Chapter 11
Human Health

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11 HUMAN HEALTH

11.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) considers the potential human health impacts associated with the Construction and Operational Phases of the BusConnects Galway: Dublin Road scheme (hereafter referred to as the Proposed Development).

The objectives of the Proposed Development are described in Chapter 1 (Introduction) of this EIAR. A detailed description of the Proposed Development is provided in Chapter 4 (Proposed Development Description) followed by a description of the construction stage in Chapter 5 (Construction) of this EIAR.

The World Health Organization (WHO) Constitution, which came into force in 1948, defines health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (WHO,1948). This assessment, therefore, includes consideration of potential impacts of the Proposed Development on physical, mental and social aspects of health.

As set out in the European Commission's (EC) Guidance on the Preparation of the Environmental Impact Assessment Report (EC 2017), human health is a very broad factor that is highly project dependent. The notion of human health should be considered in the context of the other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues should also be considered. Therefore, this Chapter is supported by, and should be read in conjunction with the following EIAR Chapters:

- Chapter 6 (Traffic & Transport);
- Chapter 7 (Air Quality);
- Chapter 8 (Climate);
- Chapter 9 (Noise & Vibration);
- Chapter 10 (Population);
- Chapter 13 (Water); and
- Chapter 14 (Land, Soils, Geology & Hydrogeology).

This assessment has been carried out according to best practice and guidelines relating to human health, and in the context of similar large-scale transport infrastructural projects.

The aim of the Proposed Development is to provide enhanced walking, cycling and bus infrastructure on this key access corridor in the Dublin region, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the Proposed Development are described in Chapter 1 (Introduction). The Proposed Development, which is described in Chapter 4 (Proposed Development Description), has been designed to meet these objectives.

The design of the Proposed Development has evolved through comprehensive design iteration with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Development are attained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development process have been incorporated into the Proposed Development, where appropriate.

11.2 Methodology Guidelines

In September 2024 *Population and Human Health Assessment of Proposed National Roads* - Standard PE-ENV-01108 was published by TII (Transport Infrastructure Ireland). This is subsequently referred to in this Chapter as the TII Standards.

Going forward this publication will certainly be the standard for Human Health assessment in terms of roads projects.

This assessment was virtually completed prior to the publication of the Standard.

In consideration of this it is worth noting that Section 1.5 of the Standard states

Where projects requiring approval under Section 51, Section 177AE or Part 8 have at the date of publication of this SD, commenced planning and design and in particular where technical advisor contracts have been executed, this SD shall also be:

- Treated as advice and guidance;
- Employed to the greatest extent reasonably practicable; and
- Applied in a proportionate manner, having regard to the characteristics and location of the project/maintenance works and the type and characteristics of potential impacts.

In consideration of this the TII Standards are considered as Guidance only.

Preexisting this Standard but still current are the Guidelines on the Information to be contained in Environmental Impact Assessment Reports, EPA, 2022 which state that in an EIAR, the assessment of impacts on human health:

"should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc."

and:

"The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure, or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect, or risk. This practice of reliance upon limits, doses, and thresholds for environmental pathways, such as air, water, or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment."

Therefore, this guidance requires that the assessment of impacts on human health is based on the assessment of the impacts on other factors, as addressed elsewhere in the EIAR, which as a result of those impacts, impacts to human health might also occur. An aim of this assessment is therefore to identify the wider determinants of health that would likely be affected by the Proposed Development and how these effects are associated with health outcomes. This Chapter also assesses risk to human health from environmental hazards, for example, noise, air pollution and water quality impacts.

The main objectives of the human health assessment, as per the new TII Standards is to:

- Ensure compliance with the relevant legislation such as the amended EIA Directive, Roads Act and the Planning and Development Act, for example to identify the likely significant effects of projects on Population and Human Health (PHH);
- Ensure compliance with the guidelines outlined within the TII Project Management Guidelines (PMGs), Project Appraisal Guidelines (PAGs) and other relevant guidelines and standards;
- Determine PHH baseline conditions and needs, and ensure these are considered in the option selection, planning and development of National Road Projects;
- Achieve robust and proportionate screening, scoping and assessment of likely significant PHH effects, focusing on key issues;
- Ensure that appropriate PHH mitigation measures are integrated into schemes to avoid and reduce significant adverse effects;
- Identify and consider enhancement measures to protect and/or improve the health and wellbeing of communities; and
- Provide clear, evidence-based information to decision makers on the likely significant effects of schemes on PHH and reduce risk in the statutory process.

The main elements of the human health assessment in this chapter include:

- Gathering of the main statements relevant to human health from the relevant EIAR Chapters and any other separate assessments into one coherent section so that it can be easily read and understood by the public and stakeholders; and
- Consideration of issues relating to human health including noise, public realm and cyclist and pedestrian safety, as raised during the consultation process that was carried out in relation to the Proposed Development (refer to Section 1.6 of Chapter 1 (Introduction) of this EIAR), and consideration of the impacts on other factors, as addressed elsewhere in the EIAR, insofar as they relate to human health.

This approach follows the requirements of the EIA Directive and transposing legislation, as discussed in Chapter 1 (Introduction) of this EIAR.

11.2.1 Zone of Influence (ZOI)

As outlined in the TII Standards:

The ZoI shall be proportionate, aiming to capture the likely significant population effects whilst avoiding the need to collect large amounts of baseline is population data. The size of the population study area will not influence the study areas, or the extent of baseline data generated by other topics, for example air and noise. For the population appraisal, it is advised that 500m from the boundary of the area under consideration or required for the construction and operation of the proposed project is used as a starting point for defining the ZoI.

However, this can be increased or decreased dependant on the receptors within the receiving environment, or effects on the wider road network included in the Appraisal Study Area.

It is likely that this part of the assessment will be undertaken at a regional level to appropriately assess and report the wider economic benefits and disbenefits of the project.

The Proposed Development is located along the R338 Dublin Road, representing a west-east approximately 3.9 km long public transport corridor commencing east of the Moneenageisha Junction where it ties into the BusConnects Galway: Cross City Link proposals and extends to the junction with Doughiska Road, tying into the Martin Junction Upgrade.

The existing land use in the vicinity of the R338 Dublin Road includes a mixture of residential, commercial and public service use properties, as well as recreational open green spaces. The existing land use across the proposed road development will stay largely the same with works designed to improve the existing road.

It is proposed to demolish two single-story buildings located just inside the existing boundary wall in the Brothers of Charity. The wall will also be demolished either side of the main entrance and will be rebuilt at the new boundary location reusing the stone from the existing wall. The existing boundary wall outside the Connacht Hotel will also be demolished and the stone reused in the new boundary treatment.

The study area for potential human health impacts during both Construction and Operational Phases relate to areas of potentially impacted sensitive receptors, which include areas where people spend significant periods of time and where concentration, sleep and amenity are important considerations. Examples of these sensitive receptors include residential dwellings, schools and other educational establishments, hospitals and nursing homes, hotels and other short-term accommodation buildings, buildings of religious sensitivity, recreational and noise sensitive amenity areas and offices.

For the Construction Phase, the assessment of the study area is focused on sensitive receptors adjacent to the works required to construct the Proposed Development, e.g., utility diversions, demolition, road widening works, road excavation works (where required), road reconfiguration and resurfacing works, and construction traffic access routes within the study area. The extent of the overall study area is up to 500m from a specific area of construction work; however, it is recognised that the most affected areas are closer

than this, with the key impacted study areas focused within 50m to 100m depending on the noise and vibration and potential impacts on air quality and the local area under consideration.

For the Operational Phase, the focus of the assessment is on sensitive receptors that bound the Proposed Development. Potential noise impacts relate to alterations to traffic patterns (e.g. introduction of a new bus lane), with particular attention focused on those areas where the Proposed Development will be encroaching closer to Noise Sensitive Locations (NSLs), specifically where bus or traffic lanes are moving closer to noise sensitive areas,

In addition, during the operational phase there are potential positive effects both within and outside the study area/ZOI arising from the utilisations of improved public transport facilities.

11.2.2 Relevant Guidelines, Policy and Legislation

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (hereafter referred to as the 2014 EIA Directive) introduced 'human health' as a factor to be considered in Environmental Impact Assessment (EIA).

