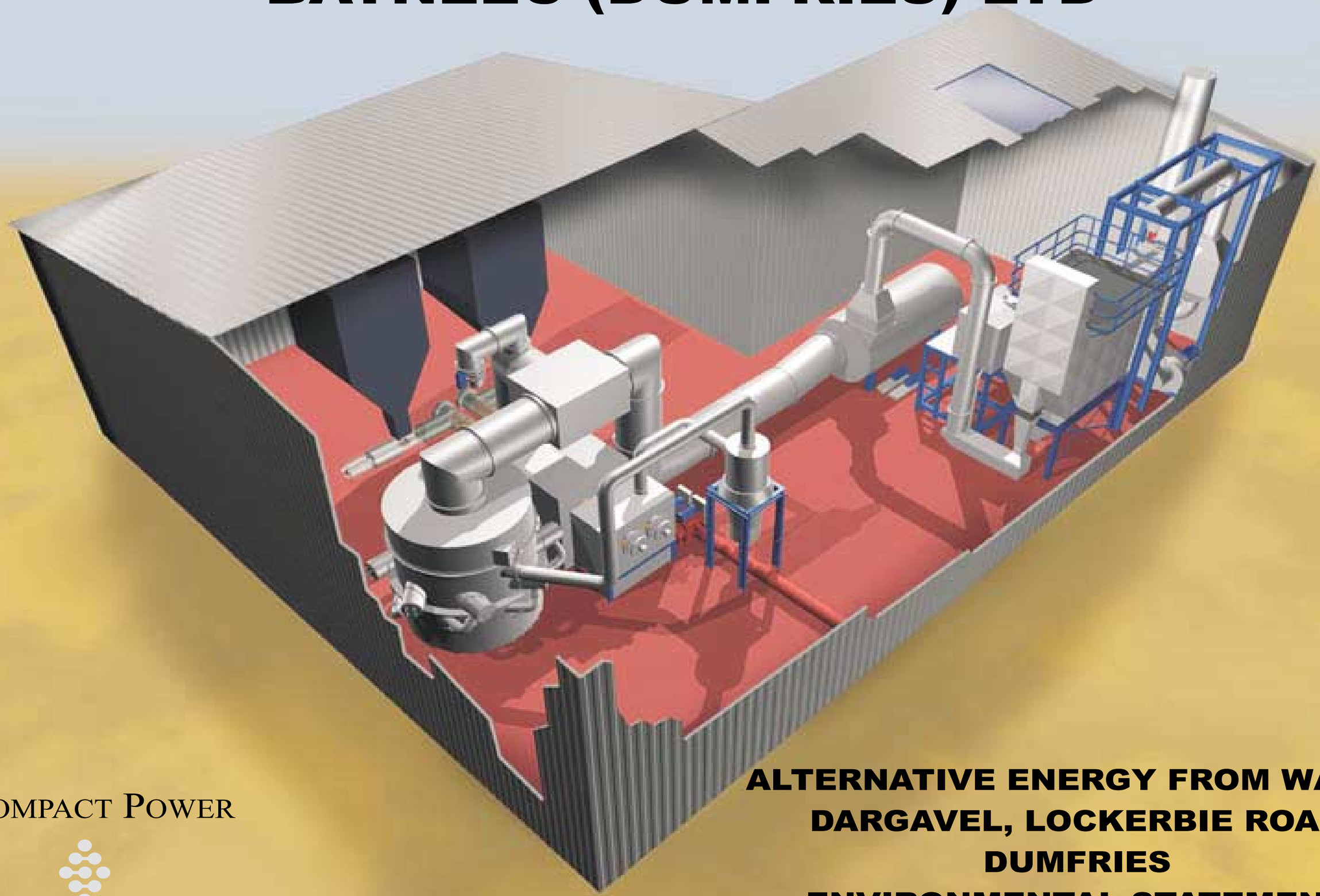
BATNEEC (DUMFRIES) LTD



COMPACT POWER

Wardell Armstrong
Engineering & Environmental Solutions

factorten
resource management

ALTERNATIVE ENERGY FROM WASTE
DARGAVEL, LOCKERBIE ROAD
DUMFRIES
ENVIRONMENTAL STATEMENT
NOVEMBER 2000

Our Ref: DMB/JR/NT02289 **Date:** 17 January 2001

BATNEEC (DUMFRIES) LTD

ALTERNATIVE ENERGY FROM WASTE
DARGAVEL, LOCKERBIE ROAD
DUMFRIES

ENVIRONMENTAL STATEMENT

NOVEMBER 2000

Prepared on behalf of Wardell Armstrong by

David Brignall (Partner): .....

John Raper (Senior Environmental Scientist): .....

BATNEEC (Dumfries) Limited
Environmental Statement
Alternative Energy from Waste

PREFACE

This document is the Environmental Statement for the proposed development of a facility to convert waste to energy by means of an advanced thermal process. The Facility will be located at Dargavel, Lockerbie Road, Dumfries. The application area (termed The Site) incorporates approximately **1. 9ha** of land to the south of Dargavel Stores industrial estate and is located approximately 2.5km to the east of Dumfries. The Development comprises the following aspects:

- **4450m^2** building to house the Plant;
- **4270m^2** of external hard surfacing;
- associated landscaping works;
- works to regrade **150m** unmetalled roadway through part of Dargavel Stores;
- diversion of the quarry access road.

The planning application includes the following documents:

(a) planning application forms, associated plans and supporting information;

(b) an Environmental Statement (this document) which describes the Development in the context of relevant planning policies and guidance and reports on the Environmental Impact Assessment undertaken into the predicted impact from the construction and operational phases of the Development. The Environmental Statement is divided, as follows:

PART A – The proposals and benefits of the Development

This provides an outline of the scope of the Environmental Statement. It describes the Site and the surroundings with respect to the Development. The construction and operation of the Facility is described in detail and the proposals for the style and size of the building, together with proposals for external landscaping, surface water control and other environmental considerations, are identified.

PART B – Planning policy

National and local planning policies are considered and an analysis of the scoping exercise undertaken prior to preparation of the application has been described. A comparison of alternative sites is discussed along with a discussion of waste streams and disposal options.

PART C – Environmental Impact Assessment

This section includes a detailed examination of the potential environmental effects of the Development. The scope of the Environmental Impact Assessment was agreed in advance with Dumfries and Galloway Council (The Planning Authority) and the Scottish Environment Protection Agency (SEPA).

Non-technical summary

A non-technical summary of parts A, B and C is included at the end of the document. It is also available free of charge, as a separate document, by writing to the following address:

Mr J A Carruthers
BATNEEC (Dumfries) Limited
Dormont
Lockerbie
DG11 1DJ

Additional copies of the full Environmental Statement can also be obtained from the above address at a cost of £80 each.

CONTENTS

Page No

PART C

TABLES

DIAGRAMS

FIGURES

Number	*Title*	*Scale*
1.1	Site location	1:50,000
1.2	Planning application boundary (The Site)	1:5,000
2.1	Site setting	1:10,000
3.1	Waste Strategy Area and anticipated catchment for the Facility	NTS
3.2	Site plan	1:2,500
3.3	Elevations	NTS
3.4	Plans	NTS
3.5	Compact Power flow diagram	NTS
3.6	Compact Power MSW pyrolyser plant	NTS
5.1	Location of alternative sites	1:25,000
6.1	Visual impact assessment	1:12,500
6.2	Photographic viewpoint locations	1:12,500
6.3	Photographs Viewpoint 3 - View from A709 roundabout	N/A
6.4	Photographs Viewpoint 4 - Facing south west towards the Site from Lochar Bridge along the A709 Viewpoint 6 - Facing south west towards the Site from the edge of Torthorwald village	N/A
6.5	Photographs Viewpoint 7 - View from Trabeattie residential property facing west towards the Site. Viewpoint 8 - Facing north west towards the Site from the edge of Collin village along Roucan Road.	N/A
6.6	Photographs Viewpoint 9 - View from the A75 facing north towards the Site. Viewpoint 10 - Facing north towards the Site from Mid Dargavel residential property	N/A
6.7	Photographs Viewpoint 15 - Facing south west towards the Site from Milburn Bridge.	N/A
6.8	Photographs Viewpoint 20 - View from the access to Lochar Moss Landfill.	N/A
6.9	Photographs Viewpoint 21 - View from A709 west of Dargavel.	
6.10	Proposed screen planting	1:750

6.11	Zone of visual influence for the proposed building only	1:20,000
6.12	Zone of visual influence for the proposed building and chimney stack	1:20,000
7.1	Regional strategic and distributor road network	1:12,500
8.1	Noise monitoring location	1:5,000
9.1	NO_2 measurement location points	1:5000
9.2	Windrose Prestwick Meteorological station	N/A
9.3	Windrose Drungans Meteorological station	N/A
9.4	Maximum 1-hour NO_x concentration	1:50,000
9.5	Annual average NO_x concentration	1:50,000
9.6	Maximum 1-hour SO_2 concentration	1:50,000
9.7	Maximum 24-hour SO_2 concentration	1:50,000
9.8	Maximum 24-hour PM_{10} concentration	1:50,000
9.9	Annual average PM_{10} concentration	1:50,000
9.10	8 hour average CO distribution contours	1:50,000
11.1	Location of surface waters	1:5,000
12.1	Location of organic farms	1:50,000
13.1	Scottish Natural Heritage: Habitat map	1:50,000

APPENDICES (separately bound document)

3.1 Compact Power emissions and abatement
4.1 Report on Best Practicable Environmental Option Assessment (based on original report produced by Factor Ten Resource Management, dated August 2000)
5.1 Scoping responses
6.1 Lower Dale character description
8.1 Noise measurement data
8.2 Suggested clauses for Prior Consent Notice
8.3 Detailed noise prediction calculations
9.1 Compact Power Finham trials abatement technology
9.2 CORDAH National Air Quality Strategy report
9.3 Site NO_2 concentration sampled over the period July - October 2000
9.4 Report on Air Quality Monitoring, July 2000
9.5 Meteorological data
9.6 Calculated stack height based on HMIP Technical Guidance Note D1
11.1 Water analysis results
11.2 Groundwater results – Lochar Moss landfill
12.1 Soil analysis – metals and organics
12.2 Soil analysis – dioxins and furans
13.1 Scottish Natural Heritage Information and Advisory Note 95 (accompanying plan shown as Figure 13.1)

PART A

1 INTRODUCTION

1.1 Terms of reference

This Environmental Statement has been prepared on behalf of BATNEEC (Dumfries) Limited to supplement the planning application for the development proposals.

1.2 Applicant company

The Applicant, BATNEEC (Dumfries) Limited ("the Company"), is a joint venture between SHREWS Limited (Scotia Holdings in Renewable Energy and Waste Systems) and Compact Power Limited. BATNEEC (Dumfries) Limited is a Scottish registered company formed in 1998 specifically to undertake the Development.

SHREWS Limited is a specialist Scottish company also set up in 1998 to promote and develop alternative energy from waste facilities within Scotland, utilising the Compact Power technology described in this application. In addition to the proposal for Dumfries, SHREWS Limited is currently negotiating two other sites located in Scotland, where it is the intention to develop similar facilities.

The business of Compact Power Limited was established in 1992 to pursue the development of an innovative thermal conversion process conceived by Professor Sharpe, then of Queen Mary's College, London. Based on the concepts of Professor Sharpe the company has developed and commercialised a proprietary small-scale advanced thermal technology that converts waste to a fuel gas for power production on-site. Waste is converted using the processes of pyrolysis, gasification and high temperature oxidation, in a unique and proprietary design, the subject of two international patents (the "Technology"). By means of the Technology the processes are controlled to achieve the highest relevant environmental standards on emissions to atmosphere. There are no liquid discharges and the resulting ash is inert and safe. By use of this Technology, energy from waste facilities can be appropriately sized to provide local solutions to waste management with minimal environmental impact.

The Technology was successfully operated as a prototype at the waste water treatment works of Severn Trent Water plc near Coventry between 1994 and 1997. The demonstration plant comprised a single tube pyrolyser with a throughput capacity of 3,000 tonnes a year. Between 1994 and 1997 an extensive series of trials were conducted on a variety of wastes, including de-watered sewage sludge, municipal solid waste (MSW), clinical waste, waste from vegetable oil refining, tyre crumb and coal slurry. A full-scale commercial plant at Avonmouth has recently been constructed and will be fully operational in November 2000.

1.3 Outline of the Development

The application site (the "Site") is an area of approximately 1.9ha comprising restored agricultural land located at Dargavel, 2.5km east of Dumfries, as shown on Figure 1.1.

It is proposed to develop a facility incorporating the Technology to convert solid wastes for energy production (the "Facility") on approximately 1.6ha of the Site (see Figure 1.2). The Applicants do not control any other land adjacent to the application boundary. The Facility will handle up to 60,000 tonnes per annum (tpa) of municipal, light industrial/commercial, rubber/tyre shred, organic, sewage screenings, wood and fabric waste, generating up to 7.8MW of electrical energy. The Facility is designed to accept non-recyclable material from these identified wastes in particular the residues of municipal waste after the optimum recovery of recyclable material. The Facility will form part of an integrated and effective network in Dumfries and Galloway to recover value from waste as opposed to current practice in which the majority of waste is landfilled. The remaining 0.3ha of land is required for access to the Facility and the quarry located to the south.

1.4 Site description

Lying adjacent to the southern boundary of Dargavel Stores industrial estate, the Site is predominately a restored former sand and gravel working now grassland, which is grazed. The adjoining industrial estate is occupied by a number of businesses servicing the road haulage and agricultural industries. Access to the Site is through the industrial estate and a small stretch of access road is included in the application boundary to facilitate improvement works. The existing access to the sand and gravel quarry will be re-routed to the east of the Site and this has been included in the application boundary.

1.5 Requirement for an Environmental Statement

This Environmental Statement is a requirement under the Environmental Impact Assessment Regulations (Scotland) 1999 (the "Environmental Impact Assessment Regulations"), and responds to the scope of assessment requested by the Planning Authority.

The Environmental Impact Assessment Regulations provide a checklist of environmental considerations that should form the basis of an Environmental Impact Assessment. The following are considered as significant factors that may require a detailed assessment:

- population;
- fauna and flora;
- soil;

- water;
- air;
- climatic factors;
- material assets, including architectural and archaeological heritage;
- landscape;
- the inter-relationship between the above factors.

Planning Advice Note 45 *Renewable Energy Technologies* includes advice on the principal planning implications of various renewable energy technologies. Annex D deals with waste combustion (i.e. incineration). In the absence of any guidance on advanced thermal processes, Annex D is used as a guide to best practice within PAN45. The issues are:

- siting and location;
- air quality and odour;
- dust;
- water protection.

These issues provide useful reference points for the Environmental Impact Assessment, the detailed scope of which has been determined by consultation with a range of public authorities and institutions.

2 SITE DESCRIPTION

2.1 The Site and surroundings

The Site is an area of open land to the south west of the Dargavel Stores industrial estate. Dargavel Stores is located approximately 2.5km to the east of Dumfries, adjacent to the A709 Lockerbie Road (see Figure 1.1).

Access to Dargavel Stores is directly from the roundabout at the junction of the A709 Dumfries to Lockerbie Road and the unclassified Catherinefield Road. The Site is some 250m south of the roundabout. The A709 connects with the A75, part of the east to west strategic road network, via a roundabout junction approximately 1.5km to the west of the Dargavel Stores junction. A second larger industrial estate is located at Heathhall approximately 1km to the north west of the Site.

The Site at Dargavel extends to approximately 1.9ha of agricultural land restored following mineral extraction including a small area within Dargavel Stores required to facilitate road improvements. The Site and its setting are shown on Figure 2.1. The access to the quarry, located to the south, traverses the Site dividing it into two open pasture areas, which are currently used for grazing. A second track to the north, which also forms a public footpath, separates the Site from Dargavel Stores. Dargavel Stores comprises a number of buildings in agricultural and industrial use, ancillary to the road haulage industry.

