Section 11:
Air Quality and Climate

11.1 INTRODUCTION

This section of the EIS has been prepared by Byrne Environmental Consulting Ltd to identify and assess the potential air quality and climatic impacts that the redevelopment of O'Devaney Gardens, Dublin 7 may have on the receiving environment during the demolition, construction and operational phases of the proposed redevelopment. This section includes a comprehensive description of the existing air quality in the vicinity of the subject site, a description of how demolition and construction activities may impact existing air quality and finally, the mitigation measures that shall be implemented to control and minimise the impact that the development may have on local ambient air quality and to demonstrate how the development shall be constructed and operated in an environmentally sustainable manner.

This Section of the EIS has considered comments made by An Bord Pleanála in their Scoping Response ref. PL29N.JS0007 which relate to the potential impacts that dust generated by demolition and construction activities may have on residents within the Masterplan area and on adjacent areas.

11.2 METHODOLOGY

11.2.1 AIR QUALITY

The existing ambient air quality in the vicinity of the site has been characterised with information obtained from a number of sources as follows:

- Site specific air quality monitoring (dust deposition) surveys at site;
- Environmental Protection Agency Annual 2008 Air Quality Report;

The existing ambient air quality surveys completed for the purpose of this study focused on the principal substance (dust) which may be released from the site during the demolition and construction phases and which may exert an influence on local air quality.

11.2.2 CLIMATE

Description of Existing Climate

Climate can refer to both the long-term weather (macro-climate) patterns in an area and also to the more localised atmospheric conditions, referred to as the microclimate. Climate has implications for many aspects of the environment from soils to biodiversity and land use practices. This section deals with the existing climate in the area and how the proposed development may impact on the microclimate.

The closest synoptic meteorological station to the subject site at Inchicore is at Dublin Airport which is located approximately 10km northeast of the site and as such, long-term measurements of wind speed/direction and air temperature for this location are representative of prevailing conditions experienced at the subject site. The most recent (2005-2009) meteorological data sets for Dublin Airport were obtained from Met Eireann for the purposes of this assessment study.

Wind

The windfield characteristics of the area are important climatological elements in examining the potential for the generation of fugitive dust emissions from the site. Fugitive dust emissions from a surface occur if the winds are sufficiently strong and turbulent and the surface is dry and loose, together causing re-suspension of particulate matter from the ground. A wind speed at ground level in excess of about 5 m/s is considered to be the threshold above which re-suspension of fine sized material from an exposed surface may occur. The mean annual wind speed in the Dublin area is approximately 5.7 m/s. The surface needs to have relatively low moisture content for this type of dust emission to take place and any wetting either by rainfall or sprayers, will greatly reduce the potential of fugitive dust emissions. Mitigation measures such as the use of sprinklers will ensure that re-suspension of dust will not be a major impact.

The windrose for Dublin Airport as presented below in Figure 11.1 indicates that the prevailing wind direction, in the Dublin area, is from the West and Southwest and blows Northeast across the proposed development.

Rainfall

Precipitation data from the Dublin Airport meteorological station for the period 2009 indicates a mean annual total of about 918 mm. This is within the expected range for most of the eastern half of the Ireland which has between 750 mm and 1000 mm of rainfall in the year.