The assessment for human health and population has been prepared by a comprehensive review of plans, policy and strategies, including (but not limited) to the documents listed below:

- Ambient Air Quality Standards Regulations 2022 (S.I. No. 739/2022);
- British Standard (BS) 5228-1:2009+A1:2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise;
- Department of Housing, Planning and Local Government (2018) Guidelines for Planning Authorities and an Bord Pleanála on carrying out Environmental Impact Assessment, (Government of Ireland, August 2018);
- Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe;
- European Public Health Association (EUPHA) (2019) Addressing Human Health in Environmental Impact Assessment (EUPHA, 2019);
- Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (EPA, 2017c);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, May 2022);
- Guidelines for treatment of tourism in an Environmental Impact Statement (Fáilte Ireland, 2011);
- Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (EU Commission 2017);
- Health Impact Assessment (Institute of Public Health Ireland, 2009);
- Health Impact Assessment Resource and Tool Compilation (US EPA, 2016);
- Health in Environmental Impact Assessment - A Primer for a Proportionate Approach (IEMA, 2017);
- Institute of Environmental Management and Assessment (IEMA) Guide to Effective Scoping of Human Health in Environmental Impact Assessment, November 2022;
- Institute of Environmental Management and Assessment (IEMA) Guide to Determining Significance for Human Health in Environmental Impact Assessment, November 2022;
- Impact Assessment Outlook Journal (Volume 8: October 2020)- Health Impact Assessment in Planning (IEMA, 2020);
- Institute of Public Health (IPH) (2021) Health Impact Assessment Guidance (IPH, 2021);
- International Association for Impact Assessment (IAIA) 2020 Human Health Ensuring a High Level of Protection;
- Population and Human Health Assessment of Proposed National Roads - Standard PE-ENV-01108 September 2024 TII;
- World Health Organisation (WHO) Night-time Noise Guidelines for Europe (WHO, 2009);
- WHO Environmental Noise Guidelines for the European Region 2018; (WHO, 2018);
- World Health Organisation (WHO) Air Quality Guidelines (WHO, 2006);

- World Health Organisation (WHO) Air Quality Guidelines (WHO 2021); and
- World Health Organisation Guidelines for Community Noise (WHO,1999).

Health Impact Assessment (HIA) is defined by the Institute of Public Health in Ireland, as a combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a policy, plan, programme, or project on both the health of a population and the distribution of those effects within the population. A Health Assessment in the context of EIA focuses the attention of the assessment on likely significant effects, i.e. on effects that are deemed likely to occur and, if they were to occur, would be expected to be significant (as per the requirements of EIA Directive).

The Institute of Environmental Management and Assessment (IEMA) Health in Environmental Impact Assessment – A Primer for a Proportionate Approach (IEMA, 2017) (hereafter referred to as the IEMA discussion document) notes that HIA and EIA are separate processes and that, whilst a HIA can inform EIA practice in relation to human health, a HIA alone will not necessarily meet the EIA human health requirement. HIAs are not routinely carried out for major infrastructure schemes in Ireland, nor are they required to be.

The recitals to the 1985 and 2011 EIA Directives referred to 'human health' and the operative texts refers to 'human beings' as the corresponding environmental factor. The most recent amendment of the EIA Directive in 2014 changed this factor to 'Population and Human Health'.

The current EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022) note that this health assessment approach is consistent with the approach set out previously in the 2002 EPA version of the Guidelines, where health was considered through assessment of the environmental pathways through which it could be affected, such as air, water or soil. The current Guidelines state:

> *'The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure, or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect, or risk. This practice of reliance upon limits, doses, and thresholds for environmental pathways, such as air, water, or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment.'*

In terms of human health protection, emissions during the Construction or Operational Phase of the Proposed Development will need to be identified and compared against accepted Health Based Standards. Accepted sources of the standards may be regulatory such as EU Air Quality Standards, or based on expert opinion such as is provided by the WHO in the case with noise guidelines.

The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022) also note that in an EIAR:

> *'the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc.,' and that,*
>
> *'assessment of other health & safety issues are carried out under other EU Directives, as relevant. These may include reports prepared under the Integrated Pollution Prevention and Control, Industrial Emissions, Waste Framework, Landfill, Strategic Environmental Assessment [SEA], Seveso III, Floods or Nuclear Safety Directives. In keeping with the requirement of the amended Directive, an EIAR should take account of the results of such assessments without duplicating them.'*

The IEMA discussion document was a primer for what a proportionate assessment of the impacts on health should be in EIA and is a useful document when considering what can and should be assessed. Regard has been given to the general approach recommended in this document when compiling this Chapter.

The IEMA discussion document states that there should be a greater emphasis on potential health outcomes, as opposed simply to the health determinants or the agents or emissions (e.g. dust) which could have the potential to have health effects, which has previously been the focus of EIA. This change in emphasis to one of outcomes does not mean a complete change in practice. The IEMA recommendations are entirely consistent with the EPA Guidelines (EPA, 2022), and indeed the new TII Standards, on what should be contained in an EIAR. The TII Standards do not recommend a stand-alone HIA but rather an assessment as part of an EIAR.

This was further emphasised by the Institute of Environmental Management and Assessment (IEMA) Guide to Effective Scoping of Human Health in Environmental Impact Assessment, November 2022 and the Institute of Environmental Management and Assessment (IEMA) Guide to Determining Significance for Human Health in Environmental Impact Assessment, November 2022. The 2017 Primer and the 2022 documents on Scoping and Significance will be henceforth collectively referred to as the IEMA documents.

The IEMA documents note that public health has three domains of practice that should be considered in the assessment of health in EIA:

- Health protection (including chemical and radiation exposure, health hazards, emergency response and infectious diseases);
- Health improvement (including lifestyle, inequalities, housing, community and employment); and
- Improving services (including service planning, equity and efficiencies).

Therefore, whilst the EPA guidance is useful in terms of health protection, for a more holistic assessment as per the IEMA and TII Standards, it is also worthwhile to look at broader health effects, such as opportunities for improvement of health and for improvement of access to services. While it is important to do this, it is also important not to attribute every conceivable event as being a health effect. A health effect would be something that would have a material impact on somebody's physical, mental, and social well-being, be that positive or negative. As outlined in the International Association on Impact Assessment IAIA Document of 2020 human health within EIA (IAIA, 2019), the Public Health perspective is underpinned by five principles:

A comprehensive approach to health: Physical, psychological, and social wellbeing is determined by a wide range of factors across society and consideration of these wider determinants and their interrelationships will inform the assessment of human health. Inter-sectoral collaboration, between public health and other sectors, should be a feature of coherent coverage of health in EIA;

Equity: The distribution of health impacts across the population must be considered, paying specific attention to vulnerable groups. Where impacts that are unfair and avoidable are identified, appropriate measures must be included to avoid or reduce adverse health outcomes, or to improve health outcomes for affected groups;

Transparency: A transparent EIA process facilitates cooperation and communication, external to the organisation conducting the EIA. It enhances the process and improves effectiveness. The reporting of the EIA must demonstrate a clear and consistent method and reasoned conclusions;

Proportionality: The scoping of human health issues into EIA will focus on whether the potential impacts are likely to be significant. Effort is then focused on identifying and gaining commitment to avoiding or reducing adverse effects and to enhancing beneficial effects. The assessment findings should be presented clearly and aim to be concise and precise and to give appropriate weight to health as a material consideration; and

Consistency: The assessment should be based on evidence and on sound judgment. The assessment process should follow an acceptable, explicit logic path and retain common sense in applying relevant guidance. Divergence from accepted practice should be explained. The assessment, its process, and conclusions, should be in accordance with up-to-date policy, guidance, and scientific consensus. This acknowledges the potential for conflict between policy and emerging evidence.

The assessment of potential impacts resulting in health effects on the population is undertaken by way of the following assessments as detailed further below:

- Risk Assessment: to identify the potential risk to human health in response to identified hazards;
- Socioeconomic impacts on human health;
- Impacts on amenity resources and subsequent effects on human health; and
- Potential for psychological effects

In performing the actual assessment in terms of human health protection, emissions during the Construction or Operational Phase of the Proposed Development will need to be identified and compared against accepted Health Based Standards. Reliable sources of the standards may be regulatory such as the EU, such as Air Quality Standards, or based on expert opinion such as is provided by the WHO as is the case with the noise guidelines.

Therefore, health protection, health improvement and improving services are all considered in this Chapter of the EIAR.

11.2.3 Appraisal Method for the Assessment of Impacts

In determining the appropriate appraisal method for this assessment, regard is given to the forgoing guidance set out in Section 11.2.3. In light of this, the assessment has been undertaken in the following stages:

11.2.3.1 Develop Baseline Understanding of Population Health Profiles and Determinants of Health

A desk study of the available data has been undertaken to identify the populations of interest and characterise them in terms of their population size, socio-economic status, burden of disease and the distribution of those existing factors. Baseline data from the assessments of other Chapters in this EIAR was then reviewed to understand baseline determinants of health. Issues such as the location and distribution of services and community amenities were obtained from Chapter 10 (Population). Information on air pollution levels and existing noise was obtained from Chapter 7 (Air Quality), Chapter 8 (Climate) and Chapter 9 (Noise & Vibration), respectively. Other relevant information, such as traffic and travel patterns, was obtained from Chapter 6 (Traffic & Transport). These were considered the most relevant aspects of the environment to understand in terms of human health. However, there is an interaction between human health and several other environmental topics assessed (refer to Chapter 21 (Cumulative Impacts & Environmental Interactions) for further information). The purpose was to build up a baseline understanding of where the health-related environmental and social issues are located and the characteristics of the communities affected, to enable an assessment as to whether these could be exacerbated or relieved by the Proposed Development.