There is an active landfill at Lochar Moss, which is partially visible from the Site located to the west. A closed landfill site is located to the north of the A709. Extraction of sand and gravel continues from Dargavel Quarry, which is located approximately 250m to the south of the Site.

Although there is agricultural land adjacent to the Site, some of which has been restored following mineral working, there are extensive areas of commercial forestry, managed by Forest Enterprise, in particular to the north of the A709. There is a smaller area of commercial woodland on the western boundary of the Site amounting to approximately 1ha.

There are five residential properties near the Site. Two properties, Barton's House and Ashwell, are located approximately 150m to the east of the Site. To the north east of the junction with the A709 are Houston’s Cottage and Sandyknowe. Mid Dargavel Farm is located approximately 750m to the south of the Site. The main settlements are located at distances of greater than 1km from the Site and include the outskirts of

Dumfries to the west and south, Heathhall to the north and Torthorwald to the east of the Site.

2.2 Land use and planning history

The Site was originally poor quality farmland with a thin layer of organic topsoil overlaying glacial deposition bordering the Lochar Moss. Wartime aircraft hangers associated with the southern fringes of the original Heathhall airfield have been utilised within Dargavel Stores for farming and industrial uses.

During the early 1950's substantial deposits of sand and gravel were extracted from the area (subject to planning consent DCC 547/56 granted by Dumfries County Council) part of which has been subsequently used for hard development, as an extension to Dargavel Stores. The landowner, J & J Currie Limited, acquired the land around 1957 and continued the sand and gravel operation towards the south of the original consent, including the land, which is the subject of this planning application.

Commercial farming has generally been reintroduced following restoration after mineral working. However, opportunities for commercial diversification associated with Dargavel Stores have also been taken. In 1967, J & J Currie Limited's fuel storage and distribution business moved from Dumfries to Dargavel. A series of separate commercial enterprises followed. Hence, in addition to sand quarrying during the past thirty three years, Dargavel has become associated with heavy transport including:

- bulk agricultural lime storage and distribution;
- heavy plant storage and maintenance;
- commercial vehicle tyre fitting;
- fuel storage and distribution;
- heavy haulage and trailer parking, bus / truck parking and maintenance
- farm plant and transport hire depot and a series of smaller light industrial processes.

Currently, there are a number of different businesses operating from Dargavel Stores, which are related to the agriculture and haulage industries. These operate from a number of mainly older industrial and agricultural buildings, and associated diesel storage tanks and open hard standing. There is also a public weighbridge at Dargavel Stores.

Following construction of the A75 Dumfries bypass, 1km to the west of Dargavel Stores, the commercial requirements of the industrial estate were recognised and

significant road safety improvements undertaken at the junction with the A709. The application Site is therefore linked with a recently upgraded and direct connection with the trunk road network.

In 1969, sand and gravel extraction operations moved temporarily away from Dargavel to other sites within the locality but operations were re-established in 1974 in association with adjoining landowners to the south of the Site. In 1984, planning consent was obtained for mineral extraction below the water table. Upon completion of the first phase a lake of approximately 2ha was stocked with trout and has become a successful private fishery. Sand extraction continues within Dargavel Quarry, which is serviced by an unmetalled roadway, that bisects the Site.

3 DESCRIPTION OF THE DEVELOPMENT

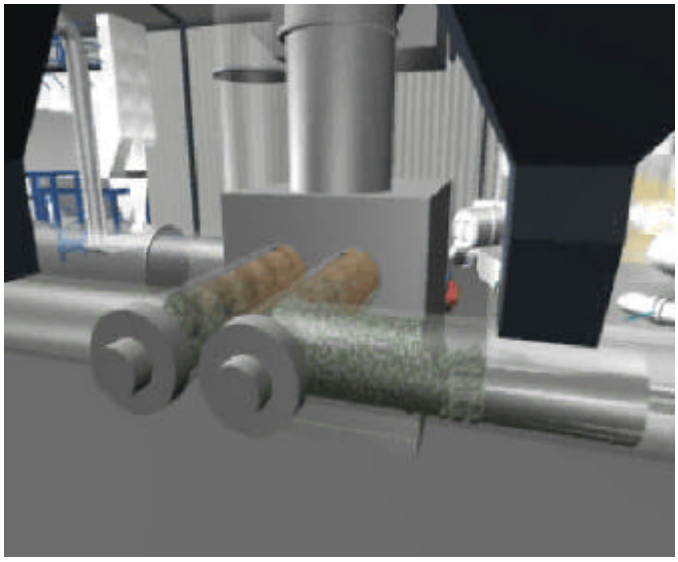
3.1 General description

The Development consists of the construction and operation of an advanced thermal technology for the conversion of non-recyclable municipal solid waste (NRMSW), mixed light industrial/commercial waste (MLICW), and specified Priority Wastes to a high calorific value (CV) fuel gas for power generation (the Facility).

3.1.1 Facility feedstock and sourcing of waste

BATNEEC (Dumfries) Limited are able to take advantage of the fuel flexibility of the process to design a Facility that permits both municipal and Priority Wastes to be converted to a fuel gas and power within a single unit of plant. The Plant consists of two interconnected pyrolysis and gasification units (MT8 Pyrolysers) supplied by Compact Power Limited. These units are each capable of processing 30,000 tpa of solid waste with an average calorific value of 12MJ/kg. Each MT8 unit consists of 8 pyrolyser tubes configured in two columns of 4 tubes stacked one above the other within a 2.6m wide x 3.8m long x 6.2m high vessel processing 3.75 kg/hr at 12 MJ/kg. The lower 6 tubes will be principally fuelled by municipal waste, mixed light and industrial waste, rubber and tyre shred. The top 2 tubes will be designed to accept the sewage screenings and organic waste fed by means of a separate, hygienic special waste feed system.

Diagram 3.1
Visualisation of pyrolysis twin tubes designed for special waste



The Facility has been designed to process the following waste streams:

- a nominal 30,000 tpa of NRMSW from within the Dumfries and Galloway region; and
- up to 30,000 tpa of Priority Waste and other specified wastes from within the Waste Strategy Area (defined herein as South West Scotland).

Of the capacity reserved for commercial waste and priority wastes a proportion would be available for organic wastes, sewage screenings and possibly clinical wastes. These require a separate feed system, which is specifically designed for such wastes. Accordingly, the input of these special wastes are constrained to the design tonnage of approximately 9,000 tpa.

Table 3.1 provides a profile of the waste streams for which the Facility will provide a sustainable solution.

Table 3.1 Catchment area and waste sources

a) Waste Sources 2002

	Distance from Facility	NRMSW/ MLICW (tpa)	Priority Wastes (tpa)	Total (tpa)
Dumfries	5 miles	30800	9350	40150
Dumfries & Galloway	70 miles	11700	5430	17130
Waste Strategy Area	70 miles	0	2500	2500
Total				59780

b) Waste Sources 2017

	Distance from Facility	NRMSW/ MLICW (tpa)	Priority Wastes (tpa)	Total (tpa)
Dumfries	5 miles	26460	11375	37835
Dumfries & Galloway	70 miles	10170	10111	20281
Waste Strategy Area	70 miles	0	1900	1900
Total				60016

Note: tpa= tonnes per annum.
Distance from facility refers to the hinterland on the road network

A graphical representation indicating the relationship between Dumfries and Galloway, the Waste Strategy Area and the principal towns from which waste will be sourced is shown on Figure 3.1.

Table 3.2 provides a breakdown of the volume of waste arising within each of the defined catchment areas and the predicted diversion to the Facility.

Table 3.2
Reference data sets for wastes

A: Reference Data Sets for Wastes: Planned Waste Throughput by Category for 2002							Total from waste streams
Waste Group	Dumfries		Dumfries & Galloway		SW Scotland (WSA)		
	Available	Waste captured	Available	Waste captured	Available	Waste captured	
MSW	55000	23800	24139	10200	224776	0	34000
MLICWW	43508	7000	18646	1500	139450	0	8500
Tyres/Rubber	8000	4000	5800	2800	9000	1500	8300
Organic	10000	4500	6300	2500	1000	200	7200
WA Wastes	60400	750	3000	30	80000	0	780
Wood/Textiles	700	100	1000	100	9000	800	1000
Total	177608	40150	58885	17130	463226	2500	59780
Cumulative Throughput		40150		57280		59780	

B: Reference Data Sets for Wastes: Planned Waste Throughput by Category for 2017							Total from waste streams
Waste Group	Dumfries		Dumfries & Galloway		SW Scotland (WSA)		
	Available	Waste captured	Available	Waste captured	Available	Waste captured	
MSW	49425	21000	19613	9000	182630	0	30000
MLICWW	33936	5460	14544	1170	108771	0	6630
Tyres/Rubber	8840	4420	15945	7698	5265	1500	13618
Organic	13000	5850	8190	2250	1300	0	8100
WA Wastes	78520	975	3250	33	104000	0	1008
Wood/Textiles	910	130	1300	130	11700	400	660
Total	184631	37835	62842	21281	413666	2200	60016
Cumulative Throughput		37835		58116		60016	

Note: Dumfries & Galloway excludes Dumfries
SW Scotland (WSA) excludes Dumfries and Dumfries & Galloway

3.1.2 Municipal Waste

The Development is intended to form part of an integrated waste management solution for the municipal waste arisings of Dumfries and Galloway. It will enable the Local Authority to treat municipal waste, which cannot be composted or recycled for technical or economic reasons.

Table 3.3 demonstrates that, assuming very high levels of recycling and composting (exceeding anticipated statutory recycling/composting targets and achieving the requirements of the Landfill Directive) (99/31/EC), over three key periods the level of Non-Recycled Municipal Waste will be between 50,000 and 54,000 tpa. This waste requires a sustainable solution. In the absence of an energy from waste facility the diversion rates would be insufficient to meet potential statutory targets for the recovery of value (which includes energy value) from waste.

Table 3.3 Impact of recycling and composting objectives on MSW				
Facility start date	2002			
Landfill Directive compliance dates with 4 year exemption		2010	2013	2020
Predicted MSW arisings	79139	92724	98399	104422
Biodegradable waste required to be diverted under Landfill Directive	0	17928	30244	38942
Recycling / composting required to meet anticipated targets	19785	27817	32472	34459
Assumed recycled volumes	1583	13909	16728	20884
Assumed composted volumes	0	23181	27060	31327
Total volumes recycled / composted	1583	37090	43788	52211
Anticipated statutory recovery obligation – Waste Strategy 2000 (maximum percentage)	0%	45%	67%	67%
Volumes required to meet anticipated statutory recovery obligation	0	41726	65928	69963
Energy fom Waste capacity required to meet anticipated statutory recovery obligations	0	3245	20467	15663
Available for energy from waste or landfill	77556	54244	52939	50123
Margin assumed recycling/composting rates exceed anticipated statutory targets	0%	10%	12%	17%

The municipal waste will be primarily sourced from the Dumfries area, providing an alternative to landfill at Lochar Moss. This landfill is due for closure within the next 2 to 3 years when alternatives to current waste management practice will be required.

There is only limited alternative landfill capacity to replace the disposal facility at Lochar Moss. This includes short term capacity at Aucheninnes, (approximately 10,000 tpa). Therefore, in the medium to long term the Facility could provide part of an integrated waste management strategy for the Dumfries area.

The Facility would also offer a solution for some of the Non-Recyclable Waste from within the wider Dumfries and Galloway region (though in much lower volumes). Such waste would probably be bulked at strategically located transfer stations and/or materials recycling facilities.

3.1.3 Specified Priority Wastes

In the case of the specified Priority Wastes, it is anticipated that the Facility will draw wastes from the main commercial centres identified in Figure 3.1. There are likely to be other sources of waste within the Waste Strategy Area not identified at this stage, the locations identified on Figure 3.1 indicate the primary sources. Therefore, the Facility will provide a strategic solution for these Priority Wastes arising from a number of industries important to the economic base within the Waste Strategy Area. This wider hinterland has been identified within the Waste Strategy Area because it is unlikely that alternative waste management options for the specified Priority Wastes would be economically viable on a town by town basis.

3.1.4 Best Practicable Environmental Option (BPEO)

This advanced thermal conversion process will form an essential and integral part of a sustainable approach to waste management principally for Dumfries, but would also provide solutions for waste management within Dumfries and Galloway and to a lesser extent South West Scotland.

As part of an integrated waste strategy the Facility offers the Best Practicable Environmental Option for NRMSW and MLICW waste within Dumfries and Galloway, and for the specified Priority Wastes within South West Scotland. A life cycle analysis has been undertaken to indicate the acceptability of the proposal as the Best Practicable Environmental Option of the Development taken as a whole. The analysis reported in Appendix 4.1 indicates that the Development is the Best Practicable Environmental Option for each waste stream. It has therefore, not been necessary to evaluate the environmental benefits derived from managing the mix of waste streams as a group.

3.1.5 Power generation

The Facility will recover up to 7.8MW of electrical power from the converted fuel gas for export to the local grid system.

3.2 Site layout

The layout of the Facility is shown on Figure 3.2, reproduced from Aitken and Turnbull drawing DFA423/001. The architectural design is shown in more detail on plans submitted with the planning application, which have been reproduced in Figures 3.3 and 3.4.

The development will be delineated by a perimeter fence approximately two metres in height. The fence will consist of green plastic coated weld mesh with concrete or wire lattice support pylons at approximately three metre centres.

Access to the Site will be by way of a surfaced roadway leading from the edge of the asphalt surfacing constructed into Dargavel Stores, following the route of the existing unmetalled road, which leads to the sand quarry and various storage buildings nearby. The roadway will cross a public right of way, which borders the Site along the northern edge. This right of way is used on an occasional basis as a bridle path, most notably during the Riding of the Marches celebrated in June. Insofar as this tends to be planned activity outside normal working hours and has not come in conflict with the vehicular crossing to the quarry, no difficulties are foreseen.

The fenced area, shown within the application boundary, measures approximately 1.6ha. The building footprint will occupy 4450m^2 and a further 4270m^2 will be devoted to concrete hard standing for vehicle circulation and parking. The residual area will be given over to mixed woodland planting, to reinforce natural screening between the building and the existing housing located east of the Site, and wild flower meadow. A series of earth bunds and embankments will act as visual screens for car parking and to attenuate traffic noise (see Figure 3.2).

The quarry road, which currently bisects the Site, will be relocated on the eastern fringe, outside the security fence. Lorry traffic associated with the quarry will decline as consented reserves are worked out and long-term access will be maintained for agricultural purposes and to the private recreational trout fishery.

3.3 Building form

The proposed building envelope comprises colour-coated steel or aluminium profiled panels with bonded thermal and acoustic insulant fitted over pressed galvanised steel purlins and cladding rails. Small areas of coloured facing brick are also featured in the design. There are no windows intended within the waste processing area but the administration and control modules, which are located on the upper floor, will have double glazed windows within the metal clad surface. Electrically controlled doors will be situated at all the principal pedestrian and vehicle entrances (see Figure 3.3).

The building essentially forms a large warehouse containing a secondary, heavy concrete, and masonry structure constructed to surround the main part of the industrial process. The structure entails the use of rolled steel stanchions and rafters in a portal frame format with a six-degree roof pitch. A modular structural grid produces a square lower floor space of 66m x 66m. Within the main frame a mezzanine floor provides a further 820m^2 of floor space (see Figure 3.4). There is a chimneystack, 20m in height, for dispersion of exhaust gases from the process.

The building is designed to contain all parts of the process including indoor vehicle reception. Upon entry, all doors will be closed. The centre protection zone is designed to operate under negative pressure and this means that any odorous air within the building will migrate towards the air intake valve forming a feed gas for the process.

CCTV will monitor the perimeter of the building, entry to the Site and will aid traffic management.

3.4 Lighting

External safety and security lighting will be provided around the perimeter concrete apron to provide low-level downward illumination from a height of approximately four metres. The lamps within these fittings will be low-pressure sodium lights shrouded with directional reflectors to obtain optimum side spread at centre spacing of approximately eight to ten metres. This lighting will be controlled by photocell. The perimeter fence will not be illuminated except at the Site entrance.

