroll have been working in the field of archaeology since 1994 and have undertaken numerous projects for both the private and public sectors including excavations, site assessments (EIS/EIA) and surveys.

1.4 IMPACT PREDICTIONS

Rating of potential environmental impacts in the specialist sections is in accordance with the Glossary of Impacts contained in the EPA Guidelines[1] as shown in Table 1.2 below, unless otherwise stated. This takes account of the quality, significance, duration and type of impact characteristic identified.

In the EIS, consideration is given to both the importance of an attribute and the magnitude of the potential environmental impacts of the proposed activities on that cited attribute.

The duration of each impact is considered to be either temporary, short-term, medium term, long-term, or permanent. Temporary impacts are considered to be those which are construction related and last less than one year. Short term impacts are seen as impacts lasting one to seven years; medium-term impacts lasting seven to fifteen years; long-term impacts lasting fifteen to sixty years; and permanent impacts lasting over sixty years.

[1] Section 5 of *Guidelines on the information to be contained in Environmental Impact Statements*, 2002, EPA.

Table 1.2 Impact Prediction Terminology

Impact Characteristic	Term	Description
Quality	Positive	A change which improves the quality of the environment
	Neutral	A change which does not affect the quality of the environment
	Negative	A change which reduces the quality of the environment
Significance	Imperceptible	An impact capable of measurement but without noticeable consequences
	Slight	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An impact that alters the character of the environment in a manner consistent with existing and emerging trends
	Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Profound	An impact which obliterates sensitive characteristics
Duration	Short-term	Impact lasting one to seven years
	Medium-term	Impact lasting seven to fifteen years
	Long-term	Impact lasting fifteen to sixty years
	Permanent	Impact lasting over sixty years
	Temporary	Impact lasting for one year or less
Type	Cumulative	The addition of many small impacts to create one larger, more significant impact
	'Do Nothing'	The environment as it would be in the future should no development of any kind be carried out
	Indeterminable	When the full consequences of a change in the environment cannot be described
	Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect
	Synergistic	Where the resultant impact is of greater significance than the sum of its constituents
	'Worst Case'	The impacts arising from a development in the case where the mitigation measures may substantially fail

1.5 DIFFICULTIES ENCOUNTERED

The EIA Regulations require that difficulties such as technical deficiencies, lack of information or knowledge encountered in compiling any specified information for the EIS be described. There were no significant difficulties encountered in the production of this EIS. Any issues encountered during assessment of individual factors are noted within the specialist section.

1.6 LEVEL OF DETAIL IN PROJECT DESCRIPTION

Some of the information provided in the description of the project (Section 4) will be subject to slight changes for these reasons:

- All descriptions of proposed developments are approximations compared to the finished development. The nature of the construction process limits the amount of detail that is available at this planning consent stage to documentation that may be decried as 'General Arrangement Illustrations'.

- While a construction management plan is provided in this EIS (as a separate document) and this plan is assessed as relevant in this – some of the details of how the project is built will be a matter for the contractor who is awarded the project following a competitive tendering process. However it will need to be ensured that the environmental effects of any variations stay within the envelope of effects predicted in this EIS.

- The detail required for later, more specific, consents – such as notification to the EPA – will be submitted to the relevant authority within the ranges and tolerances referred to herein or as otherwise agreed.

In all of these circumstances the project description specifies the outermost ('not to exceed') environmental parameters of the characteristics of the proposed development – maximum dimensions, tolerance for variation, maximum emissions, range of technologies and processes to be employed etc. This facilitates an evaluation of 'worst case' environmental effects. Actual effects will not exceed the predicted effects.

1.7 A NOTE ON QUOTATIONS

By their nature, Environmental Impact Statements contain statements about the proposed development, some of which are positive and some less than positive. Selective quotation or quotations out of context can give a misleading impression of the findings of the study. Therefore, the study team urge that quotations should, where reasonably possible, be taken from the conclusions of specialists' sections or from the non-technical summary and taken not selectively or out of context.

2 SCREENING & SCOPING

2.1 LEGISLATION AND GUIDANCE

Environmental Impact Assessments (EIAs) are carried out in response to the requirements of the European Directives on the assessment of the effects of certain public and private projects on the environment, as codified in Directive 2011/92/EU. The enabling statutory instruments (S.I.s) which transpose these Directives into law in Ireland are the European Communities (Environmental Impact Assessment) Regulations, 1989, as updated by the Planning and Development Acts 2000 to 2006 (the EIA Regulations), with the main legislation being S.I. 600/01. These Regulations outline the classes of projects subject to Environmental Impact Assessment (EIA) and the statutory format and content for an EIS.

This EIS has been prepared in accordance with the above and has regard to other relevant regulations such as the Environmental Protection Agency (EPA) *Guidelines on information to be contained in Environmental Impact Statements* (EPA 2002), the EPA *Advice Notes on Current Practice in preparation of Environmental Impact Statements* (EPA 2003) and relevant European Commission guidance documents[2].

A revised EIA Directive 2014/52/EU was adopted by the European Council on of 16 April 2014. This amends Directive 2011/92/EU. The deadline for Member States to bring into force the laws, regulations and administrative provisions necessary to comply with the amended Directive is 16 May 2017. The application for planning permission will be made before this deadline so will be subject to Directive 2011/92/EU and the current regulations.

The key changes affecting the information to be contained in an EIS are set out in Table 2.1 below.

The EPA has made draft revised *Guidelines on the information to be contained in Environmental Impact Statements* (2015) available. While these are subject to further review by the EPA including changes to ensure alignment with the legislation that will be introduced on 16 May 2017, they do indicate the changes that are likely to be introduced, particularly of the information that will be required to be contained in an EIS to make it compliant with the new legislation. This EIS has been prepared to comply with the current regulations and to anticipate and address the new requirements introduced by Directive 2014/52/EU. It follows the current Guidelines while also taking account of the changes contained in the draft revised Guidelines.

An Appropriate Assessment (AA) Screening has also been carried out to assess the potential of the proposal to affect the integrity of the Natura 2000 network. Its findings are provided in an AA Screening Report which is included as a separately bound document within the planning application document set. The findings of the screening report are referred to in the Biodiversity section of this EIS, without duplicating its contents.

The relationship between this EIS and other assessments prepared under separate legislation is discussed in Section **Error! Reference source not found.**.

[2] Including EIA-Guidance on Screening, EIA-Guidance on Scoping and EIA Review Checklist, all 2001, EC.

Table 2.1 Coverage of key changes arising from EIA Directive 2014/52/EU in this EIS

Change	Notes on Coverage in this EIS	Section / Document Reference(s)
Mandatory assessment of 'reasonable alternatives'	Covered	Section 3 *Consideration of Alternatives*
Factor of *Human Beings* replaced by *Population & Human Health*	This change clarifies the meaning of *Human Beings* as *Population & Human Health*. Population is covered by a socio-economic assessment of the proposal. Human Health is addressed under the various factors through which effects on human health could be caused, e.g. Air Quality, Noise, Traffic.	Sections 5 to 14 and Section 16
Factor of *Flora & Fauna* replaced by *Biodiversity*	This change in title aligns with current terminology and does not affect the scope of this factor.	Section 6 Biodiversity
Introduction of topic of *Land*	This is largely intended to cover the effects of removal of land from other productive uses, primarily agricultural production.	Section 7 Land, Soils, Geology & Hydrogeology
Environmental effects of climate change risks to the development	There are no risks to the site, e.g. due to flooding of chemical storage areas which could affect surrounding flooded areas, that would have significant potential to cause environmental effects.	The separate Flood Risk Assessment Screening Report considers flood risk
Requirement for competent experts to prepare the EIS	The study team are all appropriately qualified, experienced and expert in their respective fields.	Section 1.3 *Study Team*
Requirement for mitigation and monitoring proposals to be included in consent permission while avoiding duplication of monitoring under other EU legislation	Mitigation and monitoring measures proposed in the EIS are clearly set out so that they can be readily referred to or included in planning condition. Duplication of monitoring required under other EU legislation such as Waste or Industrial Emissions Licencing is avoided.	Sections 5 to 15 of the EIS and Appendix 16 *Mitigation Measures*
Requirement to consider assessments carried out under other EU Directives while avoiding duplication of assessment	See below	Ref. Section **Error! Reference source not found.**

2.3 SCREENING

2.3.1 PROJECT TYPES AND THRESHOLDS

The relevant EIA thresholds from Part 2 of Schedule 5 of the Planning and Development Regulations, 2001 are:

6. Chemical Industry (development not included in Part 1 of this Schedule)

(b) All installations for production of pesticides and pharmaceutical products, paint and varnishes, elastomers and peroxides using a chemical or biological process.

10. Infrastructure projects

(b) (ii) Construction of a car-park providing more than 400 spaces, other than a car-park provided as part of, and incidental to the primary purpose of, a development.

13. Changes, extensions, development and testing

(a) Any change or extension of development which would:-

(ii) result in an increase in size greater than -

- 25 per cent, or
- an amount equal to 50 per cent of the appropriate threshold, whichever is the greater.

Amendment of the above regulations by the Planning and Development (Amendment) (No. 2) Regulations 2011 added this category:

15. Any project listed in this Part which does not exceed a quantity, area or other limit specified in this Part in respect of the relevant class of development but which would be likely to have significant effects on the environment, having regard to the criteria set out in Schedule 7."

2.3.2 CLASS 6(B)

The project will involve production using chemical and biological processes. The proposal thus falls into class 6 (b) in Part 2, i.e. production of … pharmaceutical products … using a chemical or biological process.

The existing facility already produces pharmaceutical products using a biological process so the proposal can be considered to be an increase in the size of the plant.

The floor area at the existing plant is circa 25,000 m^2 and the proposed change will add approximately 4,000 m^2 to this. This is a 16 % increase. As no size is specified for project type 6 (b), the applicable threshold is a 25 % increase in size (ref 13 (a) (ii) above). The proposed increase is thus below the threshold so the project can be considered sub-threshold by reference to class 6(b), taking account of class 13(a)(ii).

2.3.3 PROJECT TYPE 10(B)(II)

The project includes provision of 320 new permanent car parking spaces. The comparison of the size of the car park against the relevant threshold is set out in **Error! Reference source not found.** below.

Table 2.2 Comparison of spaces in car park extension against EIA threshold

	Number of spaces
Threshold	
per 13(a)(ii)the size of extension which would trigger an EIA is *greater of*: increase of 25% above existing (25% of 481) = *120* *or* 50% of the appropriate threshold (50% of 400) = *200*	200
Number of new spaces included in proposal	
Permanent spaces	320

The proposed number of spaces is thus above the threshold. The project thus exceeds the threshold for class 10(b)(ii), taking account of class 13(a)(ii).

2.3.4 CLASS 15/ SCHEDULE 7

Class 15 and the criteria set out in Schedule 7 apply to sub-threshold projects. As this project is above the threshold for class 10(b)(ii), these criteria are not relevant.

2.3.5 SCREENING CONCLUSION

As the development exceeds a threshold contained in Schedule 5 of the Planning and Development Regulations, 2001, an EIS must be submitted as part of the planning application.

Table 2.3 Summary table of comparison against thresholds

	Above Threshold for EIS?	Sub-Threshold for EIS?
Plant Extension	No	Yes
Car Park Extension	Yes	No

2.4 SCOPING

2.4.1 BASIS OF SCOPING FOR THIS EIS

Scoping is the process of identifying potential concerns that need to be examined in detail in an EIS. The determination of potential concerns to be addressed in this EIS was largely based on:

- the requirements of the EIA Regulations;
- the requirements of the revised EIA Directive 2014/52/EU;
- the Environmental Protection Agency's *Guidelines on the information to be contained in Environmental Impact Statements* (EPA 2002) and *Advice Notes on Current Practice (in the preparation of EISs*) (EPA 2003) ;
- the Environmental Protection Agency's draft *Revised Guidelines on the information to be contained in Environmental Impact Statements* (EPA 2015);
- consultation with Cork County Council;
- consultation with the Licencing section of the EPA; and
- experience of the project team in preparing and submitting EISs.

The scoping process included circulation of a draft scoping document to Cork County Council and the EPA for comment. A copy of this scoping document is included as Appendix 2.1. The scope was discussed at meetings with both of these authorities and feedback was taken into account.

The scope of the EIS continued to be developed throughout the preparation of the EIS.

2.4.2 RELATIONSHIP BETWEEN THE EIS AND ASSESSMENTS UNDER OTHER EU DIRECTIVES AND LEGISLATION

This EIS takes account of available results from other relevant assessments while avoiding duplication of those assessments, particularly the following:

The Industrial Emissions Directive (2010/75/EU)
The site is subject to an EPA Industrial Emissions (IE) licence. Any necessary amendments to that licence will be applied for after the planning application stage and in the time for that process to be completed prior to commencement of the proposed operations.

Sections 7 to 11 of this EIS (*Land, Soils, Geology & Hydrogeology*, *Water & Hydrology*, *Air Quality & Climate*, *Noise & Vibration* and *Waste Management*) refer to the IE licence as relevant.

The Seveso Directive (82/501/EEC)
The site is not a Seveso site as it does not exceed the prescribed hazard criteria. A review has found that the proposal does not change this status as the quantities and hazard rating of chemicals used at the site are low.

The Greenhouse Gas Emissions Directive (2003/87/EC)
The MSD site is subject to an EPA Greenhouse Gas (GHG) permit. Section 9 of this EIS considers the relevant aspects under the heading of *Air Quality & Climate*.

The Habitats and Birds Directives (92/43/EEC and 79/409/EEC)
The proposal has been screened for requirement for a Natura Impact Statement (also referred to as an Appropriate Assessment or AA). This screening has assessed the potential for the proposal to affect the integrity of the Natura 2000 network of protected sites and the findings are contained in a separate AA Screening report. Section 6, *Biodiversity*, takes account of the results of this screening report as relevant, without duplicating its contents.

The Waste Directive (2009/98/EC)
Section 11, *Waste Management*, and the accompanying Construction Environmental Management Plan (CEMP) consider aspects which fall under this Directive as appropriate.

The Floods and Water Framework Directives (2007/60/EC and 2000/60/EC)
A Flood Risk Assessment screening report and a drainage report are included as part of the planning permission application documents. The former follows the specific requirements of *The Planning System and Flood Risk Management - Guidelines for Planning Authorities*[3]. Section 8 *Water & Hydrology* takes account of material presented in both of those reports as relevant. It also refers to requirements arising from the Water Framework Directive.

[3] OPW and the Department of the Environment and Local Government, 2009

3 ALTERNATIVES

3.1 INTRODUCTION

Before looking at the impacts of any development on the environment, the Planning and Development Regulations[4] require the EIS to include an outline of the main alternatives studied by the developer and an indication of the main reasons for the selected choice, taking into account the effects on the environment.

3.1.1 LEGISLATION

The Regulations state that information to be contained in an EIS shall include[5]:

> *"An outline of the main alternatives studied by the developer and an indication of the main reasons for his or her choice, taking into account the effects on the environment."*

This wording is very similar to the requirement contained in the EIA Directive[6].

3.1.2 GUIDELINES

The Environmental Protection Agency's Guidelines[7] give considerable coverage to the topic. They note that consultation about the effectiveness of EIA practice found that "the acceptability and credibility of EIA findings can be significantly affected by the extent to which this issue is addressed."

The Guidelines deal with the issue under a number of headings that are particularly relevant to this development:-

> *The consideration of alternative routes, sites, alignments, layouts, processes, designs or strategies, is the single most effective means of avoiding environmental impacts. The acceptability and credibility of EIA findings can be significantly affected by the extent to which this issue is addressed.*
>
> *However, it is important, from the outset, to acknowledge the existence of difficulties and limitations when considering alternatives. These include:*
>
> - *Hierarchy*
> - *Non Environmental Factors*
> - *Site Specific Issues*
>
> ***Hierarchy***
> *Many projects, especially in the area of public infrastructure, arise on account of plans, strategies and policies which have previously been decided upon. It is important to acknowledge that in some instances neither the applicant nor the competent authority can be realistically expected to examine options which have already been previously determined by a higher authority (such as a national plan or regional programme for infrastructure or a spatial plan).*

[4] Schedule 6 of the Planning and Development Regulations, 2001
[5] Ref Schedule 6,1(d) of the Planning and Development Regulations, 2001
[6] Article 5,3(d) and Annex IV of Council Directive 2011/92/EC
[7] *Guidelines on the Information to be contained in Environmental Impact Statements*, 2002, EPA. N.B. The 1992 Environmental Protection Agency Act (Section 72) provides for the preparation by the Environmental Protection Agency of guidelines on the information to be contained in an Environmental Impact Statement. The Act further provides that those preparing and evaluating Environmental Impact Statements shall have regard to such guidelines.

Non-environmental Issues
EIA is confined to the environmental effects which influence the consideration of alternatives. It is important to acknowledge that other non-environmental factors may have equal or overriding importance to the developer, e.g. project economics, land availability, engineering feasibility, planning considerations.
The consideration of alternatives also needs to be set within the parameters of the availability
Site Specific Issues
of land (it may be the only suitable land available to the developer) or the need for the project to accommodate demands or opportunities which are site specific. Such considerations should be on the basis of alternatives within a site e.g. design, layout.

For the purposes of the Regulations, alternatives may be described at three levels:

1. *Alternative Locations*
2. *Alternative Designs*
3. *Alternative Processes*

While this proposed development is a primarily for a fit-out of an existing and previously permitted building at an existing pharmaceutical plant, the examination of alternatives did nonetheless consider these three levels of alternatives as described below.

3.2 ALTERNATIVE LOCATIONS

MSD conducted a site search to find a suitable site for the proposed facility. The search was strategic in industrial terms, and needed to find a location with adequate size and capacity for the necessary services including infrastructure and support.

The Brinny site emerged as the preferred option in terms of schedule, accessibility, infrastructure availability and costs and environmental capacity. The existing services including water supply, waste water treatment facility, utility / waste collection systems, etc. will facilitate the development. Existing site population with its management and administration network will bring benefits and efficiencies in supporting the development. The availability of a previously permitted and suitably sized building was a significant advantage.

3.3 ALTERNATIVE SITES AT BRINNY

Three options were identified as potential sites (ref. Figure 3.1)

1. New build located front of house
2. Extension and usage of an existing facility (called B22)
3. Modification of an existing unused manufacturing building (called B21)

Option 1 presented significant constraints including:

- the space available was not adequate to accommodate the footprint requirement for the proposed facility (based on a desired two-storey manufacturing configuration with two manufacturing lines co-located).
- the location would prohibit master plan of potential 'people' related building (Admin/Lab).
- adjacent 'green' spaces would be too constrained
- it would have caused significant disruption to the existing site due to the tight site space, particularly during construction
- it would cause a direct intensification of building developments on the site

Option 2 would have involved extension of an existing facility (B22) of (18 X 35 m with a possible further extension of 12 X 20 m) and use of shell space on the first floor. B22 currently houses a Technical Operations / Development Lab and freezer storage on the ground floor associated with other production facilities.
This option also presented significant constraints including:

- existing operations within B22 facility would have to be relocated to elsewhere onsite
- these relocated operations would require multiple construction projects to accommodate them with significant and extensive disruption across the site
- nearby accommodation for project personnel would require relocation
- it would require demolition of internals that would generate significant construction waste
- the need to vacate the building and relocate existing assets in addition to construction works would significantly extend the schedule for provision of the new facility
- it would cause an indirect intensification of building developments on the site because of the displaced operations and accommodation

Option 3 presented clear advantages including:

- it involves reuse of an existing permitted empty shell building
- no significant demolition is required
- it will generate less construction waste than the other options
- current usage as a store for manufacturing equipment and some maintenance spares can be readily accommodated elsewhere with minimal disruption
- significant cost and schedule benefits over the other options

All options were estimated to require similar level of investment in utilities, i.e. new clean utility systems, air-handling units, extensions to existing utility / waste collection systems, etc.

Option 3 was selected as the optimal location.

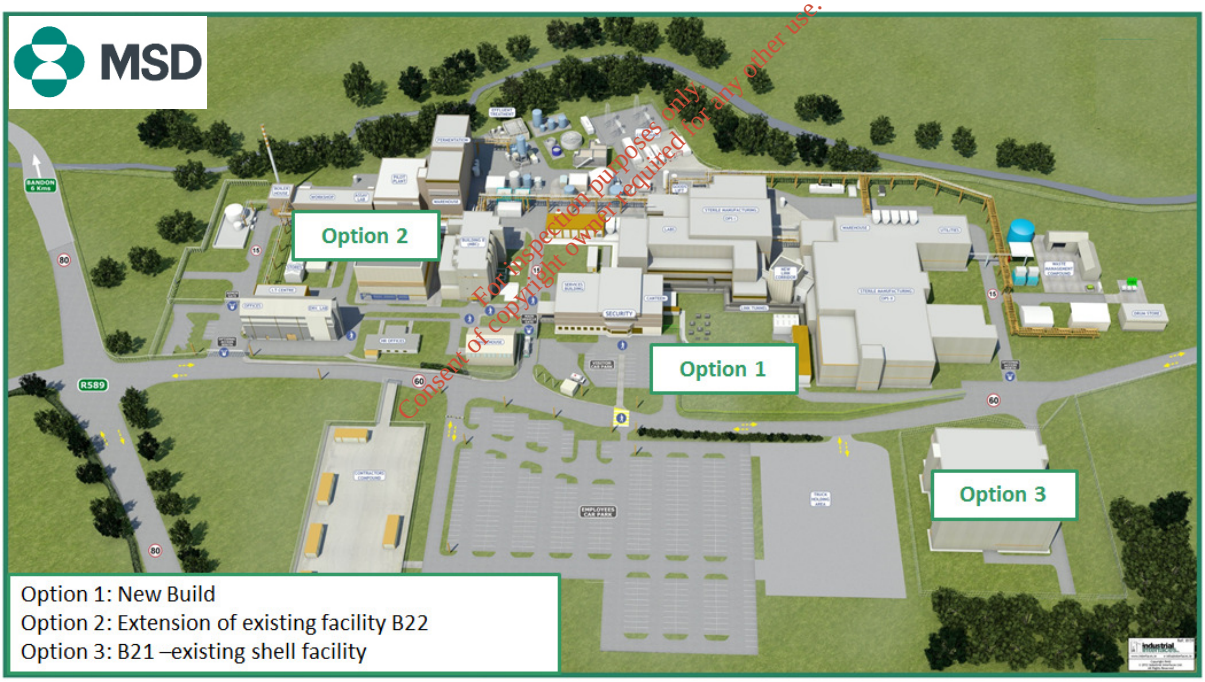

Figure 3.1 Alternative Site Locations in Brinny

3.4 ALTERNATIVE PROCESSES

The process is largely pre-determined by the available technology required to produce the vaccines per the project objective. No significant alternative process options have been considered at the pre-planning stage.

4 PROJECT DESCRIPTION

4.1 INTRODUCTION

This section also provides a description of the nature and scale of the development proposed in the context of its environs.

4.2 CONTEXT

4.2.1 SITE LOCATION

MSD Ireland (Brinny) is a large stand-alone pharmaceutical factory (c. 25,000m^2) located in open countryside approximately 5-7 km north of Bandon, and just north of Ballinacurra Bridge in the townland of Brinny as illustrated in Figure 4.1 below.

4.2.2 SITE DESCRIPTION

The building which is the main focus of the proposal, known as Building 21 (B21), is located within the Brinny MSD complex, to the north-east of most of the other existing buildings on site, and on the opposite side of the L2235 local road. The L2235 local road bisects the MSD complex in a north-westerly to south-easterly direction. The MSD site is bounded by the R589 regional road to the south-east. The Tuough River flows in a southwards direction along the West of the site and meets the Brinny River to the south of the site.

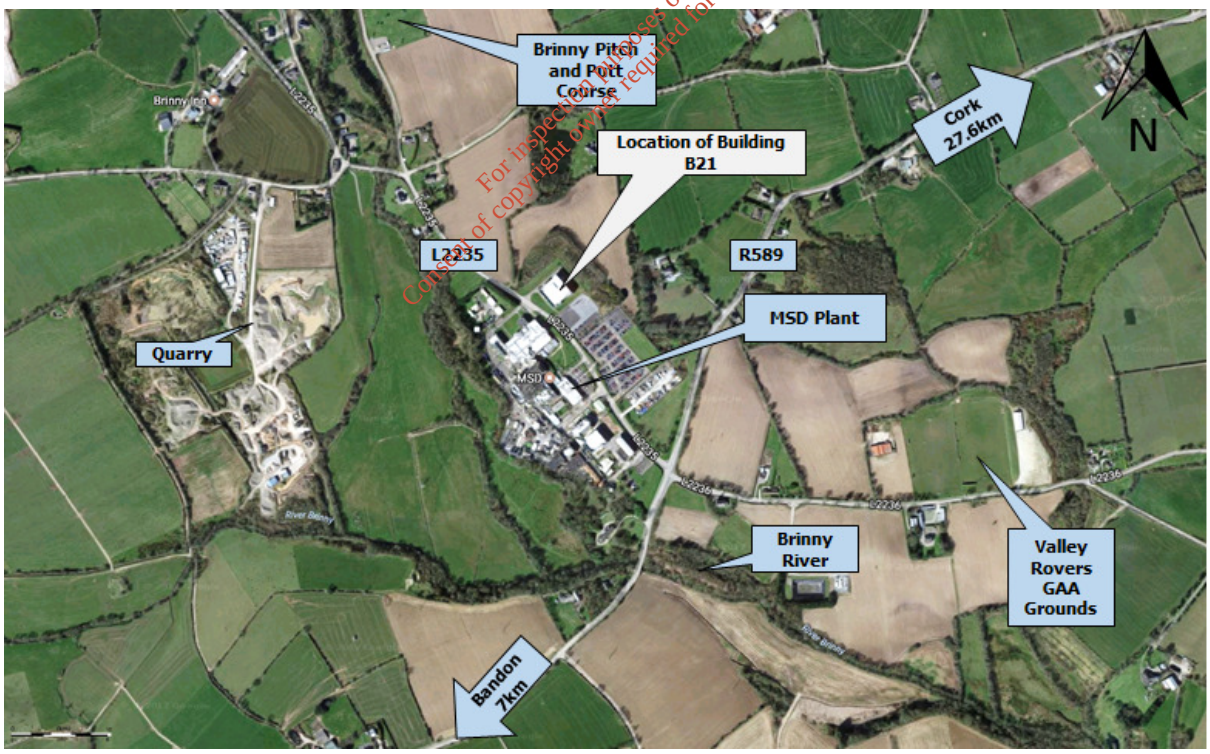

Figure 4.1 Site Context Map

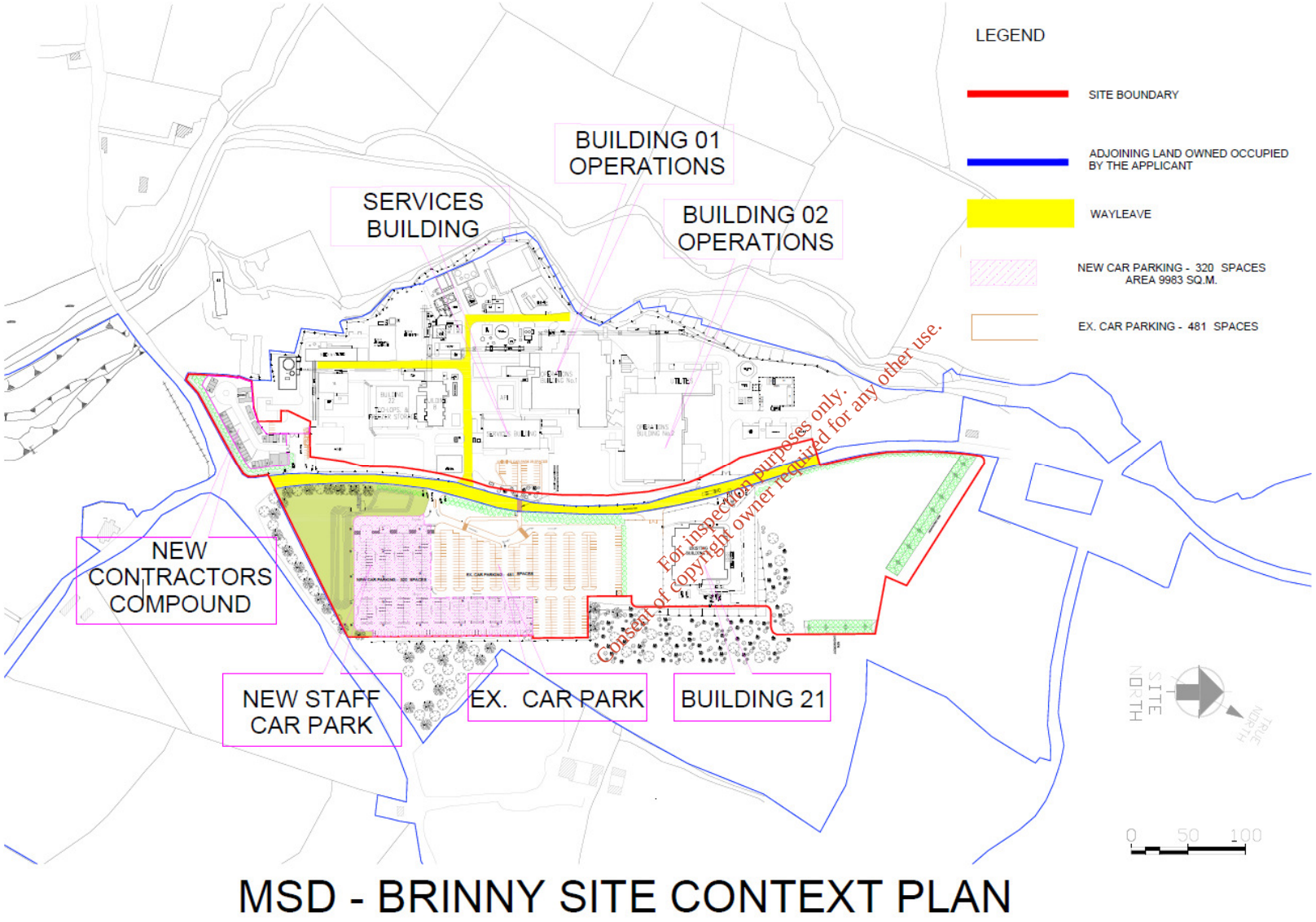

Figure 4.2 Site Context Plan

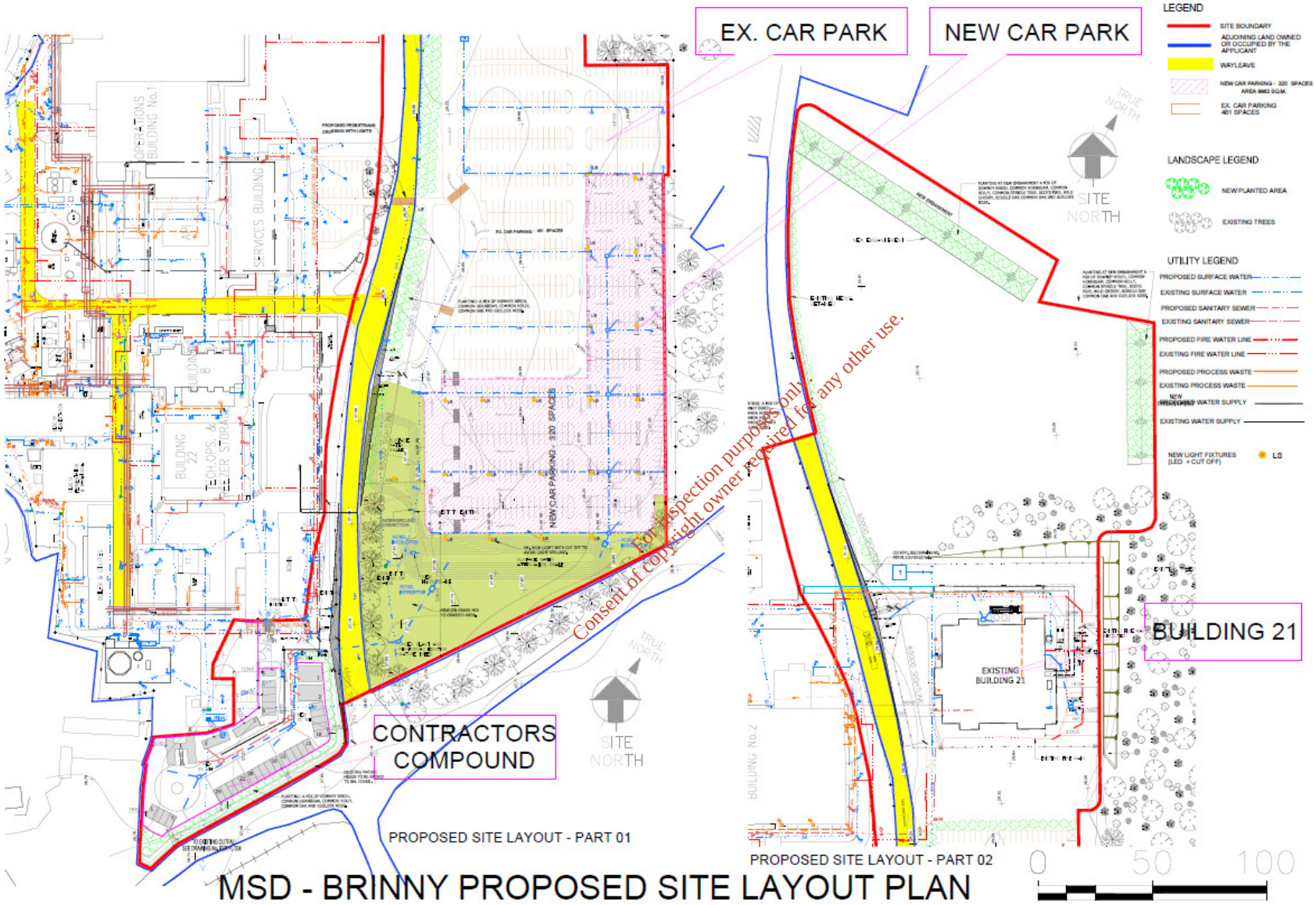

Figure 4.3 Proposed Site Layout

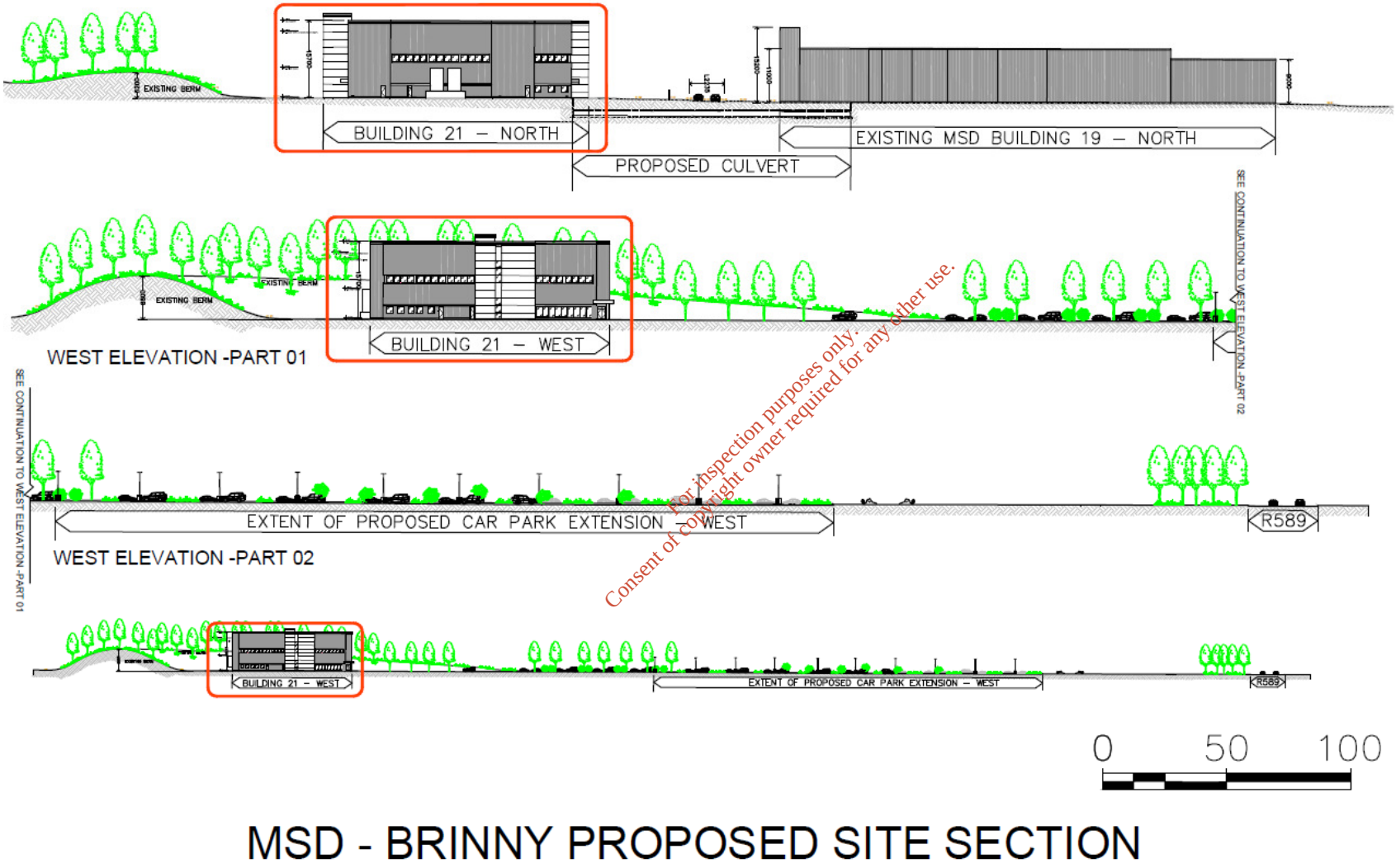

Figure 4.4 Site Sections

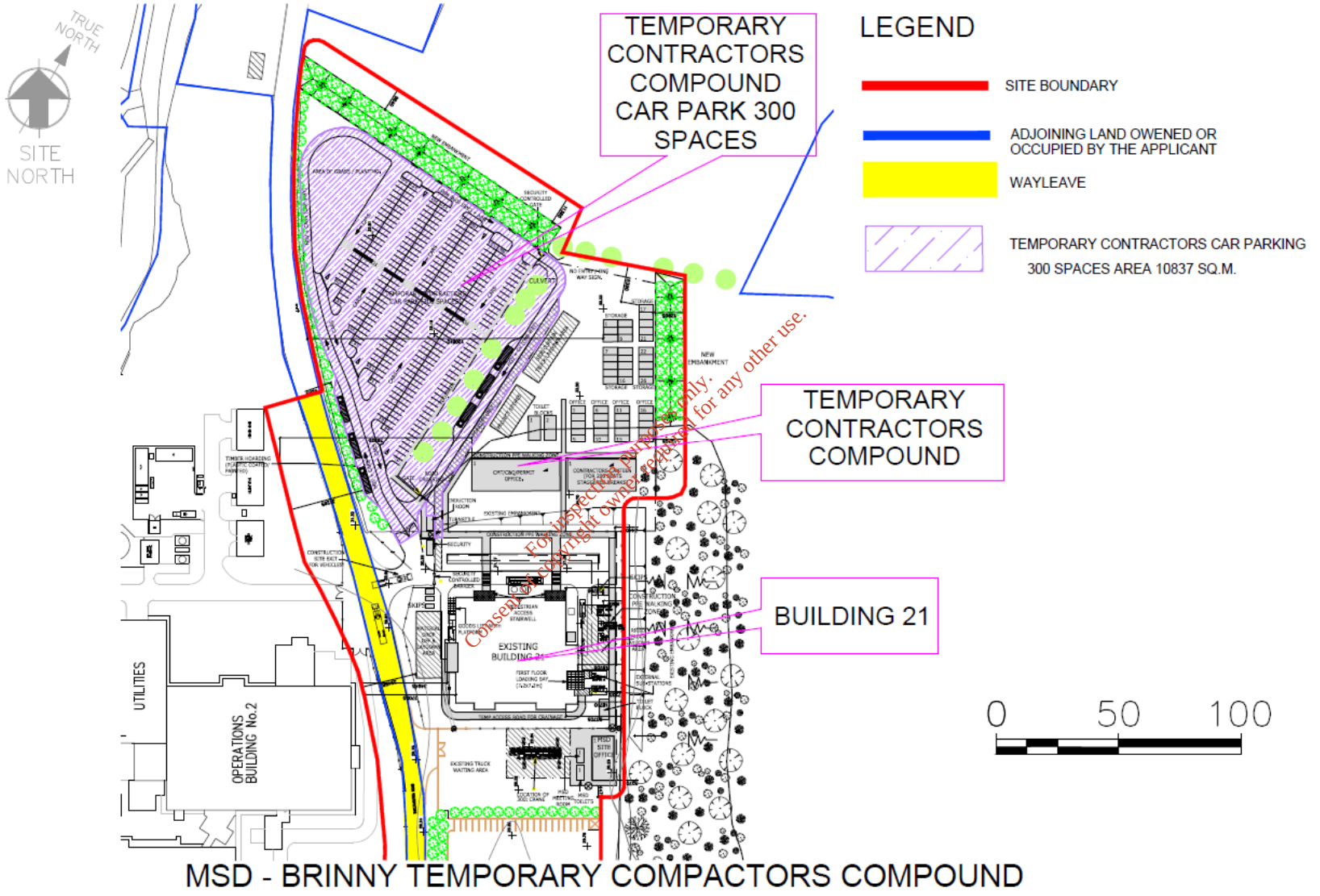

Figure 4.5 Temporary Construction Compound Layout

4.3 OVERVIEW OF THE PROPOSED DEVELOPMENT

The existing B21 will be repurposed to a new vaccine production facility. The existing building was built circa 1993 as a pharmaceutical production building, but never fully fitted out. The building shell was completed with finished metal exterior cladding and roof. The first floor steel framing is installed, but the slab was never poured. The ground floor has a temporary slab installed below the intended location of the final floor finish. Three of the four stair towers include stairs, with the northeast and southeast stairs ascending to the first floor and roof and the northwest stair connecting only to the first floor.

The new facility will have the ground floor and the first floor completely fitted out for the new process and the support areas. A new stair and cGMP elevator addition on the west side of the building will support personnel and material flow between the ground floor and first floor. Another elevator addition on the east side of the building will support material flows between floors. A new entrance canopy and vestibule on the south side of the building will be the main personnel entrance from the existing parking area. New loading docks along the east side of the building will connect with the existing driveway system. Full details including heights and areas are contained in the accompanying Planning Application Report and on the Site Notices.

The facility will include (2) independent process manufacturing suites on the first floor with a ring corridor surrounding the suites. A supervisor's office and technical chase will be located between the suites. The ground floor supports the process area with the following functions:

- Buffer Preparation
- Weigh and Dispensing
- Buffer Cold Room and Staging
- Storage (racked)
- Shipping/Receiving
- Waste Staging
- Utilities
- Locker Rooms
- Office Area

The works include car parking for an additional 320 new permanent car spaces in an extension to the existing main car park using the existing road entrance.

A permanent (sustaining) contractors' compound to the south of the existing car park will be moved across the L2235 road and relocated to the south of the western side of the MSD site. This will be laid out with two storey and single storey modular construction facilities including single storey modular workshops, two storey and single storey administration facilities, toilets, welfare facilities and laydown areas. It consists of an area sized 5,106 m^2 in total. It will be landscaped with perimeter screen planting.

The works also include landscaping, a surface water attenuation area, local landscaped berms, minor alterations to existing entrances, alterations and extensions to existing security fencing and gates, underground and overground utilities, yards, lighting, signage and associated site works.

A temporary contractor compound will be provided with offices, welfare and other facilities mainly to the North of B21. Laydown and storage areas will be also be located to the North of the building. Heavy Goods Vehicle (HGV) access and a 300 space contractor car park will be located between these facilities and the L2235. New screening berms (approx. 5m crest height) will be formed along the Northern and Eastern boundaries with soil taken from the permanent and temporary car park and compound areas. Soil from the inside slopes of these berms will be used to reinstate the temporary contractors' car park area at the end of the construction phase. The remainder of the berms, comprising the soil removed from the new permanent car parking area, will be left in place permanently. Existing tree planted berms to the North and East of B21 will be largely retained with new pedestrian access routes provided through the Northern side. An existing hedgerow and stream

will be left in place between the car parking area and the main compound, with one new breach for a road to allow vehicular circulation. The temporary contractor compound will be reinstated on completion of the development.

See the Construction Environmental Management Plan (CEMP) for more details on the temporary contractor compound Design Criteria.

4.3.1 PRODUCTION LAYOUT DESCRIPTION

The following process functions are accommodated in the layout. The configuration of these functions is to ensure the quality of the final product in a pharmaceutical facility operating in compliance with good manufacturing practice (GMP).
There are four key functional rooms in the Process Layout. (as shown on the drawings). A description of the process is included in section 4 of this document.

1. Homogenisation / Activation
2. Product Drying Room
3. Bioprocessing/ Purification Room
4. Final Fill Room

All the process uses single-use sealed plastic bag technology for liquid operations and Buffer Preparation is designed for multiple buffer stations production of different salt solutions. Benchwork and service sinks are also provided in this room.

4.3.2 STORAGE

The racked storage area is used to store and stage material in a 3-high racking system. This material is stored in a General Access area which means that cardboard and other packing supplies may be present. The intent is to remove the overwrap materials as necessary in this area and place material ready for production in a staging area directly adjacent the storage space.

Finished product is also handled and staged in this area in a segregated aisle This finished goods aisle is directly adjacent the shipping dock.

4.3.3 SHIPPING, RECEIVING AND WASTE STAGING

There is a new Shipping/Receiving Dock with a new overhead roll-up door and canopy at the building exterior. No provisions are made for a truck to have a seated connection to the door. The dock is relatively level to the exterior driveway. Two interior (2) doors access the dock. One is for received material and the other is for finished goods.