The TII standards state:

'Where information on health status is not available at the local level, this may be inferred based on available information. For example, a population with a high level of social deprivation is likely to have below average health outcomes. Any assumptions and uncertainties shall be clearly stated. Where health effects are distributed across a wide geographic and cannot be mapped to individual communities, such effects from regional economic regeneration, a proportionate approach should be used. In such cases, presenting a large volume of Small Area data is unlikely to inform the assessment. It should, however, be noted that there is likely to be significant geographic variation in health and social indicators, which is not shown in regional averages. There are no agreed thresholds to determine at what point health and social indicators vary significantly from the average. When interpreting the data, the health assessment practitioner should use professional judgement and explain any statements made about the relative health status and sensitivity of the population with reference to the data'

11.2.3.2 Identification of Potential Impacts

The characteristics of the Proposed Development have been considered and the potential pathways between aspects of the construction and operation of the Proposed Development and resultant health outcomes (beneficial and adverse) have been assessed. Due to the nature of impacts on human health, many of the potential impacts assessed are indirect. The assessment of the Operational Phase of the Proposed Development has focused on those potential impacts most likely to be influenced by the Proposed Development, namely air quality, noise, community severance, social use of outdoor space, physical activity levels, access, and risk of injuries. For the identification of construction impacts, reference has been made to the other environmental topic assessments to identify the aspects of the environment likely to be affected, and then a further consideration has been made as to whether there is a likely pathway between those impacts and human health outcomes.

11.2.3.3 Assessment of Impacts

The assessment considers the potential influence of the Proposed Development in terms of health protection, health promotion and health inequalities. The assessment describes how the Proposed Development could impact on baseline environmental and social factors (determinants of health), whether these impacts are associated with health outcomes (using evidence from the literature review), and whether those outcomes are considered to be positive or negative.

The reporting of impacts takes a descriptive approach so that the evidence and assumptions underpinning the judgement as to the significance of effects can be explained. The judgement of sensitivity, magnitude and significance considers several factors, including:

- Health status of the population;
- Social inequalities;
- Likely level of exposure to a health risk;
- Likely size of population affected;
- Level of evidence in scientific literature for an association between an environmental impact and health outcomes; and
- Existing health policy and priorities.

These considerations have been developed with regard to the IEMA and EPA Guidelines as well as the TII Standards. Where appropriate, the assessment takes account of evidence for dose-response relationships to certain pollutants (i.e. air pollution) and the likely duration of exposure to those pollutants, using information from the relevant assessment chapters in this EIAR, as well as from the literature review. Since health evidence normally underpins the limits set for certain pollutants (e.g. air quality objectives), it can be determined that significant effects on human health are not likely, provided that these limits are not exceeded.

Table 11-1 sets out the criteria used to guide the description of significance for health impacts, after considering the range of issues described above. These criteria have been aligned to terminology for level of significance set out in the EPA Guidelines (EPA, 2022).

Table 11-1 Significance Criteria for Health Impacts

Impact Level	Significance Criteria
Imperceptible	The Proposed Development will have an impact on a determinant of health of a type and degree which is not associated with any population health outcomes.
Not Significant	The Proposed Development will have an impact on a determinant of health of a type and degree where no health outcomes are attributable. Example considerations for assigning this level of significance are: • Level of exposure to impact is sufficiently low to pose no likelihood of developing an associated health outcome.

Impact Level	Significance Criteria
Slight	The Proposed Development will have an impact on a determinant of health of a type and degree where there may be a small impact on individual reported symptoms but no change in population health status can be attributed. Example considerations for assigning this level of significance include whether: • The level of risk of developing a health outcome attributed to impact is extremely low (for example where there is limited and inconsistent evidence for an association with a health outcome, or the risk of exposure to impact is very unlikely, or the level of risk attributed to the impact is very low compared to other factors); • Associated health outcomes are mild, temporary, and reversible; • People affected are not sensitive and can readily avoid or adapt to impact, or impact can be readily mitigated, with no effect on quality of life beyond the short-term.
Moderate	The Proposed Development will have an impact on a determinant of health of a type and degree where there may be a noticeable impact on individual health status but no change to population morbidity or mortality is attributable. Example considerations for assigning this level of significance include whether: • There is some scientific evidence of association between the impact and population health outcomes; • The degree of population health impact is consistent with current health trends; • Associated health outcomes are reversible and/or can be managed or mitigated; • No effect on quality of life is anticipated beyond the short-term; • No change in morbidity or mortality can be attributed to the Proposed Development.
Significant	The Proposed Development will have an impact on a determinant of health of a type and degree where there may be a significant impact on individual health status (such as change in morbidity or mortality risk) but no measurable change to population morbidity or mortality is likely. Example considerations for assigning this level of significance include whether: • There is a strong body of scientific evidence for a clear association between the impact and population health outcomes; • The impact has the potential to have a measurable effect on the health status of some individuals with an associated change in morbidity and/or mortality (i.e. there is a risk of exposure to impact which is likely to be restricted to small numbers of individuals, but the health consequences could affect health status); • The impact may influence health inequalities at a population level.
Very Significant	The Proposed Development will have an impact on a determinant of health of a type and degree where there may be a significant impact on the health status (such as change in morbidity or mortality risk) of groups of people within a community. Example considerations for assigning this level of significance include whether: • There is a strong body of scientific evidence for a clear association between the impact and population health outcomes; • The impact has the potential to have a measurable effect on the health status of groups of people (for example where exposure to impact is likely to be subject to specific geographic locations, lifestyle choices, social circumstances or health characteristics not widely experienced in a community); • The impact is likely to influence health inequalities within some groups.
Profound	The Proposed Development will have an impact on a determinant of health of a type and degree where there may be a significant impact on the health status (such as change in morbidity or mortality risk) of communities of people. Example considerations for assigning this level of significance include whether: • There is a strong body of scientific evidence for a clear association between the impact and population health outcomes; • The exposure to the impact has the potential to be widespread and affect the health status of communities; • The impact is likely to influence health inequalities at a community level.

The temporal scope of the assessment is consistent with the period over which the Proposed Development will be carried out and therefore covers the construction and operational periods. It is anticipated that construction will take place over an approximate 24-month period. The assessment does not place an end date on the operations of the Proposed Development. Where relevant EIAR chapters define specific assessment years, the health chapter assessment uses the same assessment years (e.g. opening year 2028 and design year 2043). The following temporal scope definitions set out in the EPA (2022) guidelines provide consistency of terminology:

- Momentary Effects are those lasting from seconds to minutes;
- Brief Effects are those lasting less than a day;
- Temporary Effects are those lasting less than a year;
- Short-term Effects are those lasting one to seven years;
- Medium-term Effects are those lasting seven to fifteen years;
- Long-term Effects are those lasting fifteen to sixty years; and
- Permanent Effects are those lasting over sixty years.

11.2.4 Methodology for Data Collection and Collation

There are difficulties in performing a human health assessment for EIA as outlined by the Institute of Public Health. Not least of these is the difficulty in getting baseline health data. It is quite difficult due to patient confidentiality and other reasons to accurately determine levels of even relatively common medical conditions in a relatively defined population that might be affected by such a project. Qualitative and quantitative baseline health data are a vitally important part of the appraisal section of the HIA (Health Impact Assessment). In the absence of an accurate baseline, it is very difficult to assess qualitative and quantitative changes that might occur. Generalised data that might exist for larger areas such as a city or county, but these would be at most an estimate of the local baseline and not accurate enough to allow for meaningful interpretation.

The TII Standards state:

Data should be obtained at Electoral Division (ED) or Small Area level where this is proportionate, to show variation across the ZoI. Where these boundaries extend outside the 500m study area it is for the practitioner to determine whether or not to include the data, based on the proportion of the ED / Small Area that falls within the ZoI and the receptors present.

11.2.4.1 Definition of Terms:

The following terms are used in the assessment.