The main vehicle reception yard will be lit using directional halide or SON type lighting mounted on metal columns approximately five to six metres in height at fifteen-metre spacing. This lighting will be used on an intermittent basis, generally only when traffic movement is anticipated within the external compound after dusk. This is likely only to apply to evening time in winter because no traffic movement is anticipated at the Site after 18:00.

3.5 Operations

The proposed development is a process capable of converting waste to a fuel gas from which energy is produced. Two forms of energy will be produced:

- electricity, most of which will be transferred to the national grid, the remainder being used by the Facility;
- heat, which would dissipated to atmosphere initially. However in the long term such heat could be made available to neighbouring businesses.

3.5.1 Core technology

Compact Power technology combines the advanced thermal processes of pyrolysis, gasification and high temperature oxidation to provide a means of disposing of a range of wastes to produce energy whilst complying with the highest relevant environmental standards.

The Compact Power philosophy is to optimise resource recovery through recycling and energy production and minimise the environmental impact of waste using small scale advanced thermal conversion technology as part of an integrated waste management system. This is made possible by using advanced pyrolysis and gasification techniques to convert Non-Recyclable waste into simple fuel gases for energy recovery. These processes minimise the formation of pollutants so that pollutant concentrations in the flue gases are extremely low even before the flue gases are cleaned. Compact Power then combines its process with the latest technologies for cleaning flue gases to provide plant that currently represents a state of the art alternative to incinerating waste.

Solid wastes are converted into simple gases and used to generate heat and electricity through a conventional gas-fired steam boiler and power plant. The Plant is a closed system and emissions are exhaust gases dispersed to atmosphere through a flue and ash, which typically is a dry inert material. The ash may be suitable for block production, which can be used for construction purposes. Atmospheric emissions of exhaust gases have been assessed in Section 9 of the Environmental Statement.

This thermal process converts up to 85% of the energy value of waste into readily usable steam with a wide range of applications such as power generation and combined heat and power (CHP), including process heat for industrial purposes, chilling and refrigeration requirements using absorption chillers, and water de-salination plant.

The Plant design permits accurate control and optimal conditions for each separate stage of the process. Figures 3.5 and 3.6 illustrate the core technology.

3.5.2 Pyrolysis

The feedstock is initially fed into a system of closed tubes in which pyrolysis takes place. Pyrolysis occurs when the material is heated in the absence of oxygen. In the temperature range 400° to 900°C the organic materials break down into "pyrogas" (low molecular weight hydrocarbon gases), leaving carbon residues and inert materials such as ash, metals and glass, all of which pass into the gasification chamber.

3.5.3 Gasification

This is the process, by which the residual carbon is reacted with steam at high temperature to produce hydrogen and carbon monoxide, which are both combustible gases, and carbon dioxide. This is the conventional "water gas" reaction.

3.5.4 High temperature oxidation

The pyrogas and the water gas pass into a thermal reactor, which is maintained at a constant temperature of 1250°C. Sufficient air is introduced for complete oxidation of all gases. The design of the chamber ensures that the gases and any small particles of solid matter that may come through in the gas stream remain at these temperatures for at least two seconds. These thermal conditions minimise the emission of pollutants, to ensure that the highest relevant environmental standards are achieved.

The exhaust gases from the thermal reactor provide the heat for the process and the Plant is self-sustaining even with wastes, which have relatively low calorific value. However, an auxiliary fuel source (typically gas oil) is used to ensure that the temperature

conditions in the thermal reactor are maintained at all times. This also enables the Plant to maintain its heat and power output even if the energy value of the feedstock is inadequate or the processing of the waste is interrupted for any reason.

The exhaust gases pass through a boiler where the heat is transferred to the steam and the temperature of the gases is rapidly reduced to below 250°C. The steam is then available as an energy source for heat and power applications.

3.5.5 Emissions control and ash

The process is designed to minimise emission of pollutants and particulates. The emissions from the process have been extensively tested during trials with the plant at Finham (see Appendix 9.1). The control of primary pollutants is discussed in detail within Appendix 3.1 but can be summarised as follows.

Dioxins:

- the combined effect of the pyrolysis process breaks down all hydrocarbon materials, including any dioxins in the feed stock, into simple hydrocarbon gases;
- the temperature conditions in the thermal reactor ensure destruction of any dioxins which have survived the pyrolysis phase;
- the rapid cooling of the exhaust gas gives minimal opportunity for the reformation of dioxins in the exhaust gases which can occur when gases are allowed to cool too slowly through the relevant temperature zone (about 250° - 450°C);
- the gas clean-up system has the capability to reduce any residual dioxins in the flue gas to a fraction of permitted levels.

The process destroys the dioxins originally in the waste without any corresponding disadvantage from the reformation of dioxins through combustion, as occurs with incineration.

Nitrogen oxides (NO_X):

The process does not allow oxidation of the gases to occur at the high temperatures at which NO_X from combustion is normally produced, and the rapid cooling of the exhaust gas inhibits NO_X formation. Any NO_X, which is produced, will be treated as exhaust gases flow through a 'de-NO_X' unit.

Acid Gases (HCl & SO_2):

The process is able to control both the pyrolysis and gasification conditions to ensure that the environment required to inhibit acid gas formation is maintained. The exhaust gas is dry scrubbed using sodium bicarbonate (also used in baking powder), a highly effective scrubbing reagent that removes more than 99% HCl and more than 90% SO_2.

Particulates:

These are minimised / removed at all stages of the process. Very low off-gas velocities from the pyrolysis and gasification process produce little initial particulate entrainment. A hot gas cyclone is used to remove any particulates that do become entrained within the pyrolysis gasification gas with greater than 99% removal efficiency. The thermal reactor will then oxidise any organic particulate material remaining in the gas stream. The bag filter captures any remaining particulate material.

Heavy Metals:

Those contained within the waste are either retained in the bottom ash as stable complexes or the more volatile species such as mercury and cadmium may volatilise in the pyrolysis and gasification stage. These are condensed within the rapid temperature drop across the boiler and the particles formed are filtered from the gas stream in the bag filter.

Carbon-monoxide (CO) and Volatile Organic Compounds (VOC's):

These are destroyed by the maintenance of good combustion conditions involving high temperature oxidation, excess oxygen, sufficient residence time and turbulence. By conversion of the waste into a fuel gas the Compact Power process is able to ensure constant operating conditions.

Dispersion of exhaust gases:

In addition to the relatively low volumes of pollutants existing in each cubic metre of exhaust gas emitted from the Plant, the volume of exhaust gas is far less than a comparable size incinerator. The reason for this is that for pyrolysis to occur there must be an absence of oxygen and the combustion of the resulting gases operates on a minimal air basis. The result is that compared with incineration there is far less pollution within the exhaust gases that need to be dispersed in the atmosphere. This reduced pollutant loading is the reason why a relatively short chimney stack is required in accordance with the calculation method set out in HMIP Technical Guidance Note D1. The stack height determined by this method has been calculated to be at 20m (See Appendix 9.6).

Solid residues:

Any solid residues will be stored in covered skips, both on Site and during removal from the Plant. Ash will be recycled to the extent that this is practicable, or otherwise sent to landfill. The amount of ash will depend on the characteristics of the waste fuel, but an average 20% has been calculated for the proposed wastes, giving an ash disposal tonnage of approximately 12,000tpa.

Liquid residues:

There are no liquid wastes produced by the process, which is a major advantage of the Compact Power system, compared with most incinerators, which produce liquid waste from the wet scrubbing of dirty exhaust gases. Such wet scrubbing is not required for the Compact Power process.

3.5.6 Plant design

Compact Power's designs are based on the principle of compact, modular units of plant, which can be combined to produce an integrated energy from waste system and combined heat and power (CHP) facilities. The items of plant are designed to be transportable, so that they can be modified or relocated to meet changing needs and varying waste streams.

The proposed Plant comprises two Compact Power pyrolysis units, with a combined waste input capacity of up to 60,000 tonnes per annum, which would generate up to 7.8 MW of electricity. It is likely that these units will be installed in two phases as the Facility builds up to its fully operational capacity. This phased approach can be readily achieved due to the modular construction of the Plant.

The Plant is designed to provide economies in operation and maintenance with features that minimise the risk of unscheduled stoppage. The output of heat and power can be maintained by auxiliary fuel even when the waste process is interrupted. A principal design criterion is the achievement of the environmental objective set by SEPA to use *Best Available Techniques* (BAT) to avoid or minimise harmful pollutants from any process. The combined effect of pyrolysis, gasification, high temperature oxidation and advanced NO_X treatment reduce the effects of pollution to such an extent that the system may be regarded as constituting the *Best Practicable Environmental Option* (BPEO) for the thermal destruction of certain wastes (see Appendix 4.1). The design also meets the more general objective of promoting a preferred environmental option for waste management compared to conventional landfilling.

Compared with a typical mass burn incinerator, the Plant has less environmental impact in terms of air pollution and discharges of residues to land. In addition, the Facility is visually less obtrusive due to the smaller scale and height of building required to house the Plant. A full analysis of the environmental impacts are reported in Part C of the Environmental Statement.

3.5.7 Waste reception

The Site has been designed to handle 60,000 tonnes of waste per annum from a range of wastes. The process can accept a variety of different fuel feedstock. The waste reception procedures proposed by Compact Power are derived from typical best practice at other waste treatment facilities. Waste that will be accepted for thermal conversion at the plant will consist of:

- municipal solid waste (MSW), in time this will be the non recyclable fraction only;
- mixed light industrial and commercial (MLICW);
- tyres/rubber;
- organic waste;
- waste water treatment works screenings;
- wood and textiles.

Waste will be delivered in dedicated vehicles, by operatives registered as Carriers of Controlled Waste. No waste will be accepted unless it complies with the description of waste given above, for which the Facility is authorised. All waste arriving at, and leaving, the Facility will be weighed and logged. A record will be kept of each and every delivery to the Facility and this record will include:

- date and time of arrival on site;
- type and amount of waste;
- source location of the waste received.

No waste will be accepted onto the Site unless it can be processed within the specified maximum storage period for that waste.

Due to the presence of putrescible matter in some of the waste stream, it is necessary for the waste to be received into a closed building under negative air pressure to prevent the emission of fugitive odorous air. The doors to the building will open and close for the entry and exit of the waste vehicles. This will be based upon a “magic eye” system and is designed to minimise the escape of dust and odours. The Plant will draw in air from the waste reception area of the building through the process thereby containing dust and odours within a closed system.

Waste will be received into the building in transport containers or sealed waste bins depending on the waste type. The waste-handling hall within the building is designed to be bird, insect and rodent proof and is constructed to ensure a secure area for the safe short-term storage of waste. Waste storage within individual bays or in sealed containers, has been designed to ensure an organised and safe waste-handling regime. An effective system will be in place in case of fire.

The waste handling floors will have a resistant finish to resist wear and prevent attack by the cleaning and disinfectant materials. The surface will be sloped towards a drainage holding pit. Wash-down water will be treated and processed within the Plant. Vehicles, containers, storage areas, loaders and all equipment are designed for easy cleaning to maintain a sterile environment. The use of impervious construction materials and a weekly cleaning programme, including the use of disinfectants, will be enforced to ensure a safe working environment.

3.5.8 Waste charging

The principle behind the Plant flexibility is the method for introducing waste into the process. A central waste hopper arrangement is used to feed a multi head combined shredder, blender and compactor system. The compacted waste is then fed into the pyrolyser via a cartridge feed system. Low calorific value waste streams will be blended with high calorific value wastes to provide a suitable feedstock for treatment in the process.

The proposed Plant will comprise two MT8 pyrolysis units. Each MT8 pyrolyser has eight circular charge points arranged in a configuration of two vertical columns of four. This arrangement permits the transfer of feedstock into each of the two charge points simultaneously but at the same time allowing each pyrolyser tube to be filled independently of each of the other tubes.

The feedstock is moved from the reusable cartridge filling station to the pyrolyser charge points by means of an overhead conveyor system, which ensures that full cartridges are always available for discharge into the pyrolyser. The waste is then transferred out of each of the cartridges by means of an independent transfer piston that pushes the waste into the individual pyrolyser tube. The ram speed is automatically adjusted to control the in-feed rate to match the pyrolyser consumption that will be optimised to produce the maximum heat release and thus available power. The waste feed mechanism ensures that waste material is enclosed and isolated from the building atmosphere and operators, during processing. In addition, the negative pressure experienced within the preparation area prevents fugitive emissions.

For special waste a separate overhead feed system consisting of combined shredder and hopper is used (see 3.5.11 and 3.5.12 below). This system is also under constant negative pressure to draw any odours into the Plant.

3.5.9 Tyres

The Facility is to include storage of waste material for up to 72 hours of Plant operation. A bunker containing sufficient shredded tyre will be maintained at all times. Pre-shredded tyres will be delivered within the building directly into the tyre bunker conveyor. The tyre bunker will be located within the building and would operate on a moving floor principle to ensure constant material turnover. The bunker design enables the inclusion of an effective and integral fire suppressant system.

3.5.10 Mixed light industrial and commercial / Municipal solid waste

MLICW and MSW waste will be processed within a Material Recycling Facility (MRF) which will be located elsewhere as part of an integrated waste management regime for Dumfries. Appropriate sites for the MRF may include existing waste transfer stations. The process will remove oversized material, and recyclables from the waste stream before it is then compacted into waste containers for delivery to the Site. To avoid problems with decomposition of the waste, the filled containers should be delivered to the Facility within 24 hours of processing. All putrescible waste will be treated within an agreed timescale. The quantity of incoming waste being stored will be limited to the capability of the Facility's design and the handling and storage will be confined to the designated areas.

The compacted waste containers will be received into the building where they are offloaded. A scissor jack lift will then raise the container to its discharge height where a hydraulic pusher will empty the waste into the cartridge feed hopper. Air extraction points above the feed hopper and waste hall prevent the emission of fugitive odours and dust. This extracted air is primarily used as the source of the combustion air but during shutdown air will continue to be extracted and will then be filtered and treated for odour.

3.5.11 Organic waste

Organic waste will be delivered to the Facility in lockable covered bins, the size of bins to be agreed between BATNEEC (Dumfries) Limited and the producer. The waste will be received within the building and unloaded onto the waste handling area. The bins are then lifted in a bin hoist to an upper storage area. From this level the bins are tipped into a dedicated and specially designed cartridge feed hopper, which provides a hygienic feed system for special waste. The empty bins are then lowered in the bin hoist to a washing system capable of removing any potential contaminants.

3.5.12 Wastewater treatment works screenings

Screenings will be delivered in lockable covered bins and processed using the same procedure as that described for organic waste.

3.5.13 Wood and textiles

Wood workings and wood waste together with textile and industrial carpet waste will be received in suitably sized covered bins for processing using the procedure outlined for organic and screening waste.

3.5.14 Oversized waste

Additional waste in the form of wooden pallets and cardboard packaging may also require processing. This type of waste is unsuitable for direct entry into the feed system due to problems with bridging. For these oversized wastes a compacting shredder is to be available which will extrude directly into the main cartridge feed hopper system. This type of waste will constitute only a small portion of the total waste processed.

3.6 Grid connection

Connection to the grid will be achieved through underground cabling via the on-site substation located at the west of the Site, as shown on Figure 3.2.

3.7 Drainage

3.7.1 External drainage

The drainage catchment area for the Facility will comprise the tarmac area around the Site, the tarmac access road, turning area and parking area, together with the run-off from the roofs of the buildings. The erection of buildings and hard standings at the Site will convert approximately 66% of the surface area into non-porous material. A surface water collection system will gather water and divert it via an interceptor through a serious of porous rock filled spillways adjacent to the edge of hard standings and in meadow land immediately to the south of the building. Surface water intercepted from the perimeter and access road within the Site will be combined with roof rainwater from the building. An oil and grit separator will be required before discharge into the proposed spillways for dispersal. No direct surface run off is anticipated towards the Dargavel Burn.

3.7.2 Foul drainage

All drainage from within the buildings and waste storage area will be isolated and contained by a low bund. Tanks will be used to provide containment and treatment for internal foul water. Treated effluent will be stored for recycling within the

treatment process, or until it can be pumped out and removed either by tanker for disposal at an approved location off-site or for consumption within the pyrolysis Plant.