Temperature

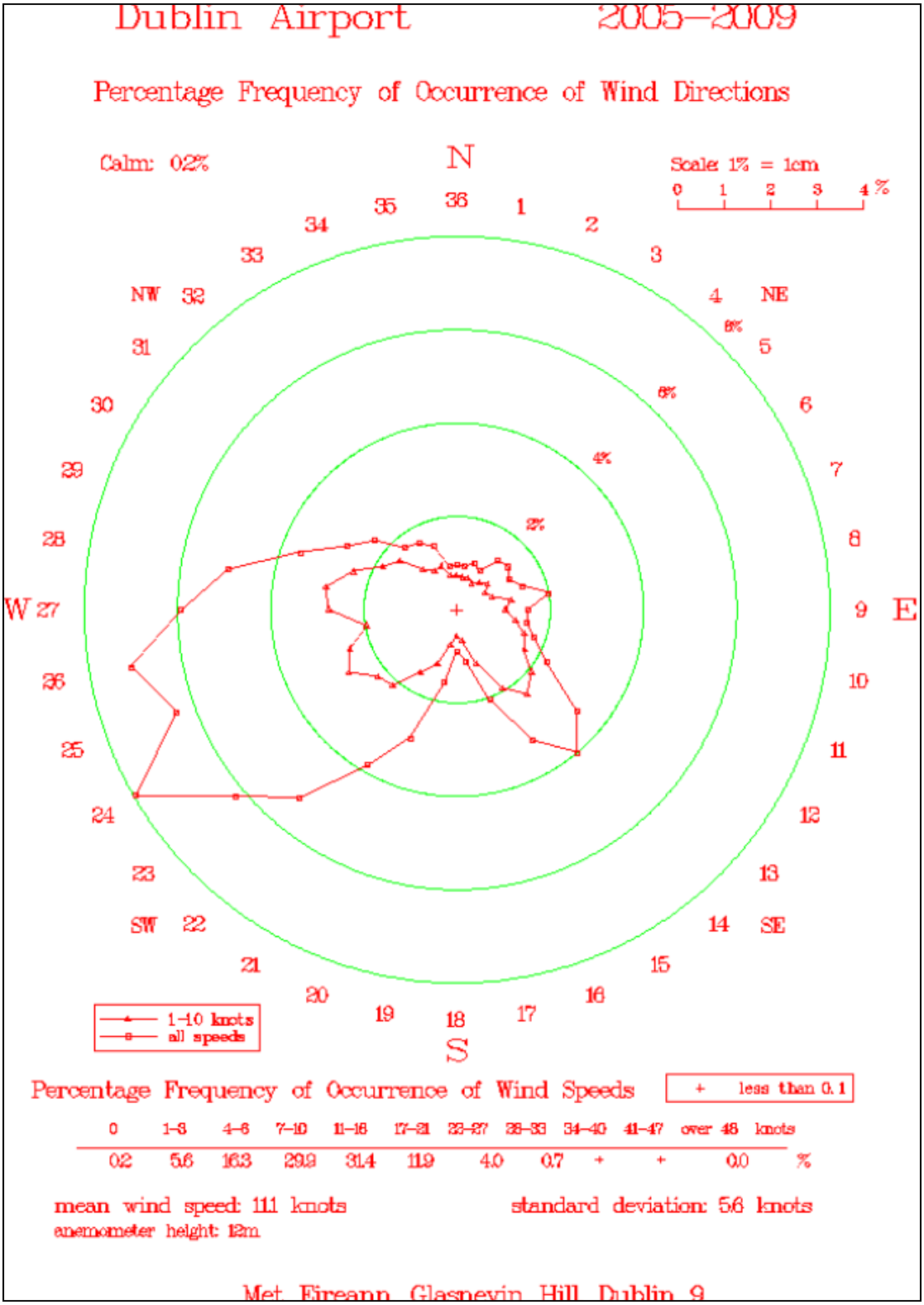
The annual mean temperature at Dublin Airport (2009) is 9.5ºC with a mean maximum of 15ºC and a mean minimum of 4ºC. Given the relative close proximity of this meteorological station to the proposed development site, similar conditions would be observed.

Table 11.1: Meteorological Data for Dublin Airport 2009

Year	Period	Rainfall (mm)	Max. Temperature (°C)	Min. Temp (°C)	Mean Temp (°C))
2009	Annual Mean	918	15	4	9.5

Data supplied by Met Eireann

Figure 11.1 Windrose for Dublin Airport 2005-2009



11.3 THE BASELINE ENVIRONMENT

11.3.1 CONTEXT

O'Devaney Gardens is situated in an urban setting off the North Circular Road in Dublin 7 in proximity to the Phoenix Park and approximately 1km west of the city centre. These general city centre area in which O'Devaney Gardens is located is a significant source of transportation related air emissions. It is noted that there are no major sources of industrial air emissions within 1km of the site.

11.3.2 CHARACTER

The existing ambient air quality at and in the vicinity of the site is typical of a large city centre urban location and as such, domestic and commercial heating sources and road traffic are identified as the dominant contributors of hydrocarbon, combustion gases and particulate emissions to ambient air quality.

Ambient air quality monitoring in Ireland is generally undertaken to assess compliance with national air quality regulations (Air Quality Regulations 2002, SI 271 of 2002) and existing European Union Directives (EU Directives 1999/30/EC and 2000/69/EC, 2008/50/EC). The most recent EPA publication (*Air Quality in Ireland 2008*) relates to air quality monitoring conducted in 2008 and includes a number of monitoring locations in Dublin City which would be comparable to the expected air quality at the subject site. The Winetavern Street air quality monitoring station which is located approximately 1.5km southeast of the subject site provides a comprehensive range of air quality monitoring data sets which have been selected as part of this assessment to describe the existing ambient air quality at the subject site. Table 10.2 below presents a summary of the 2008 Air Quality data obtained at the Winetavern Street which may be considered to be similar to that of the O'Devaney Gardens area in which the subject development site is located.