- **Agent -** A chemicals or factors in the environment to which humans are exposed that may cause adverse health effects;
- **Vulnerable / Vulnerable Groups -** An individual or group of individuals who, by nature of their age, health status or other factor is more prone to developing adverse health effects;
- **Robust -** Strong and Healthy;
- **Health based Standard -** The dosage of an agent scientifically determined to protect against human health effects;
- **Threshold -** The dosage of an agent below which there is no adverse health effect;
- **PM_{10} -** Particulate matter of diameter less than 10 µm; and
- **$PM_{2.5}$ -** Particulate matter of diameter less than 2.5 µm.

11.2.4.2 Health Based Standards

Health based standards and Guidelines are by their nature set to protect against adverse human health effects. The level at which the standard is set is chosen to protect the vulnerable, not the robust. They have an in-built measure of significance in that they are set at levels where there will be no significant health effects. This does not absolutely exclude any effect on an individual but does protect against significant health effects on populations.

An example of such a Standard is the Air Quality Standards as set by the EU Commission and detailed in the CAFÉ (Clean Air for Europe) Directive and transposed into Irish legislation by S.I. No. 739/2022 - Ambient Air Quality Standards Regulations 2022. They do not necessarily exclude each and every health effect. An individual might notice a transient slight irritation in the throat slightly below some Air Quality Standards, but fundamental health status of the population would not change.

Another example would be Air Quality Guidelines (WHO 2021) and Environmental Noise Guideline for the European Region 2018 (WHO 2018). The choice of the relevant standard and the reasons for this choice are explained in the relevant sections below.

This standards-based approach is also consistent with the Irish EPA Guidelines (EPA, 2022):

> *"The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure, or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect, or risk. This practice of reliance upon limits, doses, and thresholds for environmental pathways, such as air, water, or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment*."

11.2.4.3 Identification of Vulnerable Groups (Sensitivity)

The Guide to Effective Scoping of Human Health in Environmental Impact Assessment, November 2022 states;

> *"For health in EIA, population groups are the sensitive receptors, the health outcomes of which are considered. The IEMA Guide Determining Significance for Human Health in EIA (November 2022) explains populations in more detail. Other EIA chapters may identify receptors as community assets such as schools or hospitals. Population health refers to the health outcomes of a group of individuals, including the distribution of such outcomes within the group*."

It further states:

> *Scoping should therefore have regard to population level effects on health and differences between groups in the population. Relevant population groups for each scoped in wider determinant of health should consider both geographic populations and vulnerable subpopulations. This allows a discussion of inequalities at the assessment stage."*

For the purposes of this assessment the following populations and sub-populations are typically considered as potentially vulnerable in accordance with best practice:

- Young age;
- Older age;
- Income or unemployment;
- Health status (which in itself can be very broad);
- Social disadvantage; and
- Access or geographic factors.

11.2.4.4 Significance of Health Effects

The Guide to Effective Scoping of Human Health in Environmental Impact Assessment, November 2022states:

> *"EIA significance is defined as informed expert judgement of the importance, desirability, or acceptability of a change. For human health, this relates to whether the change is important, desirable, or acceptable for public health."*

The Guide further states:

> *"The guidance confirms that a **population** health approach should be taken when determining significance."*

This is an important statement and means that when performing the health assessment, we should concentrate on health effects in the human population rather than trying to anticipate or consider each and every possible effect on an individual, good or bad.

The Guide also states that:

> *'The EIA Report shall include: 'the information that may reasonably be required for reaching a reasoned conclusion on the significant effects of the project on the environment, taking into account current knowledge and methods of assessment.'*
>
> *'EIA health significance therefore needs to reflect what it means for a change triggered by the project to be 'important,' 'desirable' or 'acceptable' for public health. The professional judgement must reflect the context and cite relevant evidence to support the position reached.'*

The recent TII standards state:

> *'Health outcomes resulting from changes in exposure to harmful emissions may be assessed qualitatively using the method described in the previous section, or quantitatively using established exposure-response relationships. The method used shall be determined by the health assessment practitioner and should be proportionate to the risk of adverse health effects. The assessment, qualitative or quantitative, of health outcomes should be based on residual effects, taking account of known mitigation measures (such as noise barriers) that will reduce exposure to harmful emissions. The health assessment of exposure to emissions should add value to the environmental assessment rather than repeating the conclusions of other topics. Impacts on health equity should also be considered*.'

11.2.5 Traffic, Travel Behaviour and Health

The health benefits of regular physical activity are well researched and widely accepted. For most people, the easiest forms of physical activity are those that can be built into daily life, for example, by using walking or cycling as an alternative to motorised transport for everyday journeys such as commuting to work or school. Active forms of travel, such as walking and cycling, are associated with a range of health benefits as was identified by the Irish Government Economic and Evaluation Service, 2021.

Travel is necessary to access education, work and service including health services. Difficulties in travel imped access to these services. Public transport options currently are limited in Galway, limited by their availability but also limited by delays due to traffic congestion.

In light of this information, a human health context to the assessment of the effects of the Proposed Development on transport usage as provided in Chapters 6 (Traffic & Transport) and 10 (Population) can be undertaken.

11.2.6 Access to Healthcare, Employment and Education

Transport is required for access to a variety of resources important to health and social inclusion, including traveling to work or school, visiting family and friends, accessing health services, and shopping and leisure. Poor access to transport results in barriers to these important health resources and can contribute to health inequalities and social exclusion. Key issues for transport are affordability, availability and accessibility. According to data compiled by INRIX, a world-leader in mobility data, Galway places in the worst 50 cities in the world for congestion – taking 39th place, with Dublin the only other Irish city placing higher at Number 12.

11.3 Baseline Environment

The TII Standards give useful guidance on establishing the baseline environment in Human Health terms. It states:

'A large amount of Census data is freely available online. It is not necessary to include all available datasets in the baseline; data should be selected by the health assessment practitioner to be relevant to the scope of the assessment. Much of the data on health outcomes is published at the National level. This includes metrics such as self-reported health, long-term conditions, mental health status, deaths where causes include mental and behavioural disorders, levels of physical activity and body mass index. National-level data does not provide specific information about the study population and, in general, should not be included in the baseline. Localised data, such as Electoral Division or Small Area data, should be used where available to provide detailed information on the study population and show variations across the ZoI. National and regional comparisons should be provided alongside local data to aid interpretation. Where information on health status is not available at the local level, this may be inferred based on available information. For example, a population with a high level of social deprivation is likely to have below average health outcomes. Any assumptions and uncertainties shall be clearly stated. Where health effects are distributed across a wide geographic and cannot be mapped to individual communities, such effects from regional economic regeneration, a proportionate approach should be used. In such cases, presenting a large volume of Small Area data is unlikely to inform the assessment. It should, however, be noted that there is likely to be significant geographic variation in health and social indicators, which is not shown in regional averages. There are no agreed thresholds to determine at what point health and social indicators vary significantly from the average. When interpreting the data, the health assessment practitioner should use professional judgement and explain any statements made about the relative health status and sensitivity of the population with reference to the data.'

11.3.1 General Health

Health in Ireland Key Trends 2019 is the most recent health statistics report published by the Department of Health. It provides a summary of health and healthcare statistics for the country over the past ten years. In 2015 County Health Profiles, still the most recent at the time of writing, were published on the HSE website under the Healthy Ireland Strategy which is a national framework to improve the health and wellbeing of the people of Ireland. A group made up of the Health Services Executive, and Lenus the Irish Health Research Repository have published these health profiles for all local authorities in Ireland. These reports have been used to establish a community health profile for the Proposed Development.

In Ireland, there has been an increase in life expectancy and a decrease in mortality rates. Mortality rates have declined 10.5% since 2009. Ireland has the highest self-perceived health status in the EU, with 82.9% people rating their health as good or very good (Department of Health 2019). The population of County Galway is approximately 277,737 and Galway city 85,910 (CSO Census 2022).

The Central Statistics Office issued information on the health status of Galway based on the 2022 Census.

In April 2022 in Galway, almost 57,500 people (21% of the county's population) reported experiencing at least one long-lasting condition or difficulty to any extent. Of these, 20,933 people (8% of the county's population) reported experiencing at least one long-lasting condition or difficulty to a great extent or a lot. A further 36,522 people (13% of the county's population) reported experiencing at least one long-lasting condition or difficulty to some extent or a little.

Nationally,1.1 million people (22%) reported experiencing at least one long-lasting condition or difficulty to any extent, of whom 407,342 (8%) experienced a long-lasting condition or difficulty to a great extent and 702,215 (14%) to some extent.

In Ireland overall, more females (22%) than males (21%) experienced a long-lasting condition or difficulty to any extent. In Galway, this rate was 21% for females and 20% for males.