During normal operation any liquids emanating from the shredded waste will be forced into the pyrolyser along with the waste charge. The necessary drainage facilities would be installed within the ram chamber to ensure that any liquids emanating from the hopper and shredder arrangement can be disposed of when the Plant is not operating or below operating temperature. Any liquids collected will be stored within the central storage/treatment tanks.

The foul drainage system proposed for the building has been assessed on the basis of twenty-four hour working in three, eight man shifts. A suitable form of simple technology using a Sequential Batch Reactor with automatic telemetry will cater for peaks and troughs in activity. The system involves the installation of two six thousand litre underground vessels accommodating primary sludge settlement and aeration / final settlement. Essentially, the system involves two conventional flask type septic tanks through which compressed air is injected through a bubble diffuser. The resultant effluent quality is greatly enhanced. While the granular strata at the Site is extremely porous and would offer ample opportunity for discharge to the land, the waste conversion process within the proposed Facility is capable of digesting both primary and secondary settlement products. The proximity of the water table to the proposed surface levels at the Site suggests that an option to install two further 6000 litre effluent tanks with piped circulation back into the waste processing area would provide an elegant, entirely self contained and environmentally conscious solution. Washings from all internal floor surfaces will enter the foul drainage system.

3.8 Site construction and decommissioning

There is adequate area within the Site to deal with excavated material emanating from the excavations. Surplus material will be retained on-site for the formation of embankments and bunds where visual or acoustic screening is considered beneficial. The deeper excavations at the north end of the Site are expected to yield high-grade building sand and may be transferred to stockpiles within the adjacent quarry. All construction will be carried out above the water table, the depth of which has been established by monitoring.

The building and associated system comprises a large number of prefabricated components which will be manufactured offsite. Construction of large steel structures of this type is relatively quick and the building envelope would be expected to be

complete within four/five months of commencement. The location of the Site immediately adjacent to the road network on the east side of Dumfries would mean that construction traffic would be barely discernible and would be unlikely to affect the town or residences nearby. It is understood that subject to obtaining way leaves, the power connector route into the national grid would pass under land, which is predominantly agricultural. After completion of the building, the Plant installation process would continue inside the building, without any significant environmental impact.

The building will be designed on the basis of a working life of approximately 60 years. Within that period external surface and component life cycle refurbishment might be expected at intervals of 20 - 30 years.

It is anticipated that all materials to be used in the construction assembly will entail environmentally conscious technology. Deconstruction at the end of the design life cycle would involve "low tech" systems and a high proportion of potential material recycling. Those materials, which under present technologies could present uneconomic prospects for recycling, would be expected to be chemically inert and the process is not expected to contaminate these materials in any prejudicial way. In any event, it is anticipated that a building of this type could present opportunities to accommodate a series of alternative uses beyond the process currently envisaged and it is therefore very unlikely that decommissioning of the Plant need entail destruction of the main envelope. It is in the nature of the central process that Plant can be disassembled and taken to a new location.

3.9 Operational hours of work

The Plant would be expected to operate under normal conditions for 24 hours per day. Waste delivery and ancillary operations will take place during the daytime working hours, in order to minimise the noise impacts at the nearest residential properties. The operational hours are summarised as:

	Waste delivery	***Waste handling and ancillary operations***	***Plant***
Monday - Friday	0800 – 1800	0800 - 1900	24 hours / day
Saturday	0800 – 1200	0800 - 1730	24 hours / day
Sunday	-	0900 – 1200	24 hours / day

The Facility would be open from 0800 hours to accept incoming heavy goods vehicles, except on Sundays, closing at 1800 hours during weekdays and 1200 hours on Saturday.

The final one-hour period would be for maintenance and Site clearance. It is proposed that Sunday working would also be predominantly for maintenance. However, gates would be open for receipt of material from activity limited to Sunday operation, such as maintenance.

3.10 Benefits of the Development

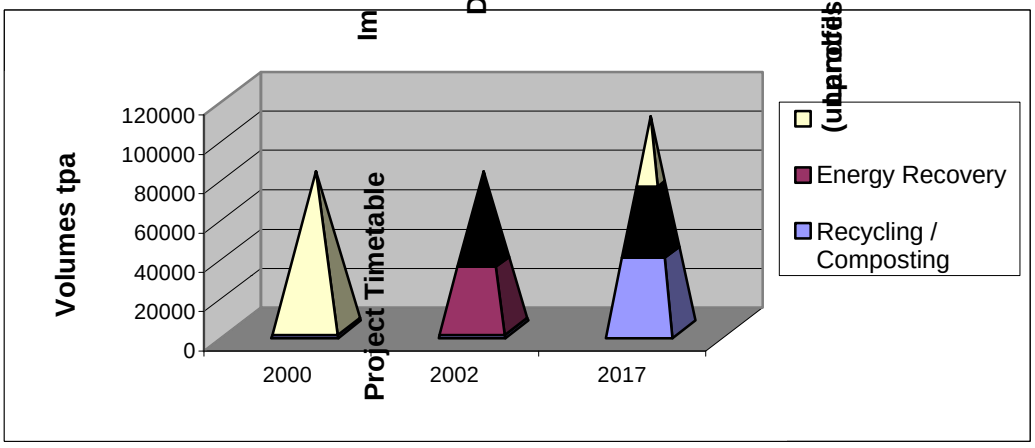
3.10.1 Sustainable waste management

The Development will make a major contribution towards a sustainable integrated network of waste management capacity within the Waste Strategy Area. The Facility will offer an immediate solution for the specified Priority Wastes and the diversion of 30,000 tpa (42%) of the Local Authority's unsorted municipal waste from landfill. In the longer term the 30,000 tpa of MSW capacity will be taken up by the non-recyclable fraction of the municipal waste stream, further increasing the diversion rate from landfill in accordance with best practice and all National, Regional and Local Policy Guidance (Section 4).

Currently, 63,000 tpa of MSW is being deposited at Lochar Moss Landfill site adjacent to the Facility. The Facility will not result in any increase in waste importation into the area, but will make a major contribution towards solving the waste management strategy for both municipal waste and Priority Waste arisings within the region.

Diagrams 3.2 and 3.3 illustrate the improvements in sustainable waste management that will flow from this development.

Diagram 3.2

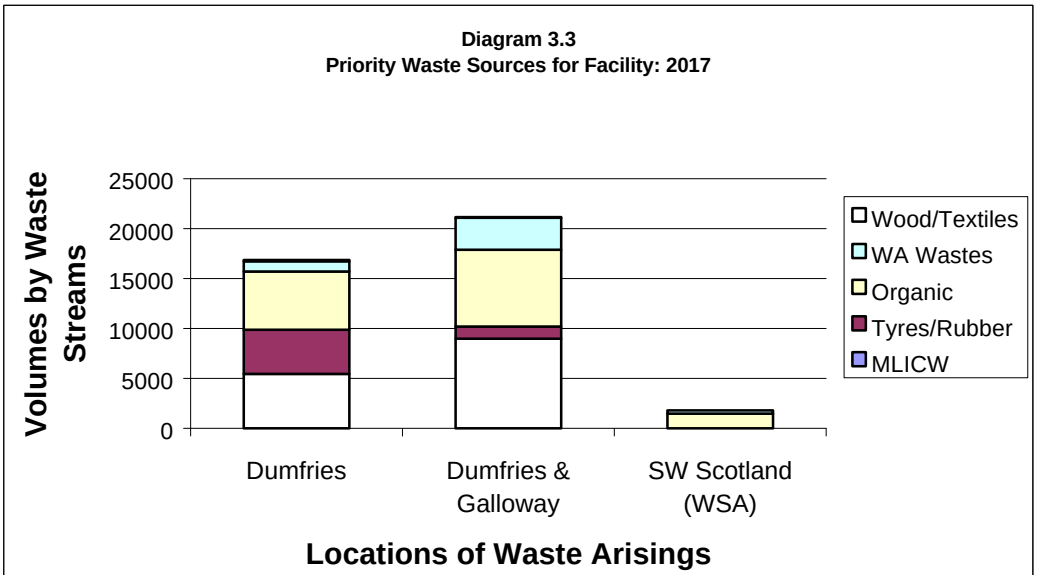


The Facility will have an immediate impact on the management of municipal waste, thermally disposing of 30,000tpa of unsorted municipal waste that would otherwise require additional landfill void space to be secured in the medium term. In the event

that recycling targets are met over the period 2002 to 2017 the Facility will progressively accept Non-Recyclable Waste including residues from the recycling activities of which there will be in excess of 30,000 tpa. The NRMSW will displace the 30,000 tpa of unsorted municipal waste being equivalent to approximately 40% of waste arising, based on assumed tonnage at that time.

The remaining waste throughput capacity of the Facility given over to MLICW / Priority Waste streams will result in a solution for the wastes shown in Diagram 3.3 and comprise up to 30,000 tpa, which will be drawn mainly from within Dumfries and Galloway (95%). The National Waste Strategy: Scotland identifies a number of these wastes as Priority Wastes. It is recognised that alternative waste management solutions for certain Priority Wastes need to be urgently found within Scotland. The unique attribute of Compact Power technology will enable the Facility to accept different wastes at relatively low volumes. Therefore, these wastes can be effectively managed at a regional level in accordance with the twin aims of self-sufficiency and proximity identified in the National Waste Strategy : Scotland.

Diagram 3.3
Priority Waste Sources for Facility: 2017



Note: Dumfries & Galloway excludes Dumfries
SW Scotland excludes Dumfries and Dumfries & Galloway

The National Waste Strategy: Scotland provides an indicative waste hierarchy in order to identify in the waste management process the preferred environmental solutions for the disposal of waste (Diagram 3.4).

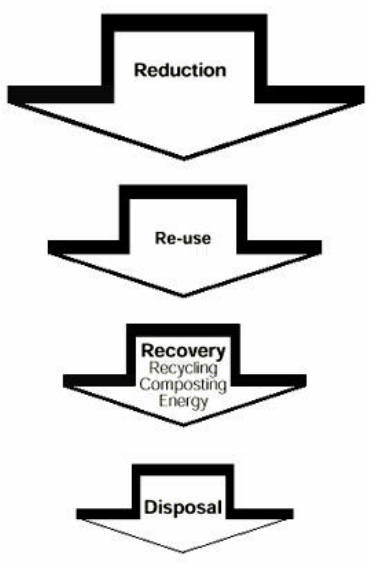


Diagram 3.4: Waste hierarchy

The current waste practices in the Dumfries and Galloway region and throughout the Waste Strategy Area involve considerable transportation of wastes combined with an over reliance on landfilling as a method of disposal. The National Waste Strategy: Scotland is clear that landfilling is not sustainable, and represents the least desirable waste management option. However, it is acknowledged that disposal will continue to provide an important element of waste management practice for the foreseeable future. The waste that has been targeted for the Facility is both waste that cannot be economically or technically reused or recycled and the recovery of energy in this advanced process provides an alternative solution for the treatment of waste at a higher level in the waste hierarchy.

The National Waste Strategy: Scotland advises that: *Waste management practices in Scotland are currently at the lower end of the hierarchy. A significant change is therefore needed to move them up the hierarchy towards a more sustainable position. This will involve considerable technical innovation and there will be opportunities to develop new and imaginative solutions to find alternatives to simple landfilling*[1].

The Facility is a new and imaginative alternative to intensive landfilling and/or large-scale mass burn incineration for the management of Non-Recyclable Wastes.

Further the small-scale nature of the Facility is appropriate for managing Non-Recyclable Wastes for the more dispersed populations outside the central belt of

[1] Page 14 National Waste Strategy: Scotland

Scotland. The National Waste Strategy: Scotland advises that the *principles of proximity and self-sufficiency indicate that innovative local solutions should be sought so far as possible for most waste streams.*[2] It is the ability to accept mixed wastes that allows the Facility to be a viable solution for the relatively low volumes within the Waste Strategy Area.

Mass burn incineration facilities are typically economic at input rates of 200,000 tpa, making them unsuitable for local integrated waste management systems for municipal waste within areas such as Dumfries and Galloway. To achieve such scale a mass burn incineration plant would need to draw waste from far outside the region, contrary to the aims of proximity and self-sufficiency. Moreover, the demands of such a plant would leave little or no scope for recycling, except to the extent that waste would need to be sourced from an increasingly wider area outwith the region as recycling increased.

A local integrated waste management solution such as that which the Development offers would facilitate substantial material recovery and / or composting services that provide not only environmental benefits but also greater employment generation than an incineration intensive solution.

In summary the Facility provides a:

- key component in an integrated waste strategy for municipal solid waste centred on Dumfries, that does not constrain the development of recycling and composting capacity;
- solution for a number of Priority Wastes primarily from within Dumfries and Galloway, and to a lesser extent the Waste Strategy Area consistent with the proximity principle and aim of self-sufficiency for such wastes pursuant to the National Waste Strategy: Scotland.

3.10.2 Employment

The employment contribution of the Development is discussed below.

Direct employment from alternative energy Facility

The Facility on a standalone basis would employ:

[2] Page 36 National Waste Strategy: Scotland

1 General Manager
1 Weighbridge Operator
1 Administration Clerk
4 Plant Supervisors
4 Plant Operators
2 Waste Operatives
1 Maintenance Engineer

} Actual staff numbers required for the Facility (4 shifts per day)

These jobs are skilled and semi-skilled requiring full training in this new technological field. These are net employment gains and do not result in job losses elsewhere in the local economy.

The present network of local waste agents will be supported by the Development, which will offer them a viable off-take for their recycling businesses.

Employment from the Development of a viable integrated waste management scheme

As part of a local integrated waste management solution for municipal waste, consisting of composting, recycling and small scale energy recovery the following jobs would be created:

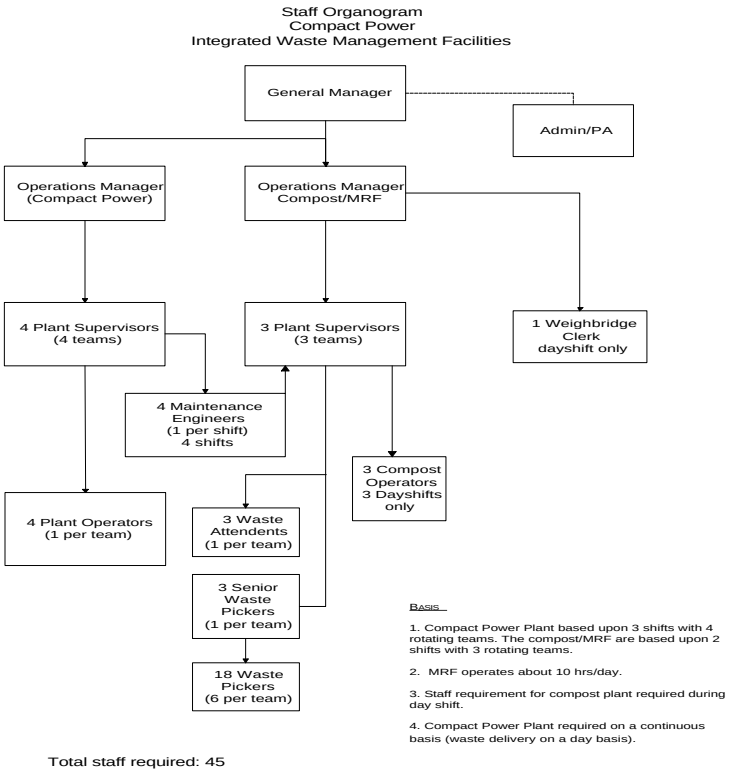


Diagram 3.5: Staff organogram for an integrated waste management system

The Compact Power integrated waste management approach would therefore create the following employment opportunities, by grade:

3 Managerial jobs
2 Administrative jobs
7 Supervisor jobs
11 Skilled operation and maintenance jobs
24 labouring jobs

Of the 45 jobs created 21 are high to medium skill positions in an industry fast changing from haulage and civil engineering based activities to become a technically driven industry. Environmental technology is one of the fastest growing businesses in Europe and the Development will enable local people to develop relevant skills for export throughout Scotland, the rest of the UK and Europe.