Table 11.2: Dublin City Air Quality Data 2008		
Parameter	**Annual mean concentration (Limit Value[2]) µg/m3**	**Data Source and Comments**
NO_2	3 *(40)*	EPA monitoring data 2008[1] Winetavern Street
SO_2	1 (*20)*	EPA monitoring data 2008[1] Coleraine Street
PM_{10}	17 (*40)*	EPA monitoring data 2008[1] Winetavern Street
Dust Deposition	225 - 365 mg/m^2-day	Byrne Environmental Consulting Ltd
	(350 mg/m^2-day)	Site Specific Data August 2009
CO	300 (*10,000)*	EPA monitoring data 2008[1] Winetavern Street
Lead	0.001 (*0.5)*	EPA monitoring data 2008[1] Winetavern Street
Black Smoke	2 (*250)*	EPA monitoring data 2008[1] Crumlin

NOTES
[1] EPA Annual Air Quality Monitoring Report 2008
[2] Limit values as defined in Air Quality Regulations 2002, SI 271 of 2002

Table 11.3: Assessment Criteria for Air Quality Impact Assessment			
Parameter	**Averaging Period**	**Concentration Limit Value (mg/m3)**	**Air Quality Standard**
Sulphur Dioxide (SO_2)	Annual	20	Irish AQS SI No. 271 [1]
	24 hour	125	Irish AQS SI No. 271 [1]
	1-hour	350	Irish AQS SI No. 271 [1]
Nitrogen Dioxide (NO2)	Annual	40 (protection of health)	Irish AQS SI No. 271 [1]
	Annual	30 (protection of vegetation)	Irish AQS SI No. 271 [1]
	1-hour	200	Irish AQS SI No. 271 [1]
Particulate Matter (PM10)	Annual	20	Irish AQS SI No. 271 [1]
	24 Hours	50	Irish AQS SI No. 271 [1]
Carbon Monoxide (CO2)	8-hour mean	10,000	Irish AQS SI No. 271 [1]

[1] Irish Air Quality Standard Regulations, SI No. 271 of 2002

Nitrogen Oxides

The Air Quality Standards Regulations 2002 specify a limit value of 40 µg/m^3 for the protection of human health. The standard, taken from Daughter Directive 2000/69/EC, came into force in 2005.

Sulphur Dioxide

The Air Quality Standards Regulations 2002 specify an annual limit value of 20 µg/m^3 for the protection of human health. The standard, taken from Daughter Directive 2000/69/EC, came into force in 2005.

Carbon Monoxide

The Air Quality Standards Regulations 2002 specify a limit value of 10,000 µg/m^3 for carbon monoxide (CO), which is applied to the maximum daily eight-hour mean concentration. The standard, taken from Daughter Directive 2000/69/EC, came into force in 2005.

Particulate Matter PM_{10}

PM_{10} is particulate matter less than 10 µm aerodynamic diameter (or, more strictly, particles which pass through a size selective inlet with a 50% efficiency cut-off at 10 µm aerodynamic diameter). Airborne particles originate from a wide variety of sources. Significant natural sources of PM_{10} particles include re-suspension of soil material in rural areas, sea spray and reactions between natural gaseous emissions. Particles are classified into two categories. They may be primary – they are emitted directly from primary sources such as industrial sources, power stations, cement factories combustion process and motor vehicles; or they may be formed from secondary sources – particles formed within the atmosphere from condensation of vapors, or as a result of chemical reaction processes.

Council Directive 1999/30/EC and as transposed into Irish Law (June 2002) as Statutory Instrument S.I No. 271 specifies a limit value of 50 µg/m^3 for the 24-hour average concentration of PM_{10}, not to be exceeded more than 35 times in a calendar year (90.4 percentile).

Dust Deposition

Dust levels in urban atmospheres can be influenced by industrial activities and transport sources. There are currently no national or European Union air quality standards with which these levels of dust deposition can be compared. However, a figure of 350 mg/m^2-day (as measured using Bergerhoff type dust deposit gauges as per *German Standard Method for determination of dust deposition rate, VDI 2129)* is commonly applied to ensure that no nuisance effects will result from industrial or construction activities.

Dust Deposition Rate is normally measured by gravimetrically determining the mass of particulates and dust deposited over a specified surface area over a period of one month (30 days +/- 2 days). The results are expressed as dust deposition rate in mass per unit area per day (mg/m^2-day). For the purposes of assessing the potential for unacceptable soiling of property arising from dust emissions, a figure of **350 mg/m^2-day** (as measured using Bergerhoff type dust deposit gauges as per German Standard Method for determination of dust deposition rate, *VDI 2119*) is considered to an appropriate limit value.

The *VDI 2119* standard specifies that the dust deposition measurement period should be of one month duration 30+/- 2 days. This guideline limit value of 350 mg/m^2-day is obtained from the commonly applied *German TA Luft Air Quality Standard* emission limit value, which was established to protect against damage or impairments to property or amenities and it, is to this standard that the results of this survey have been assessed.

The site specific baseline dust deposition measurement results are presented below in Table 11.4 and the monitoring locations are presented in Figure 11.2.

Table 11.4: Baseline Dust Deposition Monitoring Results - August 2009		
Reference	**D1 St. Bricins Hospital**	**D2 O' Devaney Gardens**
Recorded value (mg/m2 per-day)	145	189

The range of measured baseline dust deposition values in the vicinity of the site boundaries range between 145 to 189 mg/m^2-day and indicate that there are relatively low levels of dust existing in the ambient environment when compared to typical expected values for an urban environment as detailed below in Table 11.5.