Just over 230,000 people (83%) in Galway stated their health was very good or good in Census 2022. This was down from 87% in Census 2016 and 88% in Census 2011. Nationally, 83% of people had good or very good health, down from 87% in 2016 and 88% in 2011.

Among the county's females, 74,374 (53%) reported very good health, as did 53% of males (72,461).

There were also 4,403 people who reported bad or very bad health in the county, up from 3,805 people in 2016.

In Galway, more than 22,000 people smoked daily in April 2022 which was 8% of the population, compared with 9% nationally. Almost 13,100 people (5%) smoked occasionally while almost 53,700 people (19%) had given up smoking. Nearly 168,000 people stated they never smoked (60%). Nationally, 60% of the population never smoked.

The number of males in the county who smoked daily was greater than the number of females (12,536 males compared with 9,535 females).

There were over 16,800 unpaid carers in Galway in April 2022, which was 6% of the county's population compared with 4% in 2016. Nationally there were almost 300,000 unpaid carers or 6% of the population, up from 4% in the previous census.

Females in the county were more likely to be carers than males, with 59% of all carers being female, a similar trend to the national figure. There were 9,953 female carers (7% of all females), compared with 6,863 male carers (5% of all males) in Galway.

There were 296 carers in Galway under 15 years of age providing regular unpaid care which was an increase on 2016 when there were 215 young carers.

As well as the growth in the number of carers, the period between 2016 and 2022 also saw some notable increases in the hours of unpaid care provided. The number of carers in Galway providing 43 or more hours of unpaid help each week more than doubled, from 2,141 in 2016 to 4,580 in 2022.

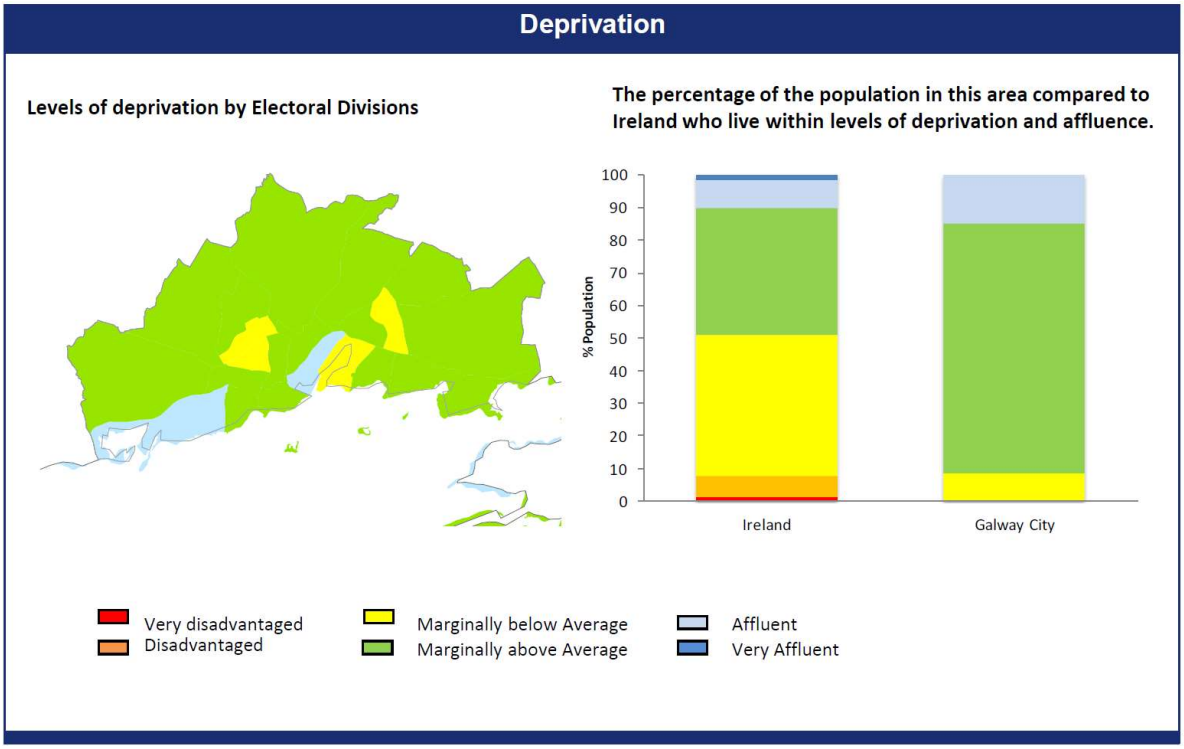

Figure 11-1 Deprivation Map for Galway City (Extract from Health Profile 2015 Galway City)

This map is based on the 2015 Census. A similar map from the 2022 Census is not available at the time of writing however preliminary information suggests there would be relatively little difference.
Note: There are parts of Galway City which score relatively highly on the Pobal Deprivation Index including the ED which contains the neighbourhood of Newcastle and areas close to the city centre.

When one looks at the deprivation map for Galway County (Figure 11-2), one can see an area described as affluent, immediately to the north and west of Galway City. The area to the east of Galway City is described as average in affluence terms, whereas west Galway or Connemara are among the most deprived areas in Galway County.

The latter area is an area which would have the potential to benefit most from the proposed road development.

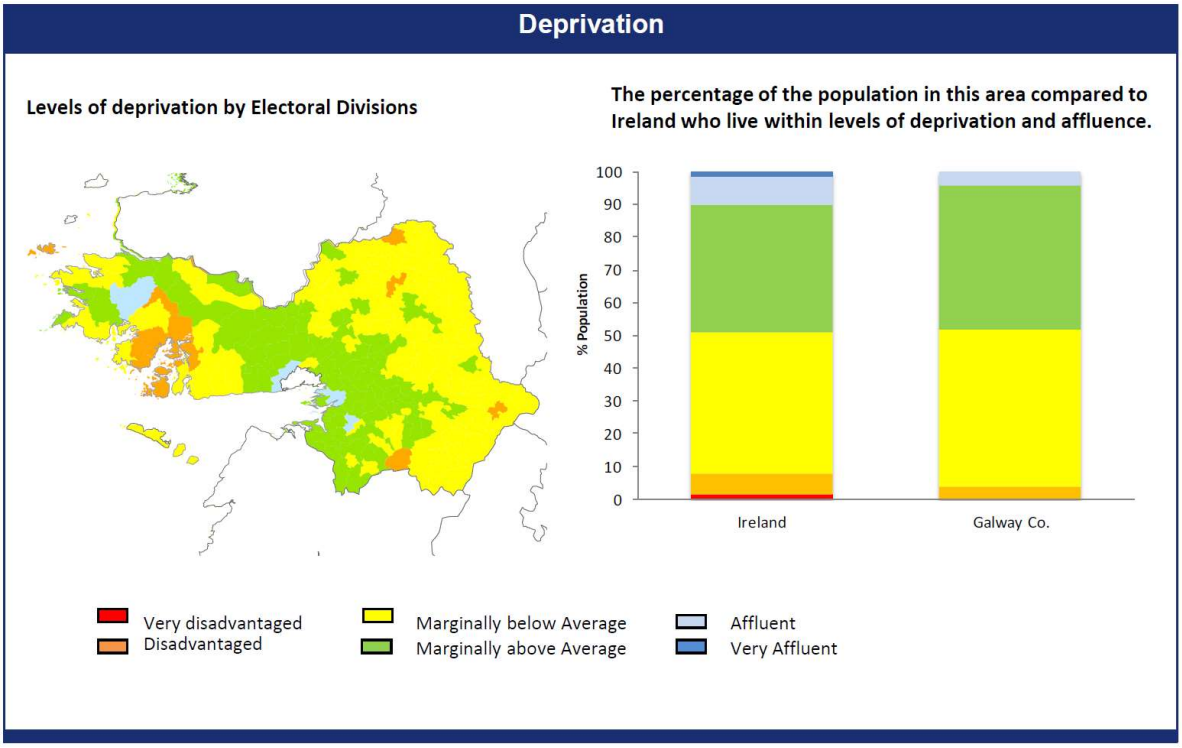

Figure 11-2 Deprivation map for Galway County

11.3.2 Traffic, Travel Behaviour and Health

The health benefits of regular physical activity are well researched and widely accepted. As noted above, for most people, the easiest forms of physical activity are those that can be built into daily life, for example by using walking or cycling as an alternative to motorised transport for everyday journeys such as commuting to work or school.

Active forms of travel, such as walking and cycling, are associated with a range of health benefits. These include improved mental health, reduced risk of premature death and prevention of chronic diseases such as coronary heart disease, stroke, type 2 diabetes, osteoporosis, depression, dementia, and cancer (British Medical Association 2012). Research also suggests that countries with highest levels of active travel generally have amongst the lowest obesity rates (Bassett et al. 2008).