Indirect employment

Whist the core technology will be manufactured elsewhere in the UK, much of the installation, ancillary mechanical / electrical engineering and civil engineering will be sourced from within the area. There will also be a need for occasional maintenance work to be found locally.

The joint venture partners are also committed to exploiting the expertise they will develop from the commissioning of the Development at Dargavel by building similar facilities elsewhere in Scotland using a similar approach to the management of waste. The local need for fabrication and maintenance jobs will therefore be replicated at other locations in Scotland.

PART B

4 PLANNING POLICY GUIDANCE

4.1 Introduction

Planning policy guidance relevant to this Development is articulated at four principal administrative levels:

- European Directives on waste set out a number of objectives for the management of the process.
- The Scottish Executive, through Planning Advice Notes (PANs) and National Planning Policy Guidance (NPPGs), provides national planning policy guidance.
- Dumfries and Galloway Council, through the Structure Plan approved in 1999, provides strategic policy relating to the siting of waste management and renewable energy facilities, and policy advice at the local level through the Local Plan. The Structure Plan and Local Plan together form the Development Plan for Dumfries and Galloway.
- Overlaying this advice is the recent National Waste Strategy: Scotland, published by SEPA in 1999. This requires that local waste strategies be produced to define local needs within the national framework. The local Waste Strategy Area combines East Ayrshire, South Ayrshire and North Ayrshire Councils with Dumfries and Galloway Council.

4.2 European Community and UK policy guidance

The underlying policies on waste and energy have been developed over the past decade at both EC and UK level. For example the EC Waste Framework Directive 91/156/EEC emphasises the importance of waste recovery, recycling, re-use or reclamation together with the use of waste as a source of energy. This approach is further supported by EC Landfill Directive EC 99/31, which seeks to promote more sustainable waste disposal options, particularly those having the least damaging environmental effects.

UK government policy has been developed through a series of documents which include: *This Common Inheritance, Sustainable Development – the UK Strategy* (1994); *Renewable Energy in the UK: the Way Forward* and *Making Waste Work: a Strategy for Sustainable Waste Management* (1995); and the more recent consultation paper *Less Waste, More Value.* All these strategy policy documents lend support to the extraction of energy from waste. Direct financial support has been given to such schemes by the Government through the Non Fossil Fuel Obligation (NFFO) in England and Wales and the Scottish Renewables Order ("SRO") in Scotland. The "New Renewables Obligation" and "Fossil Fuel Levy" are the most recent manifestation of the UK

Government's support for renewable energy and the role it can play in tackling global warming and achieving sustainable waste management practices.[3]

4.3 Scottish policy guidance on waste management

4.3.1 Policy Framework

Within a Scottish context the proposal should be considered in the light of two principal guiding documents: National Planning Policy Guidelines (NPPG) 10, *Planning and Waste Management* (1996) and the Scottish Environment Protection Agency (SEPA), *National Waste Strategy: Scotland* (1999). The Development Plan, set within the context of the NPPG, and the National Waste Strategy together implement the EC Framework Directive on Waste (75/422/EEC as amended by Directive 91/156/EEC) and applied in the UK by the Waste Management Licensing Regulations 1994.

4.3.2 NPPG 10

Para 24 requires Planning Authorities namely to:

(i) implement the planning provisions of the 1994 Waste Management Licensing Regulations ("the 1994 Regulations");

(ii) apply the appropriate aims of the Government's sustainable development strategy; and

(iii) implement the Waste Strategy by appropriate land allocation.

(i) The planning provisions of the 1994 Regulations

Sch 4 para 4(1) of the 1994 Regulations requires that the Planning Authority in determining a planning application relating to the recovery or disposal of waste should have regard to the objectives of ensuring waste is recovered or disposed of without using processes which could harm the environment. Particular emphasis should be placed on the following:

- risk to water, air, soil, plants or animals;
- nuisance resulting from noise or odours; and
- adverse affects on the countryside or places of special interest (NPPG 10 para 28).

These issues have all been addressed and the conclusions reported, in this Environmental Statement. The main conclusion is that the risk of harm to the environment, nuisance or adverse impact on the countryside or places of special

[3] New & Renewable Energy prospects for the 21st Century, DTI and DETR, January 2000

interest do not exist or are minimal and can be mitigated to an acceptable standard (see Sections 6 and 8 to 14).

Sch 4 para 4(2) of the 1994 Regulations requires the Planning Authority to have regard in relation to waste disposal to the further objectives of establishing an integrated and adequate network of waste disposal installations, taking account of the best available techniques not entailing excessive cost (BATNEEC). The network should provide for self-sufficiency i.e. disposal in the nearest appropriate installation by means of the most appropriate method and technology. Planning applications should be considered in the light of already adequate facilities within a reasonable distance (NPPG 10 para 29).

The Facility fits well with an integrated strategy for waste management. There are no comparable facilities within Dumfries and Galloway or the Waste Strategy Area. The Facility will provide a safe and environmentally friendly route for the disposal of Non-Recyclable Wastes (in particular difficult wastes). The waste types and volumes to be processed are such that the Facility integrates well with the schemes for the recycling of municipal waste, as it will largely accept wastes, which cannot be recycled for economic or technical reasons. Moreover, the Facility assists the Dumfries and Galloway region to become self sufficient in the disposal of wastes, many of which are currently exported from the region.

When applying the proximity principle to the requirement for self sufficiency, planning authorities should take into account that waste disposal installations which may be reliant on low or periodic waste streams may find it necessary to draw trade from distant producers where economic considerations rule out local provision. More than ½ the priority wastes arising in Scotland are exported to England and Wales and this is not sustainable in the long term (NPPG 10 paras 32, 62). This is also the view of SEPA in the National Waste Strategy: Scotland. The boundaries of the Waste Strategy Areas have been drawn to reflect the ability of areas to develop new waste management capacity.

The non-recyclable municipal waste stream for the Facility will be mainly derived from local waste arisings. However, for certain Priority Wastes the catchment area extends to the Waste Strategy Area in order to provide a solution for a part of Scotland which would otherwise need to export such wastes long distances contrary to good environmental practice. This Environmental Statement highlights the net environmental benefits that accrue from the proposal compared with alternative methods of disposal, not just to the Region, but to the wider community.

Section 3.9.1 provides an account of the contribution the Facility will make to sustainable waste management for Dumfries and the Waste Strategy Area.

Sch 4 para 4(3) of the 1994 Regulations requires policies that encourage clean technologies. The 1994 Regulations place a duty on competent authorities to implement, through their planning powers, the environmental objectives contained therein. Environmental benefits can include the provision of the service, the generation of trade or employment and the recovery of energy and materials (NPPG 10 paras 18, 29, 30, 102).

Similarly, the NPPG requires developers to pay regard to waste reduction and waste recycling (paras 53, 56).

The proposal will provide a state of the art advanced thermal technology for the recovery of energy with minimal adverse environmental impact. The environmental benefits and contribution to sustainable waste management that will occur as a result of this Development are material considerations that should be taken into account with respect to identified negative environmental impacts.

The Facility meets the highest environmental standards on emissions. Whilst para 36 of the NPPG 10 makes clear that pollution control is not directly a planning matter but "for SEPA to regulate", this Environmental Impact Assessment has included an extensive review of all the potential environmental risks from pollution and concludes that the process to be employed conforms to the requirement of the National Air Quality Strategy. Both the process itself and the abatement techniques adopted will control pollutants to the extent that they are rendered harmless and do not present an unacceptable risk to human health or the environment.

When considering the role of energy from waste in its National Waste Strategy, SEPA advises that "*The future of energy from waste probably lies in emerging cleaner technologies such as pyrolysis*". The caution on the part of SEPA is due to the fact that few commercial plants have been commissioned to date. The Compact Power technology has been demonstrated variously over a 5-year period and a fully operational commercial plant has recently been constructed and commissioned at Bristol Avonmouth, England. The Technology has been monitored variously by CRE and GMSS, and reviewed in an independent due diligence report by Halcrow Gilbert and Partners.

(ii) The achievement of sustainable development

Waste to energy can play an important role in the development of sustainable waste management strategies[4].

Not all materials can be recycled economically or indeed in a sustainable manner. There are some materials for which the environmental impact of recovery or separation is more than the combined impact of the generation of new materials and the disposal of the old.

Although recycling and recovery technology is continually improving there will always be residual materials, which need to be dealt with. These residues may be landfilled or may be used to generate energy, displacing reliance on fossil fuels and recovering the energy embodied within the material. Energy from waste is higher up the waste hierarchy than landfill but lower than recycling / recovery of material.

The waste quantities and types for the planned throughput of the Facility are described in detail in the assessment of Best Practicable Environmental Option (BPEO) (see Appendix 4.1). A great deal of emphasis has been placed on ensuring the proposed waste streams are totally consistent with greatly increased recycling and recovery activities.

In the context of NPPG 10 developments are to be assessed against the sustainable benchmarks of:

- *the proximity principle;*
- *regional self-sufficiency;*
- *the precautionary principle;*
- *the polluter pays principle;*
- *the Best Practicable Environmental Option (BPEO).*

The compatibility of the proposal with the proximity principle and regional self-sufficiency is discussed in relation to Sch 4 para 4(2) of the Waste Management Licensing Regulations 1994 and in 3.10.1 above.

The precautionary principle requires caution to be exercised when the environmental implications of a waste management proposal are unclear but potentially damaging. The operation of the technology to date and the environmental modelling of the

[4] Royal Commission on Environmental Pollution, *Twelfth Report, Best Practicable Environmental Option.* 1985.

environmental impacts demonstrate that the Facility presents no unacceptable risk to human health or the environment. Part C of this Environmental Statement discusses the predicted environmental impact of the Facility.

The polluter pays principle suggests that businesses should bear the full cost of waste disposal. However, it is important that businesses remain competitive. This Development will provide a cost effective environmental route for the disposal of the waste arisings principally for local businesses.

Para 36 of NPPG 10 explains that *"BPEO is not generally applicable to development control since the primary concern for planning is the use of land."* However, the Applicant recognises the public interest in BPEO in both its narrowest and widest sense. There is the statutory requirement that authorisations for IPC should include conditions that have regard to the objective of "*ensuring that the best available techniques not entailing excessive cost will be used for minimising the pollution which may be caused to the environment taken as a whole by the release having regard to the best practicable environmental option available as respects the substances which may be released."* Section 9 assesses whether the technology satisfies the statutory requirement for air pollution control. However, taken in its wider sense BPEO is seen as a process for determining the best option for disposal of individual waste streams. In this sense a number of points should be noted. The BPEO process suggested by SEPA (the "WISARD" assessment tool):

(a) is primarily aimed at an assessment of BPEO for the Area Waste Plan, emphasising the advice in NPPG 10 that *"BPEO may be applicable to planning policy formation only in the widest sense since SEPA's Waste Strategy will form the basis of regulatory controls (e.g. IPPC) which generally plays a more significant function in the operation of BPEO"*;

(b) is restricted to consideration of the components of municipal waste, which forms only 50% of the waste streams proposed for the Facility;

(c) does not accommodate consideration of the more environmentally friendly technologies of pyrolysis and gasification (although the Waste Strategy, on page 19 indicates that for priority waste streams pyrolysis and gasification are options that should be assessed on their own merits as distinct from incineration).

As a guide to BPEO in its widest sense an analysis of the proposal against SEPA's draft National Decision Criteria has been undertaken (see Appendix 4.1). The results of this assessment provide additional comfort that the proposal is consistent with an integrated and sustainable approach to waste management for the municipal waste,

and Priority Wastes specified for the Facility. Appendix 4.1 also provides a BPEO analysis for each specified waste streams and is discussed in 3.1.4 above.

(iii) Implementing the Waste Strategy by appropriate land allocation

NPPG 10, paras 40 and 41, deal with the obligation of local authorities to implement the National Waste Strategy by land allocation. There is no guidance on how this is to be effected, but emphasises that land allocations must be consistent with the policies of the National Waste Strategy. The National Waste Strategy itself puts land allocation in the planning context. The Waste Strategy provides:

"Planning Authorities will have to take account of this Strategy's objectives and policies in their structure and local plans which provide the context for consideration of the waste management industry's individual proposals."

"The plan led approach establishes the context for waste developments but individual applications must still be treated on their merits, having regard to local impact on communities and the environment in line with this Strategy." (Page 30, The Waste Strategy).

In the absence of a Waste Plan for Dumfries and Galloway, the Site selection criteria set by the Council in its Structure Plan and Local Plan and the main objectives of the National Waste Strategy provide guidance for the allocation of land. These principles have been used in assessing Site location (see Section 5).

4.3.3 Other relevant policies of the National Waste Strategy: Scotland

The introductions to the Waste Strategy by Scotland's Minister for Transport and the Environment, and the Chairman of SEPA both emphasise that waste disposal is a matter for the whole community and that we must put waste to work through re-use and recovery, which includes recycling, composting and energy recovery. These objectives are central to the underlying principles of all National Waste Strategy policies: "Sustainable Waste Management" (Page 6, National Waste Strategy).

The main objectives of the National Waste Strategy are those set out in Schedule 12 of the Environment Act 1995. These largely repeat the objectives of planning authorities under the 1994 Regulations. (Para (i) above).

Two key concerns underpin the National Waste Strategy: that continued dependence on landfill and the export of Scottish derived waste are not sustainable. These concerns are engaged by the National Waste Strategy through the adoption of a number of key principles for sustainable waste management practices developing

throughout the UK and Europe as in Scotland. Both Development Plans and Waste Plans must be compatible with these principles, and planning decisions must be consistent with the objectives of these principles.

With regard to Scotland's dependency on landfill SEPA conclude:
"The strong dependence on landfill for waste in Scotland is not sustainable since it involves the depletion of both renewable and finite natural resources." (Page 10, National Waste Strategy)

"Although the trend towards fewer better engineered landfills over the last decade was useful in achieving higher standards, it has led to waste being transported for longer distances than may be desirable." (Page 12, National Waste Strategy)

The "waste hierarchy" principle is, for strategic and development control decision-makers, a rough conceptual indicator of the best and least environmentally friendly waste management options. It provides a guide for the ranking of waste management options placing emphasis on waste minimisation, waste recycling and re-use (including composting), and energy recovery above waste disposal to landfill. However, it is recognised that for different waste streams, diverse options are likely to prove more environmentally effective and economically affordable. A more sophisticated and refined approach to the relative environmental performance of different waste management options is evolving through the use of BPEO and life cycle analysis. Though these tools are in their infancy and not entirely suitable for development control issues BPEO has been used to demonstrate the relative environmental performance of the Facility in addition to the environmental merits of the proposal in local land use terms (see Appendix 4.1).

The second concern is being addressed by the use of the "proximity principle" which advises that waste should generally be disposed of as near to the place of origin as possible. This aim recognises that it is not sustainable to export waste management problems and that the transportation of waste can result in significant environmental impacts. The National Waste Strategy suggests that the proximity principle has two functions:

- it is a tool for planning authorities and businesses when considering the requirements for, and location of, waste management facilities and regional self sufficiency; and
- it helps raise awareness in local communities that the waste they produce is a problem which has to be solved, thus providing a mechanism to reduce waste at source.

However, it is recognised that, because of the low level of arisings of some types of hazardous or difficult wastes, there are likely to be few facilities for their disposal and treatment. The economic size of appropriate facilities should be considered alongside the proximity principle when considering where hazardous wastes should be managed.

SEPA's stated policy on special waste is that it will:
"Encourage producers of special waste to:

- minimise waste production;
- undertake pre-treatment prior to disposal;
- make arrangements to ensure Scotland becomes more self-sufficient in its treatment and disposal than is currently the case".

To implement the National Waste Strategy, investment in new infrastructure must be stimulated and encouraged. Cost effective local solutions are needed now to bring about future savings. The statutory functions of SEPA and the planning functions of local authorities are required to facilitate this process.