4.3.4 PROCESS ROOMS

The Process Rooms are designed as an integrated suite, with controlled access for materials and personnel. The majority of the process equipment is single use bag technology. Fixed equipment such as pharmaceutical grade dryers, homogenisers and bottle filling machines are used for specialised functions. The end-product is a formulated medicine which is shipped to other MSD sites for final filling and packaging for patients all over the world

4.3.5 WASH AREA – EACH PROCESS SUITE IS SUPPORTED BY A WASH AREA

The wash area includes a Wash Room, Equipment Preparation Room and Clean Staging. The Wash Room will be used to clean equipment and tanks as well as empty bags prior to removal from the suite. A clean in place (CIP) station will support tank cleaning. The pass through washer connects to the Equipment Preparation Room. This room is used for the preparation of clean equipment to be processed through the autoclave. The pass-through autoclave is adjacent the Technical Space for mechanic access to the serviceable sections of the autoclave. The pass through autoclave connects to the Clean Staging Room. Sanitised and clean equipment will be staged in this room.

4.3.6 BUFFER PREPARATION AND STAGING

Purified sealed solutions called Buffer Solutions are used to purify and isolate the Pharmaceutical Product. Buffer Preparation and Staging is located on the Ground Floor. Buffer Preparation is designed for multiple buffer stations. Production uses multiple salt solutions using specialised powders for purification processes. Benchwork and a service sink are also provided in this room.

4.3.7 STORAGE

The racked storage area is used to store material in a 3-high racking system. This material is stored in a General Access area which means that cardboard and other packing supplies may be present. The intent is to remove the overwrap materials as necessary in this area and place material ready for production in a staging area directly adjacent the storage space. Finished product is also handled and staged in this area in a segregated aisle This finished goods aisle is directly adjacent the shipping area.

4.3.8 SHIPPING RECEIVING AND WASTE AREA

There is a new Shipping/Receiving area with a new overhead roll-up door and canopy at the building exterior. No provisions are made for a truck to have a sealed connection to the door. The dock is relatively level to the exterior driveway. Two interior (2) doors access the dock. One is for material and the other is for finished goods.

4.3.9 SAMPLE STAGING ROOM

These rooms are directly off the Ground Floor corridor and are available for the storage and preparation of the samples that are taken during processing that need to be analysed in a lab elsewhere within the site.

4.3.10 UTILITIES

The southwest side of the Ground Floor is the Utility Room for the production suites above including Electrical, Clean Utilities and Building Utilities. This area is adjacent the loading docks for access of parts and equipment replacement. The Maintenance Room is also adjacent this space.

4.3.11 LOCKER ROOMS

The Locker Rooms are adjacent the main entrance. The men's and women's locker room are both set up with an entrance vestibule that accesses the toilet room and locker area.

4.3.12 PERSONNEL SUPPORT

There are two (2) areas for personnel support. The Supervisor Office on the Production Floor and on the ground floor directly adjacent the Locker Rooms is a Tea Room (break room) for personnel to take breaks. An area separated from the Tea Room includes two (2) conference rooms and desk space for approximately 30 personnel to support production functions.

4.3.13 MATERIAL FLOW

The following materials of construction are anticipated as follows:-

Floors – Welded Vinyl or epoxy finish on new concrete floors throughout.
Interior Walls – High grade proprietary steel partitions (clean rooms) with glazing or drained gyp board (in non clean areas)
Ceilings – Walk-on steel pan ceilings generally with some standard lay-in ceilings.
Exterior – The cladding to the new stair towers and lifts is to be insulated metal panels, with flat roofing to match existing specification. Windows are to be double glazed, aluminium framed.

The majority of these works is related to the interior fit out of an existing building.

4.3.14 MECHANICAL, ELECTRICAL AND PROCESS WORKS

The following systems will be installed in the existing building.

A. Heating and Ventilation and Cooling

Plant heating will come from the existing boilers on site with a new piped connection under the road supplying process and space heating. New pharmaceutical grade ventilation systems will be constructed with sound attenuated roof mounted air handling units, located behind an existing parapet. Attenuated air cooled chillers will also be roof mounted, supplying all systems within the building.

B. Process Systems and Related Piping Systems

The following process systems will be installed at the building on the ground floor.

- 2 no. water for injection systems (W.F.I.) providing high purity water
- 2 no. glycol based Process Chillers for process cooling
- Clean steam generation capability
- Filtered air and nitrogen
- External storage of nitrogen providing process nitrogen
- External waste storage tanks

C. Electrical

A new electrical supply will be constructed from the parent MSD site system, rated at circa 1.2 M.V.A. with 2 new external transformers and local distribution within the existing building.

4.4 PROCESS DESCRIPTION

The purpose of the proposed new expansion is to manufacture Life Enhancing Vaccines for patients worldwide. There is an emerging new class of medicines that join 2 pharmaceutical ingredients together to make a more effective product working within a patient's body. This project will make these new emerging products. The production techniques themselves are small scale and sophisticated, often involving multiple steps.

The need to maintain quality control of all the multiple production steps, usually means that these production steps are fully enclosed in sealed systems where possible. In this case the design will utilise single use – pharma grade bag systems to deliver sealed systems, mostly at a small to medium scale.

The production process is as follows:

A. Materials Staging

The raw products to be used are brought into the MSD parent site warehouse and then shipped on as need basis, to a staging warehouse within the proposed facility. There they are dispensed and kitted (or prepared) for use. Some raw materials arrive as liquid in bottles and some come in powdered form.

B. Materials Preparation

The raw products are thawed and/or dissolved in water (or pharma grade solvents) and filtered ready for use. Some raw materials are also homogenised (broken up under pressure) to be suitable for use. Some products are incubated (heated in a controlled manner) for use.

C. Activation

The pharmaceutical ingredients are now mixed and activated under temperature controlled conditions and filtered again, formulated with sucrose and water and decanted into) bags suitable for drying. The protein solutions are similarly prepared in bags.

D. Drying, Processing and Dissolution

The above bag solutions are placed in the dryer and the contained solution dried. The dried powders are re-dissolved in pharma grade solvents and mixed together to form a complex molecule in solution. This solution, now containing the desired medicine is purified using multiple filtration techniques.

E. Final Filtration and Filling

The final bagged solution is filtered again, held in a final filtration vessel and dispensed in controlled conditions into bottles that are placed into cold storage and dispatched to MSD facilities elsewhere and packaging.

5 POPULATION & HUMAN HEALTH

5.1 INTRODUCTION

This section considers the impact of the proposed development in the context of population and settlement, land use, employment and other impacts of a social and economic nature. In terms of population and human health, the types of issues which developments such as this raise (both during construction and operation) include: impacts on amenities and services in the area; additional economic opportunities; increased traffic; and impacts on existing land uses. Whilst references are made to other environmental topics (such as traffic, noise and air) in this section, they are examined in detail in other sections of the EIS.

5.2 THE PROPOSED DEVELOPMENT

The development will employ up to approximately 300 contractor personnel during construction and 140 full time staff when operational.

5.3 THE EXISTING ENVIRONMENT

5.3.1 DEVELOPMENT CONTEXT

MSD Ireland (Brinny) is a large stand-alone pharmaceutical factory (c. 25,000m2) located in open countryside approximately 5-7 km north of Bandon, and just north of Ballinacurra Bridge in the townland of Brinny.

B21 is located within the Brinny MSD complex, to the north-east of most of the other existing buildings on site, and on the opposite side of the L2235 local road. The L2235 local road bisects the MSD complex in a north-westerly to south-easterly direction. The MSD site is bounded by the R589 regional road to the south-east. The Tuough River flows in a southwards direction along the east of the site which adjoins the Brinny River to the south of the site.

5.3.2 SOCIO-ECONOMIC FACTORS

The following socio-economic analysis concentrates mainly on the immediate hinterland in terms of population and employment as this is the area where most impacts will arise.

The existing MSD site is located approximately 0.5km south-east of the settlement of Ballinacurra/ Brinny, which is located within the Brinny Electoral Division (ED), Co. Cork. This area can be regarded as within the immediate hinterland in terms of the socio-economic impacts arising from the proposed development. The secondary hinterland can be regarded as County Cork, as direct and indirect employment, purchasing, employee's residences etc. are likely to be located throughout the county. Ballinacurra/Brinny is recognised as a Village Nuclei in the settlement hierarchy within the Draft Blarney-Macroom Municipal District Local Area Plan. This section includes an analysis of the immediate and secondary hinterlands in terms of population and employment which may inform on the impacts of the proposed development on the demographics in the surrounding areas.

5.3.3 POPULATION

5.3.3.1 Population Change

In terms of the County, Region and State, population change is strongly influenced by migration and emigration rates, rather than birth and death rates. The 1990's and early 2000's saw a large movement of people into the Country due to the "economic boom" in Ireland. The South-West Region and surrounding areas experienced relatively high levels of population growth as a result of strong economic growth in the region. The past 8 years have seen a decline in economic growth and a

return to emigration of people from Ireland. Economic indicators show that this trend is again reversing and signals of demand for skilled workforce and economic growth are retuning. Throughout this period Brinny continued to experience population growth (10%) above the national average (8.2%). This is in keeping with the trend at county level, which saw a 7.8% population growth in County Cork in the 2006-2011 census period. Preliminary population statistics from the 2016 census are available, however detailed analysis of these figures has not yet been published. Preliminary data indicates that County Cork saw a population increase of 4.5% in the period from 2011-2016, higher than the 3.7% national average. However, Brinny saw a significant decrease of -6.3% in the same census period.

Table 5.1 below shows the changes in population for the state, immediate (Brinny) and secondary (County Cork) hinterlands of the proposed development.

Table 5.1 Population Change at Sate, Secondary and Primary Hinterland Level[8]

	2006	2011	2016	% Change 2006-2011	% Change 2011-2016
State	4,239,848	4,588,252	4,757,976	+8.2%	+3.7%
S-W Region	621,130	664,534	689,750	+7.0%	+3.8%
Cork	481,295	519,032	542,196	+7.8%	+4.5%
Brinny ED	632	695	651	+10.0%	-6.3%

Table 5.1 above shows that the South-West Region and County Cork are moderate population growth centres. The Census data in 2006, 2011 and 2016 shown above, indicate that moderate population growth has taken place in these areas, lower than the national percentage growth which had taken place over the 2006 to 2011 period and higher growth than the national growth during the 2011 to 2016 period. Brinny witnessed population growth well above the state percentage growth over the 2006 to 2011 period at 10%, however, it also seen a significant decline in population within the 2011 to 2016 period. Despite the intermediate economic decline experienced in Ireland from 2008, population projections indicate that high population growth in the South-East Region and County Cork is expected to remain. In order to counteract the decline of the Brinny ED and to allow for population growth in the ED, it is important that the areas role and functions are consolidated and sustained. The further development of an establishment, such as that of the MSD facility, may have benefits in enabling the maintenance and growth of the population within ED's such as a that of Brinny where the MSD Facility is centrally located. This may occur through aspects such as the creation of additional jobs in the area.

5.3.3.2 Age Profile

The age profile of the population is important in terms of the potential labour force, the demand for schools, amenities and other facilities and the future housing demand. This aspect would be particularly applicable if a development required and attracted a high number of employees into a particular area, however, in the case of subject proposal, it is envisioned that employees of the new development will be dispersed throughout the immediate and wider Cork area.

Table 5.2 and Table 5.3 below show the age profiles for the state, immediate (Brinny) and secondary (County Cork) hinterlands of the proposed development for 2006, and 2011. This allows the changes in the population profile to be compared between census years. This level of information is not yet available from the 2016 census data.

[8] Census of Population 2006, 2011 and 2016

Table 5.2 Age Profile at State, Secondary and Primary Hinterland Level, 2006[9]

	0-14 %	15-24 %	25-44 %	45-64 %	65+ %	Total Persons
State	21	16	33	18	11	4,239,848
S-W Region	20	15	31	23	12	621,130
Cork	20	15	31	22	11	481,295
Brinny ED	23	13	26	23	16	632

Table 5.3 Age Profile at State, Secondary and Primary Hinterland Level, 2011[10]

	0-14 %	15-24 %	25-44 %	45-64 %	65+ %	Total Persons
State	21	13	32	23	12	4,588,252
S-W Region	21	12	31	24	13	664,534
Cork	21	13	31	23	12	519,032
Brinny ED	23	12	26	25	14	695

Table 5.2 shows that the age profile of the population of the South-West Region in 2006 revealed a slightly lower percentage within the 0-14 age group, at 20%, compared with the State average of 21%. County Cork recorded the same figure as the South-West region at 20%. At the other end of the scale the national figure for persons aged 65+ in 2006 was 11% of population, with the South-West Region being slightly higher at 12% and County Cork being the same at 11%. These figures are indicative of a youthful population in these areas, reflecting the arrival of a sizeable percentage of the resident population over the past decade.

In 2006 the percentage of the South-West region population within the working age groups (14-64) amounted to 69%, compared to the State average of 67%. The comparable figure for County Cork was 68% and for Brinny was 62%. These figures are indicative of a youthful population of working age, providing a strong pool of labour in the area.

The figures in Table 5.3 indicate that since 2006, the overall trend in population for the State and the South-West Region, has been static or marginally increasing in the proportion of the population in the 0-14 cohort. Between the years of 2006 and 2011 the proportion of 0-14 year olds in the State remained at 21%. Within the South-West Region during the same period the figure increased from 20% to 21%. County Cork increased slightly in the 0-14 population cohort from 20% to 21%, while as Brinny remained the same at 23%. Although this population cohort has mostly remained static and only increased marginally in areas, it still forms quite a significant percentage out of the overall population which may contribute to future working age groups (14-64).

County Cork has experienced a sustained population growth over the last ten years, despite the economic challenges that faced the country. Brinny has seen population growth and decline over this period, however, the large percentage of the population living in the hinterland of the subject site and within the working age group, is indicative of the increasing job opportunities and the continuing expansion of the Region.

5.3.3.3 Labour Force Participation

Labour Force Participation (LFP) measures the percentage of all people aged 15 years or over who are available for work, that is either at work or unemployed (labour force). The 2011 census indicates that County Cork has a LFP rate of 60.6% and Brinny has a LFP Rate of 61.6%, both slightly lower than the state average at 61.9%

[9] Central Statistics Office Census of Population, 2006
[10] Central Statistics Office Census of Population, 2011

Table 5.4 Labour Force Participation Rate, 2011[11]

	Labour Force Participation Rate
State	61.9 %
S-W Region	60.2%
Cork	60.6%
Brinny	61.6%

5.3.4 HOUSING DEMAND

Table 5.5 Population and Households at State, Secondary and Primary Hinterland Level 2006 and 2011[12]

	Population			Households		
	2006	**2011**	**% change**	**2006**	**2011**	**% change**
State	4,239,848	4,588,252	8.2	1,469,521	1,654,208	12.6
SW Region	621,130	664,534	7.0	215,344	241,325	12.1
Cork	481,295	519,032	7.8	167,234	188,019	12.4
Brinny	632	695	10.0	189	206	9.0

An analysis of the percentage of the population of Brinny and County Cork who are available for work and the significant increase in both the population and number of households in the area, as illustrated in Table 5.4 and Table 5.5 above, indicates that both the population and number of households have increased at rates lower than the State average in recent years.

5.4 PREDICTED IMPACTS

5.4.1 INTRODUCTION

The proposed development of the facility will create a demand among employees for additional housing. The workforce will likely be drawn from the immediate hinterland and a wider geographical area. It is likely to have a small direct impact on the population of the hinterlands. It is also predicted that the proposed development will have significant effects on employment - both direct employment at the facility itself and indirect employment created by the multiplier effect. It is likely that these new employment opportunities will be availed of by both persons from the immediate hinterland of Brinny and the wider County Cork area. Because of the high degree of accessibility to the site from significant settlements within the County, such as Cork City and Bandon, the beneficial impacts of the development are likely to be diffused over an extensive catchment area.

5.4.2 EMPLOYMENT

The proposed development is consistent with the creation of new employment opportunities and sustaining industry in the Brinny area, and also the wider area of the Cork.

During the construction phase of the project it is estimated that employment on-site will increase gradually over the first few months of construction, to a peak of 300 persons and then fall gradually over the last few months as the project nears completion. It is estimated that this construction stage will last approximately 15 - 18 months.

It is anticipated that the proposed development will provide employment for approximately 140 personnel once fully operational.

It is anticipated that the staff profile (in educational terms) will consist of a significant proportion of third level graduates who have graduated from educational establishments throughout Ireland and abroad. Similar to the employment profile of other biopharmaceutical manufacturing facilities, it is

[11] Central Statistics Office Census of Population, 2011
[12] Central Statistics Office Census of Population, 2006 and 2011

expected that the workforce will be made up of members of the local community, national and international graduates and European expatriates who have relocated back to Ireland.

5.4.3 HOUSING

It is not possible to accurately predict where employees of the new facility will reside. The impact on housing demand and associated infrastructure, arising from the proposed new development is likely to be dispersed over a wide area. It is therefore likely that the proposed development will not create any adverse housing impacts. The growth in housing demand locally as a result of the proposal is likely to be small.

5.4.3.1 Construction Costs

Total facility cost (fixed assets only) is estimated to be 55 – 105 million Euros. It is envisaged that local contractors, services and materials will be utilised where possible but it may be necessary to employ non-local contractors for specialist services

According to the CSO Labour Market statistics (Q1 2016) the total number of persons at work in the construction sector in Ireland was 131,300 persons. The provision of up to 300 building and construction jobs during the construction of this project can be expected to generate significant income in wages and salaries which will be of benefit to the local economy in terms of the purchase of goods and services and also to the national exchequer as taxation revenue.

5.4.4 MULTIPLIER EFFECTS

Based upon research undertaken by the Economic and Social Research Institute the direct expenditure on wages and salaries would have a multiplier effect upon further indirect, or secondary service employment. According to the ESRI research, for every 100 jobs in direct manufacturing industry, there are 91 associated jobs in the supporting service industry. In this case, it can be expected that for the additional eventual workforce of 140 people, there would be a further approximately 128 associated jobs in the service industry which would further support and sustain the economic development of the Brinny and County Cork.

5.4.5 HUMAN HEALTH

In an EIS the potential for effects on human health are dealt with under the more specific topics of air, water, noise and waste - as discussed in Section 2.

Some health or safety related topics are covered by separate and more specific legislation and so do not form part of an EIS – examples include worker health and safety, construction safety.

5.4.6 IMPACTS ON AMENITY

Local amenities in the area include the following; the Brinny River, a pitch and putt course and the Valley Rovers club grounds. Due to the proposal relating to the repurposing of an existing building on the MSD site, no recognisable impacts are anticipated on the highlighted amenities within the local area.

In terms of traffic, the existing road network is currently operating well. However, there will be an increase in traffic both during construction and operational phases. The impact of the traffic generated by the proposed development will have only minor effects on the amenity of the area. Section 13 of this EIS (*Traffic and Transportation*) gives a comprehensive analysis of all traffic issues.

5.5 MITIGATION MEASURES

No specific mitigation measures are required to ameliorate the impacts on human beings as the impacts are largely positive. Section 13 on traffic and transport deals with specific mitigation measures proposed in relation to transport improvements, which will benefit residents of the general

area. Mitigation measures in relation to the potential human health impacts of air and noise, particularly during construction are dealt with in detail in Section 9 and 10 of the EIS.

Construction traffic including both construction plant and material deliveries will be programmed to avoid peak traffic flows associated with operational shift patterns. Further detail on mitigation measures is included in Section 13 Traffic & Transportation.

5.6 RESIDUAL IMPACTS

The proposed development will have a positive long term impact on the immediate and secondary hinterland, the area of Brinny and County Cork, through continued expanded employment and the associated economic and social benefits.

6 BIODIVERSITY

6.1 INTRODUCTION

6.1.1 OVERVIEW AND AIMS

This chapter assesses potential impacts that may arise from the proposed development on flora and fauna within the receiving environment; in accordance with the following guidance documents:

- *Guidelines on Information to be contained in Environmental Impact Statements,* Environmental Protection Agency, 2002.
- *Guidelines for Ecological Impact Assessment,* Chartered Institute of Ecology and Environmental Management (CIEEM), 2016.
- *Preliminary Ecological Appraisal,* Chartered Institute of Ecological and Environmental Management (CIEEM), 2012.
- *A Guide to Habitats in Ireland,* Fossitt JA, 2000.
- *Habitat Survey Guidelines: A Standard Methodology for Habitat Survey and Mapping in Ireland,* The Heritage Council, 2011.

The chapter aims to discuss the existing ecological environment, the potential impacts of the scheme and avoidance and mitigation measures in relation to habitats, flora and fauna in the zone of influence (ZOI) of the Proposed MSD Facility, Brinny, Co. Cork.

6.1.1.1 Legislative Context

Specific focus is placed on protected species/habitat features as well as those of local or national importance. Ireland's national biodiversity action plan *Actions for Biodiversity 2011–2016*[13], in accordance with the Convention on Biological Diversity, is a framework for the conservation and protection of Ireland's biodiversity, with an overall objective to secure the conservation, including, where possible, the enhancement and sustainable use of biological diversity in Ireland and to contribute to collective efforts for conservation of biodiversity globally. The plan is implemented through legislation and statutory instruments concerned with nature conservation. The Planning and Development Acts, 2000–2015 and the European Communities (Environmental Impact Assessment) Regulations, 1989 (as amended) are particularly important in that regard and include a number of provisions directly concerned with the protection of natural heritage and biodiversity.

The Wildlife Acts, 1976–2012 are the principal mechanism for the legislative protection of wildlife in Ireland. They outline strict protection for species that have significant conservation value. In summary, the Wildlife Acts protect species from injury, disturbance and damage to breeding and resting sites. All species listed in the Wildlife Acts must, therefore, be a material consideration in the planning process. An important piece of national legislation for the protection of wild flora, i.e. vascular plants, mosses, liverworts, lichens and stoneworts, is the Flora (Protection) Order, 2015, which makes it illegal to cut, uproot or damage a listed species in any way or to alter, damage or interfere in any way with their habitats. This protection applies wherever the species listed in the Schedules to the Order are found.

The European Communities (Birds and Natural Habitats) Regulations, 2011–2015 transpose into Irish law Directive 2009/147/EC (the Birds Directive) and the Habitats Directive, which list habitats and species of Community, *i.e.* European Union (EU), importance for conservation and that require protection. This protection is afforded in part through the designation of areas that represent significant populations of listed species within a European context, *i.e.* Natura 2000 sites. An area designated for bird species is classed as a Special Protection Area (SPA), and an area designated for other protected species and habitats is classed as a Special Area of Conservation (SAC). Birds listed on Annex I of the Birds Directive in SPAs and habitats and species listed on Annexes I and II, respectively, of the Habitats Directive in SACs in which they are designated features have full

[13] This is due to be replaced by the Action Plan for Biodiversity 2017-2023; however, this is pending

European protection. Species listed on Annex IV of the Habitats Directive are strictly protected wherever they occur, whether inside or outside European Sites. Annex I habitats outside of SACs are still considered to be of national and international importance and, under Article 27(4)(b) of the European Communities (Birds and Natural Habitats) Regulations, 2011, public authorities have a duty to strive to avoid the pollution or deterioration of Annex I habitats and habitats integral to the functioning of SPAs.

Sites of national importance for nature conservation are afforded protection under planning policy and the Wildlife Acts, 1976–2012. Natural Heritage Areas (NHAs) are sites that are designated under statute for the protection of flora, fauna, habitats and geological interest. Proposed NHAs (pNHAs) are published sites identified as of similar conservation interest but have not been statutorily proposed or designated.

The International Union for the Conservation of Nature and Natural Resources (IUCN) provides a global approach for evaluating the conservation status of species to inform and catalyse action for biodiversity conservation through the Red List of Threatened Species.

6.1.1.2 Approach to Ecological Evaluation and Impact Assessment

Assessing impact significance is a combined function of the value of the affected feature (its ecological importance), the type of impact and the magnitude of the impact. It is necessary to identify the value of ecological features within the study area in order to evaluate the significance and magnitude of possible impacts.

The following parameters are described when characterising impacts (following CIEEM (2016), EPA (2002) and NRA (2009)):

Direct and Indirect Impacts - An impact can be caused either as a direct or as an indirect consequence of a proposed development.

Magnitude - Magnitude measures the size of an impact, which is described as high, medium, low, very low or negligible.

Extent - The area over which the impact occurs – this should be predicted in a quantified manner.

Duration - The time for which the effect is expected to last prior to recovery or replacement of the resource or feature.

- Temporary: Up to 1 Year;
- Short Term: The effects would take 1-7 years to be mitigated;
- Medium Term: The effects would take 7-15 years to be mitigated;
- Long Term: The effects would take 15-60 years to be mitigated;
- Permanent: The effects would take 60+ years to be mitigated.

Likelihood – The probability of the effect occurring taking into account all available information.

- Certain/Near Certain: >95% chance of occurring as predicted;
- Probable: 50-95% chance as occurring as predicted;
- Unlikely: 5-50% chance as occurring as predicted;
- Extremely Unlikely: <5% chance as occurring as predicted.

The Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for ecological impact assessment (CIEEM 2016) define an ecologically significant impact as an impact (negative or positive) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographic area. The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified (CIEEM, 2016).

The results of the ecological survey were evaluated to determine the significance of identified features located in the study area on an importance scale ranging from international-national-county-

local. The local scale is approximately equivalent to one 10 km square but can be operationally defined to reflect the character of the area of interest. Because most sites will fall within the local scale, this is sub-divided into three categories: high local importance - local importance - local value. The criteria used for assessing the importance of ecological features are shown in Table 6.1. The criteria used for assessing impact type and impact magnitude are shown in Tables A1.1 and A1.2 of Appendix 6.1.

Table 6.1 Criteria used in assessing the importance of ecological features.

Importance	Criteria
International	An internationally designated site or candidate site (SPA, pSPA, cSAC, pSAC, Ramsar Site, Biogenetic Reserve). Also, Sites which qualify for designation as SACs or SPAs – this includes sites on the NGO shadow list of SAC's.
National	A nationally designated site or candidate site (NHA, pNHA), Sites which hold Red Data Book (Curtis and McGough, 1988) plant species.
County	Sites which hold nationally scarce plant species (recorded from less than 65 of the national 10 km grid squares); unless they are locally abundant. Sites which hold semi-natural habitats likely to be of rare occurrence within the county. Sites which hold the best examples of a semi-natural habitat type within the county.
High Local Importance	Sites which hold semi-natural habitats and/or species likely to be of rare occurrence within the local area. Sites which hold the best examples of a high quality semi-natural habitat type within the local area
Local Importance	Sites which hold high quality semi-natural habitats.
Local Value	Any semi-natural habitat.

6.1.1.3 Consultation

Consultation was undertaken with the EPA and Cork County Council with regard to the scope of the EIS. The consultation resulted in an expression of low concern in relation to biodiversity related impacts due to the low ecological value of the receiving environment and the distance from protected sites. Cork County Council noted the value of hedgerows for ecological connectivity. (This input resulted in a significant change in the layout of the contractors' compound to retain and protect a hedgerow, as discussed later and in the CEMP.)

6.1.2 METHODOLOGY

6.1.2.1 Desk Study

A desktop review was carried out to identify features of ecological importance within the proposed development site and the wider environment. Ecological impact assessment is conducted following a standard source-pathway-receptor model, where, in order for an impact to be established all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism is sufficient to conclude that a potential effect is not of any relevance or significance.

- Source(s) – e.g. pollutant run-off from proposed works.
- Pathway(s) – e.g. groundwater connecting to nearby qualifying wetland habitats.
- Receptor(s) – qualifying aquatic habitats and species of European Sites.

Specific effort was put into the assessment of sensitive receptors of protected species/habitat features; as well as those of local or national importance. A source is any identifiable element of the project proposal which is known to have interactions with ecological processes. Pathways are any connections or links between the source and the receptor. This report determines if direct, indirect and cumulative adverse effects (however minor) will arise from the proposed development.

6.1.2.2 Field Survey Work

A habitat survey of the site was conducted on the 27th of January 2017 following standard guidelines set out in 'Best practice guidance for habitat surveys and mapping' developed by the Heritage Council of Ireland[14]. Habitats were classified using habitat descriptions and codes published by the Heritage Council in 'A Guide to Habitat Types in Ireland'[15]. Plant species nomenclature follows Rose's 'The Wild Flower Key: How to identify wild flowers, trees and shrubs in Britain and Ireland'[16]. A list of the dominant and notable plant species was taken for each habitat type.

A walkover survey was conducted across the site and a visual search for the presence of any watercourse/water-body within the site boundary was also undertaken. All areas directly affected by the proposed development were examined for signs of / or the presence of mammals. In particular signs of bat activity were assessed; all trees and buildings within the site were inspected for bat roost potential. Following on from this assessment targeted badger sett investigations were conducted. In addition to the onsite surveys, an assessment of the adjacent riparian habitat around the River Brinny was undertaken to identify the dominant species present. Similarly, an investigation of an adjacent water feature was undertaken to assess the wading bird species present.

Following the initial site visit, targeted field surveys were then conducted on the 8th of February 2017. The hedgerow within the construction compound was investigated for the presents of badger setts and all potential setts were then monitored using camera traps. These cameras were set up adjacent to the entrance holes for a period of 7 days to monitor the activity[17]. The TII Guidelines for Monitoring of badger sett activity recommend a minimum of 5 days surveying[18]. A wintering wading bird count was undertaken during both site visits to gauge an indication of the resident species on a small lake to the north of the site[19].

During all surveys, particular attention was given to assessing the presence of rare or protected species. Each species identified was assessed in terms of the EU Habitat Directive (92/43/EEC), Bird Directive (2009/147/EC), the Wildlife Act (1976), the Wildlife Amendment Act (2000) and the Red Data Lists for threatened and protected species, published on the NPWS website (www.npws.ie).

6.1.3 LIMITATIONS

On the date of the survey the study site was outside of the optimal survey season for habitat surveys. This timeline is ideal for Mammal Surveys as the vegetation is lacking thus there are clear views of the banks. However, a full species list is not possible due to the timing of the survey. Habitat classifications are still possible within this season which was seen to be sufficient due to the receiving environment and low ecological status of the area.

6.2 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

6.2.1 OVERVIEW

B 21 will be repurposed to provide a new vaccine manufacturing facility. A full description is as described in Section 4.

[14] *Best practice guidance for habitat survey and mapping,* The Heritage Council, Smith, George F., et al., Ireland, 2011
[15] *A guide to habitats in Ireland*, Fossitt, J.A., 2000
[16] Rose, F., O'Reilly, C., Smith, D.P. and Colling
[17] Surveys conducted under Licence 086/2016 from the NPWS
[18] TII - guidelines for the treatment of badgers prior to the construction of national road schemes
[19] *Bird Census Techniques, 2nd Edition ,* Bibby CJ, Burgess ND, Hill DA and Mustoe SH, Academic Press, London, 2000

6.3 RECEIVING ENVIRONMENT

6.3.1 OVERVIEW

The MSD Facility is an industrial site situated north-west of Innishannon Co. Cork and sits within an agriculturally dominated landscape. The River Brinny runs adjacent to the South West/South boundary to the site which flows South into the River Bandon at Innishannon.

6.3.2 ZONE OF INFLUENCE

The operational phase works are not expected to have any impacts beyond the site boundary. The construction phase works may have some effects beyond the boundary due to increased noise, artificial lighting conditions and possible water quality effects to the River Brinny. These water quality effects are detailed in Section 8. Following the source-pathway-receptor model identifying the potential likely sources a Zone of Influence (ZOI) was established; 2x2 km^2 was used as impacts are not foreseen to be significant beyond this distance; given the nature of works described above and in Section 4.

6.3.3 DESIGNATED AREAS

The National Park and Wildlife Service's (NPWS) website was used as a resource to obtain the locations of the protected sites using their online map viewer[20]. There were no Natural Heritage Areas, Special Protected Areas or Special Area of Conservation sites identified within the ZOI. There was one Proposed Natural Heritage Area identified 1.28km south of the MSD facility, and the next closest pNHA sites were over 5km away (**Error! Reference source not found.**). It is noted that the nearest European Site is 12.61 km away from the facility with no hydrological linkages identified between them.

Table 6.2 Protected sites identified within the 15km Zone of Influence of the Site[21]

Site Code	Site Name	Distance [km]
Proposed Natural Heritage Areas		
001740	Bandon Valley Above Innishannon	1.28
001515	Bandon Valley Below Innishannon	5.37
001034	Bandon Valley West Of Bandon	5.67

6.3.4 RECORDS OF PROTECTED, RARE OR OTHER NOTABLE FLORA AND FAUNA SPECIES

The digital database of the National Biodiversity Data Centre (NBDC) was consulted to assess known records of rare, protected and invasive species that occur in the surrounding landscape. The collation of this information, as well as examination of aerial photographs allowed areas of potential ecological importance to be highlighted prior to field survey work. A search was undertaken of records of Red Data Book and Protected species held by the National Biological Data Centre Database. Relevant records from the 10 x 10km grid squares occupied by the study area (W55 & W56), and those within 2km of the Proposed Scheme W55E (Figure 6.1) are listed in Table 6.3Table 6.3 List of rare and protected species known to occur within the receiving environment (NBDC data).

[20] http://webgis.npws.ie/npwsviewer/
[21] Sorted according to designation and distance

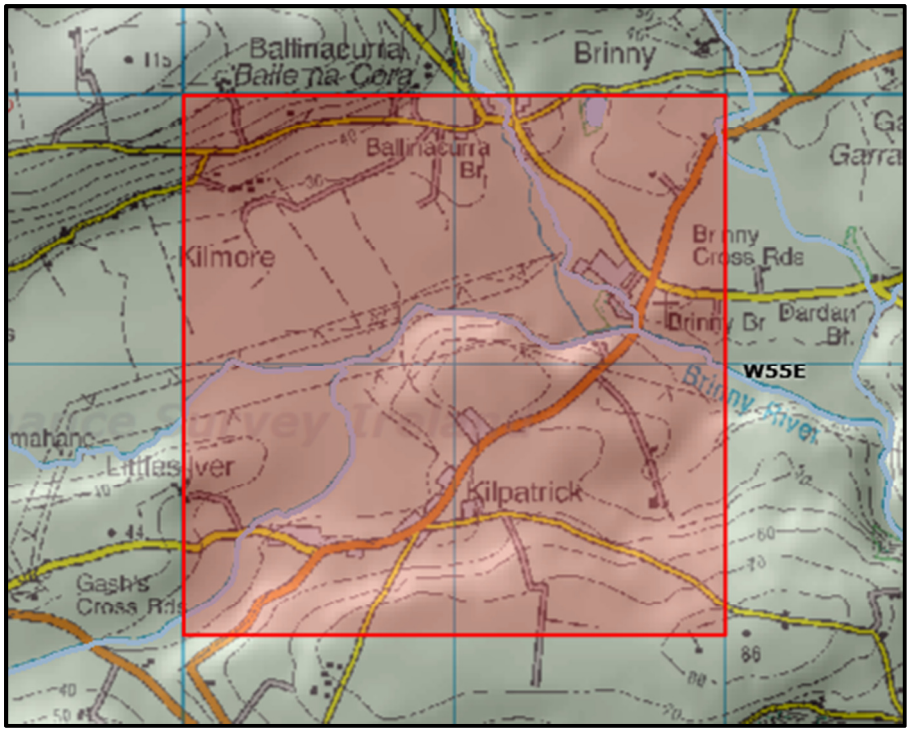

Figure 6.1 Grid Square of data sourced from the NBDC

Table 6.3 List of rare and protected species known to occur within the receiving environment[22]

Common name	Scientific name
Mallard	Anas platyrhynchos
Common Wood Pigeon	Columba palumbus
West European Hedgehog	Erinaceus europaeus
Common Coot	Fulica atra
Barn Swallow	Hirundo rustica
European Otter	Lutra lutra
Eurasian Badger	Meles meles
Spotted Flycatcher	Muscicapa striata

6.3.4.1 Invasive Flora Species

Publicly available NBDC data was accessed to identify invasive species in the hectads in which the project is located (W55 & W56). The 14-species listed below are subject to restrictions (Third Schedule) under Regulation 49 of the European Communities (Birds and Natural Habitats) Regulations, 2011.

[22] NBDC database Grid square W55E

Table 6.4 Invasive flora species list found within hectads W55 and W56[23]

Common name	Scientific name
Two-spined Acaena	*Acaena ovalifolia*
Sycamore	*Acer pseudoplatanus*
Three-cornered Garlic	*Allium triquetrum*
Butterfly-bush	*Buddleja davidii*
Traveller's-joy	*Clematis vitalba*
Canadian Waterweed	*Elodea canadensis*
Nuttall's Waterweed	*Elodea nuttallii*
Japanese Knotweed	*Fallopia japonica*
Indian Balsam	*Impatiens glandulifera*
Himalayan Honeysuckle	*Leycesteria formosa*
Himalayan Knotweed	*Persicaria wallichii*
Winter Heliotrope	*Petasites fragrans*
Cherry Laurel	*Prunus laurocerasus*
Red Oak	*Quercus rubra*
Rhododendron	*Rhododendron ponticum*

The only species listed in the NBDC database of known invasive species observed within the MSD site boundary were rhododendron (*Rhododendron ponticum*) and sycamore (*Acer pseudoplatanus*). Rhododendron was recorded to be prevalent in the southern areas of the MSD facility. Sycamore is a widely-spread species which is now common across most of the Irish landscape.

6.3.5 FIELD SURVEY RESULTS

6.3.5.1 Flora

Habitat classifications were assessed following the Fossitt system[24] and species nomenclature was derived from the Rose *et. al.* 2006 Wildflower key[25]. It is noted that the habitat surveys were conducted in sub-optimal conditions however, given the low ecological value of the site, and the level of intensive management/activity, there are no rare flora species expected to be present on site. The dominant Flora species identified on site are listed in Appendix 6.2 in Table A1.3, and a habitat map is illustrated in Figure 6.2. There were no protected or rare habitat features identified on or adjacent to the site. All habitat types are identified below, along with a brief description of their composition and structure:

Buildings and Artificial Surfaces (BL3)
The site compound is currently comprised of a matrix of buildings, roads, car parks and mixed planted vegetation patches/hedges. There are a number of temporary construction compounds and associated facilities for other project works occurring on site. The planted species on site are sparse and predominantly ornamental species which are highly managed.

Tilled Lands (BC3)
The northern area of the MSD site comprises of 2 tilled fields separated by a very sparse tree-lined hedgerow.

Treelines (WL2)
The treelines surrounding the site are sparse, with an opaque nature and irregular height. The species composition varies across the site but the dominant species are Willow (*Salix spp.*), Ash (*Fraxilinus excelsior*) and Beech (*Fagus sylvatica*). There is a planted treeline along a raised embankment present between the tilled lands and the existing MSD compound. This was planted and managed as a buffering tool to reduce disturbances such as noise to the surrounding environment.

[23] National Biodiversity Data Centre Database, 2017
[24] *A guide to habitats in Ireland*. Fossitt, J.A., 2000. Heritage Council/Chomhairle Oidhreachta.
[25] *The wild flower key: how to identify wild flowers, trees and shrubs in Britain and Ireland*. Frederick Warne Rose, F., O'Reilly, C., Smith, D.P. and Collings, M., 2006.

Artificial Lakes& Ponds (FL8)
There is a small artificial lake within private residents to the north of the site. This area was surveyed from a vantage point along a Public Road, so a detailed species list was not recorded.

Scrub (WS1)
The area buffering the artificial lake is mixed scrub, dominated by brambles (*Rubus fructicosus*) and Hawthorn (*Crataegus monogyna*). This area was covered in dense vegetation.

Improved Agricultural Grassland (GA1)
The remainder of the site was covered in perennial ryegrass (*Lolium perenne*) dominated grass with common species such as daisies (*Bellis perennis*) present. Similar grass patches of various sizes also contained within the BL3 habitat.

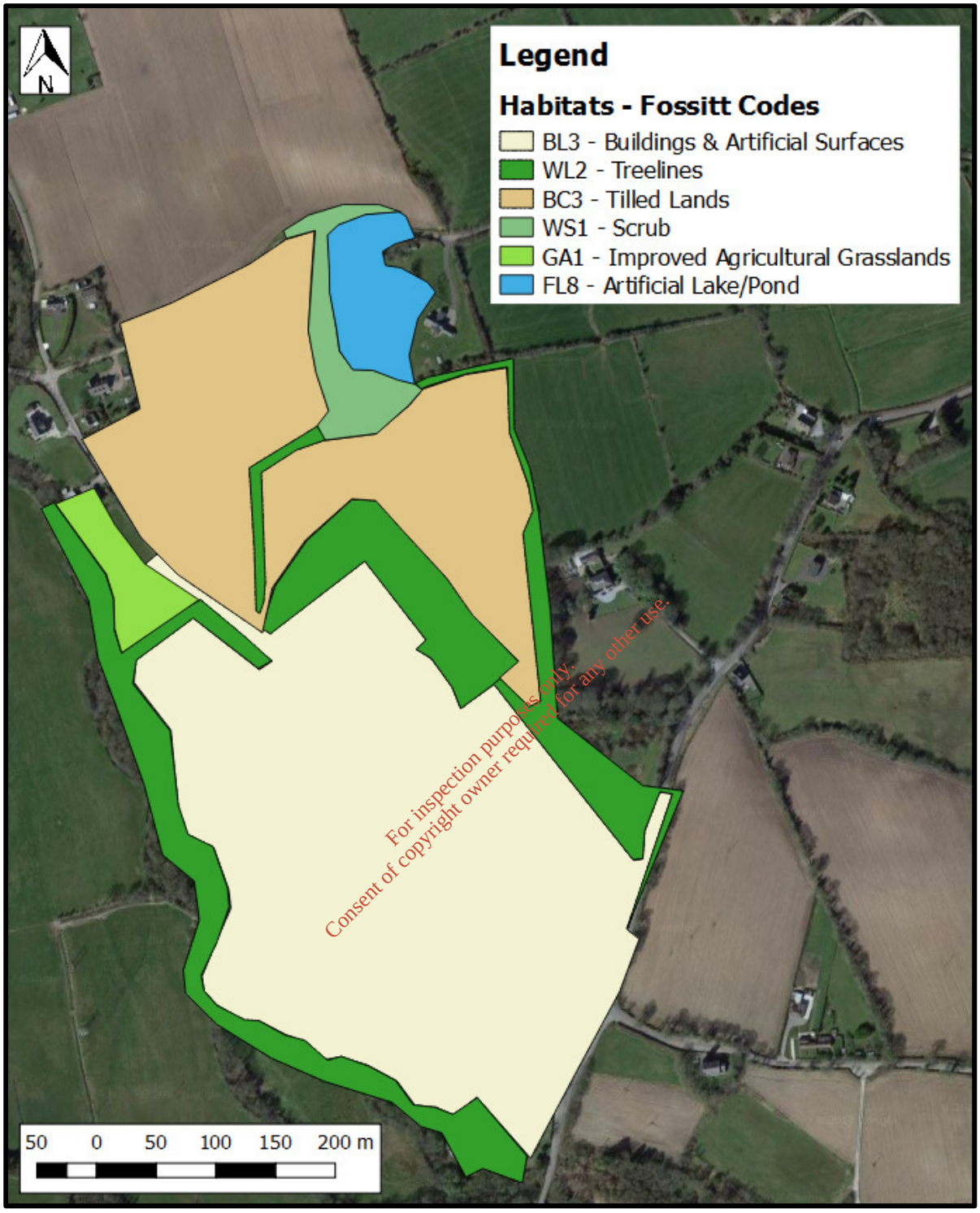

Figure 6.2 Habitat Map of the Project Area Categorised Using Fossitt Habitat Classification System

6.3.5.2 Fauna

Mammals

Mammal sightings and field signs were identified and recorded; scats, tracks, runs, snuffle holes etc. Each of the holes/hollows discovered were examined to determine their species usage, based on their characteristics and profile. There was one potential badger sett uncovered along the northern most boundary to the site. The sett comprised of 5 entrance holes and was determined to be an outlier sett due to its size and location. There were no signs of recent activity/usage by badgers, however there were signs of rabbit droppings inside one of the sett entrances. Overall the site was overrun with rabbits and other common mammal species (Table 6.5).

Table 6.5 Mammal species recorded during a walk over survey[26]

Common Name	Scientific Name
Field Mouse	*Apodemus sylvaticus*
Hedgehog	*Erinaceus europaeus*
Badger	*Meles meles*
Rabbit	*Oryctolagus cuniculus*
Fox	*Vulpes vulpes*

A site re-visit was undertaken on the 8th of February 2017 to further investigate the hedgerow within the construction compound site, and the suspected badger sett (Lat/Long = 51° 47′ 21.7″ N, 08° 42′ 12.8″ W). The Camera trap data revealed the Badger Sett to be inactive with no activity recorded during the 7-day monitoring period. The monitoring revealed limited mammal activity in general with rabbits being the only species recorded throughout.

The surrounding fence and lack of diverse flora within the facility boundary limits the potential for mammal presence/activity; the ecological value of the site is very low. The area surrounding the facility which is currently managed as agricultural tillage fields was deemed to have low ecological value. There is planted treeline bank adjacent to R21 which has limited understory vegetation, providing sparse protection or cover against predators. Similarly, the hedgerows surrounding the fields are sparse with very low potential for mammal activity; however, there was an abundance of rabbit field signs identified throughout the site.

There were no mature trees recorded on site or in the surrounding area. A site investigation was undertaken specifically assessing for any signs of bat roost potential. There were no potential roosts identified within the study area. Large farm buildings and a nearby church steeple were identified as having bat roost potential within the receiving environment; however, these were not directly adjacent to the site. Given the nature of the riparian zone to the west of the site and the sparse nature of the surrounding hedgerows, bat activity on site is thought to be very low/negligible. Therefore, no further assessments for bats were undertaken[27].