The baseline information presented in Chapter 6 (Traffic &Transport) of this EIAR shows that along the whole corridor, based on existing average mode share across a 24hr period, car is the most common form of transport at 59% of the mode share. Pedestrian is the second most common form of transport at 29% and public transport accounts for 9%. Cyclists only make up 3% of the total mode share. The baseline information on the operation of the traffic and transportation network presented hereunder provides a high-level overview of the operation of the network in relation to its operational capacity and journey times, both of which are related to human health for the reasons given in Sections 11.2.5.

This is extensively outlined in Chapter 6. For brevity this is not reproduced here but the interested reader is referred to this Chapter.

11.3.3 Air Quality and Other Pollutants

Galway City is located within air quality Zone C (cities and towns with population greater than 15,000 per Air Quality in Ireland Reports, EPA). The average concentrations of air pollutants measured in Zone C were

all below the annual mean limits under the Air Quality Standards in 2020 (the year of the most recent report available at time of preparation of this EIAR). The data covers NO_2, $PM_{2.5}$ and PM_{10}.

The baseline air quality is extensively outlined in Chapter 7 (Air Quality) of this EIAR. For brevity this will not be reproduced here but for the reader the summary findings are:

"In the 2023 Existing Baseline scenario, annual mean concentrations of NO_2 are below the national air quality limit value objective at all modelled receptors. The TII guidance (2022a) states that the hourly limit value for NO_2 of 200 µg/m^3 is unlikely to be exceeded at roadside locations unless the annual mean is above 60 µg/m^3. Annual mean NO_2 concentrations did not exceed 60 µg/m^3, indicating that exceedances of the NO_2 1-hour mean are unlikely to occur.

Annual mean PM_{10} concentrations are below the relevant national air quality standards in 2023 for all modelled receptors. At all receptors, modelling of the maximum 24-hour PM_{10} concentration indicated that there are likely to be no more than one exceedance of the 50 mg/m^3 ambient limit value compared to the threshold which allows 35 daily exceedances in any one calendar year.

Annual mean $PM_{2.5}$ concentrations are also below the relevant national air quality limit value objective for all modelled receptors."

11.3.4 Climate

The region where the Proposed Development will be located has a temperate, oceanic climate, resulting in mild winters and cool summers. The recent weather patterns and extreme weather events recorded by Met Éireann have been reviewed. A noticeable feature of the recent weather has been an increase in the frequency and severity of storms with notable events including Storm Darwin in February 2014, Storm Emma in March 2018, and Storm Ophelia in October 2018. Heavier historical rainfall events have also been recorded in recent years including heavy rainfall and pluvial.

The transport sector accounts for approximately 21% of Ireland's total GHG emissions, which is the second largest contribution after the agricultural sector. In relation to transport GHG emissions, the dominant source is road transportation.

In terms of modal split, private cars accounted for 73.7% of all road trips in 2019 whilst public transport accounted for 6.5% (DoT Annual report 2020). Compared to 2018, there was a 3% increase in the number of public transport passenger journeys in 2019 whilst the total kilometres driven by private cars reduced by 1.5% (DOT 2020). Private cars also remain the largest source of GHG emissions in the transport sector accounting for 50.4% of total transport emissions.

Section 8.4 of Chapter 8 (Climate) of this EIAR provides more details of the climate baseline.

11.3.5 Noise & Vibration

This is extensively outlined in Chapter 9 (Noise & Vibration) of this EIAR. For brevity these are not reproduced here, however a summary is outlined for the readers convenience.

Section 9.3 of Chapter 9 (Noise & Vibration) of this EIAR sets out baseline noise levels as recorded during survey work for the Proposed Development. The average daytime noise levels at the attended survey locations ranged between 51 and 68 dB LAeq, T, the higher values being recorded at monitoring locations closest to the Old Dublin Road. L_{den} values calculated for the attended survey locations ranged between 55 and 70 dB Lden.

The calculated L_{den} noise levels align closely with those discussed in Chapter 9 of this EIAR. In October 2018 the WHO issued updated Environmental Noise Guidelines for the European Region. They also issued specific guidelines for road noise. They can be summarised as follows:

- For average noise exposure, they recommend reducing noise levels produced by road traffic below 53 decibels (dB) L_{den}, as road traffic noise above this level is associated with adverse health effects. I will address this in greater detail.
- For night noise exposure, they recommended reducing noise levels produced by road traffic during night-time below 45dB L_{night}, as night-time road traffic noise above this level is associated with adverse effects on sleep.

It is noteworthy that the WHO Guidelines give the rationale for these guideline levels. The 53 decibels (dB) Lden level is based on annoyance criteria rather than more serious health effects. In fact, the Guidelines suggest, if a level was being set on Cardiovascular criteria alone that the level would likely be in the order of 59.3 decibels (dB) L_{den}.

Again, it is worthwhile looking at how this is actually calculated. It is conservatively calculated at the level of noise that may be associated with a 5% increase in relative risk of a cardiovascular event. For the vast majority of people in this room for example the risk of getting a cardiovascular event in the next year is less than 1%. For an individual who has that risk of 1%, even allowing for the worst effects on that individual the risk is 1.05%. The difference is therefore imperceptible on an individual basis. It is simply far less effect than other risk factors which is the reason that it is not considered one of the factors when calculating one's own cardiovascular risk. From an individual basis it simply is not significant. However, when one applies this across a large population such as the population of Europe with over a million people even small changes can make a significant difference. This explains why the WHO guidelines are applicable for populations but not for individuals. The 45dB L_{night} level is based on sleep disturbance, but it is perhaps surprising how conservative the levels are when one realises that this level represents only 3% of the population self-reporting highly sleep disturbed. To put this further in context even at levels of 55dB L_{night}, the level considered in the EIAR prior to the issuing of the current WHO Guidelines, the percentage of people self-reporting sleep disturbance is still only 6%.

The WHO Guidelines specifically recommend "To reduce health effects, the GDG (Guideline Development Group) strongly recommends that policymakers implement suitable measures to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposure. For specific interventions, the GDG recommends reducing noise both at the source and on the route between the source and the affected population by changes in infrastructure."

One might ask how one can reconcile these guidelines with road traffic anywhere? The fact is that these guidelines are for populations. The WHO absolutely realise that every individual residence will not be below 45dB L_{night}. However, the question in relation to the assessment of the impact on health will be determined by the overall impact on the population. As the population impacts due to environmental noise, particularly in the operational phase, will be largely positive the proposed road development would be in keeping with the WHO Guidelines.

Another issue that can arise is the comparison between the WHO guidelines and the TII standards. It must be remembered however that they serve different purposes. It is readily acknowledged that the WHO guidelines cannot be reasonably achieved for each an individual residence. Data from previous WHO guidelines, for example, show that well over 50% of the population of Europe exceeds these levels. In one sense this means they are not achievable on an individual receptor basis but can be best understood as guidance for populations a whole. The TII standards however must be viewed as the achievable goal to protect individuals. It is also clear that the levels suggested are compatible with prevention of the more significant health effects of environmental noise such as cardiovascular effects. The TII standards and WHO guidelines should not be seen as competing with each other but rather complementing the other. In simple terms TII standards should be used in relation to individual receptors such as residences whereas the WHO guidelines should be considered in terms of the population.

The TII standards are used to indicate when for example mitigation is advisable. Even these are not clear cut off points between potential harm and no harm. There is for example very little difference in practice from the noise impact at just below the levels or just above them. They are however important and in the

planning situation they are obviously the appropriate guidelines to be used. There is no contradiction between these respective guidelines when one realises the different purposes.

11.3.6 Population

Information presented in Chapter 10 (Population) of this EIAR shows that there is a range of different types of receptor types along the Proposed Development. These include residential areas, shopping centres, numerous schools and ATU Galway, recreational facilities, places of worship, tourism assets, medial facilities, and hospitals (Merlin Park and Bon Secours).

The Central Statistics Office issued summary subsequent to the 2022 census relating to Galway. Its findings were set out below.

11.3.6.1 Community Profile

Evidence shows that different communities have varying susceptibilities to health impacts both positive and negative as a result of social and demographic structure, behaviour and relative economic circumstance.

Whilst specific health data for individuals in the vicinity of the proposed road development is confidential and difficult to establish, a community profile has been used to establish the baseline and identify unequal distributions in existing factors such as deprivation or burden of poor health, in order that changes in community exposure to certain health pathways and their degree of impact on the population or community access to Healthcare, Employment and Education

Transport is required for access to a variety of resources important to health and social inclusion, including traveling to work or school, visiting family and friends, accessing health services, and shopping and leisure. Poor access to transport results in barriers to these important health resources and can contribute to health inequalities and social exclusion. Key issues for transport are affordability, availability, and accessibility.