Table 11.5: Typical Dust Deposition Levels	
Setting	**Deposition Level mg/m2-day**
City / Industrialized Area	1040
Large Urban Area	520
Urban Area surrounded by rural setting	260
Partially developed area	180
Rural Area	130

Ambient Air Quality Overview

Air quality standards and guidelines are available from a number of sources where available. The guidelines and standards referenced in this report include those from Ireland, the European Union and on-site observations. Air quality standards are developed at different levels for different purposes. European legislation on air quality has been framed in terms of two categories, limit values and guide values. Limit values are concentrations that cannot be exceeded and are based on WHO guidelines for the protection of human health. Guide values are set as a long-term precautionary measure for the protection of human health and the environment. The existing ambient air quality meets the requirements of all relevant legislation and the existing air quality at the subject site may be classified as being good.

11.3.3 SIGNIFICANCE

Based on published air quality data for the Dublin city area in the vicinity of the subject site together with site specific dust deposition monitoring data, it may be concluded that the existing baseline air quality at the subject site may be characterised as being good with no exceedances of the Air Quality Regulations 2002 limit values of individual pollutants.

The quality of existing air quality at the subject site must be maintained and improved where possible as a result of the proposed development to ensure

that local human health and the ecological environment is not adversely affected.

11.3.4 SENSITIVITY

The subject site shall be developed by demolishing existing buildings and the subsequent reconstruction of residential and commercial units. With regard to the heavily populated and commercial nature of the adjoining areas, there is potential for a deterioration of local air quality during demolition/construction works as a result of fugitive dust emissions and increased construction traffic movements.

In addition the demolition of existing buildings on site has the potential to release asbestos fibres which have the potential to adversely impact human health, however, all asbestos shall be removed from all buildings by a suitably qualified contractor prior to the commencement of demolition activities.

Appropriate mitigation and control measures shall be implemented to ensure the existing ambient air quality is maintained and that the potential risk to local human health is minimised are discussed in detail in Section 11.6.

Figure 11.2 Baseline dust deposition monitoring locations D1 – D2

11.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development involves the demolition of the existing residential complexes and the construction of new residential units.

The redevelopment of the site will be conducted in the following phased stages:

11.4.1 SITE SET UP

The set up of the site prior to works commencing shall include the following:

- Isolation of site from adjoining areas by security fencing
- Demarcation of site compounds and installation of site offices and staff facilities
- Demarcation of staff car-parking area
- Demarcation of vehicle storage area
- Demarcation of materials storage area
- Demarcation of waste storage area

In addition, at the outset of commencement of site activities, air quality monitoring locations shall be identified and established at site boundary locations to ensure that all site activities are controlled and managed to minimise the impact on local ambient air quality as detailed below in Section 11.7.

11.4.2 PRE-DEMOLITION WORKS

The demolition works for the Phase 1 site are mostly completed on lands which have recently received Part 8 approval for the removal of the blocks on the north end of the site. Any demolition work associated with the regeneration project should comply with the following practices:

- All buildings shall be stripped of glass, internal fixings, asbestos material prior to demolition and waste materials shall be segregated on site prior to export off-site by an appropriately permitted waste contractor.

11.4.3 DEMOLITION WORKS

Buildings shall be demolished by approved methods and in a manner that reduces the impact on air quality.

11.4.4 SITE CLEARANCE

Construction and Demolition (C&D) waste shall be segregated as per the requirements of the Waste Management Plan for the site and shall be exported off-site by an appropriately permitted waste contractor.

11.4.5 CONSTRUCTION WORKS

The proposed new residential buildings shall be constructed in a phased basis in a manner which will reduce the impact on local ambient air quality.

11.4.6 OPERATIONAL PHASE

The proposed new residential buildings are designed and shall be constructed to ensure thermal efficiency which shall reduce their usage of fossil fuels and subsequent release of CO_2 and Hydrocarbon emissions to the atmosphere.

11.5 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

11.5.1 'DO NOTHING IMPACT'

O'Devaney Gardens is comprised of 9 large blocks of flats which were constructed in the mid 1960's. The existing buildings, due to their age, design and nature of construction are thermally inefficient and require continuous maintenance to keep them habitable. If the subject site is maintained as a large housing development, it will continue to be thermally inefficient resulting in unnecessary fossil fuel usage to heat the buildings.

The existing condition of the buildings, many of which are in a state of poor repair, require regular maintenance which involves the utilisation of resources which is an unsustainable situation.

11.5.2 PREDICTED IMPACT

This section identifies the potential impacts that the demolition, construction and the operational phases of the proposed redevelopment may have on the local receiving environment, on adjacent residential properties, local public amenities and infrastructure and human health.

11.5.3 SITE SET-UP

The setting up of the site shall involve the construction of site security fencing and site compounds, site offices and staff welfare facilities. These short term activities will have a minimal potential to generate fugitive dust emissions or combustion gas emissions.