Birds

General passerine species are present on site such as Great Tit (*Parus major*), Robin (*Erithacus rubecula*), and Blue Tit (*Cyanistes caeruleus*). Birds of prey such as buzzards (*Buteo buteo*) and kestrel (*Falco tinnunculus*) were recorded within the wider landscape. The wading species recorded on the artificial lake located to the north of the development site were mute swan (*Cygnus olor*), coot (*Fulica atra*), moorhen (*Gallinula chloropus*) and mallard (*Anas platyrhynchos*). The site was deemed to be of negligible ecological value[28] following the habitat assessment and other specialist surveys.

26 *other species are thought to be present on but were not recorded such as the brown rat (Rattus norvegicus)
27 This determination was made based on the bay survey guidance detailed in the following guidance document:
Battersby, J. (comp.) (2010): Guidelines for Surveillance and Monitoring of European Bats. EUROBATS Publication Series No. 5. UNEP/EUROBATS Secretariat, Bonn, Germany, 95 pp.
28 Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. (CIEEM) Chartered Institute of Ecology and Environmental Management, Winchester, 2016

6.3.6 SUMMARY OF ECOLOGICAL EVALUATION

The MSD site was deemed to have low ecological value according to the CIEEM 2016 guidelines. This is due to the poor habitat quality and opaque nature or the hedgerows and existing habitat types on site. The high levels of management activity on site reduces the potential for species in the area. There were no signs of protected species such as badger found surrounding the site however no active setts were discovered. No other protected or rare species were identified on site and the presence of invasive species was recorded. Similarly, there are no habitat features present which any local importance in terms of wider landscape ecology processes.

6.4 POTENTIAL IMPACTS

Based on the baseline ecological environment and the extent and characteristics of the proposed development the following potential impacts have been identified:

- Impacts on Surface Water
- Earthworks (Screening Mounds)
- Lighting during construction and operation
- Noise and vibration

These potential impacts are discussed in the following paragraphs.

- Impacts on Surface Water

  During excavation of the proposed site for the new carparking facility there are no changes to the water table or water flow levels anticipated due to the nature of the works proposed. There may be potential for the discharge of contaminated surface water to the River Brinny during construction phase of the project. Should contaminated water enter the Brinny River this impact may have significant adverse effects on sensitive aquatic receptors. Contaminated water may lead to the release of excess sediments into the freshwater ecosystem which may potentially lead to significant adverse impacts such as suffocation / smothering to invertebrate species or aquatic plants. The release of contaminated surface water may also lead to the absorption of heavy metals or other toxins which can cause heavy mortality on adult salmonids, whilst a change in the chemical composition of the Brinny River may also lead to mortalities downstream of the proposed development.

- Earthworks (including landscaping and retention pond)

  When ground is unvegetated, during and post-works, there is a potential risk that, unless mitigated, surface water runoff from the bare soil could flow toward the Brinny River and cause increased suspended solids and other pollutants entering the river, which could impact sensitive aquatic receptors. This impact could be significant short to long-term negative impact on the freshwater habitat, depending on the type of material and quantity released.

- Lighting during construction and operation

  Strong lighting in the area of the proposed development could spill outward to the perimeter if not carefully controlled. Bats, other mammals, and birds would be sensitive to any significant changes in lighting within semi-natural habitat to the north of the development site. It is important to minimise light pollution as a matter of good practice.

- Noise/vibration

  The demolition phase and movement of heavy vehicles across the site could cause localised disturbance of breeding birds that may use the perimeter vegetation. This would be expected to have a probable, significant short-term impact at a local level but there is likely to be an existing degree of habituation to regular traffic on the site so this impact may not be across the whole area. Surveys and monitoring carried out have confirmed that the site is not considered to be of particular value to badgers. .

An assessment of the project detail outlined in Section 4 indicates the potential impacts to biodiversity are predominantly associated with construction phase works which are temporary/short term. The site determined to have low ecological value, following the CIEEM (2016) Ecological Impact Assessment Guidelines informed by the results of both the desktop study and the field surveys. The operational phase elements of the project are thought to have negligible impacts given the low ecological value of the existing habitats. The potential operational phase impacts are predominantly associated with increased traffic and activity on site facilitated by the additional onsite parking.

6.4.1 POTENTIAL IMPACTS ON DESIGNATED SITES

The Appropriate Assessment Screening Report sets out the likelihood and significance of any potential impacts on European designated sites. There are no significant adverse effects foreseen to be likely to affect the ecological integrity of any European Sites.

6.5 MITIGATION MEASURES

The accompanying CEMP provides additional management measures which will be complied with. The CEMP has detailed methods relating to the control of the following potential impacts:

- Noise
- Temporary Storage and Handling Areas for Construction Fuel, Lubricants and Solvents
- Chemicals – Other Than Fuel, Lubricants and Solvents
- Dust
- Water Protection
- Waste Management
- Protection of Flora and Fauna
- Site Lighting
- Protection of Archaeology

This CEMP details measures such as a site specific Invasive Species Management Plan which addresses the ecological concerns in relation to the control of the spread of Rhododendron which was identified to be present on site by this report. The CEMP also details the management approach to surface water run-off and management of pollutants; stating '*surface water from the site shall be properly attenuated and discharged*'. Exclusion zone will be established around trees in hedgerow along SE side of contractors' car park to same extent as trees' canopy (drip line) to keep machinery away and prevent digging or compaction of roots. Secure and durable fencing with clear signage will be maintained to ensure that there is no machinery activity or storage of materials in this zone. Measures will be taken to minimise as much as practicable any impact on ambient noise levels at noise sensitive locations in the vicinity. In this way, the contribution of noise from the site due to construction activities will not exceed applicable noise limits. The majority of the excavated material will largely be relocated to the rear of the site so as to mitigate off-site impacts. This strategy has been successfully used previously on other sites. Noise levels for heavy machinery will be in accordance with the levels as specified in Section 10.

The project is committed to:

- Full compliance with all applicable environmental regulations.
- Implementing good environmental practice as part of designs, e.g. carry out design reviews, risk assessments, etc. on all relevant projects.
- Preventing pollution from activities through a system of operational controls that include written instructions and staff training appropriate to the environmental requirements of their work.
- Continually improving project environmental performance by setting objectives and targets and implementing them through the CEMP.
- Informing all project employees about Environmental Policy and explaining what they should do to protect the environment.
- Implementing this policy through the Implementation of the CEMP.

The CEMP will be updated to take account of planning conditions, and emerging design and environmental information prior to commencement of construction. Updated design information will include, for example, emerging detailed construction methodologies and programme information.

6.6 CUMULATIVE IMPACTS

A review of planning applications in proximity to the proposed development was undertaken to assess the possibility of cumulative impact arising from proposed development at MSD and proposed developments in the sites environs. No largescale developments have been identified within proximity to the MSD facility. The receiving environment has low ecological value and the project has very-low levels of impacts identified. These factors combined with the robust mitigation measures within the CEMP further reduce potential impacts. Therefore, the project is not expected to contribute significant cumulative impacts.

6.7 RESIDUAL IMPACTS

Following the management measures detailed in the project description and within the CEMP, potential impacts to the flora and fauna of the existing environment are foreseen to be very low. The characteristics of the development detailed above indicate any potential impacts will be localised due to the magnitude of works being undertaken. The existing site is of low ecological value, with no protected species or habitat features identified.

6.8 MONITORING

The impacts are foreseen to be very low due to the characteristics of the project, and the ecological value of the receiving environment is also low. Monitoring measures proposed are limited to the construction phase and compliance with the CEMP; this is detailed in the policies of the plan which commit to ensure compliance with the CEMP by all contracted workers. This process is foreseen to be sufficient monitoring with regard to ecological impacts and the integrity of the wider landscape ecology.

7 LAND, SOILS, GEOLOGY & HYDROGEOLOGY

7.1 INTRODUCTION / METHODOLOGY

7.1.1 INTRODUCTION

The following section presents an assessment of existing environment and the impacts of the proposed development on land, soils, geology, and hydrogeology within the local environment.

In assessing likely potential and predicted impacts, account has been taken of both the importance of the attributes and the predicted scale and duration of the likely impacts.

The duration of each impact is either temporary, short-term, medium term, long-term, or a permanent impact. Temporary impacts are those which are construction related and last less than one year. Short term impacts are impacts lasting two to seven years; medium-term impacts lasting seven to fifteen years; long-term impacts lasting fifteen to sixty years; and permanent impacts lasting over sixty years.

7.1.2 METHODOLOGY

The methodology undertaken for this assessment follows the EPA Guidelines and Advice Notes as detailed in section 1. It also has regard to the revised EIA Directive, as discussed in Section 2.

Consideration is also given to both the '*Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements'* (IGI, 2013) and *'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrogeology and Hydrogeology for National Road Schemes'* by the National Roads Authority (NRA), 2009.

The rating of potential environmental impacts on the soils and geology environment follows the standard EPA terminology (ref. Table 1.2). Reference is made to the NRA criteria for estimation of the importance of geological and hydrogeological attributes at the site during the EIA stage; this is summarised in Table 2 of Appendix 7.1

The principal attributes (and impacts) to be assessed include the following:

- Geological heritage sites in the vicinity of the perimeter of the subject site;
- Landfills, industrial sites in the vicinity of the site and the potential risk of encountering contaminated ground;
- The quality, drainage characteristics and range of agricultural uses of soil around the site;
- Quarries or mines in the vicinity, the potential implications (if any) for existing activities and extractable reserves;
- The extent of topsoil and subsoil cover and the potential use of this material on site as well or requirement to remove it off-site as waste for disposal or recovery;
- High-yielding water supply springs/ wells in the vicinity of the site to within a 2km radius and the potential for increased risk presented by the proposed development;
- Classification (*regionally important*, *locally important* etc.) and extent of aquifers underlying the site perimeter area and increased risks presented to them by the proposed development e.g. removal of subsoil cover, removal of aquifer (in whole or part), drawdown in water levels, alteration in established flow regimes, change in groundwater quality;
- Natural hydrogeological/ karst features in the area and potential for increased risk presented by the activities at the site; and
- Groundwater-fed ecosystems and the increased risk presented by operations both spatially and temporally.

Sources of Information

Desk-based geological information on the substrata (both quaternary deposits and bedrock geology) underlying the extent of the site was obtained through accessing national databases and site archives. The

collection of baseline data (land, soils, geology and hydrogeology contained within the study area – see Figure 7.1) was undertaken by focusing upon a review of the following sources:

- Geological Survey of Ireland (GSI) - on-line mapping, Geo-hazard Database, Geological Heritage Sites & Sites of Special Scientific Interest (SSSI), Bedrock Memoirs and 1:100,000 mapping;
- Teagasc soil and subsoil database;
- Ordnance Survey Ireland
- Environmental Protection Agency (EPA) – website mapping and database information;
- National Parks and Wildlife Services (NPWS) – Protected Site Register;
- Cork County development plan- Natural Impact Report

Site specific data was derived from the following sources:

- *MSD Brinny 2014 IEL Groundwater Data Review*, AECOM Ireland Ltd, 2015
- *MSD Brinny 2015 IEL Groundwater Data Review*, AECOM Ireland Ltd, 2016
- *Hydrogeological Report for a Contingency Water Supply Source*, WYG Ireland, 2008

7.2 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The characteristics of the proposed development which relate to land, soils, geology, and hydrogeology are discussed below. The general description of the proposed development is presented in detail in Section 4 – Project Description.

The development involves converting an existing industrial building, known currently as B21, into a new vaccine manufacturing plant. Much of the area of the proposed development is already in hard stand, however additional permanent impermeable surfaces will be installed for the extensions of the carpark and upgrade of utilities including storm water and wastewater pipelines. Apart from a small modular chemical store (located externally within an integrated bund), there is no requirement for any bulk fuel or chemical storage.

There is no requirement for significant soil removal or importation. As the development extends both sides of a public road a shallow tunnel/horizontal drill is required to link services between the two areas of the site.

There is no requirement for discharge to ground. The additional abstraction for the proposed development is c 10-30 cubic metres per day.

Contractors will be required to operate in compliance to a construction environmental management plan (CEMP) during the construction programme and facility will operate in compliance with its EPA licence requirements during construction and operation.

7.3 THE RECEIVING ENVIRONMENT

7.3.1 SITE DESCRIPTION

The receiving environment is discussed in terms of; superficial and solid geology, hydrogeology, and site history including potential for contamination.

The site is c. 7.7 ha in extent and is located in a predominantly agricultural area. The nearest developed area is 4.25 km north east of the site at Crossbarry village. There is currently no other industrialisation in the immediate vicinity of the site.

7.3.2 BEDROCK GEOLOGY

Information obtained from the GSI indicates a sequence of different lithological groups within the surrounding area (Figure 7.1). Two bedrock lithological sequences directly underlie the site. These comprise the Lipatrick Formation towards the north and the White Strand Formation in the south. The

Lipatrick Formation comprises pyritic cherty mudstone with dolomite. The White Strand Formation consists of sandstone and interbedded pyritic mudstone.

According to the GSI online database and as would be expected within the underlying geology, there are no karstic features located in the area of the development.

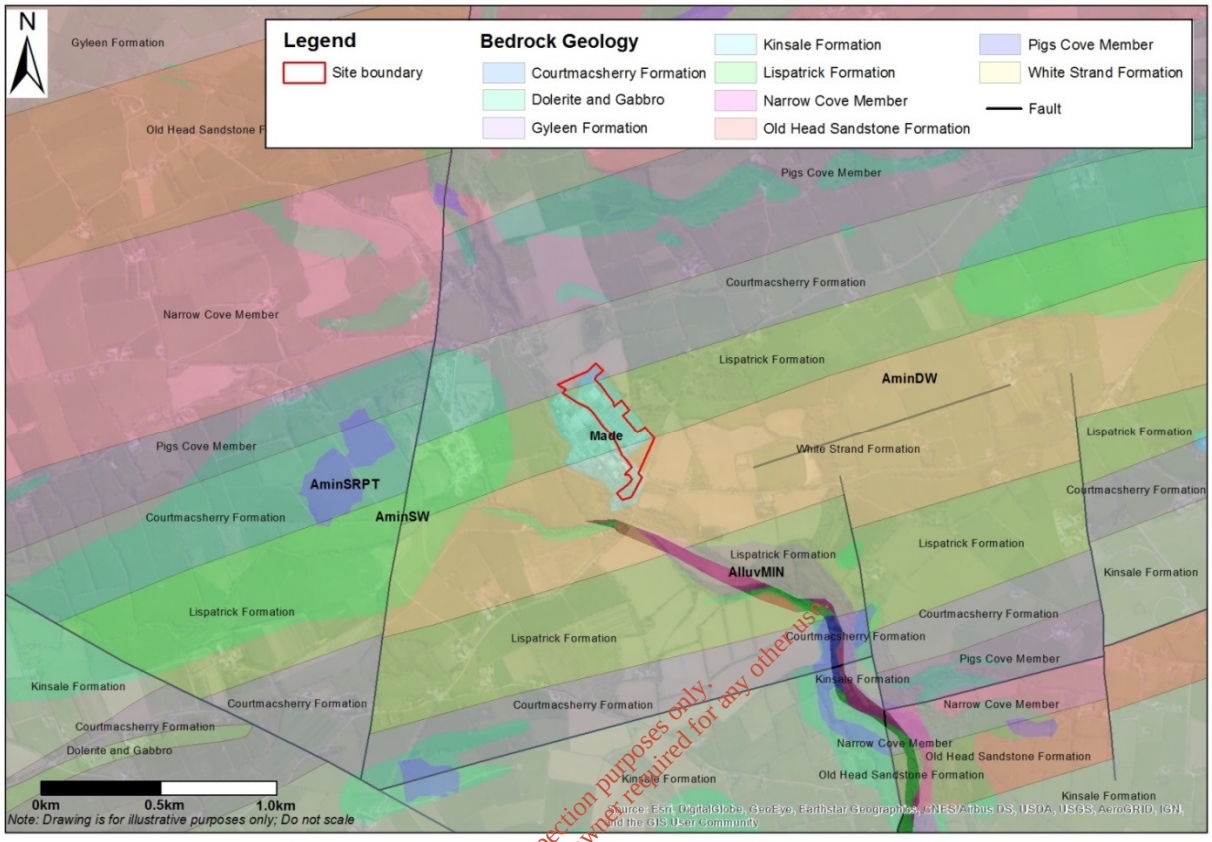

Figure 7.1 Bedrock Geology

7.3.3 OVERBURDEN

The GSI currently identifies *made ground* underlying the site. However, the main soil type which encompasses most of the local area is classified as AminDW which consists of a deep well-drained mineral soil, derived from mainly acidic parent materials as seen in Figure 7.2.

A second series of soil lithologies can also be examined on the site and the surrounding area. Specifically, these relate to soil types that were formed during the Quaternary period of Earth's glacial history. Such soil types can be classified as subsoil. Alluvium deposits can be found just south of the site, most likely reflective of deposits from the River Brinny. The main natural subsoil type which encompasses the general area is identified as TDCSsS which typically consists of Acid Brown Earth soils of which parent material is derived from Devonian and Carboniferous rocks.

The GSI also confirms extensive sand and gravel deposits extending east- west across the area. These are further discussed in 7.3.3.1 below.

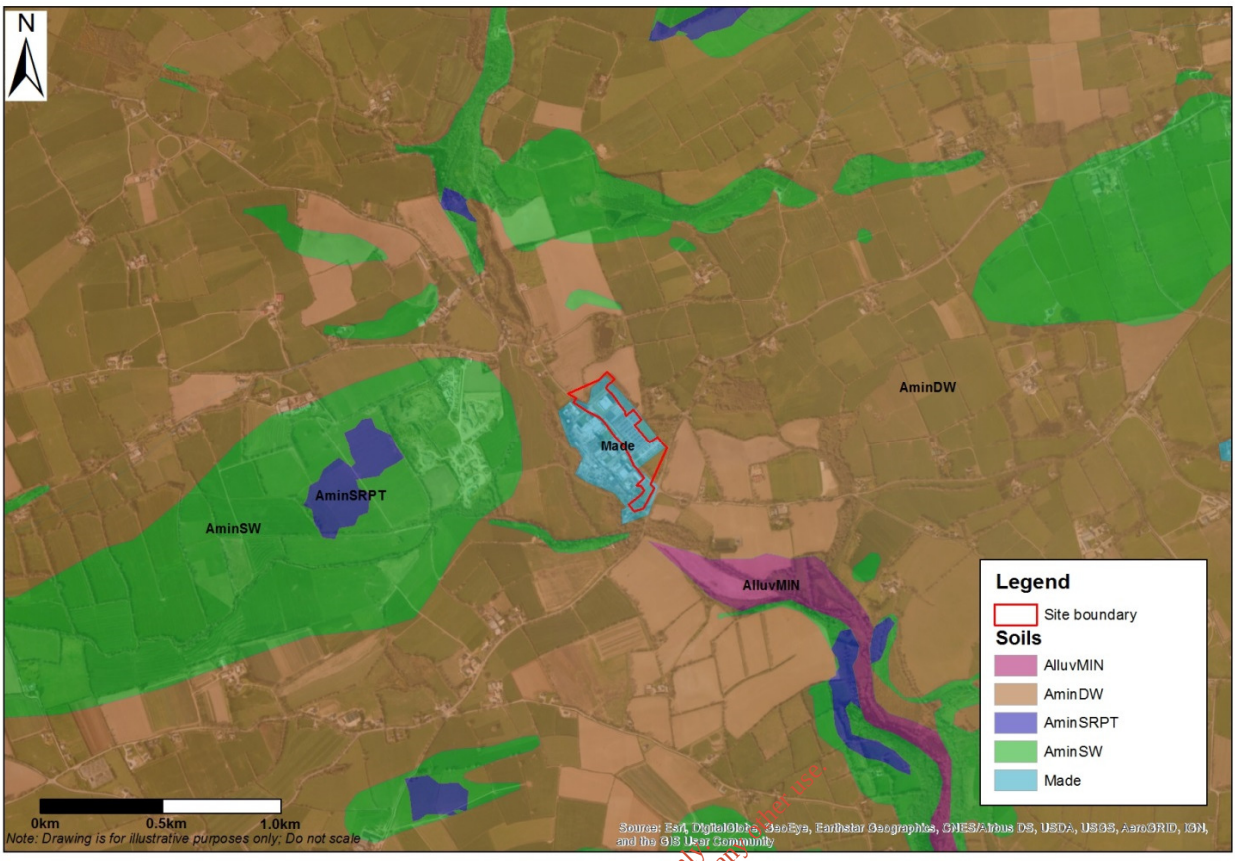

Figure 7.2 Teagasc Soil Map

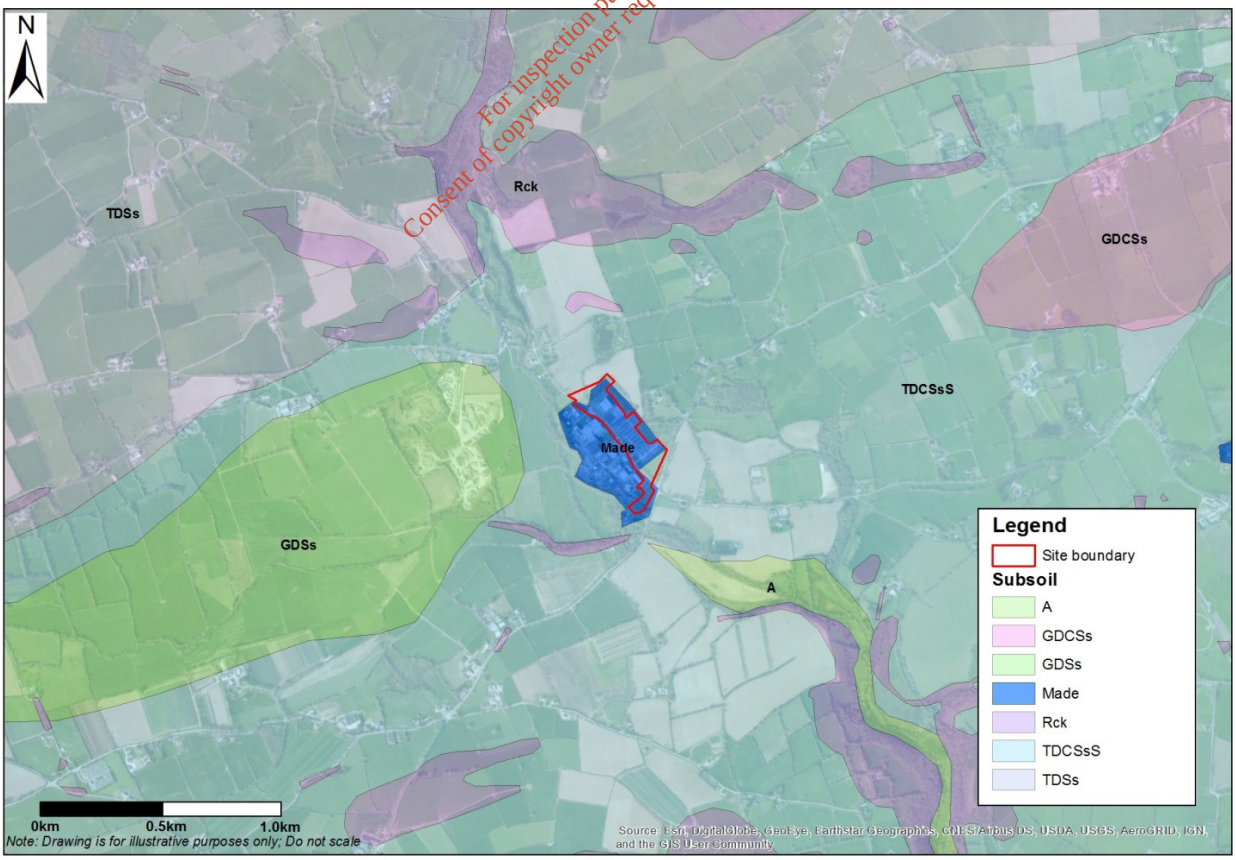

Figure 7.3 Subsoil Map

7.3.3.1 Summary of Site Specific Soil Conditions

Extensive site investigation has been undertaken at the MSD site for both water supply and installation of groundwater monitoring wells. Representative schematic cross sections (Figure 7.10) are presented within the conceptual site model section of the report (Section 7.3.1).

The geological sequence underlying the development is expected to be as follows:

- Hardstanding
- Topsoil/Made Ground
- Clayey, sandy gravel (perched water table)
- Clay and silt (Low permeability)
- Sand and gravel c. 10 m- 22 m below ground level – Locally important (Lg) aquifer[29]
- Interbedded sandstones and mudstones (Locally important (Ll) aquifer)[29]

Made Ground
A review of available logs and hydrogeological report (AECOM, 2015) shows that the site is generally underlain by made ground to a maximum depth of 2 m below ground level. This is composed of sandy gravelly clay, sandy gravelly fill or clayey sandy gravel.

Natural Ground
Information regarding details about the natural ground can be inferred across the site. However, in general the shallow gravels and deeper gravels are separated by low permeability silts. There are three trial wells near to the proposed extension of the carpark, . The well logs, included in Appendix 7.2, show that the natural ground consists of an approximately 6-10m thick, gravelly medium to coarse sand sequence. Underlying this are gravel deposits. The thickness of the gravel increases from 6 m to 8 m .

Bedrock
There is significant information on depth to bedrock across the site from previous site investigations. Depth to bedrock varies from 12.5 m (GMW15) in the north of the site, 17 m (TW3) towards the south of the site. Further south in the immediate vicinity of the proposed development the depth to bedrock increases slightly to 23.6 m (TW2). (Figure 7.6 shows these locations.)

7.3.4 AQUIFER CLASSIFICATION

The GSI classifies the principal aquifer types as:

Bedrock Aquifer

- **Lk -** Locally Important Aquifer - Karstified
- **Ll** - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- **Lm -** Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- **Pl -** Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- **Pu -** Poor Aquifer - Bedrock which is Generally Unproductive
- **Rkd** - Regionally Important Aquifer (karstified diffuse)

Gravel Aquifer

- **Lg** - Locally Important Aquifer - Sand & Gravel
- **Rg** - Regionally Important Aquifer - Sand & Gravel

Reference to the GSI National Draft Bedrock Aquifer Map for the site (see Figure 7.3) indicates that the site is underlain by a *Locally Important Bedrock Aquifer* (LI), which is described by the GSI as bedrock as "moderately productive only in local *zones".*

The site is also located within the Brinny Gravels a locally important sand and gravel aquifer (Lg). This is a small GroundWater Body (GWB) occupying a valley wholly surrounded by less permeable sandstones and mudstones of the Cork Group in the Bandon GWB. This is a local alluvial gravel aquifer. The Brinny deposit is c 15 km long and 0.5 to 1 km wide with an area as approximately 12.7 km^2

Figure 7.4 Bedrock Aquifer

7.3.5 AQUIFER VULNERABILITY

Aquifer vulnerability is a term used to represent the intrinsic geological and hydrological characteristics that determine the ease with which groundwater may be contaminated generally by human activities. Due to the nature of the flow of groundwater through bedrock in Ireland, which is almost completely through fissures, the main feature that protects groundwater from contamination, and therefore the most important feature in protection of groundwater, is the subsoil (which can consist solely/ or of mixtures of peat, sand, gravel, glacial till, clays, or silts).

The GSI presently classifies the aquifer in the region of the subject site as "moderate" which indicates an overburden depth of ≥10m of moderate permeability subsoil is present. Based on previous site and previous hydrogeological reports, a depth of sandy gravelly clay between 12-16m thick overlies the gravel aquifer. This complies with the GSI classification that the underlying aquifer is classified as being of "moderate vulnerability" (Figure 7.5).

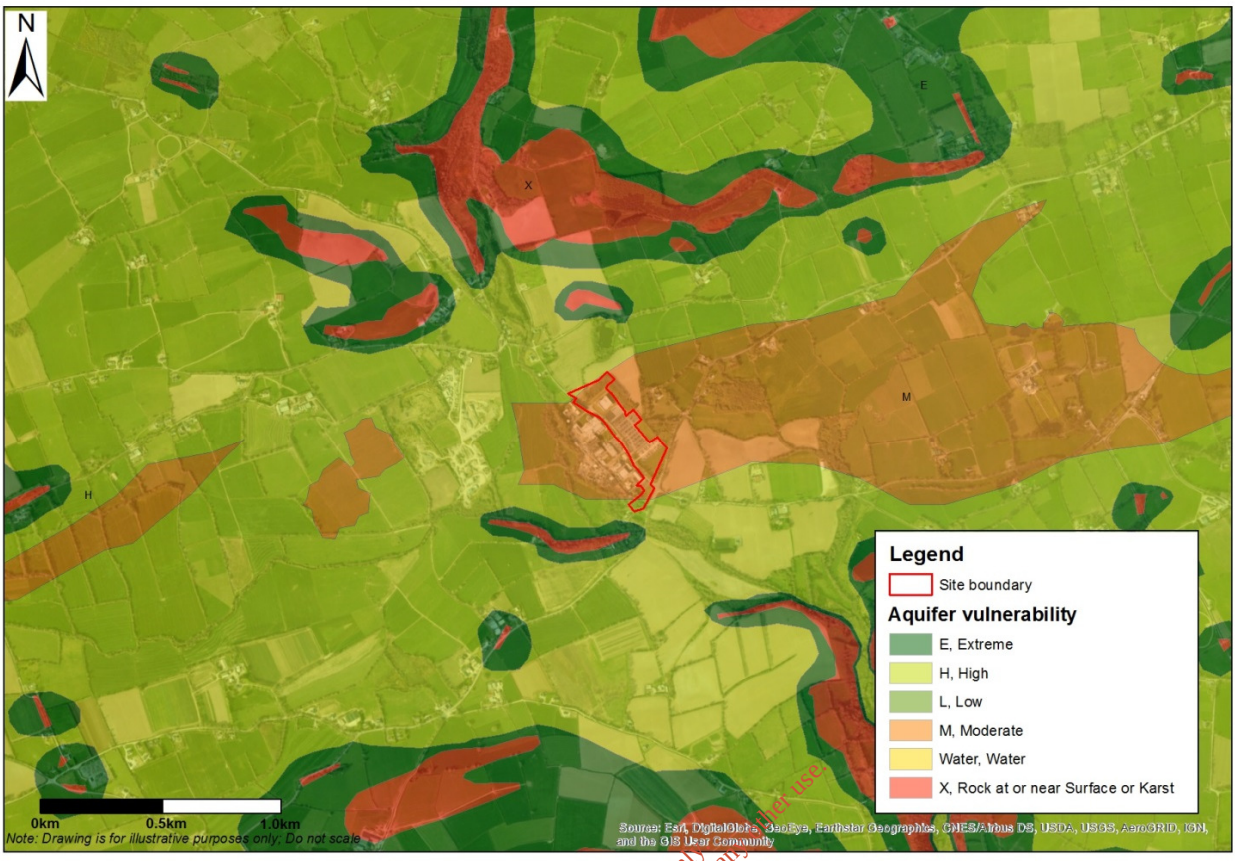

Figure 7.5 Groundwater Vulnerability Map

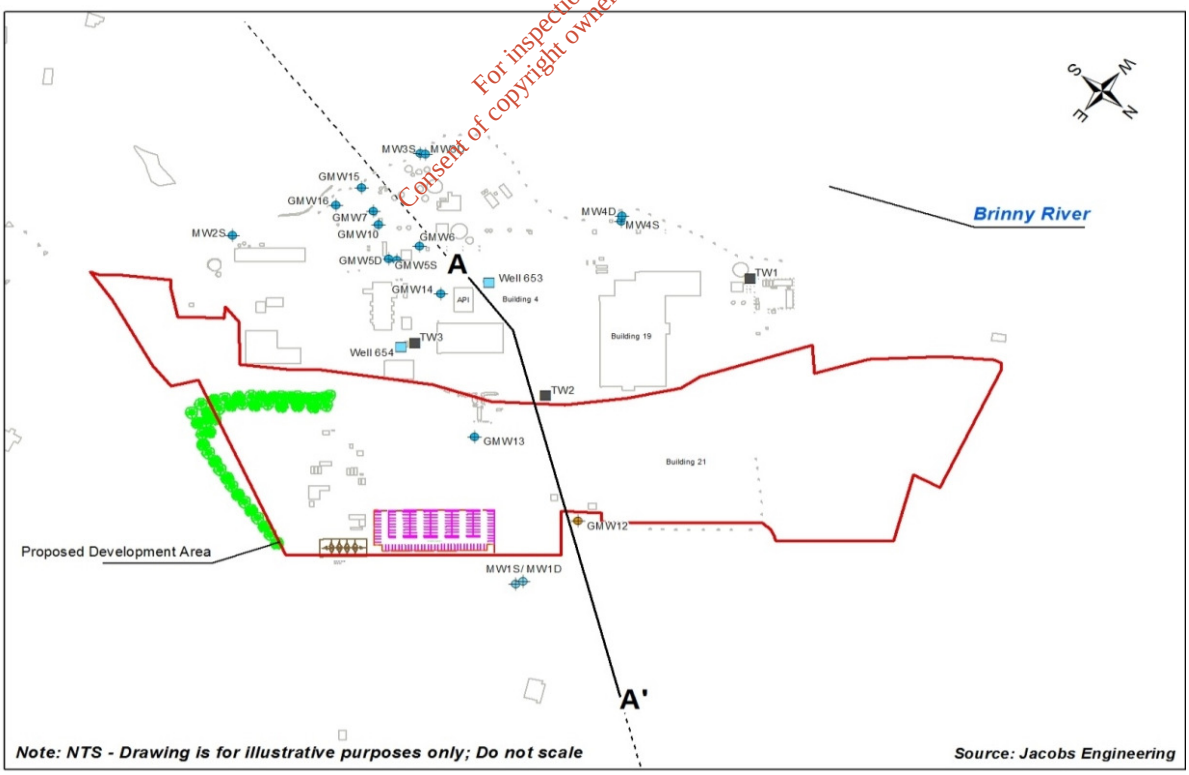

Figure 7.6 Borehole locations and line of cross section A-A' [30]

[30] Base map showing existing site is sourced from AECOM. Red line shows site boundary of proposed development. Section A-A' is presented as Figure 7.9.

7.3.6 GROUNDWATER LEVELS

The monitoring wells and pumping wells are presented above in relation to the area of the proposed redevelopment (marked in red).

The 2015 groundwater data review (source: AECOM) reviewed water level data from 2007 to 2015 for both deep (D-bedrock well) and shallow wells (S- Overburden well). A summary of the maximum, minimum and variation in water levels over that period is presented below.

Table 7.1 Summary of groundwater levels

Well	Max Water level (mOD)	Min Water level (mOD)	Variation in Water level
MW-1S	22.0	22.0	0
MW-1D	21.7	20.2	1.5
MW-4S	21.7	20.3	1.4
MW-4D	21.4	19.5	1.9
MW-3S	22.5	21.35	1.15
MW-3D	20.4	19.9	0.5
GMW4S	21.5	19.8	1.7
GMW4D	20.3	20.2	0.1
GMW5S	21.6	20.3	1.3
GMW5D	20.3	20.18	0.12
GMW10	22.25	20.3	1.95
GMW7	20.5	19.4	1.1

7.3.6.1 Groundwater flow direction

The direction of groundwater flow for the shallow water table is towards the south-west, towards the mill race where it joins with the River Brinny. The groundwater hydraulic gradient is calculated as 0.009. In the deeper gravel aquifer, groundwater flow is towards the south with flow under natural conditions discharging to the River Brinny. Locally flow is impacted by abstraction from the gravel and bedrock aquifer at the site. The hydraulic gradient is quite flat at 0.004 to 0.001.

7.3.7 Groundwater Quality

There is a significant data set over time available on groundwater quality beneath the existing plant. As part of IE licence requirements, the plant undertakes biannual groundwater monitoring from seven wells (MW-1S to MW-4D). Groundwater samples are analysed on a biannual basis for a suite of different parameters including inorganics (major ions and heavy metals), polyaromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and alcohols and acetates. Additional parameters include BOD, COD, TOC and ethylene glycol. As part of AER reporting for licence requirements, groundwater results have been compared to the relevant published standards including the relevant Groundwater Regulations S.I. No. 9 of 2010 and EPA Interim Guideline Values (IGVs), 2003. No exceedances were noted

7.3.7 GROUNDWATER WELLS

The GSI Well Card Index is a record of wells drilled in Ireland, water supply and site investigation boreholes. It is noted that this record is not comprehensive as licensing of wells is not currently a requirement in the Republic of Ireland. This current index, however, shows a number of groundwater monitoring and abstraction wells within a 3 km radius of the site; the abstraction wells generally supply a mix of uses ranging from domestic to public to industrial use. These wells are generally located within interbedded sandstones and mudstones with recorded yields ranging between ca. 27.3m^3/d to 1632m^3/d.

Figure 7.9 presents the GSI well search for the area surrounding the site (highlighted as circles), while Table 7.2 below summarises the details of some of the wells present within this search area. These include some of the abstraction boreholes currently used by the MSD Brinny site itself. Ground water is abstracted from both gravel and bedrock at the site.

Information from GSI shows that there is a public supply well located within 3km of the MSD Brinny boundary. The site is not located within the source protection zone of this supply.

Table 7.2 GSI Well Index table from well search[31]

GSI Name	Depth [m]	Depth to Bedrock [m]	Townland	County	Use	Yield Class	Yield m^3/d
1405NWW109	24.4	3.7	Clashanimud	Cork	Unknown	Poor	27.3
1405NWW120	37.8	-	Clashanimud	Cork	Unknown	Poor	28
1405NWW121	35.1	6.7	Clashanimud	Cork	Unknown	Poor	28
1405NWW145	-	-	Clashanimud	Cork	Public supply	Excellent	436
1405SWW032	17.7	14	Brinny	Cork	Unknown	Poor	28
1405SWW058	21	6.1	Skevanish	Cork	Unknown	Poor	27.3
1405SWW060	28	9.1	Rockfort	Cork	Unknown	Moderate	43.6
1405SWW216	61	1.2	Ballinacurra	Cork	Agricultural	Moderate	54.5
1405SWW201	22	20	Brinny	Cork	Industrial		
1405SWW202	85	23.5	Brinny	Cork	Industrial	Excellent	727
1405SWW203	17.8	17	Brinny	Cork	Industrial	Excellent	916
1405SWW204	23.6	19	Brinny	Cork	Industrial	Excellent	1440
1405SWW205	25.6	24	Brinny	Cork	Industrial	Excellent	1473
1405SWW206	26.5	24.5	Brinny	Cork	Industrial	Excellent	654
1405SWW207	20.2	18	Brinny	Cork	Industrial	Good	327
1405NWW149	33	33	Garryhankard	Cork	Unknown		
1405NWW202	67.1	8.5	Kilnagnady	Cork	Agricultural & domestic use	Poor	27.3
1405SWW187	7	-	Brinny	Cork	Other	-	-
1405SWW188	7	6	Brinny	Cork	Other	-	-
1405SWW189	6.2	6	Brinny	Cork	Other	-	-
1405SWW190	5.5	-	Brinny	Cork	Other	-	-
1405SWW191	6	-	Brinny	Cork	Other	-	-
1405SWW192	6	-	Brinny	Cork	Other	-	-
1405SWW198	64	9.1	Brinny	Cork	Industrial use	Moderate	54.5
1405SWW199	70.1	9.1	Brinny	Cork	Industrial use	Excellent	545
1405SWW200	23.5	-	Brinny	Cork	Industrial use	Excellent	1632
1405SWW209	40.5	-	Dunkereen	Cork	Other	Poor	38.4
1405SWW212	20.1	6.1	Dunkereen	Cork	Other	Good	175
1405SWW226	6	-	Garryhankard	Cork	-	-	-
1405SWW238	4.5	4	Littlesilver	Cork	-	-	-

[31] www.gsi.ie 2017

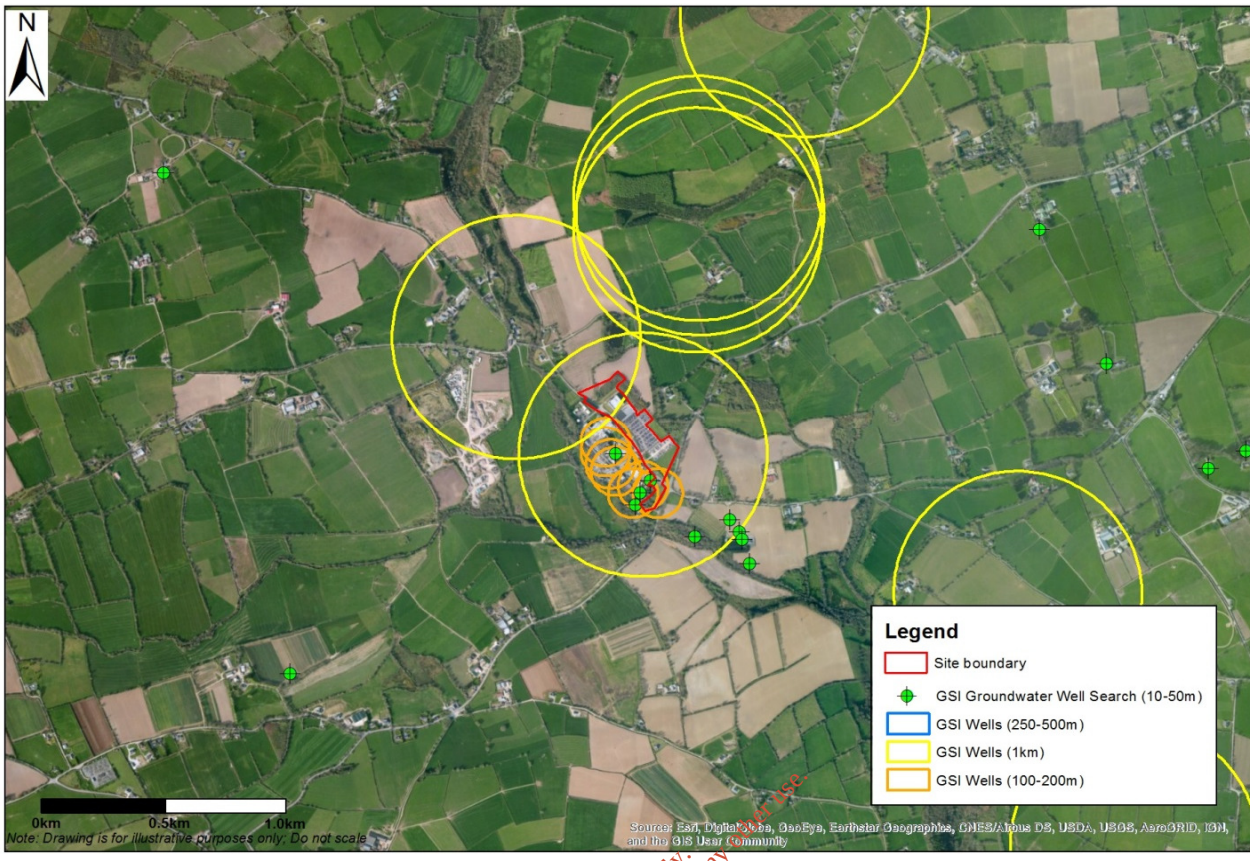

Figure 7.7 GSI Well Search

7.3.8 WATER BODY STATUS

The European Communities Directive 2000/60/EC established a framework for community action in the field of water policy (commonly known as the Water Framework Directive[WFD]). The WFD required 'Good Water Status' for all European water by 2015, to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both 'Good Ecological Status' and 'Good Chemical Status'.

Information from the EPA shows that the underlying gravel aquifer is classified as having 'good' status.

The Brinny Gravels East GWB comprises the Courtmascherry formation, Lipatrick formation and White strand formation. Other different groundwater bodies are present within 3km of the site. These consist of the Bandon groundwater body, Brinny Gravels East GWB and Ballinhassig East GWB as seen in Figure 7.10.

In general transmissivity rates in these units are likely to be to be greater than $50m^2$/day with the exception of a few being greater than $500m^2$/day for this GWB.

The general groundwater flow direction in this GWB is towards the River Brinny. Flow is through primary porosity openings within the gravels .

Information from the GSI well search shows a substantial proportion of the wells with a productivity class of excellent with yield values ranging from $327m^3$/day to $1632m^3$/day. There are exceptions with a few wells being classified as having a poor production yield ($28m^3$/day to $34m^3$/day).