Section 10.3 in Chapter 10 (Population) of this EIAR presents baseline accessibility in relation to access to work, healthcare, and other community facilities. It identifies the following facilities close to the Proposed Development corridor which serve a large number of people:

The locations of health and education facilities are presented on Figure 11.1 in Volume 3 of this EIAR. The impact of the Proposed Development on baseline access to services will be an important consideration in terms of links to health and wellbeing.

11.4 Potential Impacts

This Section presents potential impacts that may occur due to the Proposed Development, in the absence of mitigation. This informs assessment of the need for mitigation or monitoring to be proposed (refer to Section 11.5). Predicted 'residual' impacts taking into account any proposed mitigation is presented in Section 11.6.

11.4.1 Characteristics of the Proposed Development

The Proposed Development is outlined extensively in Chapter 4 of the EIAR. It has an overall length of approximately 3.9km, and includes areas such as Roscam, Doughiska, Murrough, Renmore, Merlin Park and Wellpark. The Proposed Development comprises the provision of public transport facilities and active travel facilities from east of the Moneenageisha Junction to the Doughiska Junction. This route is a main arterial route into Galway City Centre for both commuters and tourists. It also runs adjacent to the Atlantic Technological University, Merlin Park Hospital, Bon Secours Hospital and a number of schools and other amenity locations.

The Proposed Development includes a substantial increase in the level of bus priority and cycle facilities provided along the corridor, including the provision of additional lengths of bus lane resulting in improved journey time reliability. Throughout the Proposed Development, bus stops will be enhanced to improve the

overall journey experience for bus passengers, and cycle facilities will be substantially improved with segregated cycle tracks provided along the links and protected junctions with enhanced signalling for cyclists provided at junctions.

Chapter 5 (Construction) of this EIAR describes the construction of the Proposed Development on a section-by-section basis. Reference should be made to Chapter 5 (Construction) for a description of the construction activities and programme of works for each section. The key characteristics and impacts of the Proposed Development of relevance to human health during the Construction Phase are:

- Traffic management required, such as temporary traffic diversions or lane restrictions, to allow completion of particular elements of the Proposed Development whilst maintaining traffic flows as far as reasonably practicable (refer to Chapter 5 (Construction));
- Noise and vibration during the Construction Phase from construction activities, construction plant and construction vehicles (refer to Chapter 9 (Noise & Vibration));
- Dust and potential air pollution from construction activities and plant (refer to Chapter 7 (Air Quality));
- Land acquisition and temporary areas of land-take from community and residential receptors (refer to Chapter 10 (Population));
- General disruption of footways, cycleways and other areas, such as closed off areas and temporary diversions, due to construction works (refer to Chapter 5 (Construction)); and
- Occasional interruption of services such as water and power to allow some elements of construction activities to take place (refer to Chapter 18 (Material Assets)).

11.4.2 Do nothing scenario

In the Do-Nothing scenario, the Proposed Development would not be implemented and there would be no changes to existing road infrastructure, so infrastructure provision for buses, pedestrians and cyclists would remain the same.

The streetscape would continue to be based around the movement and parking requirements of private cars. High levels of traffic are associated with discouraging pedestrian and cyclist activity, and so the pattern of continued reliance on cars would continue, and the associated adverse health effects would continue, and potentially worsen as traffic congestion is predicted to increase. The baseline situation of high levels of traffic congestion and consequent delays to public transport would also continue, and potentially become exacerbated over time as traffic congestion is predicted to increase. It should be noted that travel demand and patterns of travel are anticipated to grow in line with population growth.

In a Do-Nothing scenario, the improvements envisioned by the Proposed Development will not occur.

11.4.3 Construction Phase

The implications of temporary traffic management on issues relating to human health have been assessed. Specifically, the assessment considers the potential impacts on access to health services and health impacts associated with traffic congestion and diversions. Chapter 10 (Population) provides a general assessment of accessibility, considering a wider range of community services and facilities, as well as impacts from land acquisition. Impacts of land acquisition are also assessed in Chapter 10 (Population). Chapter 18 (Material Assets) provides an assessment of impacts on utilities such as water supply and power. It is not considered that any interruption of these services would be of a scale that could have any likely significant impacts on human health, and therefore this issue is scoped out of the assessment.

11.4.3.1 Temporary Impacts on Access to Health and Education Services

Temporary diversions of pedestrians and cyclists may increase the likelihood of collisions with traffic if not appropriately managed. The traffic management arrangements set out alternative routes and crossing arrangements for pedestrians. However, there is no specific detail on how cyclists would be catered for.

There could be temporary delays in access to health and education services, but it is not considered that these would be of a scale that would have significant impact.

Cycling in Urban environments is associated with higher accident and injury rates than for example driving although this can be significantly reduced by measures such as cycle lanes.

In the absence of specific arrangements for cyclists the risk to human health from traffic collision related injuries is assessed as Negative, Significant and Temporary to Short-term. The mitigation measures proposed are included in Section 6.5.6.2 in Chapter 6 (Traffic & Transport) of this EIAR.

11.4.3.2 Health Impacts from Temporary Traffic Congestion

Traffic management will be required to allow space for working areas during construction. Traffic congestion may also arise as a consequence of loading and unloading of construction vehicles bringing materials and plant to and from the construction sites.

Psychological stress is associated with traffic congestion (see section 11.3.1.4) which is typically self-reported and does not have a precise medical definition. The population most exposed to these impacts would be regular commuters who it is unlikely that congestion associated with the construction of the Proposed Development would contrast notably from the baseline situation, as routine highway maintenance, loading/unloading activities and traffic incidents would regularly contribute to temporary increases in congestion with associated effects on driver stress. On this basis the impact is anticipated to be Negative, Slight and Temporary to Short-term for the general commuting population who use the route and Negative, Moderate and Temporary to Short-term for more sensitive groups.

11.4.3.3 Construction Related Air Pollution and Health

Chapter 7 (Air Quality) reports that air pollutants from construction vehicles, generators etc will remain in compliance with the Ambient Air Quality Standards Regulations 2022 S.I. No. 739/2022. It has assessed impacts from road traffic during construction as neutral, not significant and short-term. Air quality standards are set to protect vulnerable people, such as those with respiratory conditions, the elderly and people with certain other co-morbidities. Since air pollution will be within these standards, the effect on human health is likely to be in line with current trends, and therefore assessed as Negative, Moderate and Temporary.

Construction activities, including construction traffic may generate nuisance dust. Chapter 7 (Air Quality) of this EIAR has assessed the risk of dust impacts as low risk and negative, not significant and short-term pre-mitigation, and neutral, not significant and short-term with dust management measurements in place. The potential for local residents to become anxious about the potential impacts of dust, and possibly attribute any respiratory symptoms they may have to perceived impacts from construction dust cannot be discounted. The health impacts from construction dust are assessed as Negative, Slight and Temporary.

Earthworks, demolition and construction activities can be associated with the release of fungal spores into the atmosphere. Aspergillus is a ubiquitous organism and is present everywhere but is of particular concern when large scale demolition, excavation and earth-moving activity takes place. The vast majority of people are immune to this, but invasive aspergillosis is a disease which is harmful to people with suppressed immune systems such as hospital inpatients. This issue is therefore considered in this assessment due to the presence of Bon Secours and Merlin Park Hospitals within the study are. The National Guidelines for the prevention of Nosocomial Aspergillosis During Construction/Renovation Activities (Health Protection Surveillance Centre 2018) deals specifically with construction works occurring within or adjacent to hospitals. Fungal spores are dispersed to no measurable concentration at approximately 250m from the source of the release. The National Guidelines (Health Protection Surveillance Centre 2018) note that the fundamental requirements in preventing Aspergillus infection arising from construction works are, first, to minimise the dust generated during construction and, second, to prevent dust infiltration into patient care areas. Works in the vicinity of the hospitals will be carried out in accordance with the National Guidelines with dust suppression measures in place. Furthermore, susceptible patients are normally placed in specially designed units that have highly filtered air to protect them from outside sources. On this basis it is assessed that the risk of invasive aspergillosis is Negative, Not Significant and Short-term.

11.4.3.4 Construction Noise and Vibration and Health

Chapter 9 (Noise & Vibration) reports that with mitigation in place, during the construction phase of the Proposed Development noise levels at properties closest to working areas will be temporarily increased. The construction working hours will be time-restricted and subject to planning conditions. Construction working hours will be restricted to between 07:00 and 19:00 on weekdays, and between 08:00 and 14:00 on Saturdays. Night-time and Sunday working may be required to minimise the impact on road traffic movements during the daytime, for example at busy road junctions and in commercial areas, and for such works as pavement / road surfacing. Any such working hours outside the normal construction working hours will be discussed with the local authority. The planning of such works will take consideration of sensitive receptors, in particular any nearby residential areas.