Limited site clearance and ground excavation may also occur at this stage and these activities do have the potential to generate fugitive windblown dust emissions rising from the operation of mechanical plant such as excavators and the movement of trucks on exposed surfaces at the site.

The movement of trucks to and from the site shall result in a short term increase in the volume of diesel fuelled HGV's within the city which will generate additional hydrocarbon and particulate emissions from the vehicle exhausts.

11.5.4 DEMOLITION PHASE

The demolition works for the Phase 1 site are mostly completed on lands which have recently received Part 8 approval for the removal of the blocks on the north end of the site. The demolition phase of the re-development of

O'Devaney Gardens shall be conducted utilising standard demolition techniques as follows.

Manual Stripping of buildings of internal fixings, metals, glass and asbestos.

This stage of demolition will generate inert fugitive dust emissions, principally concrete and wood dust. The removal of asbestos from the buildings has the potential to release asbestos fibres into the atmosphere, if the removal process is not isolated and correctly managed.

Demolition of structures

The demolition of the structures shall be facilitated by the use of mechanical crushers and excavators and the use of manual steel cutting equipment. The foundations of the buildings will be removed by pneumatic rock breakers mounted on mechanical excavators.

These activities by their nature shall give rise to significant dust emissions and mechanical plant and mobile generators shall generate hydrocarbon and particulate emissions.

The stockpile of the demolished buildings shall also be a potential source of fugitive dust emissions.

Removal of C&D waste from site

With regard to the significant volume of waste material principally comprising of concrete, soil, metal and wood that shall be generated by the demolition of the buildings, there will be a requirement for a significant volume of HGV trucks to remove the material from the site.

These trucks shall be loaded with C&D waste on-site by mechanical excavators and loading shovels which will generate fugitive dust emissions as a result of the transfer of the C&D waste from stockpile to truck.

The movements of the trucks on the site shall also generate windblown dust emissions.

Where dusty waste material is loaded onto exposed open trucks, fine dusts may be released as the truck travels along public roads.

The movement of trucks from the site onto public roads may result in the soiling of public roads.

11.5.5 CONSTRUCTION PHASE

The primary issue with respect to construction phase air pollutants is the potential generation of fugitive dust emissions and construction vehicle and plant exhaust emissions of particulates and combustion gases such as SO_2, NO_x, CO and Hyrdocarbons.

Potential dust and air emissions sources during construction phase are identified as follows:

- Dust from ground excavation and construction of new realigned roadway.

- Dust emissions from on-site HGV and mechanical plant movements and construction staff vehicle movements,

- Particulate, combustion gases and hydrocarbon emissions from diesel engine exhausts from HGV's, mechanical plant and generator units.

- Contribution of construction traffic to pollutant emissions is not predicted to be short term and insignificant.

11.5.6 CUMULATIVE CONSTRUCTION PHASE AIR QUALITY IMPACTS

In accordance with Schedule 6, Part 2(c) of the Planning and Development Regulations 2001, this chapter has considered the cumulative impact of the proposed Phase 1 development in conjunction with future phases of development. This relates to the cumulative impact on the subject site itself and on surrounding sites.

The European Commissions report of May 1999 'Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions' defines cumulative impact as follows:

"Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project".

It is noted that the Scoping Response received from An Bord Pleanála indicates that:

"An assessment of the impact of Phase 1 within the Master Plan area, and the cumulative impact of Phase 1A, Phases 1B and 2 on the surrounding fringe areas bordering the master plan site, should be provided within the EIS".

Phase 1A of the proposed development comprises of:

110 residential units in four blocks A to D
Open Space Neighbourhood Park 4,680 sq.m.

Future phases of development, which will be subject to separate applications for development envisage the following:

Phase 1B <u>Mixed Use Neighbourhood Centre</u>
1,090 sq.m. supermarket
790 sq.m. ancillary retail units
1,280 sq.m. community and office space
48 elderly housing units

Phase 2 Option 1: 240 residential units
Option 2: 120 residential units, 8,000 commercial uses, public open space 1,100 sq.m.

These figures are approximate and are subject to change as the Masterplan for the area progresses during future phases of development. The location of each Phase of development is indicated on the submitted Masterplan prepared by Dublin City Council.

With regard to the cumulative impact of proposed future phases on the ambient air quality of the O'Devaney Gardens area, future phases of development will take place on a brownfield site and will form part of the comprehensive redevelopment and rejuvenation of the existing social housing on O'Devaney Gardens. In this regard, the cumulative impact of the overall development is expected to be negligible as development is taking place on a previously developed site and the primary residential use of the site is being retained.

It is considered that there will be short to medium term moderate negative impacts associated with the construction phase of the project over all phases of development. It is considered that there will be a long term positive impact as a result of the proposed development, due to the modern residential facilities being provided, the improved visual impact on the surrounding area, improvements to the streetscape and public realm, and the provision of commercial, retail and community floorspace to serve the needs of the local community.