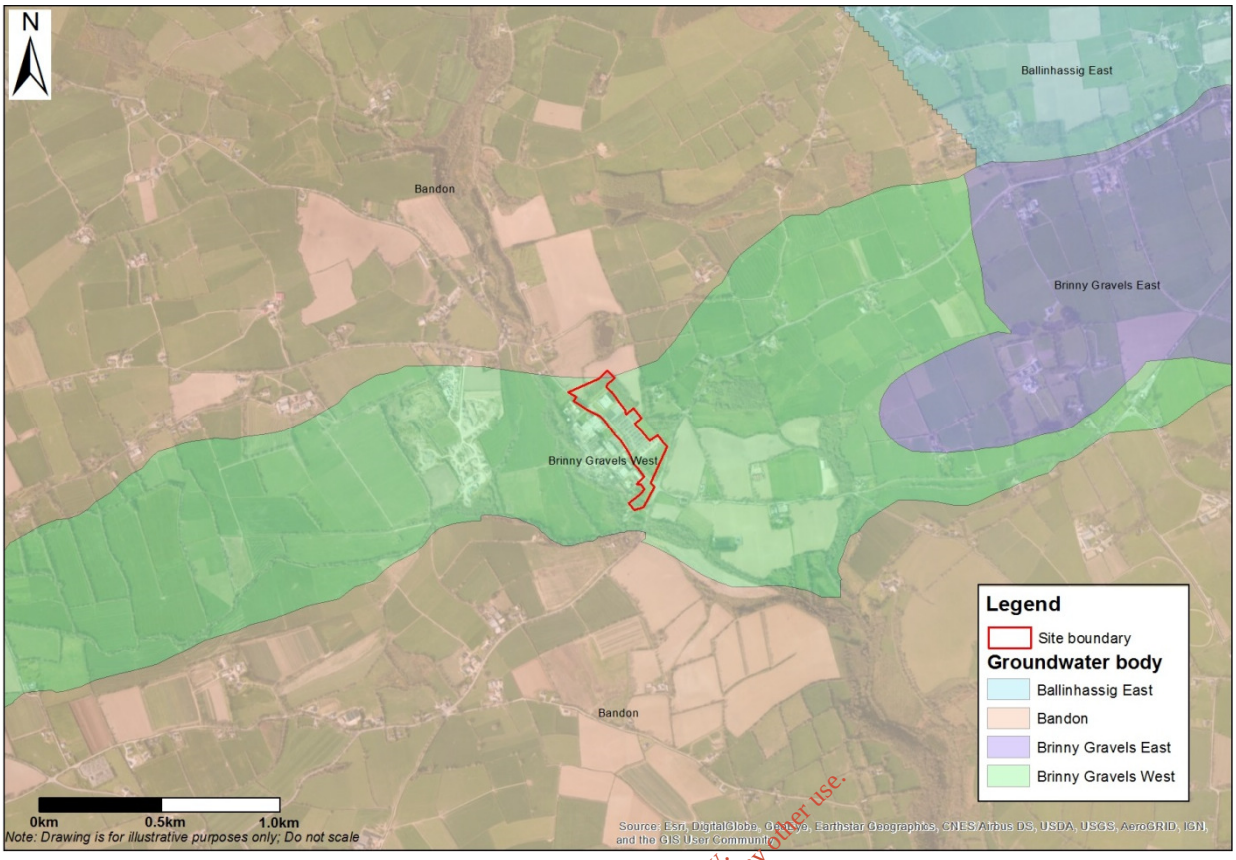

Figure 7.8 Groundwater Body Classification

7.3.9 CONCEPTUAL SITE MODEL

Borehole data was obtained from WYG investigative report (2008) and AECOM Groundwater Monitoring Reviews (2014, 2015). A regional and local cross section is presented in Figure 7.9 below to support the current conceptual site model (CSM) for the proposed development (Figure 7.13). A descriptive summary is provided below:

- The profile on site comprises thin topsoil/fill overlying clayey, sandy GRAVEL underlain by sandy, gravelly, clay and SILT. This is subsequently underlain by a thicker deposit of sandy GRAVEL (a *locally important* gravel aquifer). This is in turn underlain by interbedded SANDSTONES AND MUDSTONES which are also a *locally important* aquifer.

- Depth to bedrock varies from 12.5 m (GMW15) in the north of the site, 17 m (TW3) towards the south of the site. Further south in the immediate vicinity of the proposed development the depth to bedrock increases to 23.6 m (TW2).

- The main gravel aquifer is protected by the silt deposits to varying degrees in the local area based on nature and thickness of the deposits present. On site the hydraulic conductivity of the silts was shown to be 0.1 m/d in comparison with the gravel aquifer which had a hydraulic conductivity of 50 m/d.

- Groundwater was encountered in the majority of exploratory holes and wells. Where water was encountered, this was typically at depths ranging between 2.98m for the shallow gravels and as deep as 20.3m for the deeper gravel aquifer.

- The principal sensitive receptors in the area are the shallow gravels, the deeper sand and gravel aquifer and the bedrock aquifer which are both classified as *locally important* aquifers. Shallow groundwater from the perched aquifer discharges into the mill race which, joins the Brinny River to the south-east of the site at a location, which is directly up-gradient of the surface water quality monitoring point at Brinny Bridge. The deeper gravel aquifer discharges to the Brinny River.

- Groundwater flow direction is in a south, south-east direction (S-SE) direction towards the Brinny River. The deeper water table is impacted by abstraction at the site for water supply.

- There is no evidence of any significant impact on groundwater quality due to operation of the existing facility or previous agricultural use of the land.

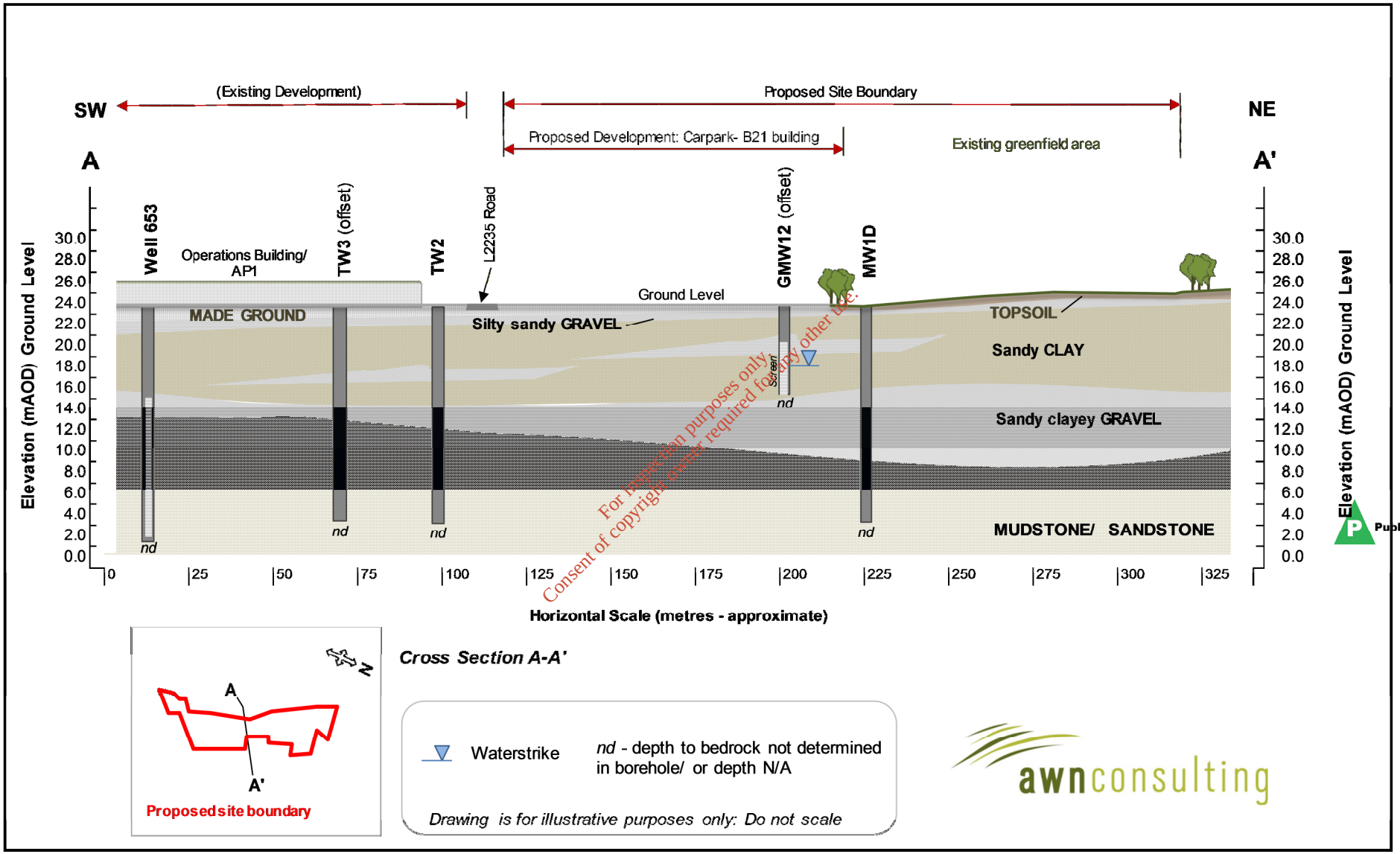

Figure 7.9 Local Geological Cross Section

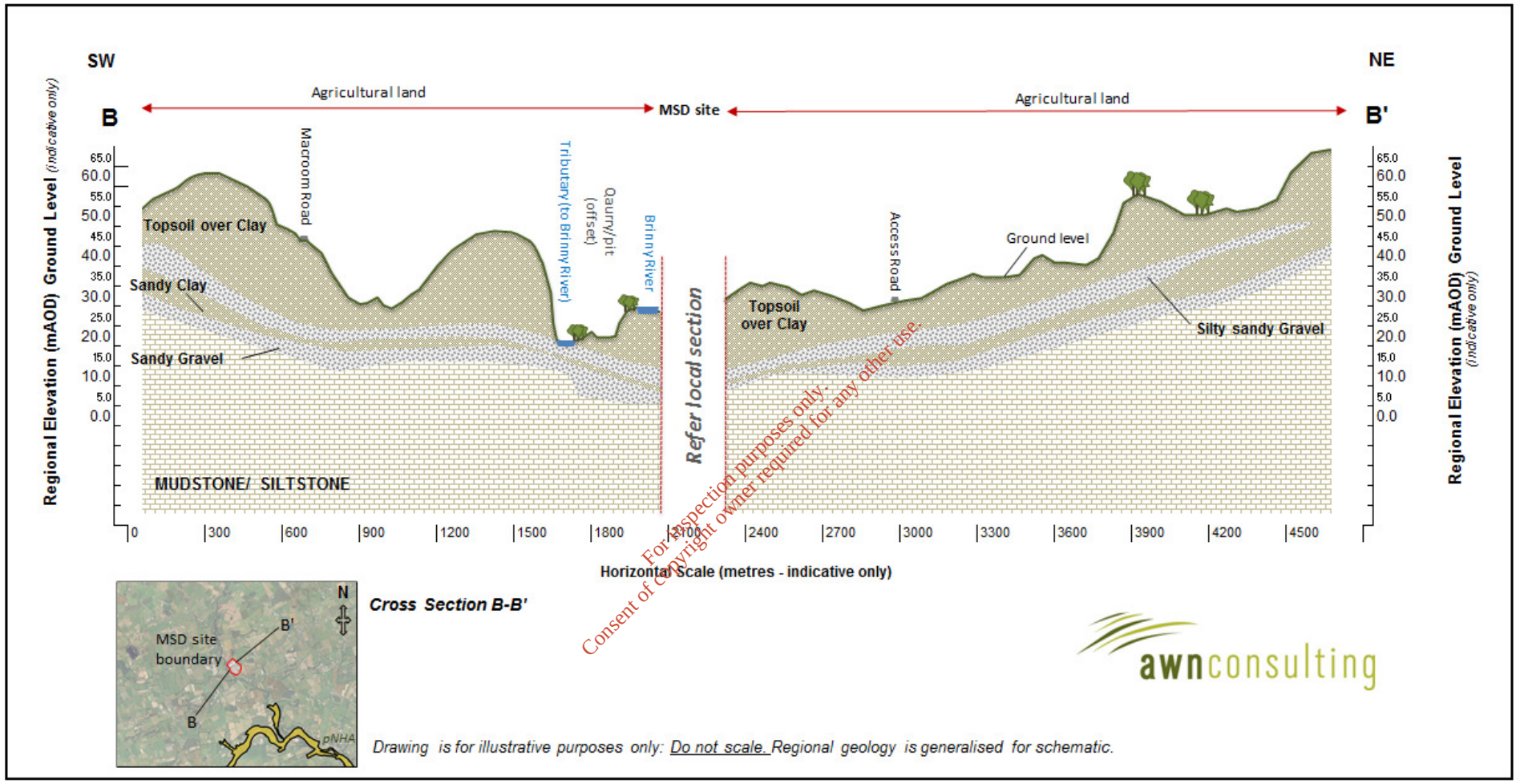

Figure 7.10 Regional Geological Cross Section

Rating of Site Importance of Geological/Hydrogeological Features

Based on the NRA methodology (refer Appendix 7.1, Table 7.2 and 7.3) and criteria for rating site importance of geological and hydrogeological features, the importance of the geology attributes at this site is rated as having a *Low* magnitude of impact based on "significance or value on a local scale". The hydrogeology is considered to have Medium magnitude of impact based on the fact that the aquifer underlying the site is a *Locally Important* aquifer and is known to provide agricultural and water supply within the local area.

7.4 PREDICTED IMPACTS

7.4.1 OVERVIEW

Predicted impacts during construction and operation are outlined below. Likely impacts of the proposed development considered are summarised in Section 7.4 with planned mitigation considered in Section 7.4.1. The implementation of the mitigation measures outlined in Section 7.5 below will ensure that accidental releases and management of run-off during the construction phase as well as during the operational phase are minimised. These measures will ensure that the development does not impact on receiving soil or groundwater quality.

The proposed development does not require discharge to ground or any significant additional lowering of the natural water table during construction or operation.

7.4.2 CONSTRUCTION PHASE

7.4.2.1 Soil Removal

Minimal removal of soils or import of soil will be required during construction and landscaping. Some minimal compaction of soils may occur during the construction phase of the car park extension due to vehicle movement across the proposed development area. As the soil is currently in industrial use it will not impact on local availability of agricultural land.

7.4.2.2 Accidental Spills and Leaks

During construction of the development, there is a risk of accidental incidences from the following sources which, if not adequately mitigated, could have localised impact on soil and groundwater:

- Spillage or leakage of chemicals and hydrocarbons stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- Run-off from concrete and cement works.

7.4.2.3 Silt in Run-off Water

Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt could impact groundwater underlying the site particularly if it is contaminated. As the proposed area for development is already mostly hard stand the potential for impact on groundwater is low.

Assessment of Impact during Construction
Based on the low potential for impact during the construction phase the potential impact on land, soils, geology and hydrogeology during construction is considered to have a short term – imperceptible impact with a neutral impact on quality. i.e. An impact capable of measurement but without noticeable consequences.

7.4.3 OPERATIONAL PHASE

7.4.3.1 Accidental Spills /Leaks and Fire

In this development, there is no requirement for bulk tank storage of chemicals or fuel. Waste tanks will be included within a suitably sized bund. Storage of other liquid raw materials/products will be IBC/drum or smaller volumes and stored within the internal bunded racked storage area. The ground surface in these areas is impermeable to the materials stored therein. In the event of a spill or leak, volumes will be small, localised and cleaned up as per the site Spill Procedure. In the event of a fire, firewater will be collected by the surface water drainage system and then diverted to the firewater retention pond with no likely discharge to ground.

Localised hydrocarbon leaks could occur from employee cars in the car park area. The permanent car parking areas are impermeable and drain to stormwater through an interceptor and so they will not have an impact on soils and groundwater.

Assessment of Impact during Operation
There are no likely significant impacts on the geological or hydrogeological environment associated with the proposed operational development of the site. Based on the low potential for impact during the operation phase the potential impact on land, soils, geology and hydrogeology is considered to have a short term – imperceptible impact with a neutral impact on quality. i.e. An impact capable of measurement but without noticeable consequences.

7.5 MITIGATION MEASURES

In order to minimise any potential impacts from the development, the following mitigation measures will be undertaken during construction and operation. It should also be noted that the proposed development is within the boundary of an EPA IE licenced facility and as such will require operation under the environmental conditions of that licence.

7.5.1 CONSTRUCTION PHASE

Contractors will be obliged to comply with the requirements of a construction environmental management plan (CEMP) during all site construction work. This will ensure good construction practices and adequate mitigation measures are in place.

7.5.1.1 Management of Stockpiles

- There is minimal requirement for any stock piling as no significant excavations or infill is required for the proposed development. Should temporary stock piles be required during construction works, a suitable area will be allocated for temporary stockpiling away from any surface water bodies or other sensitive receptors,
- There is no evidence of the presence of any contaminated soil from testing undertaken to date. However, if any contamination is encountered, contaminated soil or suspected contaminated soil will be isolated from clean soil pending testing to confirm its classification. Contaminated material will be removed by a licenced waste contractor to a licenced waste facility.
- Soils taken off site will be removed and disposed of by waste contractors licensed under the Waste Management Act of 1996 and amendments,

7.5.1.2 Accidental Spills and Leaks

- All oils, solvents and paints used during construction will be stored within temporary bunded areas.
- Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area protected against spillage and run-off.
- Designated cement wash out areas will be provided to ensure protection of water quality. Runoff from tankers washings will be contained and removed off site by a licenced waste contractor.

7.5.2 OPERATIONAL PHASE

7.5.2.1 Accidental Spills /Leaks/Fire

- There will be no direct discharge to ground. Emissions from any accidental fuel or chemical spills /leaks or runoff from rainwater that has passed over the impermeable surfaces will be prevented from entering the soil and/or underlying groundwater as all surface water runoff from the development will be directed to oil interceptors prior to discharge in compliance with IE licence requirements for stormwater. Monitoring of groundwater will be undertaken as required under the existing IE licence for the facility to ensure protection of the receiving water.

- Some additional hard standing (impermeable surface) is required for the extension of the car park which will have a very localised impact on natural recharge to the underlying aquifer but will not be significant in terms of overall recharge to the aquifer.

7.5.2.2 Monitoring

Monitoring will be undertaken as required by the existing EPA IE licence for the facility.

7.6 RESIDUAL IMPACT

In terms of the specific project the following points are of note:

- There is no likely impact on the geological and hydrogeological attributes,
- The site is already developed and as such there is no loss of agricultural land or requirement for significant removal or infill of soil or rock,
- There is no requirement during construction or operation for discharge to ground. As additional groundwater supply required is minimal, there will be no likely significance change to the natural hydrogeological regime,
- Some additional hard standing is required for the extension of the car park which will have a very localised impact on recharge to the underlying aquifer but will not be significant in terms of overall recharge.
- Apart from two waste tanks, there is no bulk tank chemical or fuel storage required during operation. The site will operate under an EPA IE licence requiring ongoing maintenance and monitoring of storage areas and transfer pipelines etc. Consequently, the potential for an accidental leak resulting in an impact to soil and or groundwater is low.

The residual impacts are those that would occur after the mitigation measures, as outlined in Section 7.5 above have taken effect. In the case of the proposed development, there is no evidence of any significant residual impacts in terms of the geological/ hydrogeological environment from the construction or operational phase. As a result, the residual impact is *neutral* in terms of quality with imperceptible significance (EPA Guidance) *and negligible* (NRA Guidance) i.e. with no measurable impact on attributes.

8 WATER & HYDROGEOLOGY

8.1 INTRODUCTION / METHODOLOGY

8.1.1 INTRODUCTION

The following section presents an assessment of the impacts of the proposed development at MSD Brinny in terms of water supply, waste water and hydrology defined in the EPA '*Guidelines on the Information to be contained in Environmental Impact Statements'*, EPA, 2002 and EPA '*Advice Notes on Current Practice in the Preparation of EIS'*, EPA, 2003.

8.1.2 METHODOLOGY

The rating of potential environmental impacts on the hydrological environment is based on the matrix from the EPA Guidelines presented in Table 1.2 – 'Glossary of Impacts' which takes account of the quality, significance, duration and type of impact characteristics identified. Consideration is given to both the importance of an attribute and the magnitude of the potential environmental impacts of the proposed activities on that attribute.

In addition to the EPA Guidelines and Advice Notes referred to in Section 1, consideration has also been given to the document entitled '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*' by the National Roads Authority (NRA, 2009). These guidelines are referenced where the methodology for assessment of impact is appropriate (refer Appendix 8.1).

The following sources of information were consulted:

- Current EPA on-line database -Envision water quality monitoring data for watercourses in the area;
- South Western River Basin District (SWRBD) Management Plan;
- T*he Planning System and Flood Risk Management, Guidelines for Planning Authorities*, Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW)
- Office of Public Works (OPW) flood mapping data (www.floodmaps.ie);
- '*Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors'* (CIRIA 532, 2001); and
- Cork County Development Plan - Natural Impact Report 2014-2020
- *Guidelines on protection of fisheries during construction works in and adjacent to waters*", Inland Fisheries Ireland, 2016.

The attributes (and impacts) to be assessed include *inter alia* the following:

- River and stream water quality in the vicinity of the site (where available);
- Surface watercourses near the site and potential impact on surface water quality arising from proposed development related works including any discharge of surface water run-off;
- Localised flooding (potential increase or reduction) and floodplains including benefitting lands and drainage districts (if any); and
- Surface water features within the area of the site.

Site-specific data was derived from the following sources:

- *Final Watershed Characterisation Technical Memorandum MSD Brinny,* AECOM, 2016
- *MSD Brinny Final Report Mixing Zone Assessment*, AECOM, 2016

- *MSD Brinny Pipeline Risk Assessment*, AECOM, 2016
- *P0005-02 Annual Environmental Report* , AER
- *Hydrogeological Investigation Report*, WYG, 2008

8.2 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development is outlined in *Section 4 - Proposed Development*. The core of the project is the refurbishment of B21 as a new vaccine production facility. A permanent (sustaining) contractors' compound to the south of the existing car park will be moved across the L2235 road and relocated to the south of the western side of the MSD site (area sized 5,106 m^2). The works also include a surface water attenuation area adjacent to the extended permanent car park

A temporary contractors' compound will be provided with offices, welfare and other facilities mainly to the North of B21. Laydown and storage areas will be also be located to the North of the building. Heavy Goods Vehicle (HGV) access and a 300 space contractors' car park will be located between these facilities and the L2235. The contractors' compound will be reinstated on completion of the development.

Contractors will be required to comply with the CEMP during construction works. Following development, the manufacturing plant will operate within the requirements of the site EPA IE licence. Specific characteristics of the existing and proposed development in relation to wastewater, water supply and surface water are summarised below.

8.3 THE RECEIVING ENVIRONMENT

8.3.1 WASTE WATER

The current development complies with the requirements of the EPA licence for the facility (P0005-02). As part of the development of the existing plant, a wastewater treatment plant was established, which incorporates processes such as BOD and suspended solids removal and nitrification/denitrification, for the treatment of its process effluent. This is subsequently discharged via a 9km pipeline to the transitional waters of the Upper Bandon Estuary. This plant will also be utilised for the treatment of effluent from the proposed development.

The WWTP Design Capacity is 600 m^3/day, current wastewater flows to the WWTP are in the region of 400 m^3/day. The proposed development has a predicted wastewater flow of approximately 10 m^3/day, so the WWTP has more than adequate capacity to treat wastewater from the proposed development.

8.3.2 WATER SUPPLY

Water supply to the current development is via three existing industrial supply wells. For 2016, the average daily extraction for the existing MSD site is < 650 m^3/d. The proposed development requires an additional 10-30 m^3/d. Testing of these wells following development confirmed that there is a maximum sustainable yield of 1443 m^3/d available, therefore there is more than adequate supply available from the existing wells on site.

8.3.3 SURFACE WATER

8.3.3.1 Storm water Site Management

The existing surface water drainage infrastructure discharges through oil/water interceptors (class I and class II). In the event of an accidental chemical release, the surface water drainage system will re-route the storm water to the onsite firewater retention facility. The current firewater retention pond consists of an open lined lagoon, with an operating volume of 4000m^3.

8.3.3.2 Surface Water Environment

MSD Brinny is located within the South-Western River Basin District (SWRBD) in Hydrometric Area No. 20 of the Irish River Network as part of the Bandon-Ilen catchment. The main hydrological features within the area consist of the River Brinny, River Sall and River Ballymahane. The River Brinny flows from the North to towards the south east of the basin. The River Brinny flows past the western boundary of the site (approximately 100m away) before joining the Bandon River 2.5km downstream. An old mill race flows at the base of an embankment along the western and southern site boundary before joining the River Brinny.

Castlenalact Lake is located at the western side of the sub catchment (Bandon_SC_050). Figure 8.1 shows the hydrological features of the surrounding area.

Figure 8.1 Hydrological Environment

8.3.3.3 River Brinny Water Quality

The proposed development is located within the south western river basin district (SWRBD), as defined under the EU Water Framework Directive (2000/60EC) European Communities Directive 2000/60EC, establishing a framework for community action in the field of water policy, (commonly known as the Water Framework Directive [WFD]).

The WFD required 'Good Water Status' for all European waters by 2015, to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both 'good ecological status' and 'good chemical status'. In 2010 the SWRBD River Management Plan (RMP) 2010-2015 was published. In the SWRB RMP the impacts of a range of pressures were assessed including agriculture, wastewater and industrial discharges and amongst others eutrophication of Rivers, Lakes and Estuaries. The purpose of this regional management plan was to identify water bodies at risk of failing to meet the objectives of the WFD by 2015 and include a programme of measures to address and alleviate these pressures by 2015. Currently, as of 2017 the EPA are undertaking a new monitoring round to provide new information regarding water quality status for all subsequent river and lake bodies, the results of which have yet to be published.

The most recent published (www.epa.ie) Waterbody WFD Status 2010-2015 of the River Brinny in the vicinity of the proposed development is "High". The WFD recognises that in some cases it may not be possible to achieve all core objectives by 2015. As part of the management plan it was identified that the Bandon Estuary of which the River Brinny flows into experiences high degree of eutrophication. Information from the National Monitoring Programme identified elevated concentrations of nitrate. The presence of intensive agricultural practices on free draining soils within this region are the primary cause of these elevated nitrate concentrations.

Table 8.8.1 shows the current status of the River Brinny and tributaries monitored as part of the WFD monitoring program.

Table 8.8.1 WFD Status of Rivers within the Study Area

Water Bodies in WMU	Current WFD Status	Achieve Good Status by
Upper River Brinny (010)	Good	2015
Lower River Brinny (020) [Proposed Development Location]	**High**	**2015**
River Sall (010)	Good	2015
Upper Bandon (100)	Good	2015
Lower Bandon (090)	Good	2015

The available results of the biological water quality monitoring at the EPA water quality monitoring locations are provided in Table 8.8.2 and the legends to explain the Biological Rating System (Q Values) are provided in Table 8.8.3.

Table 8.8.2 EPA Q Ratings for the River Brinny (1994 – 2015)

Sampling Stations		River	Biological Quality Ratings (Q Values)							
Station No.	Location		1994	1997	2000	2003	2006	2009	2012	2015
0070	Tuough Br	Brinny	4	3-4	4	3-4	4	4	4	4

Table 8.8.3 EPA Biological Rating System

Quality Ratings	Quality Class	Pollution Status	Condition
Q5, Q4-5, Q4	Class A	Unpolluted	Satisfactory
Q3-4	Class B	Slightly Polluted	Unsatisfactory
Q3, Q2-3	Class C	Moderately Polluted	Unsatisfactory
Q2, Q1-2, Q1	Class D	Seriously Polluted	Unsatisfactory

As can be seen from the monitoring data in Table 8.8.3, the River Brinny was classified as *slightly polluted to unpolluted* during each monitoring period from 1994 to 2015. The most recent data available is for 2015 and it shows that the biological quality rating is maintained as *good* status at the sampling station.

In 2008 the EPA devised a methodology to determine the overall risk of a river body. Such risk assessments were required for reporting in 2010 under the Water Framework Directive (WFD) which were further included in the programme of measures and standards (POMS). In accordance with article 5; *Overview of groundwater risk assessment source*, pathway and receptor models were used to identify the impacts on groundwater that are likely to occur. Sources may include pressures, loading and spatial location. Based on this assessment approach an associated risk can be classified for each river body for the possibility of achieving good status. These range from 1a at risk, 1b probably at risk, 2a probably not at risk and 2b not at risk.

It should be noted that whilst the River Brinny is currently classified as having *good* ecological and chemical status the WFD directive risk scores classifies the River Brinny at risk of not achieving 'good' status. The Bandon River which currently occupies 'good' ecological and chemical status is still expected to maintain this status.

8.3.3.4 Flooding

In accordance with the guidelines produced by the Department of the Environment, Heritage and Local Government - The Planning System and Flood Risk Management (FRM) Guidelines for Planning Authorities, November 2005, a Stage 1 assessment was completed. The Stage 1 Assessment is 'Flood Risk Identification'. The purpose of the assessment is to identify whether there may be any flooding or surface water management issues related to a plan area or proposed development site that may warrant further investigation.

The sequential approach, as outlined in the Flood Risk Management Guidelines was undertaken. The latest available CFRAM map (South Western CFRAM Map shows that the proposed development is within Flood Zone C i.e. outside the 1,000 year flood level (0.1% annual exceedance probability (AEP)). The Flood Risk Assessment identifies the development as 'Less Vulnerable' and in conjunction with an assessment of the available flood data is therefore classified as appropriate.

8.3.3.5 Rating of Site Importance of the Hydrological Features

Based on the NRA methodology (See Appendix 8.1, Table 2) and the criteria rating site importance of hydrological features, the importance of the hydrological features at this site is categorised as "High" based on the proximity of the site to the River Brinny which is classified as good ecological status Q4. Additionally, although the site is not within the Bandon Valley above Innishannon pNHA, storm water outfall discharges to this region. The River Bandon, parts of which are categorised as a Special Area

of Conservation is less than 2km from the site (ref Section **Error! Reference source not found.** for more details).

8.4 PREDICTED IMPACTS

The potential impacts of the construction and operational phases of the proposed development in terms of wastewater, water supply and surface water are outlined below.

8.4.1 WASTE WATER

The potential impacts of the construction and operational phases of the proposed development in terms of wastewater are outlined in the following paragraphs.

8.4.1.1 Construction Phase

There are no predicted adverse impacts on wastewater during construction. The construction waste water system shall be connected to the proposed temporary foul sewer collection tank and removed off-site by tanker for licensed disposal.

8.4.1.2 Operational Phase

The estimated volume of wastewater to be discharged from B21 is 51,000 litres per week or approx. 10 m^3/day.

Where possible, wastewater will be collected and treated at the existing treatment plant. Wastewater generated in B21 will be of similar composition to that already generated by existing operations. Any concentrated wastewater will be diverted to separate collection tanks local to B21 and removed off-site for treatment by licenced contractor.

The on-site wastewater plant has been determined to have the capacity to accept the wastewater to be discharged from the proposed development and remain within its EPA licence limits.

8.4.2 WATER SUPPLY

8.4.2.1 Construction Phase

Surface water containing suspended solids will be passed through a siltbuster or similar apparatus before being discharged into the existing surface water network.

8.4.2.2 Operational Phase

The proposed development will use the existing onsite groundwater supply sourced from three existing industrial supply wells. Based on a conservative water consumption of no more than 30 m^3/day, sustainable yield testing has shown that the existing wells have adequate capacity.

8.4.3 8.4.3 SURFACE WATER

8.4.3.1 Construction Phase

Any surface water containing suspended solids will be entrained through temporary sedimentation ponds before being discharged into the existing surface water network.

Stockpile Storage

Some small quantities of soil will be generated during the construction phase for the proposed development. These will be temporary stored in stockpiles on site.. After a heavy rainfall event runoff can occur from these stockpiles, this runoff can be heavily silted and can impact on receiving waters and surface water drains if uncontrolled. Any temporary stockpiles will be located away from surface drains. The excavated soil will be re-used as screening berms.

Uncontrolled Discharges

During construction of the proposed development, there is a risk of accidental incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.

- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.

8.4.3.2 Operational phase

Surface Water Runoff
Increase in surface water run-off will be attenuated by the car park attenuation area. This will reduce the level of surface run-off to greenfield runoff rates.

Drainage will be managed in accordance with the facility IE licence requirements. This will minimise the risk of any accidental leaks/spills impacting on receiving water quality.

8.5 MITIGATION MEASURES

A summary of the measures incorporated in the proposed development to protect water quality are included here. These measures seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

A site-specific outline CEMP including specific measures and contractor requirements is being submitted as part of the planning application and incorporates most of the mitigation measures for the proposed development. All personnel working on the site will be trained in the implementation of the procedures in the event of a spill.

During the operational phase, the MSD site strictly operates under an IE licence.

8.5.1 WASTEWATER

8.5.1.1 Construction Phase

Effluent generated on the site from the contractor's welfare facilities will be directed to temporary storage and off-site disposal by licenced contractor.

8.5.1.2 Operational Phase

Dual and low flush toilets and water economy outlets and water saving measures in the production process will be implemented.

8.5.2 SURFACE WATER

8.5.2.1 Construction Phase

To ensure good management and monitoring of surface water runoff the following measures are included in the planned development:

- All oils, solvents and paints used during construction will be stored within temporary bunded areas away from any surface water drains.
- Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place off-site in a designated area (where possible) and away from the surface water drains.
- Temporary silt traps/sedimentation ponds will be installed to entrain any silt before entering the existing surface water network.

8.5.2.2 Operational Phase

The site-wide mitigation measures and spill control programme currently in place at the MSD Brinny site which is implemented as part of the IE licence requirements will apply to the proposed development during the operational phase.

Assessment of run-off has been conducted in relation to the development of the proposed extension to the car park and new car park (ref. *Car Park S.W. Attenuation Report*[32]). Calculations were made based on the 1 in 100 year return period. The proposed attenuation area would cover an area of approximately 1,800m^2 and will be located south east of the car park. The attenuation area was sized to attenuate runoff from the proposed car park developments to existing QBAR runoff rates (5.2 l/s).

Monitoring
Surface water monitoring will be undertaken as required by the IE licence.

8.6 RESIDUAL IMPACTS

This section describes the predicted impact of the proposed development following the implementation of the remedial and mitigation measures.

8.6.1 WASTEWATER

8.6.1.1 Construction Phase

In relation to the construction phase and based on the associated mitigative measures mentioned within Section 8.5 the impact on the water during construction is considered to be have a **Short Term – Imperceptible Impact with a neutral impact on quality,** i.e. an impact capable of measurement but without noticeable consequences.

8.6.1.2 Operational Phase

There will be no direct discharges of contaminated water to the surface water environment during the operational phase.

The implementation of mitigation measures highlighted in Section 8.5 will ensure that the predicted impacts on the surface water environment do not occur during the operational phase and that the residual impact will be **Short term-Imperceptible Impact with a neutral impact on quality**.

As the proposed wastewater discharge will remain within the limit values defined for the MSD site, it can be concluded the proposed discharges will not cause the limits of the Surface Water Regulations (SI 366 of 2016) to be exceeded and the effluent discharge associated with the combined discharges including this project will have a negligible environmental impact on the River Bandon water quality status.

8.6.2 SURFACE WATER

8.6.2.1 Construction Phase

The implementation of the design and monitoring measures previously highlighted in Section 8.5 will ensure that impacts will be **Short term-Imperceptible Impact with a neutral impact on quality**.

8.6.2.2 Operational Phase

The proposed development is considered to have a **short term-imperceptible significance with a neutral impact on quality** i.e. an impact capable of measurement but without noticeable consequences

[32] Jacobs, 2017. Submitted as part of the planning application.

- The proposed development will not negatively impact on any surface waterbody during operation
- There will be no increase in flood risk as result of the site operation

The site will operate within the licence conditions of the EPA IE licence

9 AIR QUALITY & CLIMATE

9.1 INTRODUCTION

The modelling of air emissions due to operational phase traffic impacts was carried out to assess the impact on concentrations of nitrogen dioxide, particulate matter less than 10 microns, particulate matter less than 2.5 microns, carbon monoxide and benzene. The assessment of both "Do Nothing" and "Do Something" scenarios was undertaken in accordance with the UK Design Manual for Roads and Bridges screening model in order to quantify the impact of the proposed development in the context of the relative increase in ambient air quality concentrations.

The construction phase and operational phase assessments has been conducted in the context of current relevant standards and guidance, and identifies any requirements or possibilities for mitigation.

There are no additional main process emissions predicted due to the development. Within the context of steam requirement the proposed project only has an additional 300 kg/hr steam requirement which is well within the capacity of the existing boilers, therefore there will be no change in boiler emissions as a result of the proposed development. There is the potential for some new particulate emissions, however these will be abated through use of control measures such as HEPA filters e.g. weigh and dispense, glove boxes, fumehoods and classified as minor emission points. Therefore they do not require a dispersion model.

Figure 9.1 Map of Land use in Vicinity of Proposed Development[33]

[33] Google Maps, 2017

9.1.1 METHODOLOGY – LOCAL AIR QUALITY ASSESSMENT

The air quality assessment has been carried out following procedures described in the publications by the EPA (2002)[34] and using the methodology outlined in the policy and technical guidance notes, LAQM.PG(16) and LAQM.TG(16), issued by UK DEFRA (Department for Environment, Food and Rural Affairs)[35,36,37]. The assessment of air quality was carried out using a phased approach as recommended by the UK DEFRA[36]. The phased approach recommends that the complexity of an air quality assessment be consistent with the risk of failing to achieve the air quality standards. In the current assessment, an initial scoping of key pollutants was carried out at sensitive receptors. Ambient concentrations of key pollutants at these sensitive receptors have the potential to be impacted by the traffic associated with the proposed development.

Key pollutant concentrations were predicted for nearby sensitive receptors within these areas where impacts have the potential to occur for the following scenarios:

- The Existing scenario (2017), for model verification;
- Opening Year Do-Nothing scenario (DN), which assumes the retention of present site usage with no development in place (2018);
- Opening Year Do-Something scenario (DS), which assumes the proposed development is in place (2018);
- Design Year of the Do-Nothing scenario, which assumes the retention of present site usage with no development in place (2033);
- Design Year of the Do-Something scenario, which assumes the proposed development is in place (2033).

The assessment methodology involved air dispersion modelling using the UK Design Manual for Roads and Bridges (DMRB) Screening Model, the NO_x to NO_2 Conversion Spreadsheet[38], and following guidance issued by TII[39], UK Highways Agency, UK DEFRA[36] and the EPA[34].

The TII guidance states that the assessment must progress to detailed modelling if:

- concentrations exceed 90% of the air quality limit values when assessed by the screening method; or
- sensitive receptors exist within 50m of a complex road layout (e.g. grade separated junctions, hills etc.).

The UK DMRB guidance, on which TII guidance was based, states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment:

- Road alignment change of 5 metres or more;
- Daily traffic flow changes by 1,000 AADT or more;
- HDV flows change by 200 vehicles per day or more;
- Daily average speed changes by 10 km/h or more; or
- Peak hour speed changes by 20 km/h or more.

Concentrations of key pollutants are calculated at sensitive receptors which have the potential to be affected by the proposed development. Road links which are affected by the proposed development and within 200 m of the chosen sensitive receptors are required for the model. Other data requirements for the air quality model consist of; road layouts, receptor locations, annual

[34] EPA (2003) *Advice Note on Current* Practise (In*Practice in The Preparation* Of*of Environmental Impact Statements*) EPA, 2002
[35] UK DEFRA (2001) DMRB Model Validation for the Purposes of Review and Assessment
[36] UK DEFRA (2016) Part IV of the Environment Act 1995: Local Air Quality Management LAQM.TG(16)
[37] UK DEFRA (2016) Part IV of the Environment Act 1995: Local Air Quality Management LAQM.PG(16)
[38] *NO_x to NO_2 Conversion Spreadsheet (Version 5.1)*, UK DEFRA ,2016
[39] *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes,* Transport Infrastructure Ireland ,2011

average daily traffic movements (AADT), percentage of heavy goods vehicles, annual average traffic speeds and background concentrations. The UK DMRB guidance states that road links at a distance of greater than 200 m from a sensitive receptor will not influence pollutant concentrations at that receptor. Using this input data the model predicts the road traffic contribution to ambient ground level concentrations at the worst-case sensitive receptors using generic meteorological data. The DMRB model uses conservative emission factors, the formulae for which are outlined in the DMRB Volume 11 Section 3 Part 1 – HA 207/07 Annexes B3 and B4. These worst-case road contributions are then added to the existing background concentrations to give the worst-case predicted ambient concentrations. The worst-case ambient concentrations are then compared with the relevant ambient air quality standards to assess the compliance of the proposed development with those standards. TII Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes[39] detail a methodology for determining air quality impact significance criteria for developments which involve increased traffic flows or road schemes. The degree of impact is determined based on both the absolute and relative impact of the Proposed Scheme. The TII significance criteria have been adopted for the Proposed Scheme and are detailed in Table 9.2 to Table 9.4. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the annual mean limit values (40 µg/m^3). However the criteria have also been applied to the predicted 8-hour CO, annual benzene and annual $PM_{2.5}$ concentrations for the purposes of this assessment.

Table 9.1 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations[40]

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No. days with PM_{10} concentration >50 µg/m^3	Annual Mean $PM_{2.5}$
Large	Increase / decrease ≥ 4 µg/m^3	Increase / decrease >4 days	Increase / decrease ≥ 2.5 µg/m^3
Medium	Increase / decrease 2 - < 4 µg/m^3	Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 µg/m^3
Small	Increase / decrease 0.4 - < 2 µg/m^3	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 µg/m^3
Imperceptible	Increase / decrease < 0.4 µg/m^3	Increase / decrease <1 day	Increase / decrease < 0.25 µg/m^3

[40] *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes,* Transport Infrastructure Ireland ,2011

Table 9.2 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations[41]

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	Moderate	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight adverse	Moderate adverse	Substantial adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight adverse	Moderate adverse	Moderate adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight adverse	Slight adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Substantial beneficial
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Moderate beneficial
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight beneficial	Slight beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight beneficial

Note 1 Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible

[41] *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*, Transport Infrastructure Ireland, 2011

Table 9.3 Air Quality Impact Significance Criteria[4243]

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

9.1.2 METHODOLOGY – CONVERSION OF NOX TO NO_2

NO_x (NO + NO_2) is emitted by vehicles exhausts. The majority of emissions are in the form of NO, however, with greater diesel vehicles and some regenerative particle traps on HGV's the proportion of NO_x emitted as NO_2 rather than NO is increasing. With the correct conditions (presence of sunlight and O_3) emissions in the form of NO, have the potential to be converted to NO_2.

The National Roads Authority states the recommended method for the conversion of NO_x to NO_2 in "Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes"[39]. TII guidelines recommend the use of DEFRAs NO_x to NO_2 calculator[38] which was originally published in 2009 and is currently on version 5.1. This calculator (which can be downloaded in the form of an excel spreadsheet) accounts for the predicted availability of O_3 and proportion of NO_x emitted as NO for each local authority across the UK. O_3 is a regional pollutant and therefore concentrations do not vary in the same way as concentrations of NO_2 or PM_{10}.

The calculator includes Local Authorities in Northern Ireland and Transport Infrastructure Ireland guidance recommends the use of Craigavon as the choice for local authority when using the calculator. The choice of "*Armagh, Banbridge and Craigavon*" provides the most suitable relationship between NO_2 and NO_x for Ireland. The "All other Non-Urban UK Traffic" traffic mix option was used.

[42] Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, Transport Infrastructure Ireland (2011)
[43] Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible

9.1.3 METHODOLOGY ECOLOGICAL SITES

For routes which pass within 2 km of a designated area of conservation (either Irish or European designation) Transport Infrastructure Ireland requires consultation with an Ecologist[44] and when significant changes in AADT (>5%) occur.

TII'S Guidelines for Assessment of Ecological Impacts of National Road Schemes[45] and Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities[46] provide details regarding the legal protection of designated conservation areas.

Where the proposed development is predicted to adversely impact concentrations by 2 µg/m^3 or more and causing overall concentrations to be within 10% of the 30 µg/m^3 limit, then the sensitivity of the habitat to NO_x should be assessed by the project Ecologist.

If the assessment criteria of a designated area of conservation within 200 m of the proposed development and a significant change in AADT flows is met, an assessment of the potential for impact due to nitrogen deposition should be assessed. There are no designated areas within 200 m of the proposed development (the closest designated area, Bandon Valley pNHA, is 1.28 km from the site) and therefore no ecological assessment is required.

9.1.4 AMBIENT AIR QUALITY STANDARDS

In order to reduce the risk to health from poor air quality, National and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 9.2 and Appendix 9.2).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate European Commission Directive 2008/50/EC which has set limit values for the pollutants NO_2, PM_{10}, benzene and CO (see Table 9.4) Council Directive 2008/50/EC combines the previous Air Quality Framework Directive (96/62/EC) and its subsequent daughter directives (including 1999/30/EC and 2000/69/EC). Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$.

Climate agreements and long range transboundary air quality agreements (i.e. the Gothenburg Protocol) are discussed in Appendix 9.1.

[44] Guidelines for Assessment of Ecological Impacts of National Roads Schemes (Rev. 2), Transport Infrastructure Ireland, 2009

Table 9.4 EU Air Quality Standards[47]

Pollutant	Regulation Note 1	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	0%	200 µg/m^3 NO_2
		Annual limit for protection of human health	0%	40 µg/m^3 NO_2
		Critical limit for protection of vegetation	None	30 µg/m^3 NO + NO_2
Sulphur dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	150 µg/m^3	350 µg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m^3
		Critical limit for the protection of vegetation	None	20 µg/m^3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50%	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	20%	40 µg/m^3 PM_{10}
$PM_{2.5}$	2008/50/EC	Annual limit for protection of human health	0%	25 µg/m^3 $PM_{2.5}$
Benzene	2008/50/EC	Annual limit for protection of human health	0%	5 µg/m^3

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

9.2 THE PROPOSED DEVELOPMENT

9.2.1 INTRODUCTION

The proposed development has the potential to cause air quality and climate impacts during the construction phase in the form of construction dust. The development involves the reuse and conversion of an existing building (B21) into a new vaccine manufacturing building. Additionally, coinciding with present car park facilities a number of additional car park facilities will be developed in order to facilitate the proposed development.

With regards to the operational phase, the likely air quality & climate impacts associated with the proposed development are in the form of emissions from traffic generated as a result of the proposed development. The impact of these emissions are assessed in Sections 9.4. There is the potential for some new particulate emissions, however these will be abated through use of control measures such as HEPA filters e.g. weigh and dispense, glove boxes, fumehoods and classified as minor emission points. Therefore they do not require a dispersion model.

[47] based on European Commission Directive 2008/50/EC (transposed as S.I. 180 of 2011)

There will be no additional major process emissions predicted due to the development. The proposed project has an additional 300 kg/hr steam requirement. This is well within the licensed capacity of the existing boilers (A1/2, A3, A4) and, therefore there will be minimal increase in boiler or CHP emissions as per the IE licence (P0005-02) and no assessment is required. The existing building (B21) proposes to use F-Gas containing equipment which have the potential to impact on the climate. However, control measures will be in place to ensure the purchasing and use of all equipment complies with EU/517/2014.