During the Construction Phase of the Proposed Development, noise levels at properties closest to working areas, including areas of construction traffic, will be temporarily increased. The most appropriate noise mitigation measures for each work area will be determined taking account of various control measures included within Chapter 9 (Noise & Vibration), and Appendix A5.1 CEMP in Volume 4 of this EIAR.

Once the various mitigation measures are put in place, noise impacts associated with the Construction Phase will be of Negative, Not Significant to Moderate, and Temporary impact during all key construction phases during daytime periods.

As a result, no significant adverse effects on Human Health are predicted.

11.4.3.5 Psychological Effects

The community will experience annoyance from the temporary impacts of traffic management and other effects during the construction phase. As against this there is the potential reduction in annoyance amongst road users in the operational phase where there are reduced journey times.

Whilst individual annoyance cannot be discounted, annoyance in itself is not a health effect. There is no evidence that there are any significant effects on human health from transient levels of annoyance. In these circumstances the negative impacts are assessed as Slight.

The Do-Nothing scenario has potential for adverse psychological impacts. Progressively longer journey times and uncertainty will be associated with increased annoyance at least and at worst impact on psychological health.

11.4.3.6 Health Impacts from Land-take and Impacts on Property

Temporary and permanent land acquisition is described in Chapter 4 (Proposed Development Description). Land take is assessed in Chapter 10 (Population). While the proposed land-take does affect some properties and community assets, this is not to a degree that is deemed likely to affect human health over and above the community and amenity impacts reported in Chapter 10 (Population).

11.4.3.7 Other Environmental Hazards

Chapters 13 (Water) and 14 (Land, Soils, Geology & Hydrogeology) have not reported any residual impacts of a nature that could be linked to likely significant effects on human health outcomes. On this basis the effect of other environmental hazards associated with construction of the Proposed Development on population health has been assessed as neutral.

11.4.4 Operational Phase

11.4.4.1 Noise

This has been extensively discussed in Chapter 9 (Noise & Vibration) of the EIAR. The conclusion was that there are no significant residual Operational Phase noise or vibration impacts associated with the Proposed Development, whilst meeting the Proposed Development objectives.

Therefore, no adverse Human Health predictions are predicted.

11.4.4.2 Air Quality

This has been extensively outlined in Chapter 7. This concludes that there are no significant effects to air quality predicted during the operational phase as all ambient air pollutants will remain in compliance with the ambient air quality standards and the Proposed Development will have a generally neutral impact on air quality, therefore, no human health impacts are predicted.

11.4.4.3 Climate

The provision of a regular efficient public transport network will help to decrease the need for private cars being the major mode of transport. While the impact of this project overall and climate change may be small, the changes that is assessed is positive. The overall potential impact on climate change is deemed as positive and moderate in the medium term

11.4.4.4 Health Improvement

The Proposed Development has the potential to bring with it, significant socio-economic benefits. It will facilitate transport of people in a timely, reliable and efficient manner. It will also bring with it benefits to business and public facilities in Galway City centre by facilitating access without the need for cars and unrestricted by the availability of parking. This all translates into an increased potential for economic prosperity for Galway City as a thriving city at the core, which in turn will play a part in reviving the Irish economy.

Increased opportunities for exercise also have the potential to bring benefits in terms of human health. Exercise is a well-recognised method of reducing risk in terms of obesity, diabetes, hypertension, cardiovascular disease and osteoporosis amongst other conditions. There are also significant psychological benefits and studies have consistently shown self-reported well-being is significantly higher in those who frequently exercise.

Health benefits of improved journey times include reduced stress for commuters, as they will have a more efficient journey and certainty over journey time, and it is possible that the time saving may allow more time for health promoting activities such as seeing family and friends, exercise, sleeping and healthy food preparation. The associated health outcomes are likely to be beneficial. The overall potential impact on human health will be Positive, Moderate in the Medium-Term.

11.4.4.5 Improvement of Access to Services

Many of the potential impacts have already been extensively assessed above. For people needing access the city centre to access services, including health services they will be facilitated by the Proposed Development.

The Proposed Development will not change the physical ability to access healthcare services. However, the predicted improvements in public transport journey times and reliability would make public transport a much more convenient choice for travelling to healthcare services and would reduce the likelihood in missing appointments due to traffic congestion delays. The inclusion of bus priority measures would also provide more efficient and reliable routes for emergency vehicles including ambulances, and so could contribute to improved access to health services and better health outcomes.

11.4.4.5.1 Reduction in Inequalities

The Proposed Development may help to reduce inequalities by improving access to employment for those dependent on public transport. The groups that would benefit most are the socially disadvantaged and some people with disabilities, noting that there is often an interrelationship between disability and deprivation given that car ownership among disabled people and socially disadvantaged is lower. No aspects of the Proposed Development that could have a likely significant contribution to a widening of health inequalities have been identified.

The Proposed Development will upgrade some pedestrian and cycle routes to a better standard. This will likely reduce health inequalities for pedestrians and cyclists.

The Proposed Development will not only introduce greatly improved active travel infrastructure, but will also reduce traffic along the route, further increasing safety for pedestrians and cyclists. Overall, the assessed impacts on in relation to inequalities will be Positive, Very Significant and Long-term.

11.4.4.5.2 Psychological Effects

There may be positive psychological effects where improved connectivity permits greater ease of to and from the city. This would potentially facilitate closer connections with friends or relatives which might be deterred if journeys were perceived to be lengthy or difficult.

Overall, therefore, the assessment of the psychological impact on a population of community basis will be overall positive.

11.5 Mitigation and Monitoring Measures

Mitigation for Construction Phase related traffic impacts are set out in Section 6.5 (Mitigation and Monitoring Measures) of Chapter 6 (Traffic & Transport) and Appendix A5.1 CEMP in Volume 4 of this EIAR. Measures will also be developed by the appointed contractor in the Construction Traffic Management Plan to provide safe access for pedestrians and to help protect cyclists against an increased risk of collision with vehicles in areas of works and traffic management. Pedestrians will be protected through various measures such as segregated diversions around areas of works, clear signage, removal of obstacles and provision of safe crossing points.

Access to all hospitals and schools will be maintained. Mitigation for Construction Phase access to hospitals and schools are set out in Appendix A5.1 CEMP in Volume 4 of this EIAR.

Mitigation for construction related air quality impacts and noise and vibration impacts are set out in Chapter 7 (Air Quality) and Chapter 9 (Noise & Vibration) respectively and Appendix A5.1 CEMP in Volume 4 of this EIAR.

Any mitigation or monitoring requirements in relation to effects on human health are properly addressed by the measures set out in the chapters which assess effects on the vectors through which the Proposed Development has potential to cause likely and significant effects on human health. No specific mitigation or monitoring measures are proposed for human health over and above those identified elsewhere in this EIAR.

11.6 Residual Impacts

Overall effects on traffic and transport are predicted to be generally positive. As detailed above and in Chapter 6 (Traffic & Transport) of this EIAR, these include positive effects on modal share, positive, very significant and long-term impact in terms of People Movement by sustainable mode with significantly reduced bus journey times.

Minor, non-significant, effects are predicted during the construction phase, largely related to noise emissions and annoyance due to traffic measures. These are short term in duration.

Lack of regular physical activity is a leading cause of chronic disease and premature deaths. The Proposed Development will improve opportunities and convenience for walking and cycling, which will support people in the area in achieving recommended levels of weekly physical activity, for example as part of an active travel commute to work or education. It will also increase safety and the perception of safety for pedestrians and cyclists.

The Proposed Development is expected to have a significant long term positive contribution to health outcomes in the operational phase, largely related to socioeconomic benefits and associate health benefits

as well as improved access to services and opportunities for reducing inequalities. Positive psychological impacts are also predicted.

The significant positive impacts which are expected to arise in the operational phase fully align with the relevant objectives of the Proposed Development identified in Chapter 1 (Introduction) of this EIAR.

As no mitigation or monitoring measures are proposed as a result of this assessment of effects on human health, no further assessment of residual effects on human health is required.

Table 11-2 Summary of Significant Residual Effects

Assessment Topic	Residual Impacts
Increases in physical activity due to improvements in walking and cycling provisions	Positive long-term human health impact
Impacts on access to health services	Positive long-term human health impact
Improvements in People Movement by sustainable mode	Positive long-term human health impact

On the basis of the above (Table 11-2) it can be seen that overall, the significant residual Long-term effects of the Proposed Development on human health can be expected to be Positive and Significant to Very Significant.

11.7 References

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