There are currently no proposals for other developments in the immediate vicinity of the subject sites boundaries which would generate increased levels of dust or air emissions.

It is noted that the proposed Metro North development and the proposed DART Underground developments are not located in proximity to the O'Devaney Gardens site and as such, there will be no cumulative impact on air quality associated with the construction or operational phases of these proposed transport developments.

This Section of the EIS for the redevelopment of O'Devaney Gardens provides a comprehensive assessment of the potential air quality impacts and details the mitigation and management measures that shall be implemented to ensure that all aspects of the construction phase shall not have an adverse impact on any local receptor in terms of air quality.

11.5.7 OPERATIONAL PHASE

The operational phase the redeveloped O'Devaney Gardens will ultimately result in a positive impact on local air quality primarily as a result of the old buildings being replaced with modern, well insulated residential units which will be more thermally efficient resulting in a reduction in the volume of fossil fuel required to heat the buildings. It is predicted that there will therefore be a net reduction in fossil fuel combustion gas emissions including Carbon Dioxide, Sulphur Dioxide, Nitrogen Oxides, Carbon Monoxide and hydrocarbon particulate emissions.

Design options for the proposed new residential units shall include recommended energy saving strategies such as those detailed within *Chapter 17.1.4 Sustainable Site and Building Design* of the proposed Dublin City Development Plan 2011-2017 as follows:

- Energy Efficiency - All proposals for development should seek to meet the highest standards of sustainable design and construction with regard to the optimum use of sustainable building design criteria such as passive solar principles and also green building materials. For larger schemes, consideration should be given to district heating schemes and Combined Heat and Power (CHP). In order to reduce energy consumption, the following key design considerations should be considered at an early stage in the design process and incorporated, where feasible:

- Passive solar design including the orientation, location and sizing of windows

- The use of green building materials: low embodied energy & recycled materials

- The use of natural ventilation or mechanical ventilation with heat recovery

- Energy efficient window glazing units and frames
- Building envelope air tightness
- Appropriate use of thermal mass and insulation

- Appropriate renewable technologies

- Measures to conserve water

- The landscaping schemes of the new development shall include native trees, grasses and shrubs which will also contribute albeit in a minor way to the adsorption of Carbon Dioxide from the atmosphere and the release of Oxygen to the atmosphere.

- The design and development of the O'Devaney Gardens project shall be conducted in accordance to the Dublin Sustainability Action Plan which considers a number of sustainable heating and energy proposals. Options that may be considered include the use of communal gas fired Combined Heat and Power (CHP) systems, the use of biomass heating systems and the integration of solar thermal systems into the overall heating systems.

- The use of sustainable heating systems and the design and construction of the O'Devaney Gardens project to ensure a high degree of thermal efficiency shall ensure that there will be a net decrease in emissions to atmosphere of CO_2 relative the existing situation.

11.6 MITIGATION MEASURES

11.6.1 DEMOLITION PHASE

The demolition works for the Phase 1 site are mostly completed on lands which have recently received Part 8 approval for the removal of the blocks on the north end of the site.

In order to ensure that the demolition phase of the development does not have an adverse impact on local air quality, a strictly enforced air emissions programme shall be implemented at the site from the outset of demolition activities.

Best practice techniques specified in guidance documents for the Construction and Demolition Sector shall be implemented during the demolition phase and are detailed in this Section as follows:

- A 3m high solid wooden hoarding with a 3m high dust net shall be erected around the entire construction site perimeter giving a total dust barrier height of 6m.

- All buildings in which asbestos has been identified shall be sealed during the asbestos removal process. Asbestos shall only be removed by an appropriately permitted company. All asbestos waste shall be double bagged, stored in a dedicated sealed waste container/skip prior to removal off-site for disposal at an appropriately permitted/licenced facility. Records of all asbestos waste removed from site shall be maintained by the site manager and certificates of destruction shall be provided by the asbestos removal contractor. Asbestos surveys shall be conducted by an appropriately HSE approved contractor.

- Dust suppression techniques will include water spraying of stock piles and haul roads an temporarily curtailing specific operations when unfavourable weather conditions are prevailing (eg during dry, windy weather when the prevailing winds may cause dust to be blown towards local receptors).

- High Power water misting / spraying plant shall be used during the demolition activities to suppress and control dust emissions.

- All buildings shall be thoroughly wetted down prior to commencement of building demolition to suppress high level dust emissions.

- All demolition plant shall be fitted with high pressure water sprays to direct water onto demolition point. See Figure 11.3.

- Mobile crushing units (if utilised on-site) shall be fitted with spray bars to suppress dust generated by the crushing activity.

- Temporary dust screens shall be fitted around all mobile crushing plant (if used on-site).

- Demolition stockpiles shall be kept to an absolute minimum and all C&D waste shall be promptly removed from site.

- Demolition stockpiles shall be covered by tarpaulin during dry and windy weather.