9.2.2 CONTROL MEASURES

9.2.2.1 Construction Phase

Air Quality

The greatest potential impact on air quality during the construction phase is from construction dust emissions, $PM_{10}/PM_{2.5}$ emissions and the potential for nuisance dust. The outline Construction Environmental Management Plan (CEMP) defines the methods and procedures to be followed during construction. Dust control methods are covered in Section 5.5 of the CEMP.

In order to minimise dust emissions during construction, a series of mitigation measures have been prepared as contained in the CEMP. To ensure construction phase impacts are minimised and for the protection of residential receptors to the site mitigation measures recommended in the Institute of Air Quality Management *Guidance on the Assessment of Dust from Demolition and Construction*[48] for sensitive receptors have been included. Provided the dust minimisation measures outlined in the CEMP and construction management plan are adhered to, the air quality impacts during the construction phase will not be significant.

In summary the measures to be implemented include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface.
- Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly.
- Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.
- Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on- and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

[48] Construction Dust. Guidance on the assessment of dust from demolition and construction (2014) Institute of Air Quality Management

Climate
Construction vehicles, generators etc., may give rise to some CO_2 and N_2O emissions. However, due to the short-term and temporary nature of these works the impact on climate will not be significant.

9.2.2.1 Operational Phase

Air Quality
Mitigation measures in relation to traffic-derived pollutants have focused generally on improvements in both engine technology and fuel quality. EU legislation, based on the EU sponsored Auto-Oil programmes, has imposed stringent emission standards for key pollutants (REGULATION (EC) No 715/2007) for passenger cars which was complied with in 2009 (Euro V) and 2014 (Euro VI). Further details on the predicted future trends are included in Appendix 9.3.

Climate
Improvements in air quality are likely over the next few years as a result of the on-going comprehensive vehicle inspection and maintenance program, fiscal measures to encourage the use of alternatively fuelled vehicles and the introduction of cleaner fuels. Further details on this can be found in Appendix 9.3.

It is proposed to use F-Gas containing equipment within B21 which has the potential to impact on the climate. However, control measures will be in place to ensure the purchasing and use of all equipment comply with EU/517/2014.

9.3 THE RECEIVING ENVIRONMENT

9.3.1 METEOROLOGICAL DATA

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience significant variations in pollutant levels under the same source strength (i.e. traffic levels)[49]. Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ - PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The windroses from Cork Airport Meteorological Station for the years 2010 - 2014 are shown Figure 9.2. They show that the prevailing wind direction is from south to north-westerly in direction over the period 2010 - 2014. The mean wind speed is approximately 5.4 m/s over the period 1981-2010.

[49] *Air Quality Guidelines – Global Update 2005,* World Health Organisation ,2006 (and previous Air Quality Guideline Reports 1999 & 2000)

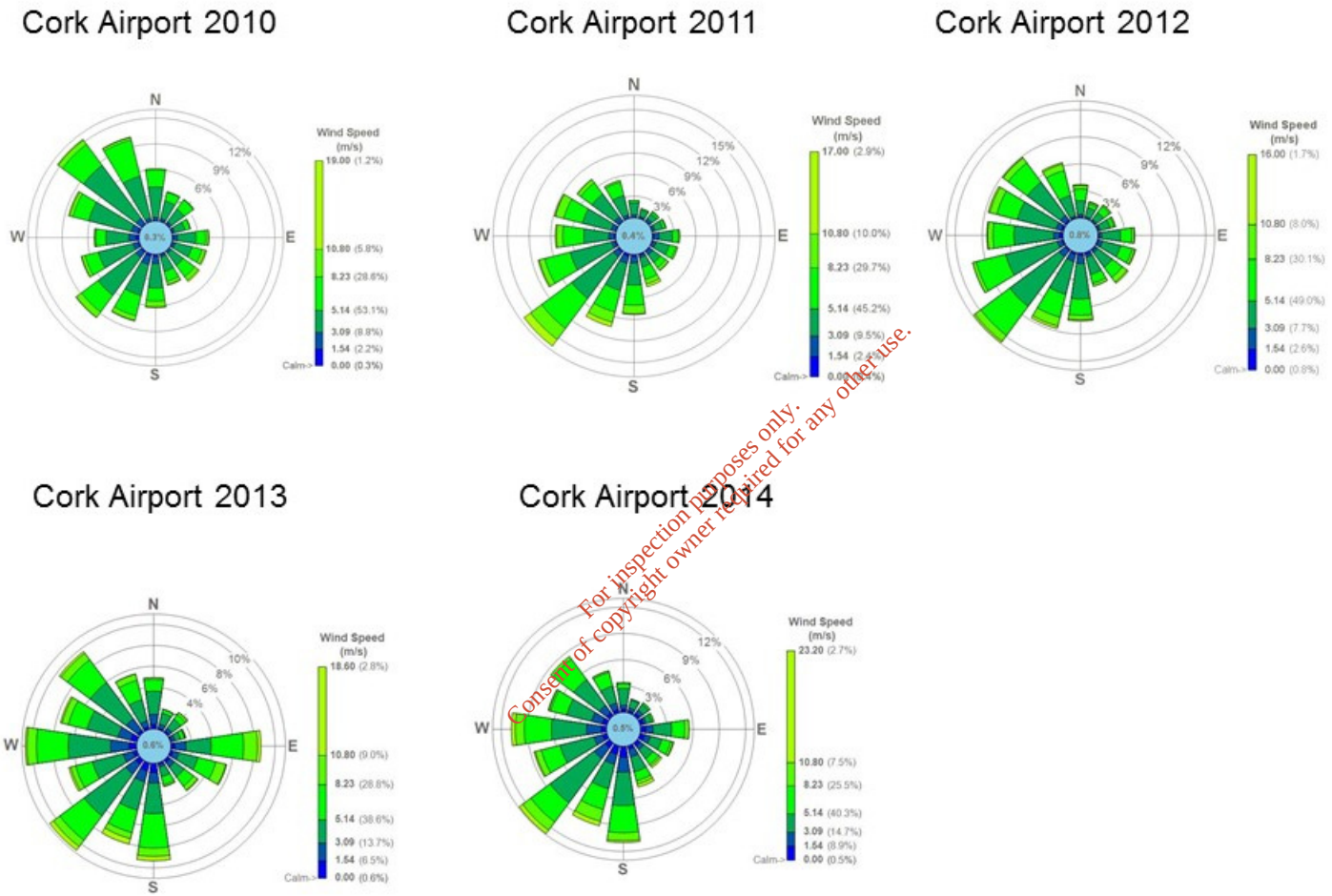

Figure 9.2 Cork Airport Windrose 2010 - 2014

9.3.2 TRENDS IN AIR QUALITY

Air quality is variable and subject to both significant spatial and temporal variation. In relation to spatial variations in air quality, concentrations generally fall significantly with distance from major road sources[Error! Bookmark not defined.]. Thus, residential exposure is determined by the location of sensitive receptors relative to major roads sources in the area. Temporally, air quality can vary significantly by orders of magnitude due to changes in traffic volumes, meteorological conditions and wind direction.

The impacts of the development were fully assessed by air dispersion modelling (UK DETR, 1998) which is the most practical tool for this purpose. The baseline environment will also have been assessed using modelling, since the use of the same predictive technique for both the *'do-nothing'* and `*do-something'* scenario will minimise errors and allow an accurate determination of the relative impact of the development.

In 2011 the UK DEFRA published research[50] on the long term trends in NO_2 and NO_x for roadside monitoring sites in the UK. This study marked a decrease in NO_2 concentrations between 1996 and 2002, after which the concentrations stabilised with little reduction between 2004 and 2010. The result of this is that there now exists a gap between projected NO_2 concentrations which UK DEFRA previously published and monitored concentrations. The impact of this 'gap' is that the DMRB screening model can under-predict NO_2 concentrations for predicted future years. Subsequently, the UK Highways Agency (HA) published an Interim advice note (IAN 170/12)[51] in order to correct the DMRB results for future years.

9.3.3 EPA MONITORING DATA AND BACKGROUND CONCENTRATIONS

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality "Air Quality Monitoring Annual Report 2015", details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes. Dublin is defined as Zone A and Cork city and its surrounding areas as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000 is defined as Zone D. In terms of air monitoring, the site of the proposed development is categorised as Zone D.

Long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

NO_2 monitoring was carried out at two rural Zone D locations in 2015, Emo and Kilkitt and in two urban areas, Enniscorthy and Castlebar. The NO_2 annual average in 2015 for both rural sites was 2.5 µg/m^3 with the results for urban stations averaging 8.5 µg/m^3. Hence long-term average concentrations measured at all locations were significantly lower than the annual average limit value of 40 µg/m^3. The average results over the last four years at a range of urban Zone D locations suggests an upper average of no more than 11 µg/m^3 as a background concentration as shown in Table 9.5.

Table 9.5 Annual Mean NO_2 Concentrations at Zone D Locations (2012-2015) (µg/m^3)

Year	Enniscorthy	Kilkitt	Emo	Castlebar
2012	-	4	-	8
2013	-	4	4	11
2014	13	3	3	8
2015	9	2	3	8
Average	11	3	3	8

[50] UK DEFRA (2011) Trends in NO_x and NO_2 emissions and ambient measurements in the UK

[51] UK Highways Agency (2012) Updated air quality advice on the assessment of future NOx and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality

The results of CO monitoring carried out at Enniscorthy (Zone D) in 2015 and 2014 showed no exceedances of the 8-hour limit value, with average levels of 0.5 and 0.4 mg/m^3 respectively. Prior to 2014, Zone D monitoring was carried out at Shannon town. Based on the above information, a conservative estimate of the background CO concentration for the region of the proposed development in 2017 is 0.5 mg/m^3.

In terms of benzene, there are no zone D monitoring stations however the average annual mean concentration in the Zone C locations of Mullingar and Kilkenny for the period 2012 to 2015 was 0.20 µg/m^3. This is well below the limit value of 5 µg/m^3**Error! Bookmark not defined.**. Based on this EPA data, a conservative estimate of the background benzene at MSD in 2017 is 0.2 µg/m^3.

Long-term PM_{10} monitoring was carried out at the urban Zone D locations of Castlebar, Kilkitt, Enniscorthy and Claremorris in 2015. The maximum 24-hour concentration (as a 90th%ile) at each of the Zone D locations is shown in Table 9.6. The long-term average of the 90.4th%ile of 24-hour concentrations is 23.1 µg/m^3. The average annual mean concentration measured is 13.4 µg/m^3 **Error! Bookmark not defined.**. The average results over the last four years at a range of Zone D locations suggest an upper average of 13.4 µg/m^3 as a background concentration as shown in Table 9.6.

Table 9.6 Annual Mean PM_{10} Concentrations in Zone D Locations (2013-2015) (µg/m^3)

Year	Claremorris	Kilkitt	Enniscorthy	Castlebar
2012	10	9	-	12
2013	13	11	-	15
2014	10	9	22	12
2015	10	9	18	13
Average	11.0	9.4	20.0	13.2

The results of $PM_{2.5}$ monitoring at Claremorris (Zone D) in 2015 indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.6. Based on this information, a conservative ratio of 0.6 was used to generate a rural background $PM_{2.5}$ concentration of 8.0 µg/m^3.

Background concentrations for the Base Year 2017, Opening Year 2018 and Design Year 2033 will be calculated for the EIS assessment. These will use 2015 background concentrations and the year on year reduction factors provided by TII in the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes and UK Defra's LAQM.TG(16) to generate background concentrations for the aforementioned years.

9.3.4 RECEPTOR LOCATIONS

Traffic data used for the DMRB assessment is shown in Table 9.7. The receptors (as shown in Table 9.8 and Figure 9.3) modelled represent the worst-case locations close to the proposed development and were chosen due to their close proximity (within 200 m) to the road links impacted by the proposed development.

Table 9.7 Traffic Data Used In The Modelling Assessment

Road Name	Base Year	Do-Nothing		Do-Something		Speed (kph)
	2017	2018	2033	2018	2033	
L2235 West of Site	1934 (8.4%)	2031 (8.1%)	2341 (8.1%)	2161 (7.8%)	2561 (7.8%)	50
L2235 East of Site	3213 (5.1%)	4023 (4.4%)	4548 (4.4%)	5374 (3.5%)	5896 (3.5%)	50
Site Access	1544 (0%)	2396 (1%)	2396 (1%)	4177 (0.6%)	3720 (0.6%)	50
The Grove	5499 (3.7%)	6051 (3.5%)	6955 (3.5%)	6846 (3.2%)	7963 (3.2%)	50
Macroom Rd	4702 (3.6%)	4897 (3.5%)	5670 (3.5%)	5151 (3.4%)	6157 (3.4%)	50
L2236	1514 (5.1%)	1674 (4.8%)	1921 (4.8%)	1905 (4.3%)	2209 (4.3%)	50
N71 North	15964 (6.7%)	16239 (6.7%)	18824 (6.7%)	16554 (6.6%)	19973 (6.6%)	50
N71 South	15625 (6.8%)	15831 (6.8%)	18361 (6.8%)	16054 (6.7%)	19407 (6.7%)	50

Table 9.8 Description of Sensitive Receptors

Name	Receptor Type	UTM Zone 29 N	
		X	Y
R1	Residential	520206	5737655
R2	Residential	520798	5737063
R3	Residential	518583	5733887
R4	Residential	519919	5736278
R5	Residential	521690	5738046

Figure 9.3 Receptor Locations

9.4 PREDICTED IMPACTS

9.4.1 CONSTRUCTION PHASE - AIR QUALITY

When the dust minimisation measures detailed in the mitigation section of this Chapter are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors.

9.4.2 OPERATIONAL PHASE – LOCAL AIR QUALITY

9.4.2.1 "Do Nothing" Modelling Assessment

CO and Benzene

The results of the "do nothing" modelling assessment for CO and benzene in the opening and design years are shown in Table 9.13 and Table 9.14. Concentrations are well within the limit values at all worst-case receptors. Levels of both pollutants reach at most 21% of the respective limit values in 2018 and 2033.

PM_{10}

The results of the "do nothing" modelling assessment for PM_{10} in the opening and design years are shown in Table 9.11. Concentrations are well within the annual limit value at all worst-case receptors. In addition, the 24-hour PM_{10} concentration of 50 µg/m^3, which can only be exceeded 35 times per year within the limit, is found to be in compliance at all receptors with no predicted exceedances. Annual average PM_{10} concentrations are no more than 38% of the limit value in 2018 and 2033.

$PM_{2.5}$

The results of the "do nothing" modelling assessment for $PM_{2.5}$ in the opening and design years are shown in Table 9.12. The predicted concentrations at all worst-case receptors are well below the $PM_{2.5}$ limit value of 25 µg/m^3. The annual average $PM_{2.5}$ concentration peaks at 39% of the limit value in 2018 and 2033.

NO_2

The results of the "do nothing" assessment of annual average NO_2 concentrations in the opening and design years are shown in Table 9.9 for the Highways Agency IAN 170/12 and Table 9.10 using the Defra technique respectively. The purpose of IAN 170/12 was to account for the conclusions of UK Defra's advice on long term trends in that there is now a gap between current projected vehicle emission reductions and projections on the annual rate of improvements in ambient air quality as previously published in Defra's technical guidance and observed trends. Hence the projections calculated via the IAN 170/12 technique show a slower than previously predicted reduction between the base year and future year predictions. The concentrations are below the limit value at all locations, with levels reaching at most 29% of the limit value in 2018 and reducing to 27% by 2033, using the more conservative IAN prediction.

The hourly limit value for NO_2 is 200 µg/m^3 and is expressed as a 99.8th percentile (i.e. it must not be exceeded more than 18 times per year). The maximum 1-hour NO_2 concentrations for the "do nothing" scenario are not predicted to exceed the relevant limit value in 2018 or 2033.

9.4.2.2 "Do Something" Modelling Assessment

CO and Benzene

The results of the modelled impact of the development for CO and benzene in the opening and design years are shown in Table 9.13 and Table 9.14 respectively. Predicted pollutant concentrations with the proposed development in place are below the ambient standards at all locations. Future trends indicate similarly low levels of CO and benzene. Levels reach at most 21% of the limit value in 2018 and 2033 for CO. For benzene, concentrations are less than 5% of the limit value in 2018 and 2033.

The impact of the proposed development can be assessed relative to "Do nothing" levels in 2018 and 2033. Relative to baseline levels, some imperceptible increases in pollutant levels at the worst-case receptors are predicted as a result of the proposed development. With regard to impacts at individual receptors, none of the five receptors assessed will experience an increase in concentrations of greater than 0.1% of the limit value in either 2018 or 2033 and thus the magnitude of the changes in air quality are imperceptible at all receptors based on the criteria outlined in Table 9.1 to Table 9.3 and the EPA Impact Classification Terminology.

The greatest impact on CO and benzene concentrations in either 2018 or 2033 will be an increase of 0.1% of their respective limit values at Receptor 4. Thus, using the assessment criteria for NO_2 and PM_{10} outlined in Appendix 9.2 and applying these criteria to CO and benzene, the impact of the proposed development in terms of CO and benzene is classed as imperceptible in both the short and long term.

PM_{10}

The results of the modelled impact of the proposed development for PM_{10} in the opening and design years are shown in Table 9.11. Predicted annual average concentrations in the region of the proposed development are below the ambient standards at all worst-case receptors. Levels are 38% of the limit value in 2018. In addition, the 24-hour PM_{10} concentration of 50 µg/m^3, which can only be exceeded 35 times per year, is found to be complied with at all receptors. No exceedances of the daily limit value for PM_{10} are predicted at any of the receptors modelled in 2018 and 2033. Future trends with the proposed development in place indicate similarly low levels of PM_{10}. Annual average PM_{10} concentrations are 39% of the limit value in 2033.

The impact of the proposed development can be assessed relative to "Do nothing" levels in 2018 and 2033. Relative to baseline levels, some imperceptible increases in PM_{10} levels at the worst-case receptors are predicted as a result of the proposed development. With regard to impacts at individual receptors, none of the five receptors assessed will experience an increase in concentrations of over 0.1% of the limit value in 2018 and 2033. Thus the magnitude of the changes in air quality are imperceptible at all receptors based on the criteria outlined in Appendix 9.2 and the EPA Impact Classification Terminology.

The greatest impact on PM_{10} concentrations in the region of the proposed development occurs in 2033 at receptor 4 where an increase of less than 0.1 % of the annual limit value or 0.04 $\mu g/m^3$ is predicted. Thus, using the assessment criteria outlined in Table 9.1 to Table 9.3 and the EPA Impact Classification Terminology the impact of the proposed development with regard to PM_{10} is imperceptible in both the short and long term at all five of the receptors assessed.

$PM_{2.5}$

The results of the modelled impact of the proposed development for $PM_{2.5}$ in the opening and design years are shown in Table 9.12. Predicted annual average concentrations in the region of the proposed development are below the ambient standard at all worst-case receptors. Levels are 39% of the annual limit value in 2018. Future trends with the proposed development in place indicate similarly low levels of $PM_{2.5}$. Annual average $PM_{2.5}$ concentrations are also 39% of the limit in 2033.

The impact of the proposed development can be assessed relative to "Do nothing" levels in 2018 and 2033. Relative to baseline levels, imperceptible increases in $PM_{2.5}$ levels at the worst-case receptors are predicted as a result of the proposed development. With regard to impacts at individual receptors, none of the five receptors assessed will experience an increase in concentrations of over 0.1% of the limit value in 2018 and 2033. Thus, the magnitude of the changes in air is imperceptible in both the short and long term at all receptors based on the criteria outlined in Table 9.1 to Table 9.3 and EPA impact classification terminology.

NO_2

The results of the assessment of the impact of the proposed development for NO_2 in the opening and design years are shown in Table 9.9 for the Highways Agency IAN 170/12 and Table 9.10 the Defra technique respectively. The annual average concentration is within the limit value at all worst-case receptors using both the Defra and more conservative IAN technique. Levels of NO_2 are 29% of the annual limit value in 2018 and 27% of the annual mean limit value in 2033 using the IAN technique concentrations. Lower values of 28% and 22% of the annual limit value in 2018 and 2033, respectively, were predicted using the Defra technique for the "Do-Something" scenarios. Maximum one-hour NO_2 levels with the proposed development in place are not predicted to exceed the limit value using either technique. The impact of the proposed development using the more conservative IAN technique on annual mean NO_2 levels can be assessed relative to "Do nothing" levels in 2018 and 2033. Receptor four is predicted to have the highest impact in each of the scenarios, however the impact is still considered imperceptible as it is less than 0.6% of the limit value. Relative to baseline levels, some imperceptible increases in pollutant levels are predicted as a result of the proposed development when using the IAN technique. With regard to impacts at individual receptors, none of the five receptors assessed will experience an increase in concentrations of over 0.6% of the limit value in 2018 and 2033. Thus, using the criteria outlined in Table 9.1 to Table 9.3 and the EPA Impact Classification Terminology, the impact of the proposed development in terms of NO_2 is imperceptible in both the short and long term at all receptors assessed.

Table 9.9 Predicted Annual Mean NO_2 Concentrations (µg/m^3)[52]

Receptor	Impact Opening Year (2018)					Impact Design Year (2033)				
	DM	DS	DS-DM	Magnitude	Description	DM	DS	DS-DM	Magnitude	Description
1	10.6	10.7	0.06	Imperceptible	Negligible Increase	9.8	9.9	0.13	Imperceptible	Negligible Increase
2	10.4	10.5	0.10	Imperceptible	Negligible Increase	9.6	9.8	0.15	Imperceptible	Negligible Increase
3	11.0	11.1	0.07	Imperceptible	Negligible Increase	10.2	10.4	0.16	Imperceptible	Negligible Increase
4	11.5	11.6	0.11	Imperceptible	Negligible Increase	10.8	11.0	0.22	Imperceptible	Negligible Increase
5	10.5	10.6	0.12	Imperceptible	Negligible Increase	9.7	9.9	0.17	Imperceptible	Negligible Increase

Table 9.10 Predicted Annual Mean NO_2 Concentrations (µg/m3)[53]

Receptor	Impact Opening Year (2018)					Impact Design Year (2033)				
	DM	DS	DS-DM	Magnitude	Description	DM	DS	DS-DM	Magnitude	Description
1	10.0	10.1	0.06	Imperceptible	Negligible Increase	7.5	7.6	0.10	Imperceptible	Negligible Increase
2	9.8	9.9	0.09	Imperceptible	Negligible Increase	7.3	7.4	0.11	Imperceptible	Negligible Increase
3	10.4	10.5	0.07	Imperceptible	Negligible Increase	7.9	8.0	0.12	Imperceptible	Negligible Increase
4	10.9	11.0	0.10	Imperceptible	Negligible Increase	8.4	8.6	0.17	Imperceptible	Negligible Increase
5	9.9	10.0	0.11	Imperceptible	Negligible Increase	7.4	7.5	0.13	Imperceptible	Negligible Increase

Table 9.11 Predicted Annual Mean PM_{10} Concentrations (µg/m^3)

Receptor	Impact Opening Year (2018)					Impact Design Year (2033)				
	DM	DS	DS-DM	Magnitude	Description	DM	DS	DS-DM	Magnitude	Description
1	14.9	14.9	0.01	Imperceptible	Negligible Increase	14.8	14.9	0.02	Imperceptible	Negligible Increase
2	14.9	14.9	0.02	Imperceptible	Negligible Increase	14.8	14.8	0.02	Imperceptible	Negligible Increase
3	15.0	15.0	0.01	Imperceptible	Negligible Increase	15.0	15.0	0.03	Imperceptible	Negligible Increase
4	15.1	15.1	0.02	Imperceptible	Negligible Increase	15.1	15.1	0.04	Imperceptible	Negligible Increase
5	14.9	14.9	0.02	Imperceptible	Negligible Increase	14.9	14.9	0.03	Imperceptible	Negligible Increase

[52] using IAN 170/12 V3 Long Term NO_2 Trend Projections
[53] using Defra's Technical Guidance

Table 9.12 Predicted Annual Mean $PM_{2.5}$ Concentrations (µg/m^3)

Receptor	Impact Opening Year (2018)					Impact Design Year (2033)				
	DM	DS	DS-DM	Magnitude	Description	DM	DS	DS-DM	Magnitude	Description
1	9.7	9.7	0.01	Imperceptible	Negligible Increase	9.6	9.7	0.01	Imperceptible	Negligible Increase
2	9.7	9.7	0.01	Imperceptible	Negligible Increase	9.6	9.6	0.01	Imperceptible	Negligible Increase
3	9.8	9.8	0.01	Imperceptible	Negligible Increase	9.7	9.7	0.02	Imperceptible	Negligible Increase
4	9.8	9.8	0.01	Imperceptible	Negligible Increase	9.8	9.8	0.02	Imperceptible	Negligible Increase
5	9.7	9.7	0.01	Imperceptible	Negligible Increase	9.7	9.7	0.02	Imperceptible	Negligible Increase

Table 9.13 Predicted Annual Mean CO Concentrations (µg/m^3)

Receptor	Impact Opening Year (2018)					Impact Design Year (2033)				
	DM	DS	DS-DM	Magnitude	Description	DM	DS	DS-DM	Magnitude	Description
1	2.04	2.04	0.003	Imperceptible	Negligible Increase	2.05	2.05	0.004	Imperceptible	Negligible Increase
2	2.04	2.05	0.005	Imperceptible	Negligible Increase	2.05	2.05	0.006	Imperceptible	Negligible Increase
3	2.08	2.08	0.004	Imperceptible	Negligible Increase	2.09	2.10	0.008	Imperceptible	Negligible Increase
4	2.11	2.11	0.006	Imperceptible	Negligible Increase	2.12	2.13	0.011	Imperceptible	Negligible Increase
5	2.05	2.06	0.007	Imperceptible	Negligible Increase	2.06	2.07	0.008	Imperceptible	Negligible Increase

Table 9.14 Predicted Annual Mean Benzene Concentrations (µg/m^3)

Receptor	Impact Opening Year (2018)					Impact Design Year (2033)				
	DM	DS	DS-DM	Magnitude	Description	DM	DS	DS-DM	Magnitude	Description
1	0.21	0.21	0.001	Imperceptible	Negligible Increase	0.21	0.21	0.001	Imperceptible	Negligible Increase
2	0.21	0.21	0.001	Imperceptible	Negligible Increase	0.21	0.21	0.001	Imperceptible	Negligible Increase
3	0.22	0.22	0.001	Imperceptible	Negligible Increase	0.22	0.22	0.002	Imperceptible	Negligible Increase
4	0.22	0.23	0.001	Imperceptible	Negligible Increase	0.23	0.23	0.002	Imperceptible	Negligible Increase
5	0.21	0.21	0.002	Imperceptible	Negligible Increase	0.21	0.22	0.002	Imperceptible	Negligible Increase

9.5 RESIDUAL IMPACTS

The results of the air quality & climate assessment show that the residual impacts of the proposed development on air quality & climate will be insignificant.

10 NOISE & VIBRATION

10.1 INTRODUCTION / METHODOLOGY

10.1.1 INTRODUCTION / SUMMARY

This chapter presents the assessment of the potential impact (for both construction and operational phases) of the proposed development which comprises the conversion of the existing Building 21 to a manufacturing building, and associated car-parking and contractors compound, in terms of noise and vibration. The assessment has been carried out with due consideration to the guidance contained in the EPA documents '*Guidelines on the Information to be contained in Environmental Impact Statements'* (EPA, 2002) and EPA '*Advice Notes on Current Practice in the Preparation of EIS*', 2003.

The characteristics of the proposed development have already been described in an earlier chapter of this Environmental Impact Statement. To avoid repetition a description of the development is not presented here.

In carrying out this assessment the potential noise and vibration impact from the proposed development to the receiving environment has been considered for two distinct phases. These are as follows;

- The short-term impact from the construction phase
- The long-term impact from the operational phase.

This assessment addresses the issue of potential environmental noise impact of the proposal on the nearby residential dwellings and the surrounding environment. Noise survey results in the vicinity of the proposed site and the closest nearby residences from recent independent noise surveys which were commissioned by MSD have been reviewed. These provide a 'snapshot' of the prevailing noise climate in the area. Noise levels were found to be typical of those expected for an area such as this.

Noise level criteria for the construction and operation of the proposed development were derived from accepted guidance[54] and MSD's existing IE Licence noise criteria. These noise criteria apply at the façades of the nearest noise sensitive locations, i.e. private properties in the vicinity of the proposed development.

Detailed information on the site layout, proposed buildings and mechanical services have all been used to predict the noise levels expected at the relevant noise sensitive locations. These have been assessed individually and cumulative impact has also been assessed where it is the case that noise sources will be operating simultaneously. The results have then been compared and assessed against the adopted noise criteria and MSD's existing IE Licence noise criteria.

In all cases, noise levels satisfy the adopted criteria and in summary, the noise impact of the proposed development is compliant with the adopted noise criteria.

10.1.2 METHODOLOGY

This assessment has been conducted using the following methodology;

- Review the existing ambient noise environment and in particular the noise at the nearest noise sensitive locations (NSLs) to the proposed development;

[54] British Standard *BS 5228-1:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites. Noise.*

- Set out appropriate noise and vibration criteria which the development should not exceed during both the construction and operational phase;
- Predict what the likely noise impact from the two phases will be at the nearest NSLs;
- Assess the predicted noise levels against the recommended assessment criteria;
- Where necessary, recommend suitable and practical mitigation measures to bring the predicted values in line with the recommended criteria.

10.2 RECEIVING ENVIRONMENT

The MSD site in Brinny, Innishannon, is situated in a rural part of West Cork. It is approximately 5-km to the north-west and 5-7 km to north of Innishannon and Bandon respectively. In the context of this noise and vibration impact assessment Figure 10.1 below provides an aerial view of Building 21 and the five nearest NSLs to the proposed development. The NSLs are all private dwellings and they are referenced as NSL 1 to 5 in this report. They are described in turn below;

NSL 1 is located approximately 180m to the east of Building 21 and 120m to the north east of the proposed new car park;
NSL 2 is located approximately 90m to the east of the temporary contractors' compound;
NSL 3 is located approximately 40m to the north of the temporary contractors' compound;
NSL 4 is located approximately 25m to the north west of the temporary contractors' compound;
NSL 5 is located approximately 50m to the west of the sustaining contractors' compound.

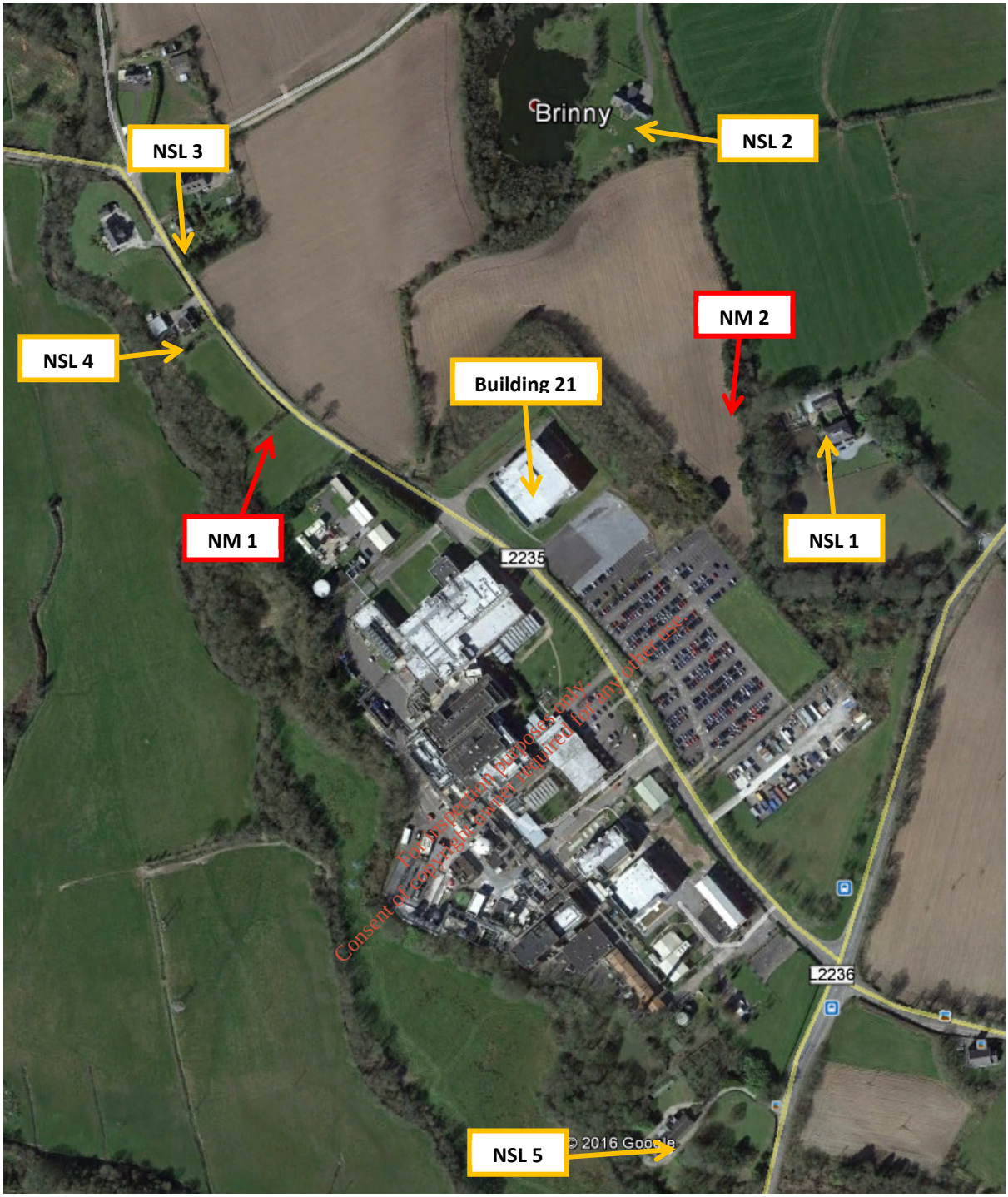

Figure 10.1 Aerial view of Building 21 and the nearest NSL.[55]

10.2.1 EXISTING NOISE ENVIRONMENT

This site is currently licensed by the Environmental protection Agency (EPA) and it operates in accordance with an Industrial Emissions (IE) licence (licence no. P0005-02) as issued by the EPA. One of the requirements of this licence is to have a noise survey carried out twice a year. To comply with this requirement, independent noise monitoring is carried out by Moloney & Associates (Acoustic and Environmental Consultants) on behalf of MSD.

[55] Google Earth (2017)

The results from two environmental noise survey reports carried out in 2016 by Moloney & Associates have been reviewed. These reports provide daytime and night-time noise levels for two locations referenced as NM1 and NM2. NM1 is approximately 85m to the south of a dwelling to the north of the site and NM2 is adjacent to the staff car park. The noise environment at NM1 and NM2 are considered to be representative of the noise environment at the nearest NSLs to the proposed development.

The daytime and night-time noise at NM1 and NM2 which were attributed to noise emissions from the MSD facility were between 40 to 42dB(A) and 41 to 42dB(A) and 39 to 40dB(A) and 41 to 42dB(A) respectively.

10.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

For a development of this nature the potential noise and vibration impact on the local receiving environment must be considered. There are two distinct stages and these consist of the short-term impact of the construction phase and the long-term impact of the operational phase.

As the building structure for the new process (Building 21) is already present the construction phase will involve the

- Installation of new stairs, elevators and modular electrical and computer rooms external to the facility
- Installation of roof mounted plant associated with servicing the building such as Air Handling Units and Chilled Water plant
- Connection of utilities from the existing plant to B21
- Internal fitout of the building to include serviced clean rooms and equipment
- the removal of topsoil and the groundworks for the preparation of a temporary construction compound,
- The relocation of an existing contractors compound to a new location
- and preparation of the associated car park to accommodate any extra vehicles.

The primary sources of noise in the operational context will be deemed long-term and are broken down as follows;

- Building services noise;
- Car parking on site;
- Additional vehicular traffic on public roads.

10.4 SETTING APPROPRIATE NOISE & VIBRATION CRITERIA

10.4.1 CONSTRUCTION PHASE - NOISE

There is no published Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and set down noise limits to which construction activities must not exceed.

For the purposes of this assessment and in the absence of specific noise limits appropriate criteria has been adopted from the following document;

- British Standard *BS 5228-1:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites. Noise.*

In accordance with the methodology set out in this standard, the appropriate noise criteria for which the total noise (total noise = existing ambient noise + construction noise) should not exceed at the nearest noise sensitive location (NSL) is based on the existing ambient noise. The measured existing ambient noise is compared against the three categories, A – C, in the Standard and based on this, the recommended limit which the construction noise should not exceed at the NSL is determined.

Table E1 from the Standard is summarised below to demonstrate the methodology for selecting the construction noise criteria for this development.

Table 10.1 Summary of Table E.1 from BS 5228-1:2009+A1:2014.

Period	Threshold Value – dB		
	Category A	Category B	Category C
Night-time (2300hrs - 0700hrs)	45	50	55
Evenings & Weekends	55	60	65
Daytime (0700hrs – 1900hrs) & Saturdays (0700hrs – 1300hrs)	65	70	75

Note 1: a significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the category appropriate to the ambient noise level.

Note 2: if the ambient noise levels exceed the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3dB due to construction activity.

Note 3: applied to residential receptors only.

Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A values.
Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Category A values.

It is assumed that construction will only take place between 07:30hrs to 20:00hrs Monday to Friday and from 07:30hrs to 13:00hrs on Saturdays.

Based on the procedure described above and the noise data from the two 2016 independent environmental noise surveys, the adopted noise level for which the existing ambient and construction noise should not exceed at the NSLs is detailed in Table 10.2 below.

Table 10.2 Construction Noise Criteria at the NSL.

Location - Daytime	Rounded Noise Level - dB	Category	Construction Noise Limit - dB
Nearest NSLs	45	A	65
Location – Night time	**Rounded Noise Level - dB**	**Category**	**Construction Noise Limit - dB**
Nearest NSLs	45	n/a	No Planned Construction Activity at Night

10.4.2 CONSTRUCTION PHASE - VIBRATION

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

It is acknowledged that humans are particularly sensitive to vibration stimuli and the threshold of perception is typically in the range of 0.14mm/s to 0.3mm/s and may cause annoyance at higher magnitudes.

Guidance relevant to acceptable vibration within buildings is contained in the following document:

- British Standard *BS 5228-1:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites. Vibration.*

Table 10.3 below sets out the transient vibration guide values for cosmetic damage as detailed within BS 5228.

Table 10.3 Peak particle velocities (ppv in mm/s)[56]

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and Above
Reinforced or Framed Structure	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
Industrial and Heavy Commercial Buildings		
Unreinforced or Light Framed Structures	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Residential or Light Commercial Buildings		

The potential for vibration at the nearest NSL during construction is typically limited to excavation works and lorry movements on uneven road surfaces. From the level of construction work envisaged for this project and due to the distance between the site and the nearest NSL there is extremely little likelihood that any form of vibration from the project will be detected at the NSL.

10.4.3 OPERATIONAL PHASE

As previously discussed this site operates in accordance with an IE licence. The noise conditions set down in this licence, which the facility should not exceed at the nearest NSL, are detailed in Table 10.4 below.

Table 10.4 MSD Brinny, IE Licence noise criteria.

Daytime (0800 – 2200) – dB(A) $L_{eq\ 30mins}$	Night-time (2200 – 0800) – dB(A) $L_{eq\ 30mins}$
55	45

In summary, the combined noise from the existing MSD facility and the proposed development should not exceed 55dB(A) and 45dB(A) daytime and night-time respectively at the nearest NSL.

[56] British Standard *BS 5228-1:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites. Vibration.*

10.5 NOISE PREDICTION METHODOLOGY

Prediction calculations for building services plant have been conducted generally in accordance with ISO 9613: *Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation, 1996.*

Traffic noise levels are predicted in accordance with guidance set out in *Calculation of Road Traffic Noise (CRTN)*[57], giving results in the form of $L_{10(18hour)}$ values.

The formula for calculating the sound pressure (L_p) based on the sound power (L_w) of the plant noise is as follows;

$L_p = L_W - 20 \, Log \, r - 11 + D$

Where;

L_p *is the sound pressure*
L_W *is the sound power;*
r is the distance to the receiver;
D is the directivity index.

The formula for calculating the L_p of a point source at a receiver based on the level of attenuation due to distance is based on the Inverse Square Law and it is as follows;

$L_{pr} = L_{ps} - 20 \, Log \, (D2/D1)$

Where;

L_{pr} *is the sound pressure level at the receiver;*
L_{ps} *is the sound pressure level at the source;*
D1 is the distance from the source;
D2 is the distance to the receiver.

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 10.5 offers guidance as to the likely impact associated with any particular change in traffic noise level.

Table 10.5 Likely impact associated with change in traffic noise level.

Change in Sound Level (dB L_{A10})	Subjective Reaction	Impact
< 3	Inaudible	Imperceptible
3 – 5	Perceptible	Slight
6 – 10	Up to a doubling of loudness	Moderate
11 – 15	Over a doubling of loudness	Significant
> 15		Profound

10.5.1 NOISE IMPACT FROM THE CONSTRUCTION PHASE

The noise impact during the construction phase will emanate from four areas and these are; the construction works associated with B21 – mainly internal but there are some minor external works - construction of the car park, the temporary construction contractors' compound to the north of the site and the permanent (sustaining) contractors' compound to the south of site. It is understood that the contractors' compounds will be largely used for the set down of vehicles and plant. The temporary contractors compound will only be in use for the duration of this proposed development whereas the sustaining compound will remain use for the operational phase. The layouts of both the

[57] *Calculation of Road Traffic Noise*, Department of Transport Welsh Office, HMSO, 1988

temporary and permanent contractors' compounds are shown in Section 4 and the noise impact from each of these three areas is assessed in turn below.

Building 21 Construction Work

Building 21 has already been constructed but there will be some light construction works taking place prior to and during the commissioning phase. While most of these will take place internally with minimal disruption to the external noise environment there will at times be some light construction work taking place on the outside of Building 21. Noise levels from typical plant items which are set out in *BS 5228-1:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites – Noise,* the noise during the construction phase has been predicted at the nearest NSL (NSL 1) which at the nearest point is 180m from Building 21. These values which are set out in Table 10.6 below are predicted to be 54dB(A) at NSL 1.

Temporary Construction Contractors' Compound

It is proposed to create a 5m high earth embankment to the north and part of the east perimeter of the temporary contractors' compound to provide a degree of noise attenuation. The NSLs which are closest to this compound are NSLs 2, 3 and 4. This compound will typically be used for the set down of construction vehicles and the storage of plant items during the daytime periods. To put forward a worst-case scenario in terms of noise impact, the noise level from a Heavy Goods Vehicle (HGV) vehicle at a distance of 10m in a typical service yard is of the order of 67dB $L_{Aeq,30mins}$ during the daytime, and this forms part of the assessment.

Taking this value of 67dB(A) into account and assessing it at NSL 2, 3 and 4 this equates to noise levels of 43, 50 and 59dB(A) respectively.

Permanent (Sustaining) Contractors' Compound

The NSL which is closest to this compound is NSL 5. This compound will typically be used for the set down of construction vehicles and the storage of plant items during the daytime periods. To put forward a worst-case scenario in terms of noise impact, the noise level from a HGV vehicle at a distance of 10m in a typical service yard is of the order of 67dB $L_{Aeq,30mins}$ during the daytime, and this has been assessed.

Taking this value of 67dB(A) into account and assessing it at NSL 5 this equates to a noise level of 53dB(A).

Car Park Construction

Various noise generating plant items, such as dumper trucks, compressors and generators will be in use for some periods during the construction phase. There will be vehicular movements to and from the site that will make use of existing roads.

Due consideration has been given to the construction programme for this project. Carpark and Compound Installation Construction duration is indicative 3-6 months in duration. From this document and the noise levels from typical plant items which are set out in *BS 5228-1:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites – Noise,* the noise during the construction phase has been predicted at the nearest NSL (NSL 1) which at the nearest point is 120m from the proposed car park. These predicted values are set out in Table 10.6 below.

It should be noted that this is a worst case assessment and for the majority of the time, plant and equipment will be at a greater distance from the boundary and consequently the impact will be less at the NSL.

Table 10.6 Typical noise levels at nearest NSL during different construction phases.

Phase	Plant Item (BS 5228 Ref.)	Plant Noise Level at 10m Distance[58] (dB L_{Aeq})	Predicted Noise Level at NSLs (dB $L_{Aeq,30mins}$)				
			NSL1	NSL2	NSL3	NSL4	NSL5
Building 21 Construction Phase	Tower Crane (C4.48)	76	54	52	51	51	43
	Compressor (D7.17)	62					
	Pneumatic Circular Saw (D7.79)	75					
	Diesel Generator (C4.76)	61					
Car Park & Compound Relocation (Initial Site Prep Works)	Dumper (D7.82)	63	57	48	45	43	49
	Tracked excavator (D3.108)	69					
	Dump Truck (D9.38)	76					
	Diesel Generator (C4.76)	61					
Car Park & Compound Relocation (General Construction Works)	Compressor (D7.17)	62	60	51	48	46	52
	Tower Crane (C4.48)	76					
	Truck Mounted Concrete Pump & Boom (C4.31)	75					
	Articulated lorry (D7.121)	70					

[58] Sound Pressure Level data from *BS 5228-1:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites. Noise.*

Phase	Plant Item (BS 5228 Ref.)	Plant Noise Level at 10m Distance[58] (dB L_{Aeq})	Predicted Noise Level at NSLs (dB $L_{Aeq,30mins}$)				
			NSL1	NSL2	NSL3	NSL4	NSL5
	Pneumatic Circular Saw (D7.79)	75					
Roadworks / Landscaping	Surfacing (D8.25)	68	52	42	39	37	44
Temporary Contractors' Compound (Operational)		67	40	43	50	59	29
Sustaining Contractor's Compound (Operational)			34	31	26	26	53

The predicted noise levels for the construction phase are all within the adopted criterion of 65dB $L_{Aeq,30mins}$ for construction activities in accordance with the guidance contained within BS 5228-1: 2009: *Code of practice for noise and vibration control on construction and open sites.*

10.5.2 NOISE IMPACT FROM THE OPERATIONAL PHASE

The three sources of noise from the operational phase are as follows;

- Building services plant;
- Car parking on site;
- Permanent (Sustaining) Contractors' Compound; and
- Additional vehicular traffic on public roads.