The Development involves a small-scale local solution that will result in waste being moved higher up the waste hierarchy in comparison to conventional controlled disposal to landfill. It is precisely the kind of technology, which is being endorsed by the National Waste Strategy. It provides an environmentally sound alternative to landfill for Non-Recyclable Wastes, particularly for a number of Priority Wastes currently being disposed of great distances from source contrary to the aims of the National Waste Strategy.

4.4 Scottish policy guidance on renewable energy

Government policy is explicitly expressed in NPPG 6 Renewable Energy (1994) and Planning Advice Note (PAN) 45 Renewable Energy Technologies (1994). Both these documents limit their consideration of planning issues to those renewable technologies that are likely to attract support under the Scottish Renewables Obligation (SRO) with connection to the electricity distribution system (NPPG 6 paras 4, 7; PAN para 1). A revision of draft NPPG6 was issued by the Scottish Executive for consultation in June 2000.

Renewable energy developments are inherently stable (NPPG 6 para 9) and the Government is committed to stimulating the development of new renewable energy sources where they have the prospect of being economically attractive and environmentally acceptable (NPPG 6 para 13). The benefits of such developments

should be borne in mind particularly where the impact on the local environment is unlikely to be significant. Investment in renewable energy developments can make an important contribution to the local and national economy (NPPG 6 para 24).

With respect to this Development, the Applicant was awarded in 1999, a contract to produce 7.2 MW_e for sale to the grid under SRO 3. The environmental issues have been quantified and are fully addressed in Part C. The Facility will create 14 permanent new skilled and semi-skilled jobs in Dumfries & Galloway with the prospect of further developments throughout Scotland.

Paras 79 and 80 of the NPPG 6 and paras D19 and D30 of the PAN 45 give specific criteria against which applications should be determined.

Para 79 of NPPG 6 refers to the framework provided in Local Plans and this is dealt with in Section 4.6. Para 80 refers to the conflicting environmental claims on land and each of these is considered in Sections 3 (grid connection), 6 (visual impact), 7 (traffic), 8 (noise), 9 (air quality), 11 (water resources), 13 and 14 (statutorily designated sites and areas). Para D19 of PAN 45 refers to particular location constraints that are addressed in Section 5, and Para D30 asks for information on the Facility, which is provided in Section 3.

4.5 Structure Plan policies

The Dumfries & Galloway Structure Plan 1999 (the "Structure Plan") makes a number of Strategy Statements.

The Structure Plan contains various headline strategy statements, each of which is linked to relevant detailed Structure Plan policies.

Strategy Statement 1:
Encouraging economic development, which diversifies and strengthens the local economy in a sustainable manner.

Para 2.7 - *Development of a strong broadly based local economy will be encouraged to address the problem of areas with persistent high levels of unemployment, reliance upon a limited number of employment sectors, and the closure or restructuring of existing businesses. This will be achieved by: - supporting the potential of Gretna, Lockerbie and Dumfries in terms of population and employment to grow and expand; supporting business development, which broadens the economic base and increases*

the supply of jobs particularly in areas of high unemployment and in rural areas; encouraging new and high technology industries".

Dumfries is identified in the policy as an area of focus for new development. It is the main centre of commerce and industrial activity for the region. The policy also emphasises the particular need to broaden the economic base and level of employment in rural areas. The Facility will generate 14 permanent new skilled and semi-skilled jobs for local people on the edge of Dumfries in an emerging and sustainable technology industry that is new to Scotland. This will broaden the employment base of the region.

Strategy Statement 3:
Improving the quality of life for everyone in Dumfries and Galloway by maintaining and improving access to essential services and facilities and caring for the natural and built environment.

Para 2.9 - Concern for the quality of life for everyone living working or visiting Dumfries and Galloway is one of the themes which runs through the Plan and influences all aspects of the strategy. The strategy seeks to maintain and improve the quality of life in the area by: - supporting the long term viability of communities by promoting towns and villages as development locations and encouraging smaller scale development in the countryside; protecting and enhancing the most valued elements of the environment such as coastal areas, high amenity landscape areas, important wildlife areas and the built environment; recognising the quality of areas not protected by statutory designation; maintaining and enhancing the area's biodiversity; encouraging the wise use of the area's natural resources.

Waste management is an essential service for everyone in Dumfries and Galloway. The Facility is compatible with the development of an integrated waste management strategy for the area. The planned waste strategy for Dumfries and Galloway is anticipated to indicate that facilities which process waste should be as close as possible to the point of production, encourage communities to take responsibility for locally produced waste and limit the transportation of waste by road to reduce CO_2 and other emissions. SEPA's National Waste Strategy emphasises the European and UK policies that promote an integrated approach to waste management and make regions self-sufficient. The Facility will be sited so as to have minimal impact on the landscape and on the built environment, and use technology, which protects the area's most valued elements of the environment. In the context of the development of an integrated network of waste management facilities, the Facility will provide an

important component to enable the total solution for MSW arisings within the region. In addition, for Priority Waste the Facility will provide part of the solution within the Waste Strategy Area. Ultimately, through the development of such facilities alongside recycling and landfill the Development will result in an integrated approach to waste management with the aim of increasing sustainability and reducing impacts upon the environment.

Strategy Statement 4:
To make the most effective and efficient use of existing infrastructure provision and maximise the benefit of public and private investment.

Para 2.10 - It is important wherever possible to maximise the use of existing infrastructure provision. Implementation of development or redevelopment schemes requires the provision of adequate infrastructure and services, which will be derived from a combination of private and public sector investment. Continuing restrictions on public spending… can curtail or restrict efforts to support and develop the economy and local communities. The strategy aims to meet these requirements by: - developing a partnership with the private sector, public agencies, and communities to ensure that these resources are used wisely and effectively; linking new development to transport corridors identified in the Plan; development of a waste management and disposal strategy which seeks to maximise the use of existing sites and adopts measures to minimise waste and increase re-cycling.

The Facility will make effective use of the improvements to the A709 and A75 roads and make no additional demands on existing infrastructure provision. The proposal is consistent with the Council's long-term waste management strategy (Proposal SP4 – Long Term Waste Strategy) providing energy recovery from waste as part of an integrated solution for part of the municipal waste stream and other Priority Wastes. Energy generation from a recognised renewable form of fuel will capitalise on the local asset which waste provides (Policy S21 – Renewable Energy). The Development is also consistent with sustainable waste management principles as described in Section 4.3 above and offers the potential for an integrated approach to municipal waste which would assist initiatives for recycling by providing an economic and secure route for non-recyclable materials and recycling rejects.

Within the Structure Plan these strategic statements are given effect in a number of specific policies.

Policy D7 supports employment creation: - *The Council is working with Dumfries & Galloway Enterprise to develop a Joint Economic Strategy to promote and support economic development in Dumfries and Galloway. Development proposals, which assist in the growth and development of the local economy, will generally be supported particularly where they would: - 1. Develop existing key sectors including agriculture, forestry, plastics, chemicals, food processing, transport and distribution and tourism or 2. Introduce new businesses and inward investment including electronics, or the use of high technology and telecommunications.* Justification 3.22 recognises that the local economy *is reliant on a limited number of employment sectors.* Justification 3.2.4 states that economic growth will be achieved by *monitoring the impact of new technology and changing business needs and responding quickly to changing requirements* and *attracting inward investment, particularly encouraging new/high technology businesses which have good long term growth prospects*.

- Criteria 1 is indirectly satisfied by this proposal. Waste disposal is an increasing cost area for many local businesses. The development of the Facility will provide a long term cost effective route for disposal of waste helping keep down operating costs for local businesses, particularly food processing, plastics, and rubber products. This will assist in enhancing the competitiveness of local businesses and Dumfries as a location for business.

- Criteria 2 is satisfied by the proposal. As explained above in Section 3, the Development is a high technology business, which will bring quality employment from inward investment. Moreover as indicated in relation to the previous criteria it will, to a degree, make Dumfries more attractive as a location for business. Such location considerations can be expected to be of increasing importance in the future as industry faces the rising costs of conventional disposal techniques, as a result of landfill tax and other economic instruments.

Policy D10 refers to small and medium sized business development: - *Small and medium sized businesses will be encouraged to utilise existing premises or serviced industrial and business sites in towns and villages. Development proposals outside these sites, including the adaptation of existing buildings, will be considered favourably subject to the Council being satisfied in relation to: - 1. The reasons for selecting the site in preference to allocated or serviced sites; 2. Impact on the landscape and the environment can be minimised; 3. traffic impact; 4. Servicing of the development; and 5. The amenity of the surrounding area is not adversely*

affected. Justification 3.30 states "*The development of local businesses is being encouraged to support local communities, diversify the economy and create new jobs. It is not possible in every town or village to identify or provide a serviced site for industrial or business use".*

The Site is not identified in the Structure Plan for business and industrial use. The reasons for selecting the Site are described in Section 5. The Site is well serviced with road infrastructure, public transport and water supply, and connection to the grid will be by underground cable from the sub-station at Kellwood Road, Dumfries. The impact on the landscape will be minimal (Section 6) and emissions from the Facility will meet the highest environmental standards (Section 9). Traffic impact will be low (Section 7). The surrounding area is characterised by two landfill sites (one of which is the principal site for Dumfries and Galloway); a mineral extraction site and an industrialised area occupied by a number of road haulage related and other industries. There is also a limited amount of agricultural land, woodland and housing. Within this context, it is considered that the amenity of the area will not be adversely affected.

Policy D27 requires prime agricultural land to be safeguarded.

The Site is pasture on restored former mineral workings and is classified in Section 12 of this Statement as Class 5.1.

Policy D36 expects all development proposals to take into account certain design criteria.

The layout plans and design statement that accompany the application indicate the measures taken to satisfy these criteria.

Policy E2 requires development proposals, which would have a significant impact on Regional Scenic Areas (RSA) to respect their special designation.

Policy E3 requires development proposals to take into account the landscape character in which they are set.

The Site lies approximately 1.6km to the south west of Torthorwald Ridge RSA and can be viewed from it. The Environmental Impact Assessment indicates changes in the landscape are "negligible" or "minor", and that there is no significant impact on Torthorwald Ridge RSA. So far as all material impacts on the landscape are

concerned, this Environmental Statement (Section 6) describes how the criteria to be used in judging the application in these circumstances have been met, and the mitigation measures contained within the design and screening proposals.

Policy E6 requires developers to ensure that habitat valued for its nature conservation is fully considered.

The Site is agricultural grassland of little conservation value. Because agriculture is such a dominant industry within Dumfries and Galloway, farmland is classified as one of a number of local priority habitats within the Dumfries & Galloway Local Biodiversity Action Plan 1999. This means that it has been identified as most in need of conservation action. In Proposals for Action (page 70) it is recommended that improved grassland be used for potentially damaging activities in preference to other more sensitive habitats. The external landscape proposals for the Site, described in Section 12, provide measures which aim to increase the biodiversity. The Site does not lie within a nationally designated Environmentally Sensitive Area (ESA) designed to help conserve specific areas of the countryside where landscape, wildlife or historic interest is of particular importance. Nor is the Site managed under the Countryside Premium Scheme, which, like ESA's, encourages land managers to adopt environmentally friendly farming practices and to manage specific habitats and features in the interests of conservation. The wider impacts of the proposal on nature conservation are considered in Section 13.

Policies E12 and E13 are designed to protect archaeological sites and archaeologically sensitive areas:

The Site has no identified archaeological interest nor does the proposal affect any archaeologically sensitive areas.

Proposal SP4 refers to the *Preparation of long-term Waste Management Strategy for Dumfries and Galloway Council. The Council is working on the preparation of a long-term waste management strategy for the period from 2002. This strategy will cover: - 1. The collection, treatment and disposal of household and commercial and construction related wastes; 2. The implementation of strategies for waste minimisation and waste recycling; 3. The evaluation of alternative options for waste treatment and waste disposal identifying the most appropriate option; and 4. Set out a timetable for the implementation of the preferred strategy identifying the investment required and funding source.* Justification 5.40 includes energy recovery in the hierarchy of options in the framework for waste management as set out in Sustainable

Development: The UK Strategy 1994. Justification 5.42 states that the development of the long-term strategy could involve energy from waste by pyrolysis as one of a number of technical solutions. The strategy will be developed in parallel with National Waste Strategy : Scotland which has been considered in Section 4.3.

Proposal SP4 concerns non-difficult waste streams. All current strategic guidance emphasises the requirement for an integrated approach towards such waste streams, within which energy from waste has a role to play. However, National Waste Strategy: Scotland 1999 (p17) recognises that *incineration* has a poor public image as bad neighbour developments. Waste Strategy 2000, produced by the Environment Agency, expresses concern at the ability of the strategic planning system to identify enough sites in England and Wales for an energy intensive approach to integrated waste management.

In response to the concerns of the public with regard to incinerators the National Waste Strategy: Scotland 1999 states:

"*The future of energy from waste probably lies in emerging cleaner technologies such as pyrolysis, gasification or anaerobic digestion."* and on p18,

"*The most common method of energy recovery is by burning municipal waste to produce electricity. These facilities are usually designed to take between 200,000 and 400,000 tonnes per annum (tpa). However, smaller systems, which can operate using 70,000 to 80,000 tpa, are available. While central Scotland could support a larger facility, smaller facilities may be more suitable since it might be easier to find sites for them and they would offer a more flexible option within a balanced range of solutions."*

The Applicant's proposal, using small-scale advanced pyrolysis and gasifcation technology is firmly set within this context. It will provide an environmentally acceptable contribution to an integrated approach for municipal and commercial waste consistent with Proposal SP4.

Policy S19 refers to the *Private Sector and Special Waste long-term Management Strategy: - The Council will work with SEPA, private sector operators and other organisations to monitor changes in waste management and identify when required any additional provision for private or special waste management facilities.* Justification 5.46 states *Further consideration will be given to private waste disposal*

sites, sewage sludge and special waste as part of the preparation of the Waste Management Subject Local Plan.

The Facility will take a range of wastes from within Dumfries and Galloway as described in Section 3 fulfilling an important role in the evolution of an integrated waste management strategy necessary to dispose of special waste consistent with the principles of sustainability and self-sufficiency. The Site is well located, meeting all relevant location criteria (see Section 5) and is likely to meet any location criteria which may be set in the forthcoming Subject Local Plan for waste management.

Policy S20 refers to Waste Management Facilities: - *The Council in advance of the more detailed policy guidance in the Waste Management Subject Local Plan will evaluate development proposals in terms of the following criteria: - 1. The reduction where possible of waste movements, taking into account environmental and other conditions; 2. The need for the site; 3. Links to waste recovery and recycling; 4. No significant adverse impact on natural and built heritage designations; 6. No significant adverse impact in terms of air, noise or water pollution; and 7. No adverse impact on the amenity of the surrounding area particularly in terms of communities in the locality.* Justification 5.47 states *Implementation of the Council's Waste Management Strategy and development proposals by the private sector may require new waste management facilities or the upgrading of existing facilities.* Justification 5.50 states *The proximity principle indicates that facilities to handle or process waste should be sited as close as possible to the point of production to encourage communities to take responsibility for locally produced waste and limit the transportation of waste by road to reduce CO_2 and other emissions.*

- Criteria 1: reducing vehicle movement:
  There is a considerable net export of waste from the region (see Appendix 4.1 for analysis of waste disposal). The Site is close to Dumfries, the commercial and residential centre of the Dumfries and Galloway region. Details of waste movements into and out of the Facility are considered in Section 3 and have been assessed with respect to the National Decision Criteria in Appendix 4.1. The Facility would reduce the current reliance upon waste management facilities outside the region, which would result in a commensurate reduction in vehicle movements and CO_2 emissions, although this has not been quantitatively analysed.

- Criteria 2: the need for the Site
  This issue has been considered in Section 3.10. The Facility will meet the demand for a waste management solution for the non-recyclable and residual

fractions of municipal, commercial waste and those Priority Wastes identified in Section 3.

- Criteria 3: links to waste recovery and recycling
  The Facility will contribute to an integrated approach to waste management as described in Section 4.3 and Appendix 4.1.