- Dust screens comprising of wooden hoarding and fine mesh netting shall be erected at all site boundaries to minimise fugitive dust

emissions extending beyond site boundaries to any occupied residential units or sensitive receptors.

- A road sweeper vehicle shall be on-site at all times to clean soiled public roads in the vicinity of the site.
- A mobile wheel wash unit shall be installed at the site exit to wash down the wheels of all trucks exiting the site.
- An independent environmental consultant shall be appointed by the contractor to prepare a dust control and monitoring method statement prior to the commencement of site activities and to witness all demolition activities to ensure that the specified dust mitigation measures are implemented.
- A weekly inspection of each dust gauge will ensure that the site manager identifies at the earliest instance if dust suppression techniques shall be implemented at the project site areas.
- A programme of dust deposition monitoring and real time PM10 monitoring shall be implemented at the site boundaries prior to and for the duration of demolition activities to ensure that the air quality standards relating to PM_{10} are not exceeded.
- Where dust levels exceed specified air quality limit values, dust generating activities shall immediately cease and alternative working methods shall be implemented.
- A complaints log shall be maintained by the site manager and in the event of a complaint relating to dust nuisance, an investigation shall be initiated.

Table 11.6 presents a summary of dust control techniques which will be implemented at the site during demolition activities.

Table 11.6: Summary of Dust Control Techniques

Sources of Particular Matter	Control Technique
Loading and unloading processes	**Containment / Suppression**
	Reducing drop heights
	Use of variable height conveyors
	Use of chutes
Double handling transfer points	**Site and process design**
	Reduction of vehicle movements
Aggregate stockpiles	**Appropriate siting**
	Away from closest receptors/site boundaries
	Use of enclosures and bunding
	Reduced drop heights
	Water suppression
	Sprays
	Bowsers

	Covering
	Covered stock bins
	Dust covers
Mobile Crushing of site generated C&D Waste (if applicable)	**Appropriate siting**
	Away from closest receptors/site boundaries
	Use of enclosures and bunding
	Reduced drop heights
	Water suppression
	Sprays
	Bowsers
Conveyors / transfer points	**Containment**
	Wind boards
	Housings
	Suppression
	Water sprays
	Housekeeping
	Clean up of spilled materials
	Appropriate siting
	Away from closest receptors/site boundaries
Concrete Cutting Plant	**Suppression**
	Water sprays fitted to equipment/plant
Roadways including site yard area	**Suppression**
	Water sprays and bowsers
	Wheel wash at site compounds
Vehicles	**Washing / Covering**
	Wheel wash to be installed at site exit
	Vehicles exiting the site with C&D loads shall be covered with tarpaulin

Photo 11.1: Demolition Excavator fitted with high power water hose on boom

11.6.2 Construction Phase

In order to ensure that adverse air quality impacts are minimised during the construction phase and that the potential for soiling of property and amenity and local public roads is minimised, the following mitigation measures shall be implemented during the course of all construction activities.

- Avoid unnecessary vehicle movements and manoeuvring, and limit speeds on site so as to minimize the generation of airborne dust.
- Use of rubble chutes and receptor skips during construction activities
- During dry periods, dust emissions from heavily trafficked locations (on and off site) will be controlled by spraying surfaces with water and wetting agents.
- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic only.
- Re-suspension in the air of spillages material from trucks entering or leaving the site will be prevented by limiting the speed of vehicles within the site to 10kmh and by use of a mechanical road sweeper.
- The overloading of trucks exiting the site shall not be permitted.
- Aggregates will be transported to and from the site in covered trucks.
- Where possible, material from the demolished stockpile shall be recycled and reused on site as fill material to minimise the usage of virgin aggregates from quarries. This shall reduce the energy required to both quarry and process the construction aggregates and the energy required to transport them from quarry to site.
- Where the likelihood of windblown fugitive dust emissions is high and during dry weather conditions, dusty site surfaces will be sprayed by a mobile tanker bowser.
- Wetting agents shall be utilised to provide a more effective surface wetting procedure.
- Exhaust emissions from vehicles operating within the construction site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised by routine servicing of vehicles and plant, rather than just following breakdowns; the positioning of exhausts at a height to ensure adequate local dispersal of emissions, the avoidance of engines running unnecessarily and the use of low emission fuels.
- All plant not in operation shall be turned off and idling engines shall not be permitted for excessive periods.

- 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.

- Material stockpiles containing fine or dusty elements shall be covered with tarpaulins.

- Where concrete batching plants are erected on site, they shall be maintained and kept clean on a daily basis. If cement is stored in a silo on site, a filter will be fitted to the silo. Alternatively, ready-mix concrete will be supplied by truck. These plants shall be located at a site location away from the closest receptors to the site.

- Where drilling or pavement cutting, grinding or similar types of stone finishing operations are taking place, measures to control dust emissions will be used to prevent unnecessary dust emissions by the erection of wind breaks or barriers. All concrete cutting equipment shall be fitted with a water dampening system.