Each of these primary noise sources is addressed in turn.

Note: that there are no significant sources of vibration associated with the operational phase of the proposed development.

Building Services Plant

The main noise sources associated with this project are the roof mounted air handling units (AHU) and the chiller unit. It has been confirmed that the proposed development has allowed for 8 X AHU units and 1 X chiller unit. There may be some intermittent sources of noise associated with operation of the building such as deliveries of liquid nitrogen which will occur periodically and will be limited in duration. It should also be noted that the liquid nitrogen deliveries will only take place during the daytime periods.

For the assessment and to represent a worst case scenario it has been assumed that these units will operate 24 hours a day. The supplier's data for the AHUs and the chiller have been used to assess the noise level from them at the nearest NSL. This noise level (taking into account attenuation over distance and the screening provided from the 3.5 m roof parapet) is predicted to be 37dB(A) at NSL 1.

The noise during the liquid nitrogen charging process, which is the only noise emitting activity from this process, is understood to be 80dB(A) at 1m. This noise level (taking into account attenuation over distance) is predicted to be 35dB(A).

Taking the value of 37dB(A) from the AHUs and the chiller unit and the value of 35dB(A) from the nitrogen charging process (which will only occur periodically and during the day) into account along with the highest existing value of 42dB(A) from the previous noise survey results, results in a combined value of 44dB(A) during the daytime period. This value, which represents worst case scenario, satisfies compliance with MSD's daytime IE noise criteria.

Taking the value of 37dB(A) from the AHUs and the chiller unit into account along with the highest existing value of 42dB(A) from the previous noise survey results, results in a combined value of 43dB(A) during the daytime period. This value, which represents worst case scenario, satisfies compliance with MSD's night time IE noise criteria.

In summary, the likely noise impact of building services noise on the local environment is not significant.

Car Parking on Site

Surface car parking is provided for the proposed development. This will be 120m at the closest point from the nearest NSL. Noise level measurements have previously been carried out in the vicinity of surface car parks in support of other planning applications. The typical noise level 10 meters beyond the boundary of these surface car parks during busy daytime periods has been found to be of the order of 48dB $L_{Aeq\ 30mins}$.

Taking into consideration the appropriate corrections for distance and the presence of nearby reflecting surfaces, the noise level at the façade of the nearest noise-sensitive location, (i.e. NSL 1 - nearest dwelling to the east at a distance of approximately 120m from the car park) from the car park activity alone is predicted to be 26dB L_{Aeq}. This is the predicted contribution of the car-parking activity to the overall noise level experienced at the receptor. This level, when assessed in combination with the existing site noise and the noise from the proposed building, is 42dB. This complies with MSD's daytime and night-time IE noise criteria.

Therefore, no mitigation measures are required in respect of car parking noise.

Sustaining Contractors' Compound

The NSL which is closest to this compound is NSL 5. This compound will typically be used for the set down of construction vehicles and the storage of plant items during the daytime periods only. To put forward a worst case scenario in terms of noise impact the noise level from a HGV vehicle at a distance of 10m in a typical service yard is of the order of 67dB $L_{Aeq,30mins}$ during the daytime.

Taking this value of 67dB(A) into account and assessing it at NSL 5 this equates to a noise level of 53dB(A). Taking the value of 53dB(A) from the contractor's compound into account along with the existing value of 43dB(A) from the previous noise survey results, results in a combined value of 53dB(A).

This value will satisfy compliance on MSD's daytime noise criteria of 55dB(A) and therefore no mitigation measures are required.

Additional Vehicular Traffic on Public Roads

The proposed development will introduce some additional traffic onto public roads in the locality of the site. Traffic flow calculation prediction results have been provided for the proposed development during the construction phase and the operational phase for the years 2018, 2023 and 2033.

Based on this information the likely increase in noise associated with the increase in traffic is presented in Table 10.7 below.

Table 10.7 Likely increase in noise from additional road traffic.

Junction Road	Increase in Noise Level - dB			
	Construction 2017	Operational Year 2018	Operational Year 2023	Operational Year 2033
L2235 West of Site	< 1	< 1	< 1	< 1
L2235 East of Site	1	< 1	< 1	< 2
Site Access	2	<2	<2	<2
The Grove	< 1	< 1	< 1	< 1
Macroom Rd	< 1	< 1	< 1	< 1
L2236	< 1	< 1	< 1	< 1
N71 North	< 1	< 1	< 1	< 1
N71 South	< 1	< 1	< 1	< 1

The predicted increase in noise levels along all of the junctions assessed due to additional vehicular traffic associated with the proposed development are typically less than 1dB but at most less than 2dB. Reference to Table 10.5 confirms that increases of this order are imperceptible and the associated noise impact is therefore not significant.

Cumulative Impact

Table 10.9 below summarises the predicted noise impact from the various noise sources at the relative nearest noise sensitive location during the operational phase. This table takes into account the contributions from the existing facility and from the additional vehicular traffic as a result of the proposed development.

Table 10.8 Assessment operational noise against the IE Licence daytime criteria

Description	Predicted Cumulative Noise Level at Nearest NSL (dB $L_{Aeq,30mins}$)		Noise Criteria – dB(A)	Compliant – Y/N
	NSL 1	NSL 5		
Building 21 Services Plant	43	43	55	**Y**
Car Parking on Site				
Additional Vehicular Traffic on Public Roads				
Sustaining Contractors' Compound	N/A	53		**Y**

Table 10.9 Assessment of operational noise against the IE Licence night-time criteria

Description	Predicted Cumulative Noise Level at Nearest NSL (dB $L_{Aeq,30mins}$)		Noise Criteria – dB(A)	Compliant – Y/N
	NSL 1	NSL 5		
Building 21 Services Plant	43	43	45	Y
Car Parking on Site				
Additional Vehicular Traffic on Public Roads				

10.6 AMELIORATIVE, REMEDIAL OR REDUCTIVE MEASURES

The findings of this noise and vibration assessment indicate that the construction and operational phases will satisfy the relevant noise criteria however, notwithstanding this and in order to ensure the process is undertaken without any adverse impact a schedule of noise control measures has been formulated for both construction and operational phases.

10.6.1 CONSTRUCTION PHASE

With regard to construction activities, reference will be made to *BS 5228-1:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites - noise*, which offers detailed guidance on the control of noise and vibration from demolition and construction activities. In particular, it is proposed that various practices be adopted during construction, including:

- limiting the hours during which site activities likely to create high levels of noise are permitted;
- establishing channels of communication between the contractor/developer, and residents etc.;
- limit traffic within the contractors' compounds to 10km/hr;
- inform contractors and visitors to the site as part of induction to be aware and considerate of the low noise environment associated with the area and of the nearest dwellings;
- all site access roads will be kept even so as to mitigate the potential for vibration from lorries
- Modular Construction with Offsite Fabrications will be used where possible to minimise site works
- Carpark and Compound area excavation materials will be relocated where possible within existing site to form berm areas thus minimising haulage offsite
- Contractor Compounds utilise modular containers and cabins and minimise site assembly works

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed, including:

- selection of plant with low inherent potential for generation of noise and / or vibration;
- erection of barriers as necessary around noisy processes and items such as generators heavy mechanical plant or high duty compressors;
- locating noisy / vibratory plant as far away from sensitive properties as permitted by site/ building constraints and the use of vibration isolated support structures where necessary.

10.6.2 OPERATIONAL PHASE

Building 21 Services Plant
Based on the specifications of roof mounted equipment in relation to noise and the height of the parapet the recommended operational noise limits are not exceeded.

However, it is envisaged that the following forms of noise control techniques may need to be employed in order to attain these limits at noise sensitive facades within the development, the project will take measures to reduce noise impacts which include the following:

- duct mounted attenuators on the atmosphere side of air handling units;
- Parapet on roof area has been increased 500mm to provide noise attenuation
- splitter attenuators or acoustic louvres providing free ventilation to internal plant areas;
- solid barriers screening any external plant.
- anti-vibration mounts on all reciprocating plant, equipment has been specified to minimise noise generation

Car Parking on Site
The noise impact assessment outlined in the previous section has demonstrated that mitigation measures are not required.

Permanent (Sustaining) Contractors' Compound
The project will take measures to reduce noise impacts which include the following:

- Workshops are located within the Sustaining Compound in order to minimise noise levels at closest NSL.

Additional Vehicular Traffic on Public Roads
The noise impact assessment outlined in the previous section has demonstrated that mitigation measures are not required.

10.7 RESIDUAL IMPACTS

This section summarises the likely residual noise and vibration impacts associated with the proposed development, taking into account the mitigation measures.

10.7.1 CONSTRUCTION PHASE

Given that the construction phase of the development is temporary in nature, it is expected that the various noise sources will not be excessively intrusive. Furthermore, the application of binding noise limits, which have been detailed in Section 10.4 of this document, along with implementation of appropriate noise and vibration control measures and appropriate selection of plant with low noise emissions will ensure that noise and vibration impact is kept to a minimum.

10.7.2 OPERATIONAL PHASE

Building 21 Services Plant
The assessment has indicated that the cumulative noise from the proposed development and the existing site will satisfy MSD's IE licence noise criteria. Furthermore, the predicted increase in noise from the proposed site when considered along with the existing noise environment is not anticipated to be perceptible.

Car Parking on the Site
The predicted noise impact associated with car parking activities at the proposed car park for the proposed development is not predicted to exceed MSD's IE noise criteria when assessed cumulatively with the noise from the existing site and the proposed development.

Sustaining Contractors' Compound

The predicted noise impact associated with the sustaining contractors' compound to the south is not predicted to exceed MSD's IE noise criteria when assessed cumulatively with the noise from the existing site and the proposed development.

Additional Vehicular Traffic on Public Roads

The predicted increase in noise levels along all of the junctions assessed due to additional vehicular traffic associated with the proposed development is less than 2dB. The resultant noise impact is therefore not significant.

Cumulative Impact

The cumulative impact of the all noise sources taken together will be within applicable IE Licence limit

11 LANDSCAPE & VISUAL IMPACT

11.1 INTRODUCTION

This landscape and visual impact assessment has been prepared to identify and assess the effects on the appearance and character on the local environs arising from the proposed development.

It analyses the existing landscape character and significance, and provides an evaluation of the potential for landscape and visual impacts of the development. The assessment is made having regard to the vulnerability of the landscape to change and to the location of visual receptors relative to the proposed development.

The main landscape features and landscape character areas were identified through a combination of site visit and documentation surveys.

Landscape impacts were analysed based on:

- The capacity of the existing landscape to absorb the proposed development;
- Effects on landscape character and features (e.g. removal or alteration);
- Proximity of sensitive viewpoints (e.g. routes) and visual receptors;
- The details of the development.

Visual impacts are evaluated taking account of:

- The potential level of visual intrusion (i.e. effect impinged upon a view);
- The potential for visual impact dependant on the proximity and elevation of structures to a sensitive viewpoint/visual receptor.

The County Development Plan was consulted to identify Landscape Character Areas and significant landscape features as well as designated Scenic Routes and Landscape. Related provisions of the Plan – such as the proximity of Protected Structures to the site, were also considered.

11.2 THE PROPOSED DEVELOPMENT

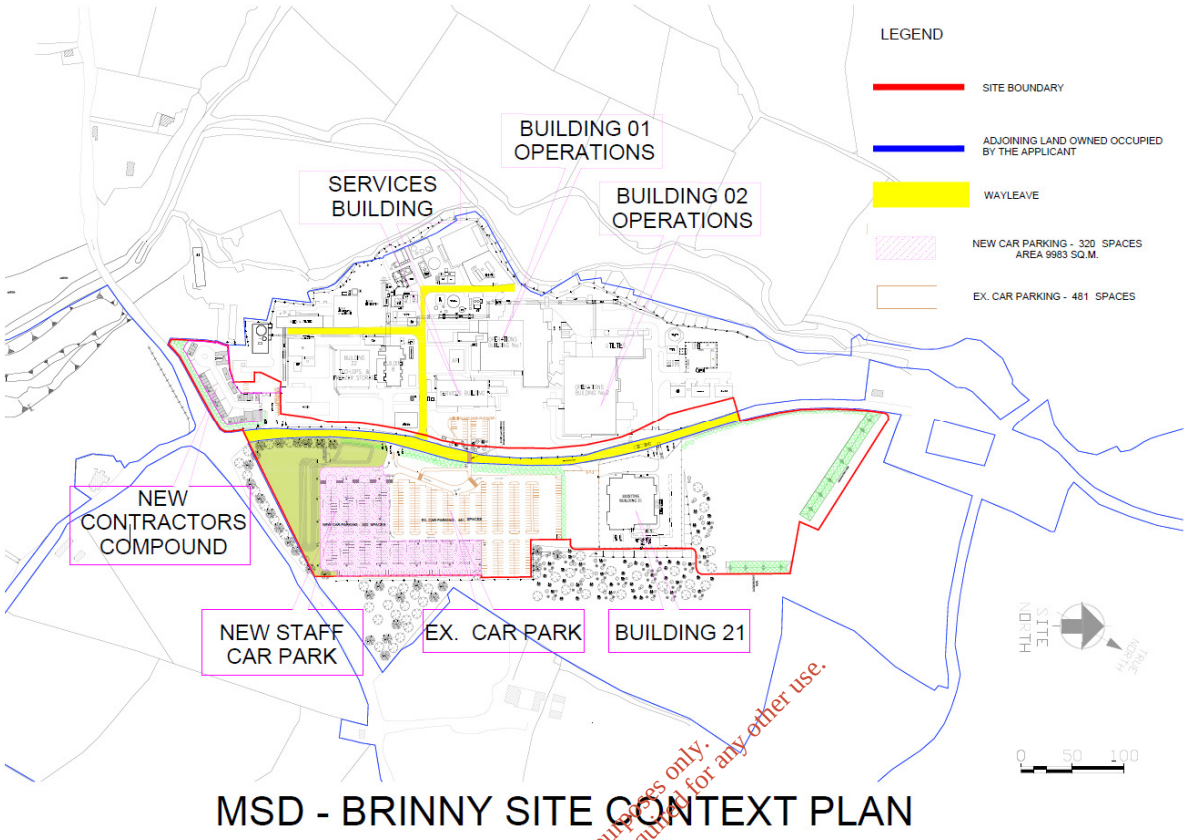

Figure 11.1 Site layout plan illustrating the location of the existing B21 building on site

A full development description is included in section 4 of this document. In summary, the proposed development consists of:

- Repurposing the existing B21 to a new bio-pharmaceutical facility for vaccine production. This will result in minor changes to the external envelope of the existing building consisting of new windows, opes and an entrance lobby.
- Additional car parking provision

11.3 RECEIVING ENVIRONMENT

The subject site is located around 27km south west of Cork City, just under 5km north of the N71 at Innishannon, and 5-7km north of Bandon.

The primary land uses immediately surrounding the MSD site are largely undeveloped rural / agricultural land uses to the north, west, east and south. Further to the west of the site lies a quarry, currently in operation. The small settlement of Brinny is also located less than 1km to the north-west and comprises largely of residential dwellings and amenity facilities (i.e. Pitch and Putt course).

11.4 CHARACTER

The established character of the area arises from the mixture of land-uses and structures

11.4.1 SIGNIFICANCE AND SENSITIVITY

The Landscape Character of Ballinacurra/Brinny settlement is situated within the Broad Fertile Lowland Valley landscape character type. This landscape type is seen to be of countywide importance, and is of high value due to its environmental and cultural benefits which derive from the area's landscape features.

It has a low sensitivity to significant change of character arising from new development. The land context and setting are not within or adjacent to any designated scenic viewing pints or drives – nor are they part of the setting or context of a Protected Structure.

11.4.2 LANDSCAPE

As shown in the Figure 11.2 below, the MSD facility is located within the Landscape Character Type Broad Fertile Lowland Valleys (6a) which is identified as having High Landscape Value, High landscape Sensitivity and is considered important on a County level (CDP, Appendix E – Landscape Character Assessment).

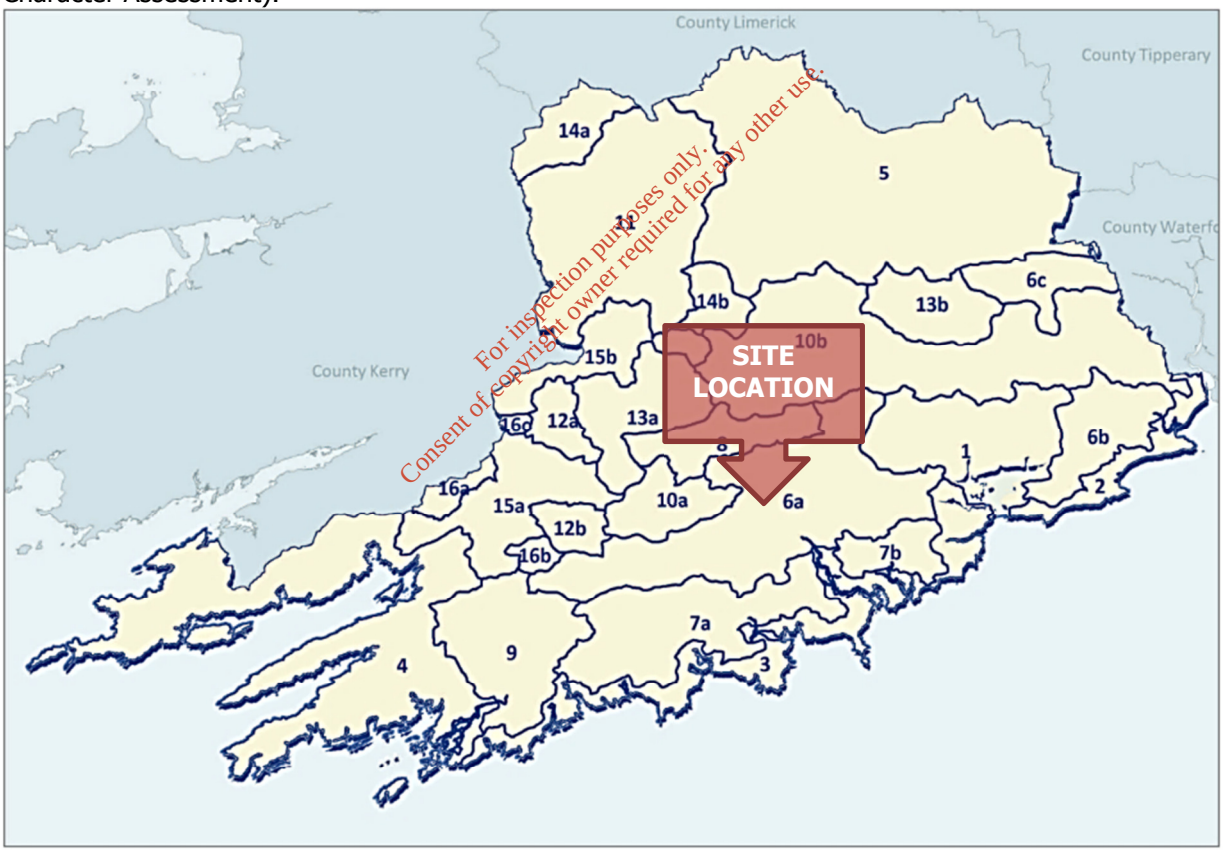

Figure 11.2 Landscape Character Types[59]

It is stated in the plan (Section 13.6.5) that ***High sensitivity landscapes*** *are vulnerable landscapes with the ability to accommodate limited development pressure. In this rank landscape quality is at a high level, landscape elements are highly sensitive to certain types of change. If pressure for development exceeds the landscape's limitations the character of the landscape may change*.

[59] Cork Development Plan , Appendix E – Landscape Character Assessment, Cork County Council, 2009

Section 13.6.9 - Within these High Value Landscapes considerable care will be needed to successfully locate large scale developments without them becoming unduly obtrusive. Therefore, the location, siting and design of large scale developments within these areas will need careful consideration and any such developments should generally be supported by an assessment including a visual impact assessment which would involve an evaluation of visibility and prominence of the proposed development in its immediate environs and in the wider landscape.

Section 13.6.11 - The capacity of each landscape character type to absorb new development will largely depend on the sensitivity of the landscape type. Developments which are likely to create a significant environmental and particularly visual impact will best be absorbed in areas where the landscape is robust, i.e. has the capacity to absorb development without significantly changing its character. All developments should be assessed on a site by site basis to avoid, minimise or mitigate any potential environmental or visual impact.

County Development Plan Objective GI 6-1: Landscape

- **c)** Ensure that new development meets high standards of siting and design.
- **d)** Protect skylines and ridgelines from development.
- **e)** Discourage proposals necessitating the removal of extensive amounts of trees, hedgerows and historic walls or other distinctive boundary treatments.

County Development Plan Objective GI 6-2: Draft Landscape Strategy

- Ensure that the management of development throughout the County will have regard for the value of the landscape, its character, distinctiveness and sensitivity as recognised in the Cork County Draft Landscape Strategy and its recommendations, in order to minimize the visual and environmental impact of development, particularly in areas designated as High Value Landscapes where higher development standards (layout, design, landscaping, materials used) will be required.

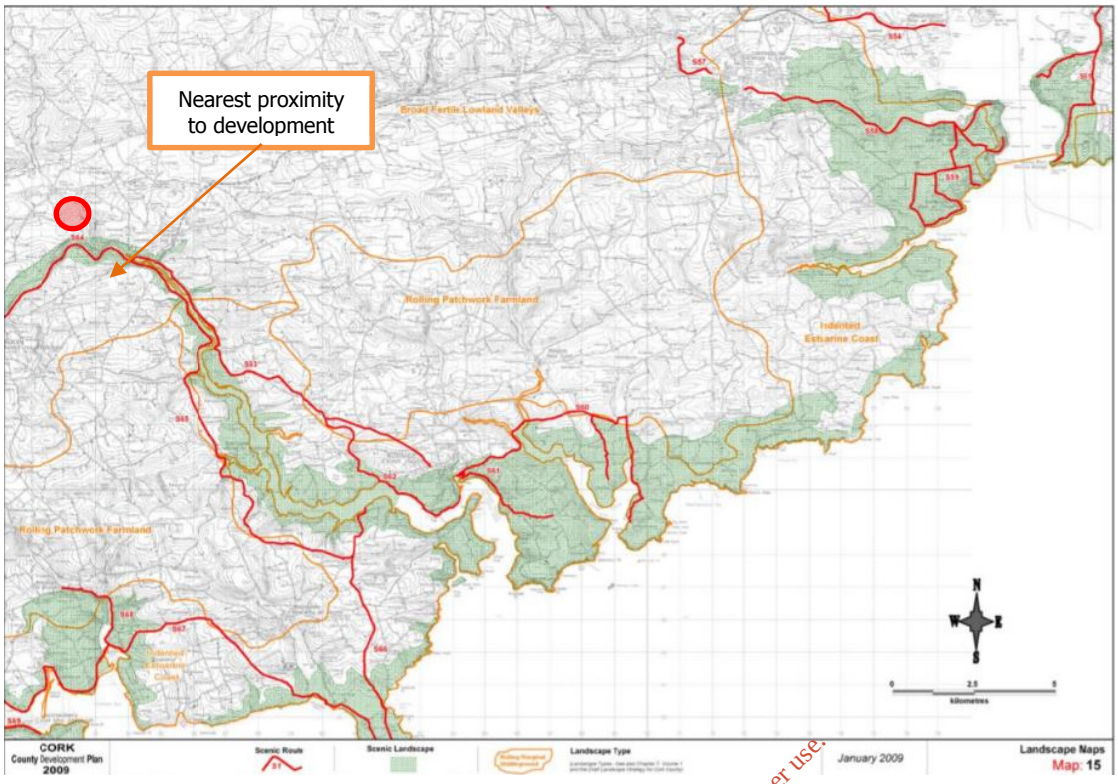

Figure 11.4 Map showing Scenic Routes and Landscape from the Cork County Development Plan.

County Development Plan Scenic Routes and Landscape

The nearest Scenic Landscape and Scenic Route lie approximately 2.5 km to the south of the proposed development. The designated feature S64 [As per table 4.1 CCDP Scenic Routes – Views and Prospects] is part of the N71 National Secondary Road between Bandon and Innishannon. It is protected on account of the Views of the Bandon River & woodland. The Bandon River Valley is also designated as a Scenic landscape.

The proposed development [marked as a red circle] is located about 2.5 km north of the nearest Scenic Route S64 [the N71]. A photograph from the road at the nearest proximity to development is provided below.

Both the Scenic Route and the Scenic Landscape are low-lying features that are visually isolated from the surrounding landscape. [see photograph below] There is no existing or potential inter-visibility between the proposed development and these protected landscape features.

Figure 11.5 Photograph from the road at the nearest proximity to development showing enclosure

Figure 11.6 Location of Viewing Points 1 – 6

The green overlay on approach roads indicates that there is limited or no visibility of the existing plant from these portions of roads. A central zone – delineated with a broken red line – indicates the approximate zone of principal visibility

Figure 11.7 View 1

First view of the existing plant, seen from east on the L2236 just before the junction with the Cork – Bandon Road. The location of the proposed project is hidden behind existing trees on the right hand side of the view. The Church of Ireland church and the Old Rectory are located on this road – but at a greater distance, so there will be no inter-visibility.

Figure 11.8 View 2

First view of the existing plant, seen from north-east on the Cork – Bandon Road. The upper portions of structures are intermittently visible through winter vegetation. The location of the proposed project is hidden behind existing trees on the right hand side of the view.

Figure 11.9 View 3

First view of the existing plant, seen from north-west on the L2236. The upper portions of structures are intermittently visible through winter vegetation. The location of the proposed project is hidden behind existing trees in the centre of the view

Figure 11.12 View 4

First full view of the existing building, seen from north-west on the L2236.

Figure 11.13 View 5

First full view of the existing building, seen from south-east on the L2236.

Figure 11.14 View 6

First full view of the existing building, seen from south-west on the Cork – Bandon Road

11.5 PREDICTED IMPACTS

As demonstrated in the previous section [View 1- 6] there is very little visibility of the existing operation from the wider landscape. The project principally comprises the re-purposing of a long-established building.

This will give rise to minor changes to the appearance of a small part of this extensive holding. These are consistent with the long-established and permitted use of the site for manufacturing use. There will be no resultant significant, adverse effects on the appearance or character of the immediate or wider environs of the site. Minor impact on views from the North due to the contractors' compound will be temporary and localised and will be mitigated by creation of new berms and planting and reinstatement of the contractors' compound area after the construction phase.

11.6 MITIGATION MEASURES

Landscaping works should be carried out in accordance with the works specified in the planning application.

12 MATERIAL ASSETS

12.1 INTRODUCTION

Material Assets are described in the EPA Guidelines[60] as including: architectural, archaeological and cultural heritage; designed landscapes; natural resources of economic value; buildings & structures; and infrastructure.

Subsequent regulations together with evolution of practice in EIA have led to most of these subjects normally being covered under other EIS headings. In this EIS, impacts on the various components of material assets as named above have been assessed in the following sections:

Section Number	Heading
7	Land, Soils, Geology & Hydrogeology
8	Water & Hydrology (including surface water, waste water and water supply)
11	Waste Management
12	Landscape & Visual Impact (includes interactions with Architectural Heritage)
14	Traffic and Transportation
15	Archaeology & Architectural Heritage

The quantities and types of chemicals that will be used in the facility have been reviewed to see if a report on Control of Major Accidents Hazards (Seveso) Report[61] is required. A Seveso report would assess the potential for major accidents to affect human health and the environment, including built infrastructure. The review found that the hazard potential of this project does not trigger a requirement for a Seveso report.

Impacts on built infrastructure that are not addressed in other sections of the EIS (as listed above) are normally the main item remaining to be covered under the heading of Material Assets and this is the case for this EIS.

As other material assets have been covered elsewhere, this section deals only with electrical supply and with physical connections to gas infrastructure.

12.2 ELECTRICAL SUPPLY

The electrical demand of the proposed development will be met from the existing supply to the MSD site. The total anticipated electrical demand is anticipated to be in the order of 1600 KVA, and there is sufficient capacity in the existing electrical supply to meet this demand

This will be supplied from the existing 10 kV capacity on site.

12.3 GAS CONNECTION

Gas needs will be provided from the existing gas main which serves the MSD site and is adjacent to the site of the proposed development. The additional boiler loads at 300 kg/hr steam requirement is modest and well within the capacity of the existing boilers.

[60] Guidelines on the information to be contained in Environmental Impact Statements, EPA, 2002
[61] Ref Seveso III Directive 2012/18/EU

There are no anticipated changes to the existing gas supply to the site as there is sufficient capacity to meet this small additional demand.

13 TRAFFIC & TRANSPORTATION

13.1 INTRODUCTION

This section presents an assessment of the impact of the proposed development on local traffic and transport operations. The assessment focuses on the effects of increased traffic on the local road network during construction of the development and also the operational scenario. The volume and type of traffic generation in relation to the development and the likely effects of this traffic have been considered within this section. The assessment considers the impact of the development traffic on the baseline traffic levels.

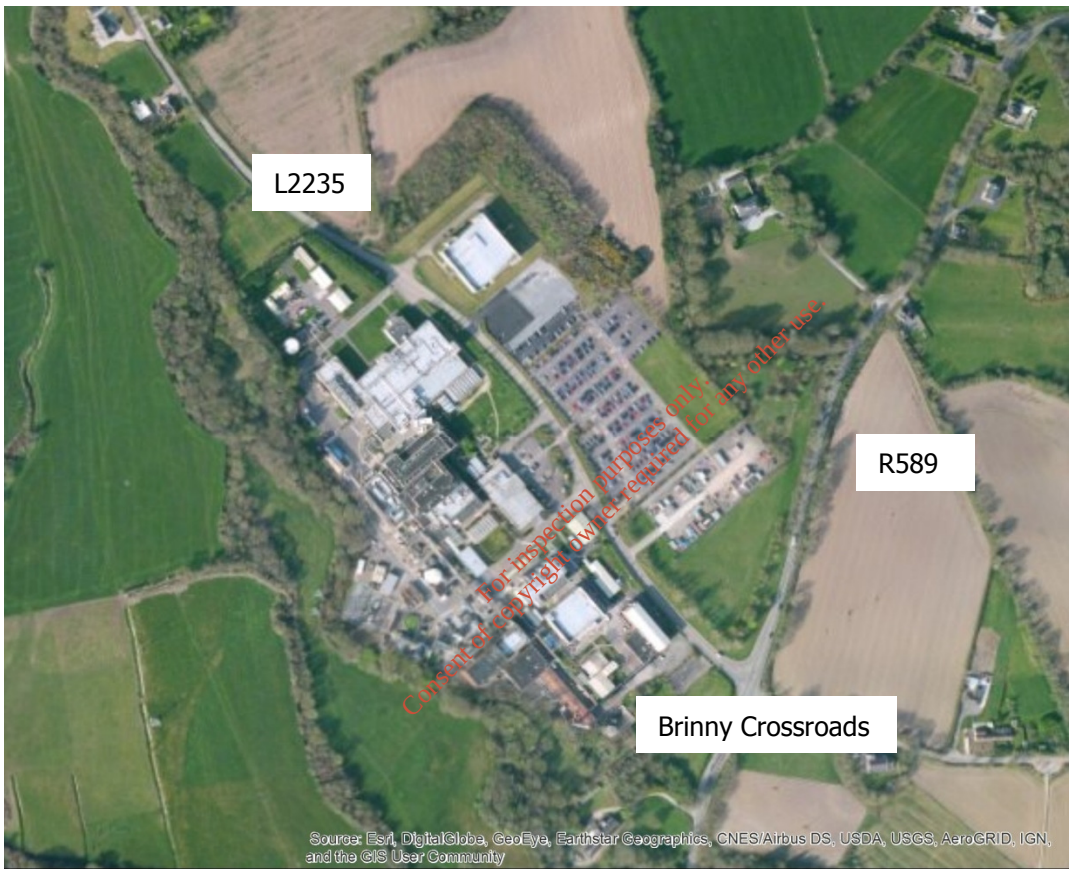

Figure 13.1 Location of Site in relation to Local Road Network

The majority of the existing site is bound to the northeast by the L2235 with car parking and B21 located on the opposite side of the L2235. The site as a whole is generally surrounded by agricultural land. The R589 Road is immediately east of the site and forms Brinny Cross with the L2235 and the L2236. This is demonstrated in Figure 13.1 above.

13.2 THE PROPOSED DEVELOPMENT

The proposed development consists of the refurbishment and use of the existing B21 on the MSD site. As part of the development, car parking facilities are to be extended to allow for the consolidation of current staff parking as well as new staff. The development is predicted to employ an additional 140 operational staff further to completion.

13.2.1 CONSTRUCTION PHASE

The construction programme for the new development will have a duration of approximately 15 months and assessment of the impacts of construction phase vehicles is based on daily traffic movements above the baseline level. During the peak month of construction, the proposed development is predicted to generate approximately 272 daily construction trips including 20 HGV trips, above the baseline level. Construction is expected to begin in 2017 and be completed during 2018.

During construction it is assumed that construction traffic will route via the local road network in line with current turning proportions. More details on the proposed construction trip distribution is contained within the Traffic and Transport Assessment (TTA), which should be read in conjunction with this assessment.

It is proposed that construction staff will park in a temporary construction compound car park for 300 cars located to the north side of B21. The temporary car park will be decommissioned upon completion of construction.

13.2.2 OPERATIONAL PHASE

A year of opening of 2018 is forecast and during the operational phase of the proposed development, approximately 747 two-way daily car trips are forecast. The operational traffic is predicted to route through the local road network in line with existing distributions, derived from junction turning count data as detailed within the TTA. It is proposed that approximately 803 car parking spaces will be provided as part of the development proposals. As the TTA demonstrates, the proposed operational parking provisions are appropriate for the requirements of the proposed development.

13.3 RECEIVING ENVIRONMENT

13.3.1 EXISTING ACCESSIBILITY

A detailed baseline accessibility assessment was undertaken as part of the Traffic and Transport Assessment (TTA), which contains details of the existing sustainable infrastructure and services. This section of the EIS adheres to the EPA 'Guidelines on the Information to be Contained in Environmental Impact Statements', 2002 (ref Section 1)

13.3.2 WALKING

The site is located within walking distance of unmarked bus stops on the R589 which serves movements between Cork and Bandon. There is currently limited footway provision due to the rural location of the development, however, a footway is provided on the west side of the L2235 between the R589 and the access to the visitor's car park. At this point the footway ties in to the zebra crossing point between the main site and the car park on the east side of the L2235.

13.3.3 CYCLING

The TTA confirms that nearby residential areas such as Innishannon and Bandon are located within a feasible cycle journey time of 30-40 minutes from the site.

13.3.4 PUBLIC TRANSPORT

There are unmarked bus stops at Brinny Cross on the R589 bus stops within the local vicinity of the site which provide direct services to and from Cork City Centre, Bandon and Butlerstown. Bus passengers can connect to local Cork services and national bus services from Cork City Centre.

13.3.5 EXISTING TRAFFIC CONDITIONS

Classified Junction Turning Count (JTC) surveys at key junctions on the local road network were undertaken by Idaso on Wednesday 18th January 2017. The locations of the traffic surveys are illustrated in Figure 13.2 below and are:

- Site 1 – R589 / L2235 / L2236 Brinny Cross;
- Site 2 – L2235 / MSD Staff Car Park; and
- Site 3 – L2236 / N71 junction.

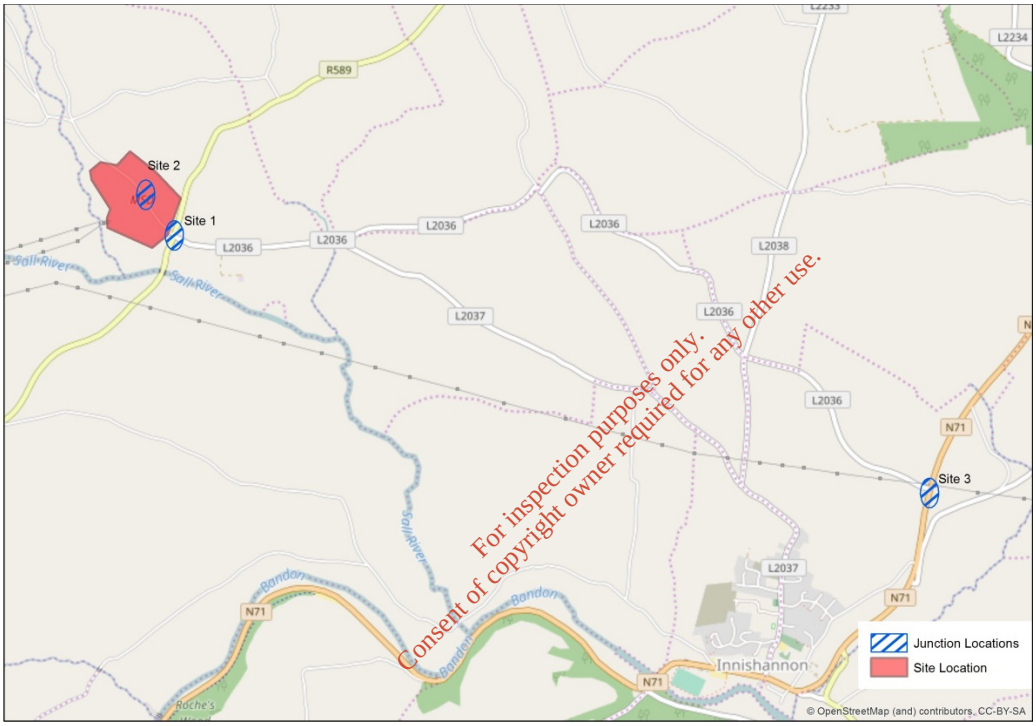

Figure 13.2 JTC Survey Locations

Traffic growth for the surrounding road network is based on the medium growth rates for Cork CC obtained from Project Appraisal Guidelines, Table 5.5.1: National Traffic Growth Forecasts: Annual Growth Factors. Medium growth rates have been applied to the base flows for the following scenarios:

- Baseline year (2017);
- A proposed construction peak and opening year (2018); and
- Opening year + 5 (2023)
- Opening year + 15 (2033) representing a typical design year as assessed in the Transport Assessment.

Applied growth rates are shown in Table 13.1 below.

Table 13.1 Growth Rates for County Cork

Years	Medium Growth for Light Good Vehicles	Medium Growth for Heavy Goods Vehicles
2006-2025	1.011	1.006
2026-2040	1.010	1.001

13.3.6 BASELINE AND CONSTRUCTION START (2017)

The baseline that is utilised in the assessment has been established from observed traffic counts, details of which are contained within the TTA.

The baseline (2-way) Annual Average Daily Traffic (AADT) flows for 2017 are detailed in Table 13.2 below which provides a sound basis upon which to assess the future impacts of construction.

Table 13.2 Baseline (2-way) AADT 2017

Link	AADT	HGV	%HGV
L2235 West of Site	1,837	155	8%
L2235 East of Site	3,052	155	5%
Site Access	1,467	0	0%
R589 North	5,224	192	4%
R589 South (Macroom Rd)	4,468	160	4%
L2236	1,438	73	5%
N71 North	15,167	1,023	7%
N71 South	14,845	1,013	7%

13.3.7 OPENING YEAR (2018)

It has been assumed that operational traffic will route through the local traffic network via a variety of routes, in line with trends exhibited in the observed traffic flow counts. These routes are detailed below in Table 13.3 As traffic survey data is for 2017, and the opening assessment year is 2018, the observed traffic counts were factored in line with factors in Table 13.1.

Table 13.3 Projected (2-way) AADT 2018

Link	AADT	HGV	%HGV
L2235 West of Site	1,889	156	8%
L2235 East of Site	3,412	156	5%
Site Access	1,826	0	0%
R589 North	5,488	193	4%
R589 South (Macroom Rd)	4,576	161	4%
L2236	1,514	74	5%
N71 North	15,373	1,029	7%
N71 South	15,020	1,019	7%

13.3.8 OPENING YEAR + 5 (2023)

The forecast 2023 Design Year (Opening Year + 5) AADT levels are detailed in the Table 13.4 below:

Table 13.4 Projected (2-way) AADT 2023

Link	AADT	HGV	%HGV
L2235 West of Site	1,969	160	8%
L2235 East of Site	3,547	160	5%
Site Access	1,826	0	0%
R589 North	5,720	198	3%
R589 South (Macroom Rd)	4,775	165	3%
L2236	1,578	75	5%
N71 North	16,037	1,054	7%
N71 South	15,670	1,044	7%

13.3.9 OPENING YEAR + 15 (2033)

The forecast 2033 Design Year (Opening Year + 15) AADT levels are detailed in the Table 13.5 below:

Table 13.5 Projected (2-way) AADT 2033

Link	AADT	HGV	%HGV
L2235 West of Site	2,184	170	8%
L2235 East of Site	3,910	170	4%
Site Access	1,826	0	0%
R589 North	6,347	210	3%
R589 South (Macroom Rd)	5,311	175	3%
L2236	1,749	80	5%
N71 North	17,829	1,119	6%
N71 South	17,424	1,108	6%

13.4 PREDICTED IMPACTS

13.4.1 SIGNIFICANCE CRITERIA

While the EPA 'Guidelines on the Information to be Contained in Environmental Impact Statements', 2002 (ref Section 1) provide a qualitative approach to understanding impacts relating to traffic and transport, the 'Guidelines for the Environmental Assessment of Road Traffic'[62] (IEMA Guidelines) provide thresholds upon which impacts can be assessed and in turn ensure that a robust assessment of impacts is undertaken. Consequently, the traffic and transport related impacts of the proposed development will be assessed based on the IEMA Guidelines while having regard to the EPA Guidelines.

The IEMA Guidelines suggest that two broad principles are used as a screening process to focus the scale and extent of the assessment. These are:

"include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%); and

"Include any other specifically sensitive areas where traffic flows will increase by 10% or more."

Criteria for assessing the significance of the increases in traffic volumes as a result of the Proposed Development have been derived on this basis as shown in Table 13.5.

62 Institute of Environmental Management and Assessment (IEMA) (1993), 'Guidelines for the Environmental Assessment of Road Traffic'.

Table 13.6 Significance of Effects in relation to Traffic Flow Increases

Significance Criteria	Factor (High)
Major	Above 90%
Moderate	Between 60% and 90%
Minor	Between 30% and 60%
Negligible	Under 30%

While in the first instance, impacts are assessed against these criteria, an element of professional judgement must also be applied with respect to the carrying capacity of the roads being considered. Where existing traffic levels are exceptionally low (e.g. on some unclassified roads), any increase in traffic flow is likely to exceed these thresholds. Where this situation is identified it is important to consider any increase both in terms of its relative increase in respect of existing traffic flows, as well as the overall total flow in respect of the available capacity of the section of road being considered.
Any potential environmental effects including accidents and safety, driver delay, pedestrian amenity, pedestrian delay and severance are considered on a case by case basis using professional judgement and reasoned argument. The significance of any impact, the scale of which is outlined within Table 13.5, is assessed on the basis of the magnitude of the effect and the likelihood of the effect occurring.

13.4.2 ASSESSMENT OF ENVIRONMENTAL IMPACTS

This scenario identifies and assesses the impact of the proposed daily construction traffic on the baseline traffic levels on the links and volumes detailed in Table 13.2. The TTA has assessed the impact of the proposed development and committed developments on key junctions on the local road network. The TTA, which should be read in conjunction to this chapter, considers the operation of these junctions for all assessment scenarios and provides commentary on any capacity, queuing or delay issues.
In terms of the transport review, the effects that may result from an increase in traffic volume without mitigation measures may include:

- Congestion;
- Air pollution;
- Journey delays; and
- Reduction in safety levels.

The most discernible environmental effects of traffic may be noise, severance, pedestrian delay and intimidation. The effects of noise are detailed within the Section 10 of this EIS *Noise & Vibration*. Pedestrian delay and intimidation relate to the impact on pedestrian movement and the perceived difficulty and discomfort in crossing a road. Severance, which is the perception of communities and facilities being divided by a road, is not predicted to be an environmental effect given the existing road network and split nature of the MSD site. Air pollution effects are addressed along with effects of greenhouse gas emissions in Section 9 *Air Quality & Climate*.

The traffic volumes forecast during each phase (during construction and operational) of the proposed development are described below.

13.4.3 CONSTRUCTION PHASE – DEVELOPMENT IMPACT

This scenario identifies and assesses the impact of the proposed daily construction traffic on the baseline traffic levels on the links and volumes detailed in Table 13.2. The TTA has assessed the impact of the proposed development on key junctions on the local road network. The TTA, which should be read in conjunction to this section, considers the operation of these junctions for all assessment scenarios and provides commentary on any capacity, queuing or delay issues.

The main construction period duration is estimated to be approximately 15 months and the construction traffic impact will be temporary for this duration. Details on the predicted traffic levels during the peak hours are detailed in the TTA and summarised below.

During construction, potential impacts may include:-

- Increased vehicles movements associated with construction staff and management travelling to / from the site;
- Increased vehicle movements consisting of HGVs and construction plant that may result in traffic congestion on roads;
- Increased queuing and congestion; and
- Increased conflict between pedestrians and vehicle traffic on the L2235.
- Temporary road closure of L2235 to be completed under a road closure permit to allow routing of utilities from main site to B21

In addition to the aforementioned temporary impacts, there is the potential for impacts on air quality, noise and vibration to occur as a result of construction traffic. These potential impacts and any associated mitigation measures are considered separately within the relevant sections.