- Criteria 4, 5, 6 and 7: environmental and amenity impact
  Aspects of the environmental and amenity impact of the Development are considered in detail in Part B of this Environmental Statement. The Environmental Impact Assessment provides a range of mitigation measures to ensure that unacceptable impacts on the environment and local amenity, resulting from the Development, can be minimised.

Proposal SP5 refers to the Waste Management Subject Local Plan: - *The Council in parallel with the preparation of its long-term waste management strategy will prepare a Waste Management Subject Local Plan starting in 1999.* Justification 5.52 states *The Council considers that waste management should be treated as a separate issue in terms of the preparation of Local Plans for Dumfries and Galloway. The Waste Management Local Plan will: - identify waste treatment and waste disposal facilities; identify, where required, and protect from development, sites for new facilities.*

Information in Sections 3 and 4.3 and Appendix 4.1 are material to this policy. They illustrate the compatibility of the proposal with emerging waste management planning policies, and in particular the National Guidance upon which local policies are to be formulated.

Policy S21 refers to Renewable Energy: - *Development proposals for renewable energy sources will be considered positively provided they do not have significant adverse impact on: - 1. The built and natural heritage; 2. Areas and routes important for tourism or recreational use in the countryside; 3. Water and fishing interests; 4. Air quality; and 5. The amenity of the surrounding area.* Justification 5.54 refers to Government policy, which is to provide 10% of electricity needs from renewables by 2010. Justification 5.57 states that for waste combustion proposals, the matters to be considered are visual impact, noise, and traffic generation and pollution control. Justification 5.58 states that, in order to make a full evaluation of the impact of a development, an assessment of the impact of ancillary development is required as part of the overall proposal.

All of these matters are addressed in detail in Part B of the Environmental Statement.

Proposal SP6 refers to the priority to be given to the preparation of a Subject Local Plan on Energy Development starting in 1999.

It is anticipated that this Development will assist the growth of renewable energy technologies and would therefore, be compatible with the aims and policies of the Subject Local Plan on Energy Development.

4.6 Local Plan policies

The Site lies within the area covered by the Dumfries & District Local Plan 1993 (the Local Plan). The Consultative Draft Nithsdale Local Plan 1999 (the Draft Local Plan) is also used to indicate where there may be variations from Local Plan policies. The Local Plan deals with matters necessary to guide development and changes in land use over a period of ten years. Policy DEV1 states *There will be a presumption against development which would give rise to a material degree of land use conflict and which would materially detract from the character or amenity of the locality.* The Draft Local Plan General Policy 2 expands on this: *developers will be required to satisfy the Planning Authority with regards to their proposals in terms of all of the following: - a) roads access, vehicle and pedestrian needs, ground conditions, foul and surface water drainage and water supply; b) traffic generation onto the adjacent road network; c) flooding; and d) environmental impact.*

There is no significant conflict in terms of land use that would materially detract from the character or amenity of the locality (see Section 6).

All other matters referred to in DLPGP 2 are addressed in Part C of this Environmental Statement. The assessment provides a range of mitigation measures to ensure that unacceptable impacts on the environment, and local amenity, resulting from the Development are minimised.

Draft Local Plan General Policy 7 lists a number of siting and design requirements to be taken into account when considering development proposals.

The layout plans and design statement, which accompanies the application, address all these requirements.

Draft Local Plan General Policy 8 seeks to ensure that sites are not overdeveloped.

The amenity of those living in the area and the impact that the Development will have on the existing character of the area and public views of the Site are all taken into account. The Site will not be overdeveloped as a result of the proposal.

Draft Local Plan General Policy 12 seeks to ensure that public health, safety and amenity are not endangered by potentially polluting uses of land.

These issues are fully addressed within this Environmental Statement. The Environmental Impact Assessment demonstrates that appropriate mitigation measures can be implemented to minimise potential impacts on public health, safety and amenity.

Local Plan Policies 11, 12 and 13 and Proposal IP1 have been overtaken by events since 1993 so that Draft Local Plan General Policy 23 may be more applicable. This refers to *"Business and Industrial Development on Unallocated Sites"*.

DLPGP 23: *Business and industrial development will be encouraged to locate on sites allocated for such development in the Local Plan. Where a proposal is not located on such a site the development will be considered in terms of the Finalised Structure Plan Policies D9 and D10. The Planning Authority will require the developer to demonstrate that the use/reuse of vacant or derelict land and buildings has been first considered.* Justification: *Sites suitable for industrial or business development not identified by the Local Plan may occasionally become the subjects of planning applications. The developer will be required to demonstrate the need for the proposal at that location. Developers will be expected to look at the feasibility of developing brownfield sites or vacant/derelict buildings in preference to greenfield sites.*

Policy D9 refers to large-scale industrial developments and is not material to this proposal.

The Development is appropriately located to be an important element in an integrated network of new waste management capacity to meet the challenges of the Landfill Directive (99/31/EC) in respect of MSW and Priority Wastes. The contribution of the Facility to obtaining compliance with the Landfill Directive is fully explained in Sections 3 and 4. The extent of the search of the Dumfries area for a suitable site for the Facility is described in Section 5 and a full and reasoned justification for selecting the Site is given. Consideration of Structure Plan Policy D10 is given above. The Development meets the interim location requirements of the Structure Plan and

accords with the views on the National Waste Strategy, for the development of an integrated waste management network for waste.

Local Plan Policy U1 refers to the Dumfries Aquifer: *There will be a presumption against development which could affect the quality and/or quantity of water available for public supply from the Dumfries Aquifer.* Justification 7.6 states *Ground water from the Dumfries basin aquifer is used as a public water supply requiring minimum treatment. This resource has to be protected.*

The Site lies on the eastern edge of the Dumfries Aquifer but no impacts associated with the Development on the quantity or quality of the public water supply have been identified (see Section 11).

Structure Plan Policies S19 and S20 and Proposals SP4 and SP5 supersede Local Plan Proposal UP2 on waste management.

Consideration of Structure Plan Policies and Proposals in relation the Development is given above.

Local Plan Policy R6 refers to Rights of Way: *The Regional Council has a duty to keep open and free from obstruction any public right of way within the Plan area…"* Justification 9.7 states: *Public footpaths constitute one of the main tourist resources in the region and enable visitors and residents alike to fully appreciate the scenic beauty of the area.* Draft Local Plan General Policy 37 expands: "*Where a Right of Way is adversely affected by a development proposal the Planning Authority will seek to secure an alternative route or satisfactory mitigating measures.*

The Site is adjacent to a Public Right of Way and access to the Site will be constructed across the footpath. The Applicant will ensure that the right of way is kept open and free from obstruction at all times. Measures to mitigate this impact of the development are detailed in Section 14.

Local Plan Policy A1 seeks to protect prime quality agricultural land from development.

The Site is not prime quality agricultural land. Agricultural issues are further discussed in Section 12.

Draft Local Plan General Policy 57 requires developers to use *Surface Water Best Management Practices.*

Surface Water Best Practice Management Practices have been adopted (see Section 11).

Draft Local Plan General Policy 60 requires satisfactory drainage arrangements to be put in place.

Satisfactory drainage arrangements for the Development have been included in the design of the Facility. This issue is also addressed in Sections 3 and 11.

Appendix 1 of the Draft Local Plan gives design guidance to developers.

The guidance given in relation to the detailing of new buildings has been followed (see the layout plans and design statement which accompany the planning application).

4.7 Other non-statutory guidance and suggested best practice

In Planning for Renewables (1997) published by Friends of the Earth Scotland (FoES), developers are given guidelines on good practice both in the way development proposals are framed and the procedures to be adopted for public consultation.

All of the environmental impacts, which FoES wishes to see mitigated, have been addressed in this Environmental Statement.

FoES support energy production from renewable sources. Developers are asked to detail the environmental and economic benefits of the development. Particular emphasis should be given to the reduction in CO_2, electricity and heat outputs, local economic multipliers, employment in construction, operation and maintenance and the opportunities for education and demonstration.

The economic and environmental benefits of the proposal are described in this Environmental Statement. The proposal is considered compatible with the guidance note, a copy of which can be obtained from Friends of the Earth Scotland.

FoES wish to see genuine consultations with the local community before planning applications are lodged with the local authority. Site visits to similar schemes should

be arranged, and contact with the local community should continue during the construction and operation of the development.

The Applicant gave a presentation of its proposals on 12th January 2000 in Torthorwald Village Hall to which all members of Torthorwald Community Council were invited as well as owners of residential property and occupiers of commercial property in the immediate vicinity. Also invited were the local elected Councillor and local members of FoES.

A public meeting in Dumfries & Galloway College on 22nd March 2000 was organised. The meeting was advertised in the local press and on local radio and attracted about 40 people. Exhibitions of the Applicant's proposals were available for inspection and a slide presentation was given followed by a question and answer session.

A commercial facility in Avonmouth, Bristol using identical technology will start taking waste in November 2000. On the 12th October 2000 representatives of Loreburn Community Council visited the Avonmouth Facility. A further visit to this facility is to be arranged for Saturday 27th January 2001 for other interested members of the public.

The Applicant company is registered in Scotland, will have a local Director on the Board and will set up a Community Liaison Group prior to the construction of the Facility so that a relationship with the community can be established which will continue throughout the lifetime of the operations. This Group will address local concerns, explore local benefits and agree future developments.

A viewing gallery is incorporated into the main structure of the Facility, which will enable the Applicant to demonstrate the technology to visiting parties and describe how the process contributes to a sustainable waste management strategy for the region.

PART C

5 SCOPING AND THE CONSIDERATION OF ALTERNATIVES

5.1 Scoping methodology

A scoping opinion was requested from the Planning Authority, under Regulation 5 (1) of the Environmental Impact Assessment (Scotland) Regulations 1999. The screening letter also asked for the local authority's view on the scope of the Environmental Impact Assessment. The purpose of the scoping exercise was to:

- focus the Environmental Impact Assessment on the issues and potential impacts which need most thorough attention;
- identify those which are unlikely to need detailed study;
- provide a means to discuss methods of impact assessment and reach agreement on those which are most appropriate to the Development.

5.2 Identification of potential impacts

Dumfries and Galloway Council confirmed that an Environmental Impact Assessment was required and specified the key issues for the scope of the Environmental Impact Assessment as follows (see also Appendix 5.1):

- visibility and visual assessment;
- noise;
- amenity;
- archaeology;
- ecology/wildlife;
- hydrology/water protection;
- land use;
- grid connection;
- roads/traffic;
- safety/risk (in event of accident);
- effects on air (offensive odour and/or emissions);

Table 5.1 lists the potential environmental impacts associated with factors of acknowledged environmental interest.

Table 5.1 Potentially sensitive environmental interests	
Local amenity	Visual intrusion Traffic Air quality Noise Cumulative impacts
Surface and ground water	Pollution Contaminated land
Highways network	Routing Junction capacity Disruption to traffic
Agricultural land	Loss of agricultural land
Cultural heritage	Visual intrusion
Flora and fauna	Habitat loss Secondary effects - air quality impacts, surface and groundwater changes
Landscape setting	Change in landscape character Zone of visual influence

Consultations

Consultation has been carried out with the relevant statutory bodies, which have a responsibility for the local environment, together with non-statutory consultees, to enable the preparation of an informed perspective. The consultees included:

- Scottish Environment Protection Agency (SEPA);
- Dumfries and Galloway Council;
  - Planning;
  - Landscape;
  - Operations Manager (Traffic);
  - Environmental Health Manager;
  - Biodiversity Officer;
  - Council Archaeologist;
  - Cultural Heritage;
- Torthorwald Community Council;
- Health and Safety Executive (HSE);
- Farming and Wildlife Advisory Group (FWAG);
- Scottish Natural Heritage;
- Scottish Wildlife Trust;
- Royal Society for the Protection of Birds (RSPB);
- Friends of the Earth Scotland;
- Historic Scotland.

Scoping responses have been included in Appendix 5.1.

5.3 Scope of work in assessment topics

The specified scope of work for the various components of the Environmental Impact Assessment is summarised below.

Landscape and visual impact

An appraisal of the Site and the surrounding landscape has been undertaken, and the effects of the Development on the appearance of the area assessed. The assessment has addressed comments made by Scottish Natural Heritage, Dumfries & Galloway Council (the Planning Authority) and Torthorwald Community Council (the local community council). The scope of this assessment has been refined after discussions with planning officers at the Council following the initial correspondence. Following the production of architect's plans for the building design, the Council recommended that an analysis of the zone of visual influence of the building and stack should be undertaken in addition to the previously agreed scope of work.

Traffic

An assessment of existing traffic flow has been made using available data, in conjunction with an assessment of potential traffic routing to and from the Site via the Strategic Route Network. The Operations Manager (Depute) at the Council does not perceive a problem regarding traffic to and from the Development, and no material impact on the road network is anticipated.

Noise

A baseline survey of the day and night noise environment was undertaken at nearby residential properties where the Development may have a potential impact. The potential noise emissions associated with activities on site were identified, calculated and assessed using the relevant criteria given in BS4142: 1997: *Method for Rating industrial noise affecting mixed residential and industrial areas* and BS5228: 1997: *Noise and vibration control on construction and open sites*. The Council's Environmental Health Manager stated that following the Scottish Parliament adoption of the Integrated Pollution Prevention and Control (IPPC) Regulations, SEPA would be the authority responsible for controlling noise impacts from site operations. It was considered that the design should take account of the effect of operations during the night period (2300 to 0600 hours).

Air quality

Potential emissions of airborne contamination will occur from the Plant and these are demonstrated by computer model. The impacts are assessed against local air quality data and to the National Air Quality Standard. In addition, Scottish Natural Heritage (SNH)

specified that the impact from air emissions upon sensitive lichens and mosses should be addressed.

The specified operations will require IPPC authorisation from SEPA. The authorisation will require that the emissions from the process be assessed and monitored on a continuous basis.

Water resources

The quality of surface and groundwater will be analysed to provide a statement of existing baseline conditions. As the process does not generate leachate, the assessment focuses on the treatment of surface drainage and sewage, and the containment of fuel in storage areas.

Land use

It is proposed to build the Facility on an area of restored mineral working, currently pasture used for grazing. The Development will result in the permanent loss of this land for agriculture. An assessment of this loss of agricultural land is made along with an analysis of baseline soil contamination.

Fauna and flora

The Site has limited ecological value. However, the assessment has considered the potential impacts associated with emissions to air and water quality on the local environment.

Material assets

The Local Authority's Sites and Monuments Record contains no record of ancient sites or monuments for the Site. The views of the Development from Torthorwald Castle and the public footpath, which is adjacent to the north western boundary of the Site, have been considered within the landscape assessment.

5.4 Consideration of alternative sites

5.4.1 Justification for Dumfries as a location

Since 1997, Dumfries & Galloway Council has been in the process of developing a strategy for waste disposal in the region. Unitarisation of local government in 1995 led to the amalgamation of waste disposal services, which had hitherto been the responsibility of four district councils each with their own policies and perspectives. It was clear that whilst suitable landfill space was available in the short term, in the medium term the future availability of landfill space was going to be problematic. Increasing investment was also going to be needed to meet government waste

minimisation and recycling targets. The solution that the Council believed to be most appropriate was to put an Outline Business Case to government for a Private Finance Initiative (PFI), which would attract private investment into waste management in the region. This would be a comprehensive solution and allow the Council to develop a long-term waste management strategy for Dumfries & Galloway. The pyrolysis and gasification technology developed by Compact Power Limited is designed to provide a solution to local waste problems within the context of the emerging waste strategy and therefore has particular application in Dumfries & Galloway given its predominantly rural nature. Private investment in this technology would enable Dumfries and Galloway Council to include an energy recovery process in the integrated long-term strategy for waste management within the region.

Apart from the Council's responsibility for municipal solid waste (MSW), active waste produced by the commercial and industrial sector also needs a management strategy other than to landfill; indeed some of this waste has to be exported from the region. Some commercial and industrial wastes, such as tyres and rubber will soon be banned from landfill altogether. Dumfries and Galloway produces 240,000 tonnes of MSW, commercial and industrial wastes that needs to be reused, recycled or processed in an economic and environmental manner. 75% of this waste is produced in Dumfries, the commercial, industrial and residential hub of the region. Therefore, the location of the Development within or close to Dumfries would be compatible with the proximity principle.