- An independent environmental consultant shall be appointed by the contractor to prepare a dust control and monitoring method statement prior to the commencement of site activities to ensure that the specified dust mitigation measures are implemented.

- A programme of dust deposition monitoring and real time PM_{10} monitoring shall be implemented at the site boundaries prior to and for the duration of construction phase activities to ensure that the air quality standards relating to PM_{10} are not exceeded.

- Where dust levels exceed specified air quality limit values, dust generating activities shall immediately cease and alternative working methods shall be implemented.

- A complaints log shall be maintained by the site manager and in the event of a complaint relating to dust nuisance, an investigation shall be initiated.

11.6.3 OPERATIONAL PHASE

The Operational Phase of the re-developed site will not generate air emissions that would have an adverse impact on local ambient air quality or local human health and as such there are no mitigation measures specified for the Operational Phase.

11.7 MONITORING

This section describes the dust monitoring methodologies that shall be implemented at the site during the demolition and construction phases to ensure that dust generated by site activities does not cause nuisance or cause detrimental health effects to residential areas and sensitive receptors located in the vicinity of the site boundaries. The proposed monitoring locations are presented below in Figure 1.4.

11.7.1 PM_{10} MONITORING METHODOLOGY

It is proposed to sample for PM_{10} over 24-hr periods at 2 locations over continuous one-week periods in accordance with the Standard Methodology *European Standard EN12341*.

The monitoring locations for the PM_{10} survey will be at site boundary locations located adjacent to the closest residential receptors to the site.

The proposed sampling methodology will involve auto-filtration with *in situ* analysis to give real-time monitoring data and allow direct comparison of the 24-hour average with the Air Quality Standard limit values.

A meteorological station will also be installed at the site which will continuously record temperature, rainfall, wind speed and wind direction.

11.7.2 DUST DEPOSITION MONITORING METHODOLOGY

Dust deposition levels will be monitored on a continuous basis in order to assess the impact that site activities may have on the local ambient air quality and to demonstrate that the environmental control measures in place at the site are effective in minimising the impact of demolition and construction site activities on the local receiving environment. Dust deposition measurements shall be conducted to determine the potential for dust nuisance or complaint to arise from local residents adjacent site works areas. The following procedure shall be implemented at the site on commencement of site activities.

The dust deposition rate will be measured by positioning Bergerhoff Dust Deposit Gauges at strategic locations near the boundaries of the site for a period of 30 +-2 days. Monitoring shall be conducted on a continuous basis (i.e. monthly) with replacement Bergerhoff Dust Deposit Gauges being positioned immediately following the removal of the previous monitoring periods gauges. The proposed monitoring locations are presented below in Figure 10.4.

The selection of sampling point locations will be completed after consideration of the requirements of *Method VDI 2119* with respect to the location of the samplers relative to obstructions, height above ground and sample collection and analysis procedures.

The optimum locations will be determined by a suitably qualified air quality expert to ensure that the dust gauge locations are positioned in order to best determine potential dust deposition in the vicinity of the site boundaries and existing on-site buildings.

After each (30 +-2 days) exposure period, the gauges will be removed from the sampling location, sealed and the dust deposits in each gauge will be determined gravimetrically by an accredited laboratory and expressed as a dust deposition rate in mg/m^2-day in accordance with the relevant standards.

Technical monitoring reports detailing all measurement results, methodologies and assessment of results shall be subsequently prepared and maintained by the Site Manager.

A dust deposition limit value of **350 mg/m^2-day** (measured as per German Standard Method *VDI 2119 – Measurement of Particulate Precipitations – Determination of Dust Precipitation with Collecting Pots Made of Glass (Bergerhoff Method) or Plastic.* is commonly specified by Local Authorities and by the EPA to ensure that no nuisance effects will result from specified activities and it is to this Best Practice standard method that this programme of dust monitoring and control has been prepared.

The *German Federal Government Technical Instructions on Air Quality Control - TA Luft* specifies an Immission value for the protection against significant nuisances or significant disadvantages due to dustfall. This limit value is **350 mg/m^2-day** and it is to this limit value that all measured dust deposition levels shall be assessed. This limit value is commonly specified by Local Authorities at construction sites.

Figure 11.4 Dust Deposition and PM_{10} monitoring locations

D1 & D2 Dust Deposition Monitoring locations
PM10a & PM10b PM_{10} monitoring locations

11.8 REINSTATEMENT

Reinstatement issues are not relevant to this Section of the EIS.

11.9 REFERENCES & SOURCES

Air Quality Regulations 2002, SI 271 of 2002
European Union Directives (EU Directives 1999/30/EC and 2000/69/EC, 2008/50/EC).
Air Quality in Ireland 2008 - EPA 2009
Greater London Authority – The Control of dust emissions from construction and demolition – Best Practice Guidelines, Nov 2006.
German Federal Government Technical Instructions on Air Quality Control - TA Luft
German Standard Method for determination of dust deposition rate, VDI 2129.)
European Standard EN12341 .