Table 13.7 details a comparison of the forecast construction traffic impact against baseline traffic levels.

Table 13.7 Traffic Impact Associated with the Development Construction AADT (2-way)

Link	Baseline Traffic Flows 2018		Construction Traffic 2018		Base 2018 + Construction		Increase (% of Baseline)	
	AADT	HGVs	AADT	HGVs	AADT	HGVs	AADT	HGVs
L2235 West of Site	1,856	155	66	3	1,922	158	3.6%	2.1%
L2235 East of Site	3,084	155	659	24	3,743	179	21.4%	15.6%
R589 North	5,279	192	419	16	5,698	208	7.9%	8.3%
R589 South (Macroom Rd)	4,515	160	123	5	4,638	166	2.7%	3.3%
L2236	1,453	73	122	5	1,576	78	8.4%	6.5%
N71 North	15,323	1,023	95	9	15,417	1,032	0.6%	0.9%
N71 South	14,998	1,013	39	7	15,037	1,020	0.3%	0.7%

During the busiest period of construction, the anticipated increase in trips on the L2235 between the development site and Brinny Cross is 659 two-way vehicles over the course of an entire day. This equates to a worst case percentage increase of 21.4% and 15.6% in AADT and HGV movements respectively.

As such, in line with the IEMA guidelines the increase in traffic flows is considered to be of minor significance.. Further mitigation in terms of traffic management during the construction phase (e.g. off peak HGV deliveries) are set out within the outline Construction Environmental Management Plan.

13.4.4 OPERATIONAL PHASE – DEVELOPMENT IMPACT

Following completion of the proposed development, the construction trips will be removed from the network. These will be replaced, however, by trips associated with permanent staff, over and above the current traffic baseline level. The impact of these trips against the opening year baseline (2018), opening year + 5 years baseline (2023) and opening year + 15 years baseline (2033) are detailed in Table 13.7, Table 13.8 and Table 13.9 below.

Table 13.8 Traffic Impact against 2018 Opening Year Baseline AADT (2-way)

Link	Baseline Traffic Flows 2018		Operational Traffic 2018		Base 2018 + Operational		Increase (% of Baseline)	
	AADT	HGVs	AADT	HGVs	AADT	HGVs	AADT	HGVs
L2235 West of Site	1,856	155	33	1	1,856	155	1.8%	0.6%
L2235 East of Site	3,084	155	328	1	3,084	155	10.6%	0.6%
R589 North	5,279	192	209	1	5,279	192	4.0%	0.6%
R589 South (Macroom Rd)	4,515	160	61	1	4,515	160	1.4%	0.6%
L2236	1,453	73	61	0	1,453	73	4.2%	0.6%
N71 North	15,323	1,023	50	6	15,323	1,023	0.3%	0.6%
N71 South	14,998	1,013	23	6	14,998	1,013	0.2%	0.6%

Table 13.9 Traffic Impact against 2023 Opening Year + 5 Baseline AADT (2-way)

Link	Baseline Traffic Flows 2023		Operational Traffic 2023		Base 2023 + Operational		Increase (% of Baseline)	
	AADT	HGVs	AADT	HGVs	AADT	HGVs	AADT	HGVs
L2235 West of Site	1,936	160	32	0	1,969	160	1.7%	0.0%
L2235 East of Site	3,220	160	327	0	3,547	160	10.1%	0.0%
R589 North	5,513	198	207	0	5,720	198	3.8%	0.0%
R589 South (Macroom Rd)	4,715	165	60	0	4,775	165	1.3%	0.0%
L2236	1,517	75	60	0	1,578	75	4.0%	0.0%
N71 North	15,993	1,054	44	0	16,037	1,054	0.3%	0.0%
N71 South	15,654	1,044	17	0	15,670	1,044	0.1%	0.0%

Table 13.10 Traffic Impact against 2033 Opening Year + 15 Baseline AADT (2-way)

Link	Baseline Traffic Flows 2033		Operational Traffic 2033		Base 2033 + Operational		Increase (% of Baseline)	
	AADT	HGVs	AADT	HGVs	AADT	HGVs	AADT	HGVs
L2235 West of Site	2,152	170	32	0	2,184	170	1.5%	0.0%
L2235 East of Site	3,584	170	327	0	3,910	170	9.1%	0.0%
R589 North	6,139	210	207	0	6,347	210	3.4%	0.0%
R589 South (Macroom Rd)	5,251	175	60	0	5,311	175	1.2%	0.0%
L2236	1,689	80	60	0	1,749	80	3.6%	0.0%
N71 North	17,786	1,119	44	0	17,829	1,119	0.2%	0.0%
N71 South	17,407	1,108	17	0	17,424	1,108	0.1%	0.0%

The main traffic impacts in 2018, 2023 and 2033 are on the L2235 between the main car park access and Brinny Cross. This link has a maximum AADT increase of 24.5% in 2018 due to the additional traffic from the development travelling via the R589 Brinny Cross. This increase in traffic is under 30% and therefore considered to be of negligible significance in line with the IEMA guidelines.

13.5 MITIGATION MEASURES

It is considered that the predicted increases in network traffic as a result of construction and operational development will be of minor and negligible impact respectively over the course of the day and therefore no intervention or physical mitigation is required. The impact of the concentration of additional trips in the peak hours has been assessed within the TTA. Notwithstanding this, the CEMP will mitigate traffic impact through:

- Programming deliveries outside of peak periods; and

- Ensuring construction vehicles route to site via agreed routes.

The more detailed aspects of the Construction Environmental Management Plan will be agreed in consultation with Cork CC.

For the operational phase a Mobility Management Plan will be used with the aim of reducing vehicular traffic and promote sustainable modes. A Mobility Management Plan has also been included within the application. The objectives are:

- To improve travel options
- To improve awareness of the sustainable modes of travel available
- To minimise the need to use private vehicles
- To promote health and environmental benefits of sustainable travel

A Mobility Management Plan can also:

- Assist in increasing accessibility while reducing congestion
- Improve local air pollution, greenhouse gases and noise
- Increase business efficiency and equality
- Reduce the carbon footprint of the organisation/development
- Reduce the traffic impact on the local highway network
- Reduce adverse impacts on local residents and businesses
- Improve the health and wellbeing of the workforce through the formation of active travel patterns

Some of the measures to be promoted within the Mobility Management Plan include the following, however the Mobility Management Plan should be read in conjunction with this chapter:

Walking & Cycling

- Provide information on pedestrian links to public transport;
- Provide suitable internal walking routes with appropriate crossing points and street lighting i.e. improved crossing on L2235;
- Provide cycle spaces in safe locations. While appropriate cycle parking is proposed the cycle parking provision should be increased as interim targets are met; and
- Provide changing and shower facilities within the MSD site and seek to improve on where required.

Promotion of sustainable and active travel

- Provision of a Travel Options Leaflet for the site, available in hard and electronic formats;
- Provide and promote an on-site Green Travel Day;

Promotion of smarter working measures

- Provide high speed broadband through the site for video and tele-conferencing;
- Review staff travel policy to include criteria to encourage tele-video conferencing use; and
- Provide training for tele-video-conferencing facility use.

A Mobility Management Plan is a continuous and evolving document requiring monitoring, review and revision to ensure that it remains relevant to all users of the site. The Mobility Management Plan contains more details on the requirement for the appointment of a Mobility Management Plan co-ordinator, to deal with promotion, engagement and monitoring of the effectiveness of the implemented measures.

Staff surveys will be carried out within 6 months of the opening of the development. Travel surveys will subsequently be undertaken bi-annually. These will be carried out in order to monitor the impact of the Travel Plan and to establish how successful it has been in inducing modal shift. The measures implemented will be reviewed so that they can be adjusted and new measures introduced, where necessary.

Monitoring reports will be submitted to Cork County Council at an agreed frequency and these reports and revised versions of the Mobility Management Plan can be made available as required. On-going monitoring will take place via the Mobility Management Plan Coordinator who will collect any feedback and suggestions from users at site about the Mobility Management Plan and its measures.

14 WASTE MANAGEMENT

14.1 INTRODUCTION / METHODOLOGY

The following section has been prepared to address the potential impacts associated with waste management during the construction and operational phase of the proposed development at B21 and associated works including car-parking and contractors compound.

The assessment has been conducted in the context of current relevant standards and guidance including the EPA Guidelines and Advice Notes as described in Section 1 *Introduction* .

14.1.1 METHODOLOGY

An extensive document review was carried out to assist in identifying current and future requirements for waste management at the proposed manufacturing facility and included the following:

National and Regional Waste Policies, Strategies and Reports, such as:

- *Changing Our Ways; A Policy Statement on Waste Management,* Department of the Environment, Heritage and Local Government (DoEHLG), 1998;
- *Preventing and Recycling Waste – Delivering Change,* DoEHLG, 2002;
- *Making Ireland's Development Sustainable – Review, Assessment and Future Action, World Summit on Sustainable Development* (2002);
- *Taking Stock and Moving Forward,* DOEHLG, 2004;
- *A Resource Opportunity, Waste Management Policy in Ireland,* Department of Environment, Communities and Local Government (DoECLG), (2012);
- *Characterisation of Building Related Construction and Demolition Debris in the United States*; US EPA
- *National Waste Database Reports 1998 - 2010*; Environmental Protection Agency (EPA),
- Southern Waste Region, *Southern Region (EMR) Waste Management Plan 2015 – 2021* Environmental Protection Agency (EPA), 2015.

EU Legislation such as:

- Council Decision 2003/33/EC, establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of Annex II to Directive 1999/31/EC;
- Council Directive 1999/31/EC, on the landfill of waste;
- European Waste Catalogue - Council Decision 94/3/EC (as per Council Directive 75/442/EC) [9];
- Hazardous Waste List - Council Decision 94/904/EC (as per Council Directive 91/689/EEC); and
- EPA, *European Waste Catalogue and Hazardous Waste List* (2002).

Irish Legislation such as:

- Waste Management Act 1996 (No. 10 of 1996) as amended 2001 (No. 36 of 2001), 2003 (No. 27 of 2003) and 2011 (No. 20 of 2011). Subordinate and associated legislation includes:
  - European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) as amended 2011 (S.I. No. 323 of 2011)
  - Waste Management (Collection Permit) Regulations 2007 (S.I No. 820 of 2007) as amended 2008 (S.I. No. 87 of 2008) and 2016 (S.I. No. 24 of 2016)
  - Waste Management (Facility Permit and Registration) Regulations 2007 (S.I. No. 821 of 2007) as amended 2008 (S.I. No. 86 of 2008), 2014 (S.I. No. 310 and S.I. No. 546 of 2014) and 2015 (S.I. No. 198 of 2015)
  - Waste Management (Licensing) Regulations 2000 (S.I. No. 185 of 2000) as amended 2004 (S.I. No. 395 of 2004) and 2010 (S.I. No. 350 of 2010)
  - Waste Management (Packaging) Regulations 2014 (S.I. No. 282 of 2014)
  - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997)
  - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)

  - European Communities (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
  - Waste Management (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended 2014 (S.I. No. 349 of 2014) and 2015 (S.I. No. 347 of 2015)
  - Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009) as amended 2015 (S.I. No. 190 of 2015)
  - European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 191 of 2015)
  - Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) as amended 2000 (S.I. No. 73 of 2000)
  - Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) as amended by European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations 2011 (S.I. No. 324 of 2011)
  - The European Communities (Transfrontier Shipment of Hazardous Waste) Regulations 1988 (S.I. No. 248 of 1988)
  - European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015)
- Litter Pollution Act 1997 and Regulations;
- Local Government Act 1994 and Regulations; and
- WEEE Directive 2002/96/EC and Regulations

Local Authority Plan:

- *Cork County Development Plan 2014 – 2020,* Cork County Council (CCC), 2015.

Local Area Plan:

- *Macroom Electoral Area Local Area Plan, Second Edition,* CCC, January 2015.

In addition, the following best practice guidelines and codes of practice were consulted:

- *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects,* National Construction and Demolition Waste council (NCDWC) and DoEHLG, (2006); and
- *Construction and Demolition Waste Management – a handbook for Contractors and Site Managers,* FÁS and the Construction Industry Federation (CIF), (2002).

Estimates of waste generation during the construction and operational phase of the project have been calculated. The waste types and estimated quantities are based on published data by the EPA in National Waste Reports [63], data recorded from similar previous developments, Irish and US EPA waste generation research and other available research sources.

Mitigation measures are proposed to minimise the effect of the proposed development on the environment during the construction and operational phases, to promote efficient waste segregation and to reduce the quantity of waste requiring final disposal. This information is presented in Sections 14.5 and 14.6.

A detailed review of the existing ground conditions on a regional, local and site specific scale are presented in *Section 7: Land, Soils, Geology & Hydrogeology*. This section of the EIS also discusses the environmental quality of the soil and groundwater at the site including soils which will be stripped and reused / stored as berms

14.2 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development is outlined in *Section 4 - Proposed Development*.

With regards to waste management, the proposed development will generate waste during the construction phase and when the overall development is operational.

[63] National Waste Reports 1998 – 2012, EPA,

Following development, the plant will operate within the requirements of the IE license.

14.2.1 CONSTRUCTION PHASE

There will not be any significant demolition work required as part of the proposed development, however there will be a small volume of waste materials generated from the repurposing of the existing B21 to make it suitable for use as a new vaccine production facility. It is likely that waste materials generated from this activity will mostly be made up of broken concrete and cladding materials.

A small volume of made ground and gravel sand subsoils will be excavated in the area required for the car park extension to allow for laying of subbase and hardstanding. This quantity is expected to be minimal. Additional small quantities of soil will be generated from works to relocate the contractor compound and install the surface water attenuation area. A detailed description of the existing soil conditions at this location are outlined in Section 7.3.3.1. Previous site investigations carried out at the facility indicate that any excavated material is likely to be clean and inert. Any excavated material will be reused on site for the new screening berms. Part of the berms will be termporary and will be used to reinstate the contractors' compuound post construction..

During the construction works required in B21 and the car park extension works, waste will be produced from surplus materials such as broken or off-cuts of timber, plasterboard, metals, concrete, tiles, etc. Waste from packaging (cardboard, plastic, timber) and oversupply of materials may also be generated. The contractor will be required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

The principal elements of the adaption and fit-out of B21 will include pouring concrete floors, inclusion of a new manufacturing suite on the first level, construction of access points and division of space into rooms. The main waste material will likely be generated from structural steel elements, concrete, M&E fittings and plasterboard. It is anticipated that some asphalt paving waste will also be generated from car park surfacing works.

An estimate of the waste quantities that will be generated from the proposed works are presented in Table 14.1 and are calculated using typical construction waste generation rates for similar developments from published research[64] [65]. An estimated waste generation rate of 5kg/m^2 has been applied to B21 using the floor area of the building (c. 4000m^2) and applying the breakdown of construction and demolition waste types averaged from the most recent National Waste Reports[3]. (Note: EPA published research provides a typical waste generation rate of 30kg/m^2 which includes soil and stones material. The soil and stones fraction is reported as being 83% of the total waste quantity from the research conducted. The extent of excavations required in the proposed development are known and all excavated waste will be retained on site, therefore this soil and stone waste quantity is excluded from Table 14.1).

[64] EPA and GMIT, A Review of Design and Construction Waste Management Practices in Selected Case Studies – Lessons Learned. EPA Research Report 146 (2015)
[65] EPA, National Waste Reports 1998 - 2012

Table 14.1 Estimated on- and off-site reuse, recycling and disposal rates for construction waste

Waste Type	Tonnes	Reuse		Recycle		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Concrete, bricks, tiles, ceramics and plasterboard	12.0	40	4.8	45	5.4	15	1.8
Asphalt, tar and tar Products	1.1	0	0	55	0.6	45	0.4
Metals	1.1	5	0.1	90	1.0	5	0.1
Other	4.4	10	0.4	60	2.6	30	1.3
Total	**18.6**		**5.3**		**9.6**		**3.5**

It should be noted that until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with complete accuracy the construction waste that will be generated from the proposed works as the exact materials and quantities may be subject to some degree of change and variation.

The first step will be to characterise the waste materials generated and then look to segregate on site based on characteristics, where it is practical. Where the on-site segregation of certain waste types is not practical, off-site segregation will be carried out by waste contractors at their licensed facilities. Non-hazardous waste will be placed in suitably sized and labelled receptacles, located in proximity to the area of waste generation. When full, the receptacles will be transferred to dedicated waste storage areas (WSA) and the waste placed in the appropriate, suitably sized skips which are protected from rainfall. The WSAs will be located adjacent to the dedicated laydown areas on either side of B21 as shown on the Construction Compound Layout in the *Construction Environmental Management Plan (CEMP)*.

Hazardous waste will be placed into labelled bins and transported to a designated covered and bunded hazardous WSA to be placed in suitable receptacles, drums, Waste Electrical and Electronic Equipment (WEEE) cages or fluorescent tube coffins as appropriate. The location of this area will be designated by the contractor on site.

All waste receptacles leaving the site will be covered or enclosed and transported off site by an approved waste contractor holding a current waste collection permit. All waste arisings will be brought to facilities holding the appropriate Certificate of Registration (COR), waste permit or waste/IE licence, as required. Copies of waste transfer notes will be retained on site by the Main contractor and monthly records of waste quantities will be requested from the appointed non-hazardous and hazardous waste contractor(s).

14.2.2 OPERATIONAL PHASE

The proposed development will give rise to a variety of waste streams when the project is completed and manufacturing processes are fully operational. The waste will be generated from process and non-process related activities. Non-process related waste (i.e. office and welfare waste) will be similar to that generated at the rest of the existing facility.

The main non-process related waste types will typically comprise:

- Paper (confidential and non-confidential);
- Cardboard;
- Plastic;
- Glass;
- Timber;
- Metal;
- Compostable food waste;
- Empty toner cartridges;

- Waste electrical and electronic equipment (WEEE); and
- Waste batteries.

Typical non-process related hazardous waste generated in this type of setting usually consists of batteries (potentially lead/acid), WEEE and fluorescent light tubes.

Other wastes that may be generated in smaller quantities may include textiles (rags), cleaning products, aerosols, paints and furniture.

The proposed manufacturing process is described in detail in *Section 4* and is generally based on the usage of single-use sealed plastic bag technology for liquid operations. The anticipated waste types from this approach will comprise mainly:

- Plastic bags;
- Plastic wrapping;
- Plastic drums/bottles;
- Drum liners;
- Tubes and hoses;
- Filter cassettes; and
- Non-reusable gowning.

It is estimated that approximately 1,300kgs of solid waste from the above manufacturing process would be generated in B21 on a weekly basis. However, this is dependent on batching frequency and duration. The above waste types will be similar to those already generated in the existing manufacturing areas at MSD and waste will be managed in accordance with existing procedures and will be subject to compliance with the requirements of the facility IE Licence.

Liquid waste streams will also be generated from the manufacturing process and waste which is not suitable for discharge as wastewater to the site wastewater treatment plant will be temporarily stored on site and transferred off-site for recovery or disposal, as appropriate. Further details on the wastewater discharge from the facility is presented in *Section 8 – Water & Hydrology*.

There will be a new shipping/receiving and waste staging area constructed on the north-western side of B21 adjacent to a general storage area. It is anticipated that the majority of packaging waste will be generated here as deliveries are received and unwrapped for storage prior to use in production. Non-hazardous waste streams will be divided into recyclables and non-recyclables in accordance with existing procedures at the facility. Segregated bins for storage of recyclables and non-recyclables will be allocated throughout the offices and meeting rooms, as required. Additional waste storage areas will be required for confidential waste paper and organic (food) waste.

Hazardous waste will be segregated at source and will be packaged, labelled and transferred to a designated hazardous waste staging area. Waste management companies, as appointed by MSD, will be responsible for the transfer of waste off-site to authorised recovery/disposal facilities.

All waste types generated on site will be managed according to MSD's waste management procedure which complies with Irish and European waste management legislation as well as the relevant conditions of the facility's IE Licence. Waste records as required under Condition 11.8 of the facility IE Licence (P0005-02) shall continue to be retained on site.

14.3 Receiving Environment

In terms of waste management, the baseline environment is largely defined by Cork County Council (CCC) as the local authority responsible for administering waste management activities in the area in which the proposed development is located. This is largely governed by the requirements set out in the Regional Waste Management Plan for the Southern Region published in 2015.

The *Southern Region Waste Management Plan 2015 – 2021* is the current regional waste management plan for the CCC area and addresses all areas of waste management from waste

prevention and minimisation to its collection, treatment, recovery and final disposal. The Plan is guided by international, European and Irish legislation and policy on waste management and is the reference document in relation to waste management for the current Cork County Development Plan.

The Regional Waste Management Plan has set a number of targets for the region. The main targets set are:

- A 1% reduction per annum in the quantity of household waste generated over the period of the plan;
- Achieve a reuse/recycling rate of 50% of municipal waste by 2020;
- Reduce to 0% the direct disposal of residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices; and
- Preparation of 70% of construction and demolition wastes for reuse, recycling and material recovery (excluding soil and stones) by 2020 (in line with the requirements of the *Waste Framework Directive*).

Municipal landfill charges in Ireland are based on the weight of waste disposed. As well as charging by weight of waste disposed, landfill charges are subject to a €75 per tonne landfill levy introduced under the *Waste Management (Landfill Levy) (Amendment) Regulations 2012*.

The Cork County Development Plan 2014 – 2020 contains several objectives in relation to waste management. The objectives most relevant to this development are as follows:

- Support the policy measures and actions outlined in 'A Resource Opportunity' 2012 – National Waste Policy.
- Encourage the delivery of an effective and efficient waste management service in line with the Waste Management Acts and relevant Waste Management Plan for the County/Region.
- Support the incorporation of the recommendation and policies of the National Hazardous Waste Management Plan 2008-2012.

Environmental objectives for the Macroom Local Area are outlined in the *Macroom Electoral Area Local Area Plan, Second Edition, January 2015* but there are no specific objectives for waste management outlined for the Local Area or the village areas of Ballinacurra/Brinny.

14.4 PREDICTED IMPACTS

14.4.1 CONSTRUCTION PHASE

The construction phase of the project will generate a range of non-hazardous and hazardous waste materials. Correct segregation, storage, handling and transport of waste will ensure litter is not generated at the proposed development and does not become a nuisance to the public.

Use only of permitted waste hauliers and permitted/licensed facilities will ensure appropriate management of waste and avoidance of environmental impacts/pollution. Compliance with regional and national legislation as outlined previously and the allocation of adequate time and resources dedicated to ensuring efficient waste management practices will ensure that adverse impacts are avoided.

A small volume of made ground and subsoils will be excavated to facilitate the construction of the new car parking area, underground services and landscaping. Site investigations in the location of the proposed excavations show no evidence of contamination of the soil to be excavated. In the event that localised contamination is encountered, material will be correctly identified, segregated and classified to ensure there is no negative impact to workers as well as water and soil environments, both on and off-site.

14.4.2 OPERATIONAL PHASE

Effective and compliant waste management during the operational phase of the proposed development will follow the priorities of the waste hierarchy and avoid significant volumes of waste being sent unnecessarily to landfill. The current procedures for waste management at the existing MSD facility will be implemented in the proposed development ensuring that maximum segregation is achieved at source and that waste minimisation is applied, where possible. The requirements of the *Cork County Development Plan 2014 – 2020* and the targets outlined in the *Southern Region Waste Management Plan 2015 – 2021* will also be followed.

The continued use of permitted/licensed waste hauliers and facilities will ensure waste removed from the facility will be managed appropriately and will avoid environmental impacts or pollution.

In addition, the correct management and storage of waste will avoid litter or pollution issues at the proposed development.

14.5 MITIGATION MEASURES

This section outlines the measures that will be employed in order to reduce the amount of waste produced at the development, manage the wastes generated responsibly and minimise the effects of the waste that is generated on the environment.

14.5.1 CONSTRUCTION PHASE

The following mitigation measures will be employed to ensure effective waste management and reuse, recycling, recovery and disposal of waste material generated at the site during the construction phase:

- Building materials will be chosen with an aim to 'design out waste' and, where feasible, construction materials will be pre-fabricated off-site to minimise waste generation on-site;
- On-site segregation of non-hazardous construction waste materials into appropriate categories, where possible, including, but not limited to:
  - Any excavated made ground, topsoil and subsoils segregated into the appropriate categories for waste acceptance at landfill;
  - Concrete, bricks, tiles, ceramics;
  - Plasterboard;
  - Metals; and
  - Timber
- On-site segregation of all construction related hazardous waste materials into appropriate categories including:
  - Contaminated soils (if encountered);
  - Waste oil and fuels; and
  - Paints, glues, adhesives and other known hazardous substances
- All wastes will be segregated at source, where possible, and stored in skips in designated waste storage areas as shown in the Construction Compound Layout in the *Construction Environmental Management Plan*;
- All waste materials will be stored in skips or other suitable receptacles in a designated area of the site. This area will be signed and advised of to all construction staff on commencement of the project;
- Left over materials (e.g. timber off-cuts) and any suitable construction materials shall be reused on site where possible;
- The Main Contractor shall appoint a Waste Manager to oversee the management, preparation and implementation of a site specific Construction & Demolition Waste Management Plan (C&DWMP) in accordance with the requirements of the *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects* (2006).
- The Main Contractor will be required to prepare and put in place the C&DWMP prior to commencement of activities on site;
- All waste leaving the site will be recycled, recovered or reused, where possible;

- All waste leaving the site will be transported by suitably permitted contractors and taken to appropriately registered, permitted or licensed facilities; and
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

14.5.2 OPERATIONAL PHASE

Operational waste management procedures will be put in place at the facility to ensure that waste materials from operations at the new development will be managed appropriately. Mitigation measures will include:

- On-site segregation of all waste materials into appropriate categories including, but not limited to:
  Non-hazardous waste:
  - Paper (confidential and non-confidential);
  - Cardboard;
  - Plastic;
  - Glass;
  - Timber;
  - Metal;
  - Construction & demolition waste;
  - Compostable food waste;

  Hazardous waste:
  - Process waste including:
    - IPA wipes;
    - Spent resins;
    - Cleaning solutions;
    - Empty containers, used tube sets, hoses , filters;
    - PPE; and
    - Mixed corrosives.
  - Non-process waste, including:
    - Fluorescent tubes;
    - Batteries; and
    - WEEE containing hazardous components.

- Storage and segregation of waste materials will be carried out in accordance with the existing MSD procedures and in line with the requirements of the facility IE Licence.
- Reuse, recycling or recovery where possible of waste collected from the development, with the exception of those waste streams where appropriate facilities are currently not available;
- Transport of all waste leaving the site by appropriately permitted hauliers only, and all waste to be taken to suitably registered, permitted or licensed facilities; and
- Records and copies of relevant documentation of all waste leaving the site to be maintained on file.

14.6 RESIDUAL IMPACTS

There will not be any negative residual impacts from the proposed development if the mitigation measures as outlined in Section 14.5 are implemented. These mitigation measures will ensure the waste arising from the construction phase of the development is dealt with in compliance with the provisions of the *Waste Management Acts 1996 – 2011* as amended, associated Regulations, the *Litter Pollution Act of 1997* and the *Southern Region Waste Management Plan (2015 - 2021)*. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved.

14.6.1 CONSTRUCTION PHASE

The careful management of waste during the construction phase by a competent contractor and overseen by a dedicated waste manager will ensure there are no residual impacts on the site or surrounding areas.

The objective of setting targets for waste management (as outlined in Table 14.1) is only achieved if the actual waste generation volumes are calculated and compared. This is particularly important during the construction phase where there is a potential for waste management to become secondary to progress and meeting construction schedule targets. The guidelines on preparation of C&DWMP's specify the need for a Waste Manager to be appointed who will have responsibility to monitor the actual waste volumes being generated and to ensure that contractors and sub-contractors are segregating waste, as required. Where targets are not being met, the waste manager will identify the reasons for targets not being achieved and work to resolve any issues. Recording of waste generation during the project will enable better management of waste contractor requirements and identify trends.

14.6.2 OPERATIONAL PHASE

During the operational phase, implementation of MSD's waste management procedures will ensure that all waste materials are segregated and collected from the facility with no residual impact on the environment.

During the operational phase, facility management personnel will monitor waste generation volumes against the estimated waste volumes in Section 14.2.2. There may be opportunities to reduce the waste bins and equipment required where waste generation rates have been overestimated. Reductions in equipment/bin requirements will reduce waste contractor costs. National waste legislation, as well as CCC *Waste Bye-Laws*, will be consulted on a regular basis in case of any changes which may impact on waste management procedures.

15 ARCHAEOLOGY & ARCHITECTURAL HERITAGE

15.1 INTRODUCTION

This section takes into account all relevant legislation and policies in relation to archaeology, architectural and cultural heritage (see Appendix 15.1). The assessment amalgamates desk-based research and the results of field inspection to identify areas of archaeological/cultural heritage significance or potential likely to be impacted by the proposed development. The proposals for the site comprise works to an existing un-serviced shell building (B21) and the construction of a temporary contractor's compound and car park to the north-west of same. Additional car parking is also proposed for the south-east end of the site. A full project description is presented in Section 4.

15.2 METHODOLOGY

The assessment of the archaeology, architecture and cultural heritage of the proposed development area included desk-based research as well as field inspection. A desk-based study of the proposed development site was undertaken in order to assess the archaeological, architectural and cultural heritage potential of the area and to identify constraints or features of archaeological/cultural heritage significance within or near to the proposed development site. Field survey of the study area was undertaken in February 2017 to determine if previously unrecorded archaeological/architectural or cultural heritage features were located within the proposed development site and to assess any potential impacts on known or previously unrecorded sites or monuments within the study area.

15.2.1 DESKTOP ASSESSMENT

A primary cartographic source and base-line data for the archaeological assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for County Cork. All known recorded archaeological monuments are indicated on 6-inch Ordnance Survey (OS) maps and are listed in aforementioned records. The 1st (1841) and 2nd (1901) edition OS maps for the area were also consulted as were aerial photographs.

The following sources were consulted for this assessment report:

- The Record of Monuments and Places (RMP)
- The Topographical Files of the National Museum of Ireland on www.heritagemaps.ie
- First edition Ordnance Survey maps (OSI.ie)
- Second edition Ordnance Survey maps (OSI.ie)
- Third edition Ordnance Survey Map (Record of Monuments and Places for County Cork)
- Down Survey maps for County Cork (www.downsurvey.tcd.ie)
- Aerial photographs (copyright of Ordnance Survey Ireland (OSI.ie)
- Database of Irish Excavation Reports
- Cork County Development Plan 2015-2022
- National Inventory of Architectural Heritage (NIAH)

Record of Monuments and Places
A primary cartographic source and base-line data for the assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for County Cork. All known recorded archaeological monuments are indicated on 6-inch Ordnance Survey (OS) maps and are listed in these records. The SMR/RMP is not a complete record of all monuments as newly discovered sites may not appear in the list or accompanying maps. In conjunction with the consultation of the SMR and RMP the electronic database of recorded monuments (www.webgis.archaeology.ie/historicenvironment) was also consulted.

List of Monuments covered by Preservation Orders and List of National Monuments in the ownership / guardianship of the Minister for Arts, Heritage and the Gaeltacht
National Monuments in the ownership / guardianship of the Minister for the Environment, Heritage and Local Government are listed on the Department of the Environment, Heritage and Local Government's website www.archaeology.ie.

Cartographic Sources and Aerial Photography
The 1st (1841) edition and 2nd (1901) edition OS maps for the area were consulted, where available, as was OSI aerial photography on OSI.ie. The Down Survey map for this area of County Cork was also consulted.

Topographical Files - National Museum of Ireland
Details relating to finds of archaeological material and monuments in numerous townlands in the country are contained in the topographical files held in the National Museum of Ireland. The files as shown on www.heritagemaps.ie were consulted for any find spots in the area of the proposed development.

Archaeological Inventory Series
Further information on archaeological sites may be obtained in the published County Archaeological Inventory series prepared by the Department of Arts, Heritage and the Gaeltacht. The archaeological inventories present summarised information on sites listed in the SMR/RMP and include detail such as the size and location of particular monuments as well as any associated folklore or local information pertaining to each site. The inventories, however, do not account for all sites or items of cultural heritage interest which are as yet undiscovered.

County Development Plan
The County Development Plan for Cork (2015-22) was consulted for the schedule of buildings (Record of Protected Structures) and items of cultural, historical or archaeological interest which may be affected by the proposed development. The development plan also outlines policies and objectives relating to the protection of the archaeological, historical and architectural heritage landscape of the county. A digital dataset for the RPS was download on ArcGIS online and overlaid on the GIS maps for the subject site and study area.

Database of Irish Excavation Reports
The database of Irish excavations contains annual summary accounts of all excavations carried out under license. The database is available on line at www.excavations.ie and includes excavations from 1985 to 2016. This database was consulted as part of the desktop research for this assessment to establish if any archaeological excavations had been carried out within or near to the proposed development area.

National Inventory of Architectural Heritage (NIAH)
This source lists some of the architecturally significant buildings and items of cultural heritage and is compiled on a county by county basis by the Department of Arts, Heritage and the Gaeltacht. The NIAH database was consulted for all townlands within and adjacent to the study area. The NIAH survey for Cork has been published and was downloaded on to the base mapping for the proposed development (www.buildingsofireland.ie). The National Inventory of Architectural Heritage (NIAH) is a state initiative under the administration of the Department of Arts, Heritage and the Gaeltacht and established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999.

The purpose of the NIAH is to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for the Department of Arts, Heritage and the Gaeltacht to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS). The published surveys are a source of information on the selected structures for relevant planning authorities. They are also a research and educational resource. It is hoped that the work of the NIAH will increase public awareness and appreciation of

Ireland's architectural heritage. The NIAH also incorporates a desk-based survey of Historic Gardens and Designed landscapes of the country. This dataset was also downloaded onto the base mapping in order to establish if any such gardens or landscapes were located within the immediate vicinity of the proposed development.

15.2.2 GEOGRAPHICAL INFORMATION SYSTEMS

GIS datasets were used in the assessment of the cultural heritage. GIS is a computer database which captures, stores, analyses, manages and presents data that is linked to location. GIS is geographic information systems which includes mapping software and its application with remote sensing, land surveying, aerial photography, mathematics, photogrammetry, geography and tools that can be implemented with GIS software. A geographic information system (GIS) was used to manage the datasets relevant to the archaeological and architectural heritage assessment and for the creation of all the maps in this section of the report. This involved the overlaying of the relevant archaeological and architectural datasets on georeferenced aerial photographs and road maps (ESRI), where available. The integration of this spatial information allows for the accurate measurement of distances of a proposed development from archaeological and cultural heritage sites and the extraction of information on 'monument types' from the datasets. Areas of archaeological or architectural sensitivity may then be highlighted in order to mitigate the potential negative effects of the development on archaeological, architectural and cultural heritage.

15.2.3 FIELD INSPECTION

Field inspection of the proposed development site was undertaken in February 2017. The field assessment was carried out in order to assess the potential impact of the proposed development on any recorded archaeological monuments or architectural/cultural heritage features located within the vicinity of the site. The field work also served to identify any previously unrecorded archaeological monuments or other cultural heritage features within the proposed development area. Field survey was undertaken by a qualified archaeologist. A full photographic record of the site is presented in Appendix 15.1.

15.2.4 LEGISLATION

All relevant legislation and statutory instruments pertaining to archaeology and cultural heritage have been taken into consideration in this assessment. The detail of same and the relevant policies and objectives of the Cork County Development plan are outlined in Appendix 15.2.

15.3 THE PROPOSED DEVELOPMENT

The proposed development is located at the existing MSD Ireland (Brinny) facility and in agricultural land immediately adjacent to same.

The development will include the construction of additional car parking facilities in lands to the north-west of the aforementioned B21 building and in a green space at the south-east end of the site. While the proposed works to B21 will largely involve works to an existing structure, the construction of the car parks will require ground works in the form of topsoil removal.

15.4 THE RECEIVING ENVIRONMENT

15.4.1 SITE DESCRIPTION

The existing MSD plant at Brinny is divided by a public road which extends in a north-west south-east direction from the adjacent Brinny crossroads at the south-west towards Ballinacurra Bridge at the north-west. The proposed development area comprises a partially developed site with some green areas at the south-east and south-west. The majority of the proposed development area is located to the east of the aforementioned public road. The main central area within the red line boundary is occupied by existing car parking facilities and a contractor's compound. To the north of the car park is

the B21 building, which is the focus of much of the development proposal. A landscaped berm surrounds B21 to the north and east. Further to the north-west beyond the berm is a large field which was in tillage at the time of the site visit. It is proposed to utilise a portion of this field as a temporary contractor's compound and associated car parking.

At the south-west side of the site a small green area is located within the existing facility adjacent to the public road at Brinny cross roads. It contains a low earthen berm and is separated from the adjoining private property to the south-west by a fence outside which is a screening line of trees/hedge. A further green area is located adjacent to the public road at the cross roads and immediately north of same. It is currently under rough pasture with a widely spaced line of trees close to the roadside.

15.4.2 HISTORICAL BACKGROUND AND CARTOGRAPHIC EVIDENCE

The townland of Brinny is described by Lewis in his Topographical Dictionary of Ireland (1837) as follows:

***BRINNY**, a parish, partly in the Eastern Division of the barony of EAST CARBERY, and partly in the barony of KINNALEA, but chiefly in that of KINNALMEAKY, county of CORK, and province of MUNSTER, 3 miles (N. E.) from Bandon; containing 1949 inhabitants. In the civil war of 1641 a running fight took place between a part of the garrison of Bandon and a body of insurgents, which terminated at Brinny bridge in the defeat of the latter, of whom 50 were killed. The parish is situated on the north road from Cork to Bandon, and comprises 7200 statute acres, as applotted under the tithe act. About two-thirds of the land are under tillage, and the remainder in pasture; the soil is good, and the system of agriculture is greatly improved; there is neither waste land nor bog. Good building stone, of which there are several quarries, and flags of excellent quality abound in the parish. The surrounding scenery is pleasingly diversified, and there are several handsome gentlemen's seats, the principal of which are Upton, the residence of the Rev. Somers Payne; Brinny House, of J. Nash, Esq.; Garryhankard, of T. Biggs, Esq.; Beechmount, of T. Hornebrook, Esq.; Brothersfort, of W. Whiting, Esq.; and Kilmore, of W. Popham, Esq. There are some extensive flour-mills near the bridge, and in the demesne of Upton is a police barrack.*

The living is a rectory and vicarage, in the diocese of Cork, with the rectory and vicarage of Knockavilly episcopally united in 1810, forming the union of Brinny, in the patronage of the Bishop: the tithes amount to £405, of which £5 is payable to the dean of Cork and £400 to the rector; and the gross amount of tithe is £1025. The church was wholly rebuilt by aid of a loan of £300 from the late Board of First Fruits, in 1813; it is a neat edifice with a tower. Divine service is also performed in a licensed house at Knockavilly, and in a school-house in the summer evenings. The glebe contains only eight acres, and there is no glebe-house. In the R. C. divisions this is one of the five parishes constituting the union or district of Innishannon. The parochial school, in which are 27 boys and 18 girls, is supported principally by the rector, who also superintends a Sunday school; and a school of 58 boys and 30 girls is supported by subscription, aided by an annual donation of £3 from the parish priest.

Later in the nineteenth century the church at Brinny is also described.
`*Brinny Church, which was an unsightly structure, has been entirely remodelled under the present Incumbent. A tower has been built; the church handsomely re-seated; the chancel laid with encaustic tiling; stained glass windows put in. In short, the internal fittings are all entirely new. Divine Service is held on Sundays and chief festivals at 12 noon and 6. The union is under diocesan scheme. The assessment is £134, and stipend of Rector, £250. The present Incumbent holds a " good service" pension. The Parochial School, under the management of the Rector, has 25 children on roll. Amongst the parochial organizations are-Branch of Young Women's Christian Association, Prot. Orphan Society, various missions, etc. There is a fine Glebe House, with offices', and nine acres of land, free of rent.'*

A review of the available historic mapping for the area was also undertaken. The Down Survey maps of 1654-6 (www.downsurvey.tcd.ie) for Brinny were consulted but do not provide any detail for the townland. The Civil Survey, so called because it was ordered by the Civil Authority, was taken from

1654-6 in order to value the lands in Leinster, Munster, Ulster and Connaught assigned to satisfy the claims of soldiers for their arrears of pay during the Civil War, and of those Adventurers who made cash available in the 1640's to pay for the war and were promised land in Ireland in return. The Civil Survey, based as it was on the records of the original owners and not the result of an official or government survey, was considered by many of the new owners to be inaccurate and the Down Survey, so called because a chain was laid down and a scale made, was taken from 1656-8 under the direction of William Petty.

The Down Survey is a mapped survey. Using the Civil Survey as a guide, teams of surveyors, mainly former soldiers, were sent out under Petty's direction to measure every townland to be forfeited to soldiers and adventurers. The resulting maps, made at a scale of 40 perches to one inch (the modern equivalent of 1:50,000), were the first systematic mapping of a large area on such a scale attempted anywhere. The primary purpose of these maps was to record the boundaries of each townland and to calculate their areas with great precision. The maps are also rich in other detail showing churches, roads, rivers, castles, houses and fortifications. Most towns are represented pictorially and the cartouches, the decorative titles, of each map in many cases reflect a specific characteristic of each barony.

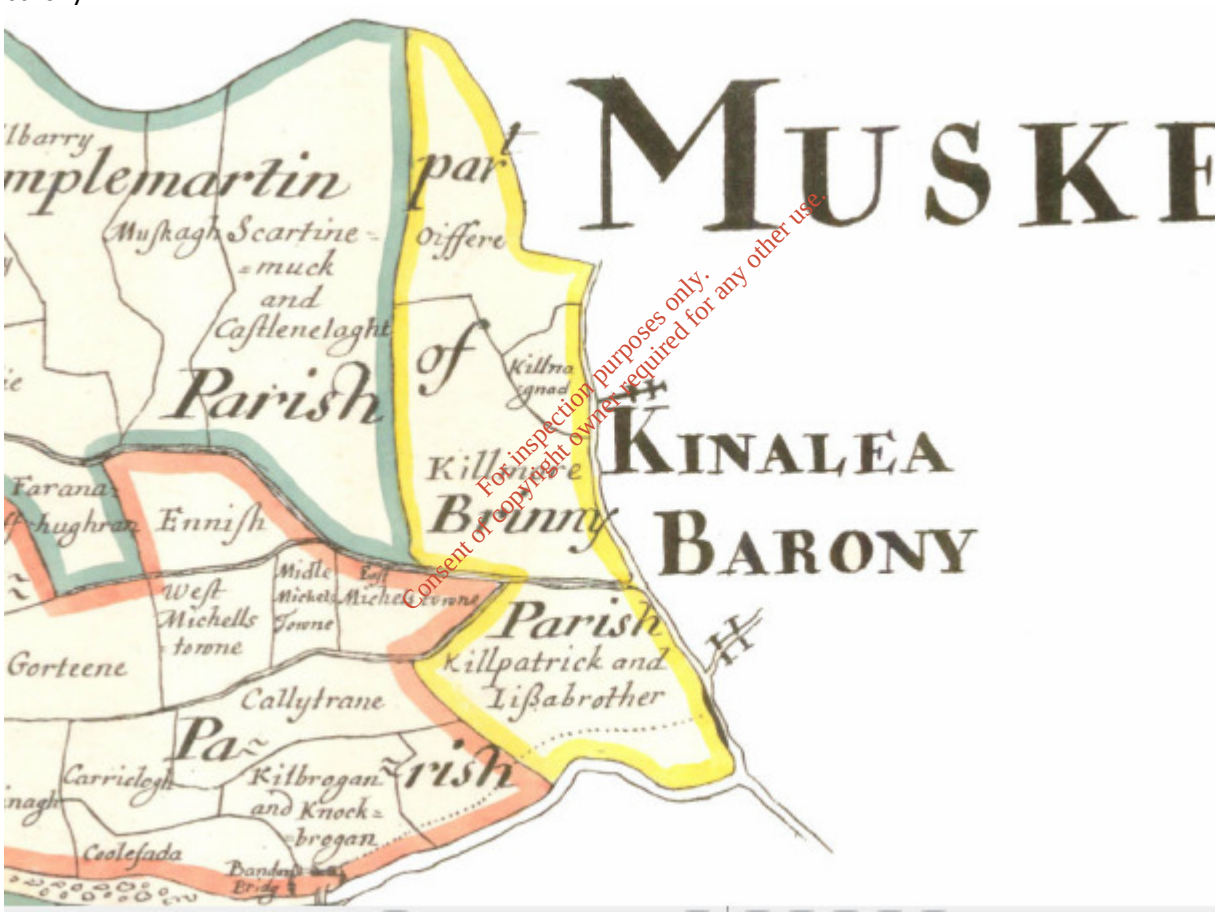

Figure 15.1 Extract from 17th Century Down Survey Map of Brinny Parish[66]

In 1777 George Taylor and Andrew Skinner surveyed and mapped the roads of Ireland and published their results the following year. The maps were engraved by Garnet Terry. The strip maps were welcomed for their accuracy and for showing details of roads and crossroads, naming landlords and their houses and outlining topographical features.

[66] www.downsurvey.tcd.ie

Figure 15.2 'Brinie' and the name 'Nash Esq'.[67]

Grand Juries were established in the eighteenth century to determine whether there was a good case for a criminal prosecution to take place. Later they took over some of the functions that are now carried out by county councils. Bridge building, road maintenance, and the building of fever hospitals were some of the duties carried out by Grand Juries. The poor law unions took over most of these functions in 1840 and county councils took over any remaining fiscal and administrative functions after the Local Government Act of 1898. Neville Bath's map for the Grand Jury of Cork was surveyed in the 1790s and published in 1811.
The map is one of the best and most detailed maps of the county before the Ordnance Survey maps of the 1840s.

Figure 15.3 Brinny Parish with Brinny church and other structures indicated. [68]

[67] Extract from Taylor and Skinner Road Maps (1777)
[68] Extract from Grand Jury Map No. 5 of Cork county (1811)

The first (1841) and second (1901) edition Ordnance Survey (OS) maps for the area were also consulted for items of potential archaeological or cultural heritage merit on or adjacent to the proposed development site.

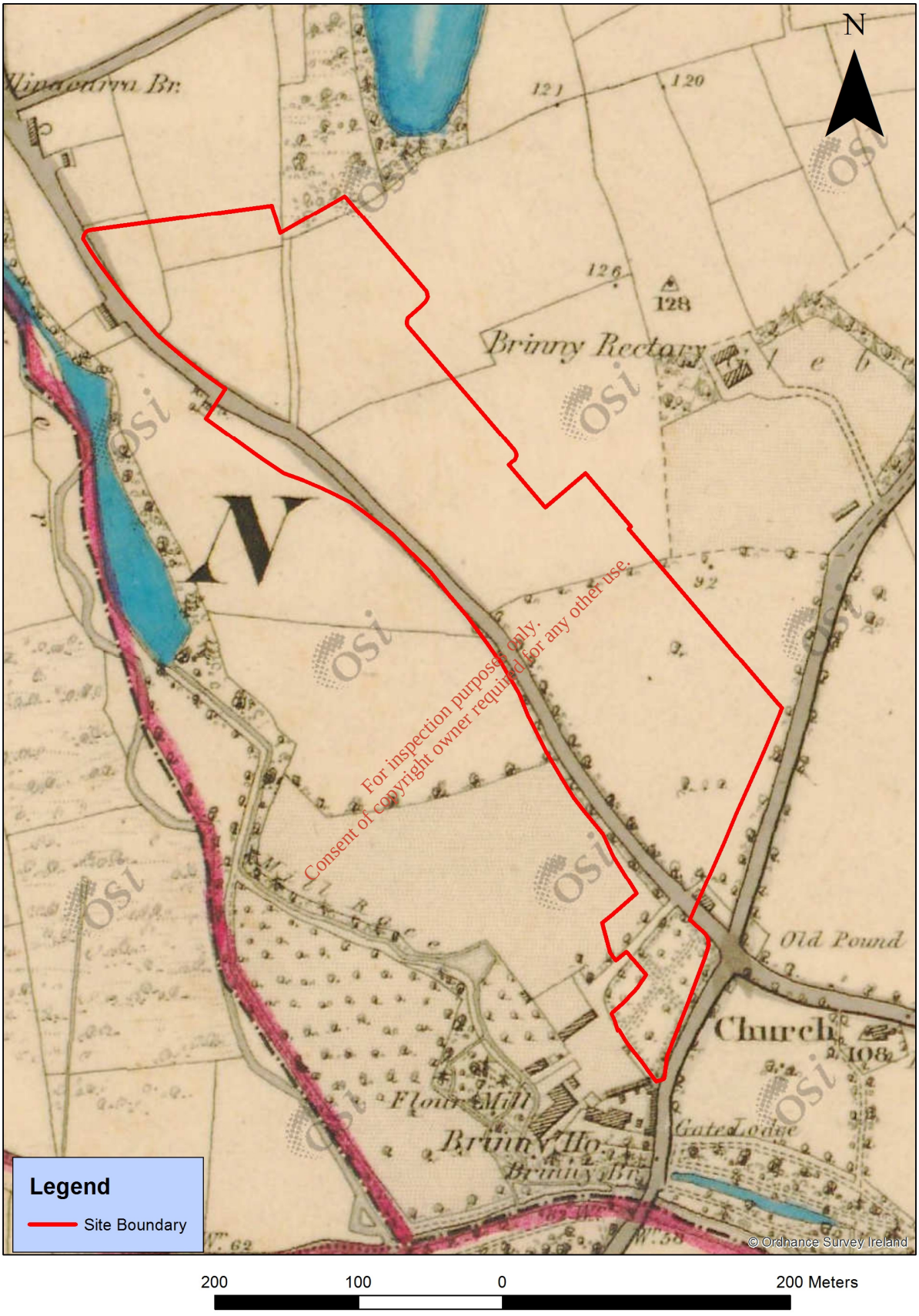

Figure 15.4 Proposed development site boundary overlaid on 1st ed. (1841) OS mapping.[69]

[69] Note Brinny House to SW and associated garden within SW portion of red line boundary.

The first ed. (1841) OS map depicts the land within the current red line boundary as agricultural, being divided into fields. One small structure is indicated adjacent to the public road just north of the cross roads, however, no above ground remains of this building are extant. Brinny House and Flour Mill are shown further to the south-west outside the proposed development site boundary. A garden seemingly associated with the house is located to the north-east of same at the west side of the cross roads and is located within the south-western portion of the proposed development site and the existing MSD facility. No above ground remains of the garden are now visible in this area which is now occupied by a temporary contractor's compound to the south of which is a grassed area with a low berm of topsoil.

Figure 15.5 Temporary contractor's compound within garden shown on 1st ed. OS map, looking NE.

Figure 15.6 Topsoil berm within area of garden, looking NW.

No additional features of archaeological or cultural heritage merit are indicated on the second edition (1901) OS map.

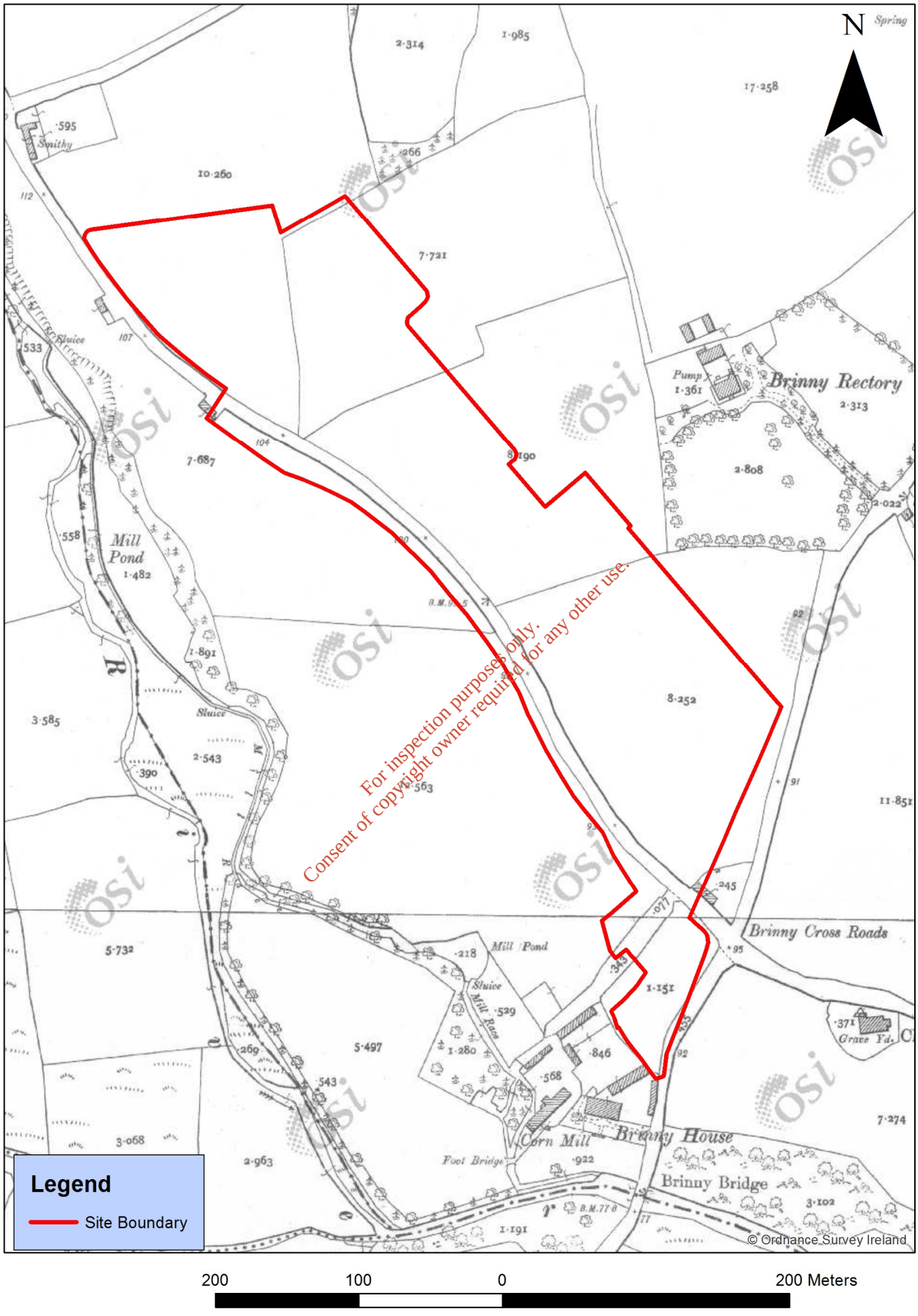

Figure 15.7 Second ed. (1901) OS map overlaid with development red line boundary.

15.4.3 ARCHAEOLOGY

Archaeology is considered here to include all recorded monuments listed in the Record of Monuments and Places (RMP), National Monuments (i.e. those in the ownership/guardianship of the state), previously unrecorded sites, sites reported in the Excavations Database (www.excavations.ie) if not included in the RMP and find spots or sites listed in the Topographical Files.

15.4.3.1 National Monuments

The term 'national monument' as defined in Section 2 of the National Monuments Act (1930) means a monument 'the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto'. National monuments in State care include those which are in the ownership or guardianship of the Minister for Arts, Heritage and the Gaeltacht. Section 5 of the National Monuments Act (1930) allows owners of other national monuments to appoint the Minister for the Arts, Heritage and the Gaeltacht or the relevant local authority as guardian of such monuments, subject to their consent. This means in effect that while the property of such a monument remains vested in the owner, its maintenance and upkeep are the responsibility of the State. Monuments are also protected by Preservation Orders, also National Monuments.

No National Monuments in State Care or subject to a Preservation Order are located on or in the vicinity of the proposed development site. The nearest National Monument in State Care is Kilcrea Friary (NM No. 182) over 8km to the north (Figure 15.8). The nearest monument subject to a preservation order is the levelled ringfort of Lisnacaheragh in Garranes townland over 5km to the north-west.

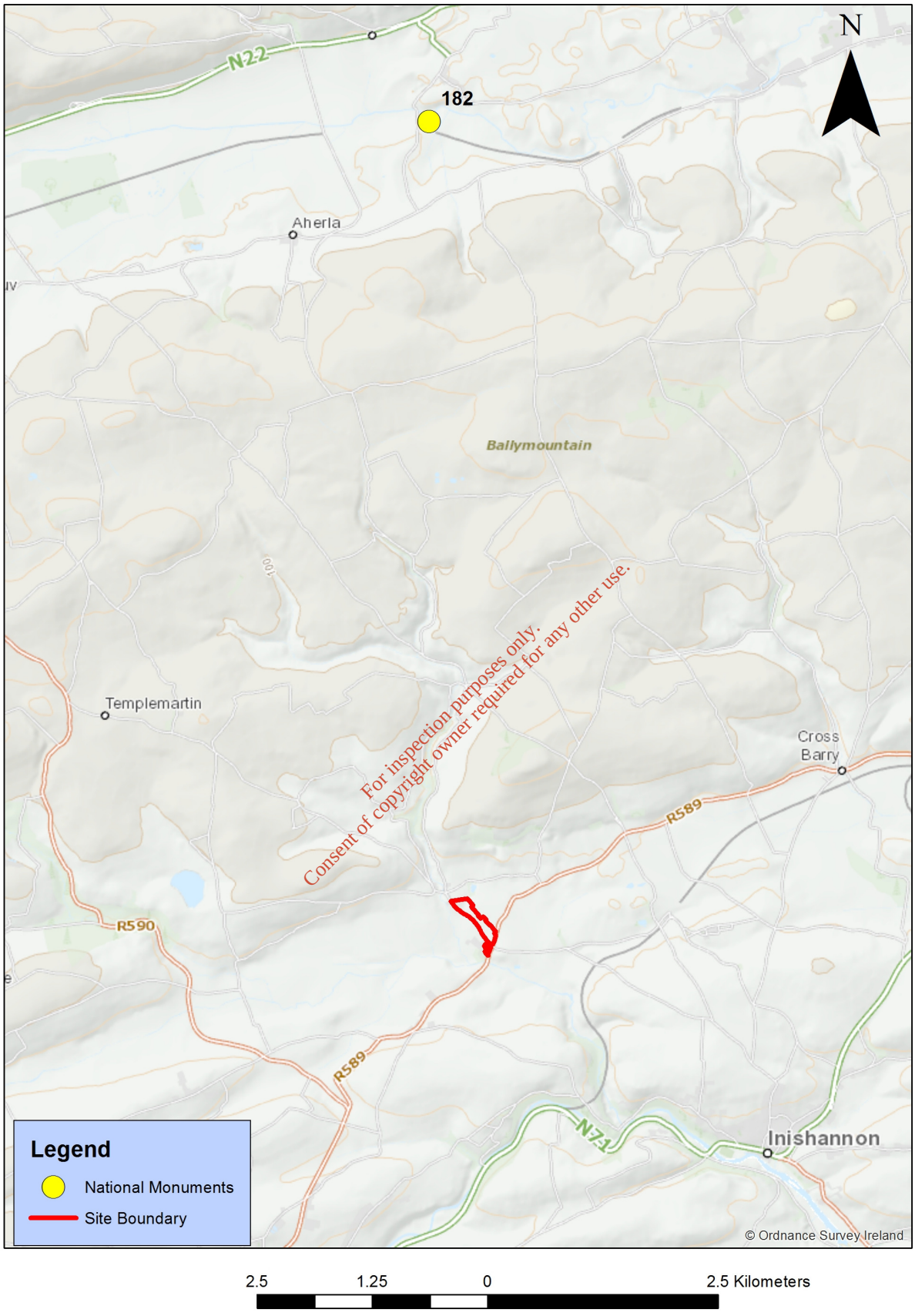

Figure 15.8 Nearest National Monument in State Care in Relation to Site Boundary.

15.4.3.2 Recorded Monuments

No recorded monuments are located within the proposed development site boundary.

Sixteen recorded monuments are located within 1km of the proposed development site boundary and are listed in Table 15.1 below and shown on Figure 15.13. Of these, five (CO096-055, CO096-56001 and 002, CO096-069001 and 002) are situated within 250m of the red line boundary (Figure 15.21). The nearest monument comprises a corn mill (CO096-056001) *c.* 50m to the south-west of the south-western portion of the proposed development site. The mill and the adjacent Brinny House are indicated on the 1st edition (1841) OS map. The mill is described on the Historic Environment Viewer (www.webgis.archaeology.ie/historicenvironment) as follows below:

Table 15.1 Recorded monuments within 1km of the proposed development site red line boundary

SMR/RMP	ITM E	ITM N	TOWNLAND	CLASSIFICATION
CO096-026----	552419	559346	BRINNY	Moated site
CO096-055----	551064	559971	KILMORE (Kinalmeaky By.)	Mill - corn
CO096-056001-	551583	559258	BRINNY	Mill - corn
CO096-056002-	551542	559197	BRINNY	Inscribed stone
CO096-057----	551487	559007	KILPATRICK (Kinalmeaky By.)	Ringfort - rath
CO096-058----	552002	558495	KILPATRICK (Kinalmeaky By.)	Ringfort - rath
CO096-068001-	550821	560103	KILMORE (Kinalmeaky By.)	Country house
CO096-068002-	550821	560103	KILMORE (Kinalmeaky By.)	Mill - unclassified
CO096-069001-	551800	559313	BRINNY	Church
CO096-069002-	551795	559308	BRINNY	Graveyard
CO096-077----	550519	560518	KILNAGNADY	Standing stone
CO096-078----	551994	558420	KILPATRICK (Kinalmeaky By.)	Burial ground
CO096-082----	552215	558628	KILPATRICK (Kinalmeaky By.)	Souterrain
CO096-083----	552364	560242	CLASHANIMUD	Souterrain
CO096-088----	550609	559178	KILMORE (Kinalmeaky By.)	Moated site
CO096-103001-	551788	558940	KILPATRICK (Kinalmeaky By.)	Souterrain

CO096-056001 – Mill – corn
Indicated as L-shaped flour mill on 1842 OS 6-inch map. Weather-slated 6-bay,4-storey structure (long axis NE-SW) built on gentle SW-facing slope. Gabled extension to rear, NW end. Late 19th century addition at NE end is 3-bay, 3-storey with same roofline as original mill. According to local information, waterwheel and internal gearing and fittings removed in late 1960s and replaced with modern milling machinery. Intact mill race (dry) approaches mill from N; taken from Brinny river. Millstones lying nearby. To rear of mill an inscribed stone with inscription 'To the prosperity of Nash 1776 D.H. Bulle' was removed from Brinny house which stood immediately to SE during its demolition in 1982.

A stone outbuilding seemingly associated with Brinny House and Mill is located a short distance outside the south-western site boundary and outside the existing chain-link fence separating the MSD facility from adjoining private property.

Figure 15.9 Unroofed stone outbuilding outside the development site boundary, looking SW.

CO096-056002 – Inscribed stone

Further to the south-west, *c.* 130m from the south-western portion of the proposed development area is an 18th century stone dedicated to Nash who was previously the owner of Brinny House (now demolished). Nash is also cited on the Taylor and Skinner road maps (Figure 15.2) as the landlord of the area towards the late 18th century.

CO096-069001 and 002 – Church and graveyard

The Church of Ireland church and graveyard at Brinny townland are located *c.* 90m to the east-south-east of the proposed development site boundary, to the south-east of Brinny crossroads. The monuments are described as follows on www.webgis.archaeology.ie/historicenvironment.

On S side of road, E of Brinny crossroads; pentagonal-shaped graveyard (c. 40m N-S; c. 50m E-W) enclosing site of ancient parish church (CO096-069001-) of Brinny. Church rebuilt in 1730s and enlarged in 1813 (Brady 1863, vol. 1, 45). Rectangular nave; three windows in both N and S walls, each has two round-arched lights divided by mullion; two windows with quatrofoil over mullion on W gable. Chancel to E with large E window similar to those on W gable of nave, small paired lancets in N and S walls. Slim 3-storey tower with gabled roof added at NW corner in 1883 (Cole 1903, 27), door on N wall. Inscribed headstones date from 19th century to present day.

The church is also a Protected Structure and listed in the NIAH (see below).

Figure 15.10 Church and graveyard CO096-069001 and 002, looking SE.

CO096-055 – Mill – corn

The remains of a corn mill are located *c.* 220m to the north-west of the north-western end of the proposed development site boundary in the townland of Kilmore. It is described on www.webgis.archaeology.ie/historicenvironment as follows:

Roadside, 3km NW of Innishannon on the Brinny river. Gabled, 5-bay, 3-storey mill with brick dressed opes; in poor condition. Two-storey addition to rear. Conglomerate millstone used as step into mill. Mill race taken from river to N; now destroyed.

Figure 15.11 Corn mill CO096-055 in Kilmore townland, looking E.

Figure 15.12 Rear of Corn mill CO096-055 on right of photo.

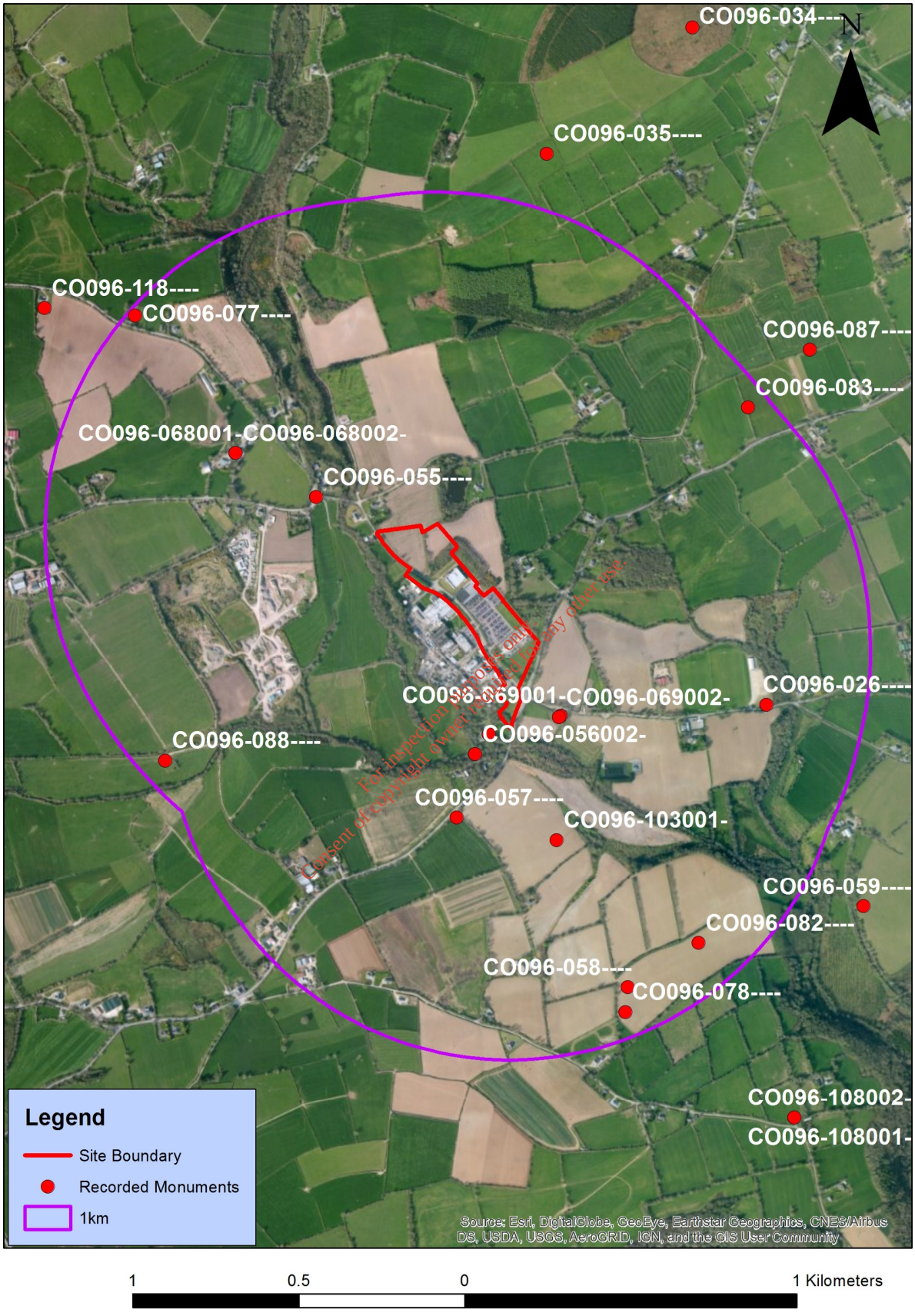

Figure 15.13 Recorded monuments within 1km of the proposed development site boundary.

Figure 15.14 Recorded monuments within 250m of the proposed development site boundary.

15.4.3.3 Sites Reported in the Excavations Database

The database of excavations carried out in Ireland was consulted for any licensed archaeological work which may have been undertaken on or in the vicinity of the proposed development site. Many of the summaries for the area relate to monitoring of works associated with the laying of a gas main for Bord Gais Networks in 2010 and 2011 which did not produce any archaeologically significant results and so are not reproduced here. The hillfort in the adjoining townland of Clashanimud (1.5km to the north-east) was subject to archaeological investigations over a number of years, the results of which are summarised below.

2004:0219 - CLASHANIMUD, Cork
County: Cork Site name: CLASHANIMUD
Sites and Monuments Record No.: SMR 96:34 Licence number: 04E1038
Author: William O'Brien
Site type: Hillfort
ITM: E 532205m, N 537568m
Sample excavation was carried out in August 2004 at a large bivallate hillfort in the Crossbarry area of mid-Cork. The inner enclosure, consisting of a bank and external ditch, was trenched, as was an adjacent radial field bank. There were artefact finds. Radiocarbon dating of charcoal samples from the bank and ditch indicate that the inner enclosure at this hillfort was built around 1300-1100 BC. Excavation of the northern side of the inner enclosure was also carried out. A series of surface hollows in that area were confirmed to have derived from quarrying activity in the modern era. Test-pit sampling of geophysical survey anomalies in this part of the site proved inconclusive. It is planned to carry out further research excavation at this site in coming years.

2005:205 - CASHEL HILLFORT, CLASHANIMUD, Cork
County: Cork Site name: CASHEL HILLFORT, CLASHANIMUD
Sites and Monuments Record No.: SMR 96:34 Licence number: 04E1038
Author: William O'Brien, Department of Archaeology, NUI, Galway.
Site type: Hillfort
ITM: E 532205m, N 537568m
Excavation was carried out at Cashel hillfort, Co. Cork, in summer 2005, funded by the Royal Irish Academy. A seventeen-week investigation saw a total area of 520m^2 excavated at this large bivallate enclosure. The focus of this work was the summit area of the hillfort, the north-west quadrant of the inner enclosure and the defences of both the outer and inner enclosures. The investigation of the summit area and inner enclosure was disappointing, producing no significant finds or features. Excavation of the defences uncovered conclusive evidence of massive timber palisading along the inner enclosure, with post fencing along the top of the outer enclosure bank as well. A previously unknown external ditch was discovered outside the latter bank feature. Radiocarbon results confirm that these defences were built around 1200 BC, consistent with the Late Bronze Age date range now attributed to multivallate hillforts in Ireland.

2006:296 - Clashanimud, Cork
County: Cork Site name: Clashanimud
Sites and Monuments Record No.: - Licence number: 04E1038
Author: William O'Brien, Department of Archaeology, University College Cork.
Site type: Bronze Age hillfort
ITM: E 552139m, N 561390m
A third season of excavation was conducted at the large hilltop enclosure known as Cashel hillfort, located in Clashanimud townland, Brinny, Co. Cork. A total of fourteen weeks' excavation, followed by a week of site conservation work, was carried out in the period May to August 2006. A programme of systematic test-pitting that commenced in 2005 was extended to the south-west quadrant of the inner enclosure, as well as to selected areas of the outer enclosure. A total of fifteen test-trenches were excavated in 2006, the majority of which were 4m^2 cuttings. A further objective of the 2006 excavation was to identify the original entrances to this bivallate hilltop enclosure. The 2006 season added further information on the hillfort defences at Cashel fort, which supports the results of the previous two excavation seasons. A stone-faced earthen and stone bank, topped by a massive timber palisade, with an adjacent external rock-cut ditch, protected the inner enclosure. The size and strong

construction of this palisaded bank and ditch points to a strong defensive element rather than a symbolic feature or animal enclosure. The wooden palisade of this inner enclosure was subsequently burned down, in what appears to have been a single deliberate act of warfare. Test-pit excavation of the inner hillfort enclosure did not reveal evidence of human occupation from any period. The extent of this testing over three seasons, combined with the absence of early finds, indicates that there was no significant residential occupation of the inner hillfort enclosure in prehistory or in later periods. The same is probably true of the outer hillfort enclosure, though considerably less excavation has been carried out in that area. The 2006 excavation did identify the original entrance to the inner hillfort enclosure, located on the western side of the site. A causeway across the enclosing ditch at this location led to an opening in the inner bank, which was originally protected by a wooden gate in the defensive palisade.

15.4.3.4 Find Spots in the Topographical Files, National Museum of Ireland

The database of archaeological find spots recorded by the National Museum of Ireland as shown on www.heritagemaps.ie was consulted for any relevant finds in the vicinity of the proposed development site. No such find spots are recorded in Brinny townland or in the adjacent townlands. The nearest find spot is situated *c.* 6km to the north-west in Garranes ringfort which was excavated in the 1930s by Seán P. O'Ríordáin. The find spot at Garranes is recorded as follows:

National Museum Point: Potsherds; Iron; Bronze; Bone Objects etc.

Name Excavation

Object Type Potsherds; Iron; Bronze; Bone Objects etc.

15.4.4 ARCHITECTURAL HERITAGE

15.4.4.1 Record of Protected Structures (RPS)

No Protected Structures are located within the proposed development site boundary.

Six Protected Structures are located within 1km of the latter, of which five (612, 614, 615, 616 and 618) are located within 250m of the development red line boundary.

Table 15.2 Protected Structures within 1km of the proposed development site boundary

RPS ID	STRUCTURE	TOWNLAND
612	Tuck Mill	Brinny
613	Dardan Bridge	Brinny, Garryhankard, Rockfort, Clashanimud
614	The Old Rectory	Brinny
615	Corn Mills	Brinny
616	Church of Ireland (In Ruins)	Brinny
618	School	Kilpatrick

The Old Rectory (614) is located *c.* 100m to the north-east of the eastern site boundary and *c.* 180m ENE of B21 which is the subject of the current development proposals. It is also listed in the NIAH and a description of same is provided below in Section 15.4.4.2. The Old Rectory is currently screened from view from the area of B21 by an existing landscaped berm which will be retained as part of the proposed development. Similarly, views of the Old Rectory are not possible from the north-western portion of the proposed development site given the presence of the aforementioned berm and intervening field boundaries.

Figure 15.15 B 21 (SE elevation), looking ENE towards landscaped berm & Old Rectory (RPS 614).

Figure 15.16 Looking ENE towards Old Rectory (RPS 614) from existing carpark adjacent to B 21.

Figure 15.17 View of existing landscaped berm (right) and existing mature field boundaries (left).

Other nearby Protected Structures comprise the Church of Ireland church (RPS 616) to the south-east (also described above in Section 115.4.3.2 and the Corn mill (RPS 615) to the south-west of the south-western portion of the proposed development site boundary. The mill is screened from view by existing mature trees and hedging which exists along the SW side of the development site.

Figure 15.18 Existing hedging at SW side of proposed site, looking SW towards mill (RPS 615).

Views of the church (RPS 616) from the south-west side of the proposed development area are possible.

Figure 15.19 View of Church (RPS 616) from SW side of proposed development site, looking E.

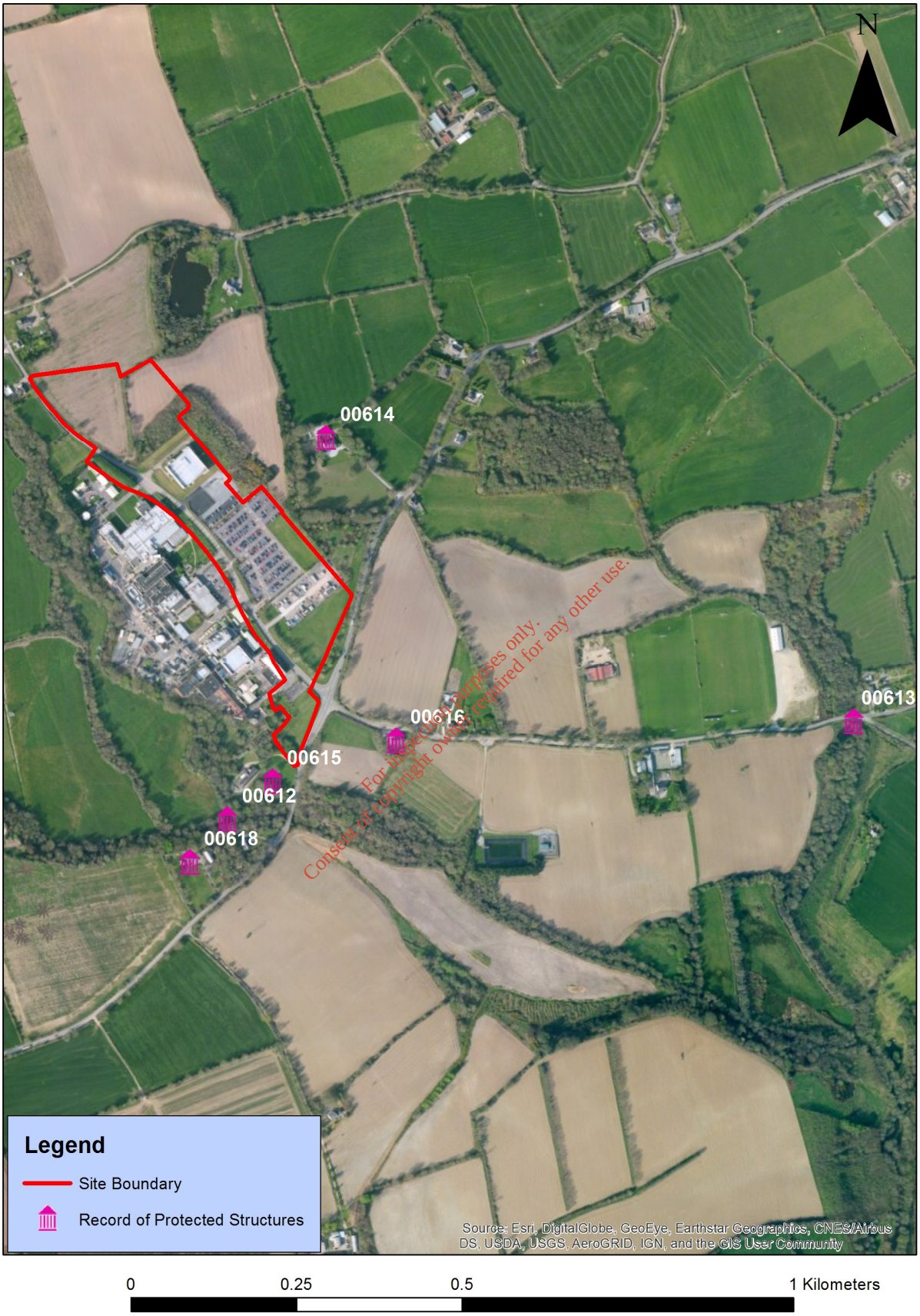

Figure 15.20 Protected Structures within 1km of the proposed development site.

15.4.4.2 National Inventory of Architectural Heritage (NIAH) including Historic Gardens and Designed Landscapes

Five NIAH structures and two historic gardens are located within 1km of the proposed development site boundary (Figure 15.21).

Table 15.3 NIAH structures within 1km of the proposed development site boundary

REG.NO	DATE	NAME	TOWNLAND	ORIGINALTY
20909621	1770 - 1810	Ballinacurra Mill	KILMORE	mill (water)
20909622	1800 - 1840	Ballinacurra Bridge	BRINNY,KILMORE	bridge
20909628	1790 - 1830	Brinny Glebe	BRINNY	rectory/glebe/vicarage/curate's house
20909629	1900 - 1910		BRINNY	post box
20909631	1810 - 1815	Brinny Church of Ireland Church	BRINNY	church/chapel

Table 15.4 Historic Gardens within 1km of the proposed development site boundary

Site Name	ITM E	ITM N	Townland
Brothersfoot House	551660	558465	Kilpatrick
Brinny Rectory	551660	559764	Brinny

The nearest NIAH structure comprises a roadside post-box (Reg. 20909629) located *c.* 36m to the south-east of the south-western site boundary, further to the south-east of which is the Church of Ireland Church (described above).

The Rectory (Reg. 20909628) is situated just over 100m to the north-east of the eastern site boundary and is also a Protected Structure (RPS 614). The building is described in www.buildingsofireland.ie as follows[70]:

Brinny Glebe, County Cork

Reg. No.	20909628
Date	1790 - 1830
Previous Name	N/A
Townland	BRINNY
County	County Cork
Coordinates	151743, 59692
Categories of Special Interest	ARCHITECTURAL ARTISTIC SOCIAL
Rating	Regional
Original Use	rectory/glebe/vicarage/curate's house
In Use As	house

[70] all images and descriptions obtained from www.buildingsofireland.ie, 2017

Description
Detached five-bay two-storey over basement former rectory, built c.1810, now in use as private house. Hipped slate roof with over hanging timber clad eaves on paired timber brackets, having rendered chimneystacks and uPVC rainwater goods. Rendered walls with cut limestone plinth. Diminishing square-headed window openings with tooled limestone sills, having six-over-six pane timber sliding sash windows to first floor, nine-over six pane to ground floor and three-over-three pane timber sliding sash windows to basement. Round-headed stairwell window openings with stone sills to rear (north-west) elevation with nine-over-six pane timber sliding sash windows with spoked heads. Segmental-headed entrance door opening to front elevation, having carved timber doorcase with timber panelled door flanked by engaged fluted columns surmounted by cornice and decorative spoked fanlight, having limestone stepped approach. Square-headed door opening to rear with timber battened door. Multiple-bay two-storey outbuilding to rear with hipped slate roof and rubble stone walls. Square-headed window openings with fixed timber-framed windows. Square-headed door opening with timber battened door and overlight. Segmental-headed carriage arch with double-leaf timber battened door. Segmental-headed entrance arch to yard with pilasters and dressed voussoirs, square-headed pedestrian entrance to side.

Appraisal
A handsome former rectory, which with its hipped roof and symmetrical entrance front, is typical of the middle sized houses of the early nineteenth century. It retains much of its original form and fabric, with historic features such as timber sash windows, paired eaves brackets and slate roof adding to its character, while the fine doorcase forms the building's decorative focus. The related outbuilding adds to its setting and context.

As outlined above in section 15.4.4.1 views to the structure are not possible from B21 or from the proposed car parking facility further to the north-west. A small garden plot is indicated on the 1st ed. (1841) OS mapping to the west of the Rectory and is recorded in the Historic Gardens and Designed landscape section of the NIAH.

Further to the north-west, *c.* 120m to the north-west of the northern site boundary is Ballinacurra Bridge (Reg. 20909622) to the north-west of which is Ballinacurra Mill (20909621) which is also a recorded monument. All of the NIAH structures listed above are described in Appendix 15.3

Figure 15.21 NIAH structures & historic gardens within 1km of the proposed development.

15.5 PREDICTED IMPACTS

15.5.1 ARCHAEOLOGY

15.5.1.1 Direct Impacts on Recorded Archaeological Monuments

No direct (physical) impacts on the recorded archaeological resource are anticipated as no recorded monuments are located within the proposed development site boundary.

15.5.1.2 Direct Impacts on potential sub-surface archaeological deposits

A potential impact on the archaeological resource also lies in the uncovering of sub-surface archaeological features during topsoil removal and other ground works associated with the construction of the car parks at the north-west and south-east ends of the proposed development site. The north-western area comprises agricultural land which has not undergone any significant ground works other than those associated with its agricultural use (tillage). Similarly, the green area at the south-east end of the site (north of the public road) appears relatively undisturbed. While no recorded monuments are located in the immediate vicinity of these area, the potential still exists (albeit slight) for the uncovering of previously unrecorded archaeological features or deposits during topsoil removal.

The small green area within the existing MSD facility at the south-west end of the proposed development site is located within an area which previously functioned as a garden associated with Brinny House. This area appears to have undergone some ground disturbance in recent years and may also have been landscaped somewhat reducing the potential for the uncovering of sub-surface remains.

15.5.1.3 Indirect Impacts

Indirect impacts here are those which may have a negative (or positive) effect on the archaeological landscape after the construction phase of the development (i.e. operational). Indirect impacts may include visual impact on the surrounding archaeological landscape. The development proposals largely comprise alterations to an existing building (B21) and car parking facilities which will not be visually intrusive in the landscape. Furthermore, the proposed development is largely located within an existing facility, apart from the portion of agricultural land to the north-west.

The nearest above ground recorded monuments comprise the corn mill to the south-west and the Church of Ireland church to the south-east. Views to the corn mill from the proposed development site are not possible given the presence of dense hedge screening along the south-western site boundary. In this regard, no indirect impacts to this monument are anticipated as the screening hedge is maintained.

Views to the Church of Ireland church are possible from the south-west and south-east ends of the proposed development site. As outlined above, however, the proposals for this end of the development area comprise carparking facilities which will not result in a significant visual intrusion in the landscape, particularly given that it will also be located within the existing facility which is now a much-changed and industrialised landscape. It is considered, therefore, that the development proposals will not result in a significant visual impact to the church as they are unlikely to detract further from its visual setting.

15.5.2 ARCHITECTURAL HERITAGE

15.5.2.1 Direct Impacts on Architectural Heritage

No direct (physical) impacts on the architectural heritage resource (structures listed in the Record of Protected Structures or NIAH) will occur as none are located within the proposed development site boundary. While a number of architectural heritage features survive in the general vicinity of the

proposed development site, all are located outside the site boundary and in this regard will not be directly impacted.

15.5.2.2 Indirect Impacts

Indirect impacts here are those which may have a negative (or positive) effect on the archaeological landscape after the construction phase of the development (i.e. operational). Indirect impacts may include visual impact on the surrounding architectural heritage landscape. The nearest above ground architectural heritage features comprise the roadside post-box, Church of Ireland church (discussed above) and the Old Rectory.

As demonstrated in Section 15.4.4.1 views to the rectory are not possible from the proposed development site given the presence of the landscaped berm and an existing mature field boundary. Also, as the proposals involve works to an existing building (B21) additional impacts to the setting of the Protected Structure (and NIAH structure) are not anticipated. In this regard indirect impacts to the rectory will not occur as the screening berm is maintained.

While views to the Church of Ireland church are possible it is considered that the nature of the proposed development will not unlikely to detract further from its visual setting.

Views of Ballinacurra bridge and mill are not possible from the proposed development site, or vice versa, therefore no indirect impacts are anticipated.

15.6 MITIGATION MEASURES

The predicted impacts on the archaeological and architectural heritage are regarded as being negligible with no direct impacts on the recorded archaeological resource (RMPs) or architectural resource (RPS and NIAH) identified.

The potential does exist, however, for uncovering sub-surface archaeological features during ground works associated with the development of the car parking facilities at the north-west and south-east ends of the proposed development site. In this regard the following mitigation measure is recommended. All recommendations are subject to the approval of the Planning Authority and the National Monuments Service of the DAHRRGA.

- Archaeological monitoring of topsoil removal associated with the proposed development should be undertaken. Should archaeological finds, features or deposits be uncovered during the monitoring consultation with the National Monuments Service of the DAHRRGA will be required in order to decide how best to proceed. Further mitigation in the form of preservation in situ or preservation by record (excavation) may be required. A report detailing the results of the monitoring should be compiled on completion of the work and submitted to the relevant authorities.

15.7 RESIDUAL IMPACTS

Residual impacts are defined as the overall impact of the development on the cultural heritage on the basis of implementing the mitigation measures recommended in this report. No potential impacts to the recorded archaeological or architectural heritage resource were identified and therefore no mitigation measures were necessary in that regard. If the recommended mitigation measure regarding the potential impact to unrecorded sub-surface archaeology is implemented no residual impacts are anticipated.

16 INTERACTIONS & CUMULATIVE EFFECTS

16.1 MATRIX OF INTERACTIONS

This section of the EIS provides a simple matrix identifying environmental components and recording where interactions are identified. These are then expanded upon in the text that follows, with cross references made to the more detailed assessments outlined in the relevant chapters of the EIS.

Again, for detailed descriptions and accounts, we refer the reader to the relevant sections of the EIS.

Table 16.1 Matrix of Interactions

Interaction	Population & Human Health		Biodiversity		Soils, Geology & Hydro-geology		Water & Hydrology		Air Quality & Climate		Noise & Vibration		Landscape & Visual		Material Assets		Traffic & Transport		Waste Manage-ment		Archaeology & Cultural Heritage	
	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Population & Human Health			✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗
Biodiversity					✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Soils, Geology & Hydro-geology							✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Water & Hydrology									✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗
Air Quality & Climate											✗	✗	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗
Noise & Vibration													✗	✗	✗	✗	✓	✓	✗	✗	✗	✗
Landscape & Visual															✗	✗	✗	✗	✗	✗	✗	✗
Material Assets																	✗	✗	✗	✗	✗	✗
Traffic & Transport																			✗	✗	✗	✗
Waste Manage-ment																					✗	✗
Archaeology & Cultural Heritage																						

✗	No Interaction
✓	Weak Interaction
✓	Some Interaction
✓	Strong Interaction

Con. ⇨ construction phase

Op. ⇨ operational phase

See following pages for descriptions of interactions and cumulative that correspond to grid boxes marked with a 'tick'.

Boxes with an 'x' indicate that no interactions or cumulative effects are likely to occur.

16.2 INTERATCIONS AND CUMLUATIVE EFFECTS

16.2.1 POPULATION & HUMAN HEALTH

Noise & Vibration

Interactions: Increasing industrial activity has the potential to increase ambient noise levels at nearby sensitive receptors for people – dwellings and amenities. Project mitigation measures address this during construction and EPA IE Licence requirements do so during operations (ref. Section 10).

Cumulative Effects: Cumulative noise effects taking account of baseline noise from adjacent roads as well as noise from the existing MSD plant are predicted to be below appropriate limits (ref. Section 10). Land-use planning further addressees this effect.

Traffic & Transportation

Interactions: There will be a slight increase in traffic on local roads during the construction and operational periods. Impacts are rated as minor during construction and as negligible during operations. Mitigation measures are discussed in Section 10 as appropriate.

Cumulative Effects: Increasing traffic is part of a cumulative process on the road network. This has been taken into account in the assessment. Land-use and transportation planning further address this effect.

16.2.2 AIR QUALITY & CLIMATE

Traffic & Transport

Interactions: Air quality could be affected by increased traffic during construction and operation. As noted in section 16.2.1 above, the impacts on traffic are found to be minor to negligible. The effects of this on Air Quality & Climate are nonetheless taken account of in section 9.

Cumulative Effects: Potential cumulative effects of traffic on air quality are also taken into account in section 9.

16.2.3 NOISE & VIBRATION

Traffic & Transport

Interactions: Increasing traffic leads to increased levels of local ambient noise which add to the background noise of plant operations. As noted in section 16.2.1 above, the impacts on traffic have been found to be minor to negligible. The effects of traffic noise on Noise are nonetheless assessed in section 10. Mitigation Measures further address this effect.