The Facility will require a 33kV connection to the grid in order to produce energy from waste. There are only 4 electricity substations in Dumfries & Galloway capable of taking such a load, these are: Chapelcross, Kirkcudbright, Newton Stewart and Dumfries. Chapelcross, Kirkcudbright and Newton Stewart are too far from the source of most of the local waste. Similarly, therefore, Dumfries would be the most appropriate choice for an energy production Facility.

Dumfries is on two major transport routes; the east west E18 Euroroute and the north south A76. Therefore, Priority Wastes sourced from the Waste Strategy Area can be delivered to a Facility, located in Dumfries via the strategic road network.

5.4.2 Choice of site

Several factors need to be taken into account in selecting an appropriate site for the development of energy from waste facilities, namely:

- In order to comply with National Waste Strategy: Scotland and meet the proximity principle, the Facility must be as close as possible to sources of

waste. The principal source of MSW will be from the Dumfries area, which has been used to define the search area.

- For economic viability the Facility must be as close as possible to a grid connection.
- To do as little damage to the environment as possible, the Facility should be situated as close as possible to major infrastructure routes, including rail.
- The prevention of social exclusion and environmental damage requires developments to be situated on, or close to, a public transport route.
- To prevent further environmental damage, new development should apply a sequential test to the availability of brown-field land.
- To justify major public expenditure on infrastructure improvements, new development should be situated to take advantage of this.
- The site must be large enough to accommodate the development and allow for possible future expansion.

Figure 5.1 identifies the location of the alternative sites considered in the selection process.

5.4.3 Justification for Dargavel as a site

The search for a suitable site started in late 1997 with approaches to both Dumfries & Galloway Council and Dumfries & Galloway Enterprise Company Limited (the Enterprise Company). The Council produces a monthly property register of land available to rent and for sale from the private sector, and is also a significant landowner itself. The Council's Development Plan identifies land suitable for industrial development.

A site at the Council owned Garroch Loaning Industrial Estate was considered suitable, but discussions with the Council were discontinued when the Applicant was informed that an 8" gas main ran under the site, which rendered the site not suitable for development.

In early 1998, developers negotiating the purchase from the Council of land at Maxwelltown Industrial Estate were approached. Development of a part of this site by the Applicant would have allowed the supply of surplus heat from a Facility to a number of nearby retail warehouse outlets, including those being proposed by the developer. But the developer did not consider that such a Facility would be compatible with the quasi retail uses that were being considered for the site.

At the same time, enquiries made of agents representing the Enterprise Company, also a significant landowner in the region, revealed that it had nothing to offer. Land at Cargenbridge was being held in strategic reserve for plastics related manufacturing technologies and the intention for sites at Dumfries Enterprise Park, Heathhall, was to attract light industrial and business use.

The site at Stephen's Croft, Lockerbie was considered. Close to major infrastructure and adjacent to the railway, a suitable energy from waste facility could have serviced the timber related industries being attracted there with both electrical power and heat for drying. However, the landowner was reserving the site for timber related industries and had no space available for such a Facility. Besides, the need to comply with the proximity principle means that the waste used to fuel the plant will be mainly locally derived. The need to be located close to a rail head would only be relevant if large quantities of waste were being transported over long distances.

The search was then directed at sites in private ownership that were identified in the Development Plan as suitable for industrial development. The only one at Eastfield Road in Dumfries was too small for the Applicant's purpose, therefore, the search was widened.

Dargavel Stores industrial estate was considered suitable because of its proximity to road infrastructure, and enquiries of the landowner indicated a willingness to allow development of a facility to produce energy from waste, subject to planning consent being granted. However, the site being offered was too small for the Applicant's purpose. Land immediately to the south of Dargavel Stores in the same ownership, however, was perceived to meet the Applicant's requirements for space, close proximity to major road infrastructure and public transport and relatively easy grid connection.

The site selection process is summarised in Table 5.2.

Table 5.2
Choice of suitable site for the Facility

Location	*Advantage*	*Disadvantage*
Dumfries Enterprise Park, Heathhall	Large enough site Reasonably close to road infrastructure Close to public transport Brownfield site	Difficult grid connection across town Incompatible with landowner's development proposal (office/light industry)
Garroch Loaning, Dumfries	Large enough site Close to road infrastructure Close to public transport Brownfield site Public investment in improvements Amenable landowner	Potential rail link but not in foreseeable future Difficult grid connection across town Gas main through site makes it un-developable
Plastics Park, Cargenbridge	Large enough site Close to road infrastructure Close to public transport Brownfield site Public investment in improvements	Difficult grid connection across town Incompatible with landowner's development proposals (plastics related industry)
Stephen's Croft, Lockerbie	Large enough site Close to road infrastructure Close to rail infrastructure, Close to public transport Public investment in improvements Potential users of electricity and heat on adjacent sites	Incompatible with landowner's development proposals (timber related uses) Too far from main sources of waste (Dumfries)
Eastfield Road, Dumfries	Close to public transport Brownfield site Very close to grid connection	Site too small Poor road infrastructure Incompatible with landowner's development proposals (housing)
Maxwelltown, Dumfries	Site large enough Close to major infrastructure Close to public transport Brownfield site Potential to sell heat to neighbouring retail users	Potential rail link but not in foreseeable future Difficult grid connection across town Incompatible with landowner's development proposals (quasi retail)
Dargavel Stores, Lockerbie Road, Dumfries	Close to major infrastructure Close to public transport Brownfield site Potential to sell heat to neighbouring haulage related users Public investment in improvements Amenable landowner Relatively easy grid connection	Site too small
Dargavel, Lockerbie Road, Dumfries (proposed Site)	Site large enough Close to major infrastructure Close to public transport Potential to sell heat to neighbouring haulage related users Public investment in improvements Amenable landowner Relatively easy grid connection	Restored mineral site

Note: For location see Figure 5.1

5.4.4 Further justification

The Plant is capable of operating on a range of fuels including methane gas. The Site is close to the Lochar Moss landfill, and this may, in the future, allow methane in landfill gases to be extracted and utilised safely for the production of energy.

6 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

6.1 Introduction

This assessment is based on an initial site survey and desk analysis. Following completion of the building design the analysis was extended to determine the zone of visual influence using a validated computer technique. A series of photographs were taken of the Site from several locations in January 2000 (Figure 6.2) and have been included on Figures 6.3 – 6.9 to illustrate the Site in its landscape context. Table 6.1 provides a description of each photographic viewpoint defining, where relevant, the significant landscape elements which contribute to the character of the area, together with the contribution of the existing Site from each viewpoint and an assessment of the predicted visual impacts resulting from the Development. It should be noted, however, that not all viewpoints described in Table 6.1 are illustrated by photographs.

6.2 Assessment criteria

In assessing impact, consideration is given to the likely effect upon settlements, properties, roads and public rights of way, as well as the effects upon the wider landscape resource. This methodology takes account of the recommendations of the Countryside Commission for Scotland embodied in their document *Landscape Assessment, Principles and Practice* and *Guidelines for Landscape and Visual Impact Assessment* produced jointly by the Institute of Environmental Assessment and the Landscape Institute June 1995.

The assessment identifies the significance of potential impacts, which are presented as a combination of the importance of visual receptors and the magnitude of the change. Properties/settlements and roads, for instance, are considered to be of high importance. The magnitude of visual impact is determined by the distance from the viewer, the extent of change in the field of vision, the proportion or number of viewers affected and the duration of activity on a scale low-medium-high (Figure 6.1).

Impacts may be negative or beneficial, permanent or temporary, and are assigned a level on the scale slight-moderate-substantial, taking into account any mitigation.

Consultation has taken place with Scottish Natural Heritage and Dumfries and Galloway Council, to determine the scope of the assessment. The following issues are addressed:

- the impact of the Development upon the landscape character of the immediate surrounding area;
- the visual impacts during construction and operation of the proposed Development;

- the zone of visual influence following construction of the building and chimneystack.

6.3 Baseline conditions

6.3.1 Location

The Site is located approximately 4km to the east of Dumfries town centre and lies approximately 2km north west of the village of Collin, adjacent to the A709. It is approximately 2.5km south west of the village of Torthorwald (see Figure 1.1).

6.3.2 Landscape character of the Site and surrounding area

The Site is accessed from the A709 Lockerbie Road to the north and comprises two parcels of open grassland. It is adjacent to existing industrial and farm buildings located immediately north west of the Site boundary. An established coniferous plantation delineates the south western boundary of the Site, whereas the south eastern boundary is open farmland. Approximately 50m to the south east is a belt of deciduous woodland. The access to Dargavel Quarry, which is situated approximately 250m south of the Site, traverses north west/south east across the Site. A footpath passes the Site along the north western boundary. The nearest residential properties are the neighbouring Barton's House and Ashwell, approximately 150m east of the Site.

The Site is located within the Lower Nithsdale area of Dumfries and Galloway. Approximately 1.6km to the north east of the Site is Torthorwald Ridge, identified as a Regional Scenic Area in the Dumfries and Galloway Structure Plan 1999. Torthorwald Castle is situated approximately 2km north east of the Site. The Consultative Draft Nithsdale Local Plan 1999 identifies the remains of the Castle as a 'Known Archaeological Site', however, due to safety issues the area has no public access.

The landscape character of the surrounding area, as described in the *Dumfries & Galloway Landscape Assessment* (March 1995), is typical of that found in the lower sections of the Nithsdale valley (dale). It is generally flat or gently undulating. The central sections of the valley contain flood plains through which the River Nith meanders. Closer to the valley side the topography, created by a combination of glacial moraines and fluvioglacial deposits, is more irregular (for a full description of the Nithsdale Valley, see Appendix 6.1).

The topography of the surrounding area ranges in height from around 20m AOD in the north, west and south, to around 100m AOD in the east.

The immediate surroundings of the Site are characterised by agricultural land uses, both pasture and arable, creating a generally open, broad scale landscape. Field boundaries are predominantly hedgerows, many of which have lines of mature hedgerow trees. Small villages and farmsteads are also characteristic features of this landscape. Coniferous and broad-leaved woodlands are widely distributed in the vicinity of the Site, underlining the rural character of the surroundings.

6.3.3 Visibility of the Site

The visibility of the Site has been assessed by field reconnaissance and from the interpretation of computer generated zones of visual influence. The analysis has been plotted (see Figure 6.1) and is summarised in Table 6.1. It should be recognised that the Development would be located adjacent to the existing farm/industrial premises to the north of the Site. This group of farm/industrial buildings is visible from relatively few receptors in the surrounding area (Viewpoint 3, Figure 6.3, Viewpoint 10, and Figure 6.6, Viewpoint 20, Figure 6.8 and Viewpoint 21, Figure 6.9). There are filtered views from Barton's House and Ashwell to the east of the Site (Viewpoints 16, 17 & 18, Table 6.1). The Site is also generally visually contained when viewed from the north, east and south. There are, however, open views into the Site from the footpath along the north western boundary (Viewpoint No 1, Table 6.1).

6.3.4 Night time lighting

Currently there are no night-lights within the Site. The junction on the A709 has street lighting, which is the dominant source of lighting in the locality. There are lights within the Dargavel Stores industrial buildings, which are used during working hours.

6.4 Potential impacts

The important visual components of the Development have been identified as follows:

- construction activity during Site development;
- the proposed building including the stack;
- auxiliary on-site operations including HGV access to the Site;
- night lighting;
- proposed screen planting as a mitigation measure.

6.4.1 Landscape impacts

Both in the short-term, during construction of the proposed building, and in the long-term during operation of the Facility, the impacts will be negative in the sense that there is a change to the landscape. However, the Development is relatively small in scale and the changes in the general landscape setting of the area will therefore be

minor. The existing land uses within the adjacent industrial estate are of a similar nature and therefore the change in the landscape associated with the siting of the proposed building is considered to be minimal.

No trees or hedgerows would be felled and, as the site has been previously disturbed for mineral workings, there are no archaeological remains that could be disturbed as a result of the development. Therefore of the primary elements, identified by the Dumfries and Galloway Landscape Assessment within the character area, the existing tree lines and shelterbelts determine the potential effects of the Development upon the open character and the medium to long views. Because of the scale of the development / building mass and its relationship with existing industrial/farm buildings and tree belts, the impact upon the landscape character has been defined as low.

6.4.2 Visual impacts

Visual impacts may result from:

- views into the Site including views of the building and auxiliary operational areas;
- woodland/screen planting.

The visual assessment (Table 6.1) has verified that views of the Site can be obtained from relatively few receptors. The proposed location of the building and its associated potential impacts are identified in Table 6.1. Photographic views of the Site are illustrated in Figures 6.3 – 6.9. An assessment of potential impacts is shown diagrammatically on Figure 6.1. This takes into account the screening associated with intervening vegetation and undulating topography, together with mitigation factors incorporated into the Site design.

The most significant visible components of the proposed development have been identified as follows:

- the height of the building;
- the chimney stack;
- increased HGV movement into Dargavel Stores industrial estate;
- movement of HGVs from the existing industrial estate to the Facility;
- screen planting.

6.4.3 Computer ZVI analysis

A computer generated zone of visual influence (ZVI) has been developed to assess the visibility of the building and stack. The methodology used to generate the ZVI is given in Appendix 6.2. This is essentially a 'bare ground' ZVI, which has been modified to take account of the existing buildings at Dargavel Stores and the major woodland blocks in the area (these have been identified on the analysis plans, Figures 6.11 and 6.12). The ZVI has been used as an analytical tool to determine likely areas of visibility of a structure that cannot readily be assessed by a field assessment due to the height of the structure above ground level. However, the ZVI does not take into account the screening effects of all intervening trees, hedges and buildings other than at Dargavel Stores. It also tends to accentuate the actual visibility because there is no allowance for attenuation with distance. To aid the interpretation of the ZVI the major woodland blocks and settlements have been identified on the base plan. In addition, the ZVI has been constructed up to 2.5km from the Development, even though it has been assessed that actual visibility is limited or non-existent at greater distances (see Table 6.1). The analysis in Table 6.1 and Figure 6.1 takes account of the visibility identified in the computer generated model.

The ZVI analysis has been assessed for the height of the proposed building, (Figure 6.11) and for the building and stack combined (Figure 6.12). The building will have a relatively small visual impact, as existing buildings and woodland largely screen the building. This analysis generally confirms the field assessment presented in Table 6.1. The ZVI also indicates that the building is likely to be visible from the higher ground of Torthorwald Ridge, to the east of the Site. However, the field assessment demonstrates that a building of similar size and construction to those at Dargavel Stores would not be readily perceived at this distance. Therefore, although elements of construction may be visible, in the longer term, it is considered that the ZVI analysis accentuates actual visibility.

The analysis shown in Figure 6.12 demonstrates the predicted increase in visibility associated with the stack. Additional heat, which is not utilised by the power generation turbines, will be dissipated using the roof mounted dry coolers. Therefore, this technology completely removes the potential for pluming, which is often associated with non-enclosed systems such as cooling towers. However, in certain weather (i.e. cool and still air conditions) water vapour emissions from the stack may be evident at distances of 2.5km. Due to the use of dry cooling for the Facility the incidence of water vapour being evident in these conditions is likely to be less than 2 or 3 occasions per year.

6.4.4 The communications network

There are a number of roads in the area surrounding the Site, including the A709 Lockerbie Road from which the Site is accessed. The visual analysis demonstrates the following:

- The Site is well screened from the A709 to the north west by existing farm/industrial buildings and intervening vegetation (Viewpoints 20 & 21, Figure 6.8 and 6.9, Viewpoint No 13, Table 6.1).
- There will be partial views of the proposed building from the A709 roundabout, approximately 250m north east of the Site (Viewpoint 3, Figure 6.3). There are no views of the Site from Roucan Road, which lies approximately 1.1km east of the Site (Viewpoint No 5, Table 6.1 and Viewpoint 8, Figure 6.5). Generally, areas of woodlands and intervening landform act as effective screening for receptors to the east of the Site. However, there may be limited views of the stack along short sections of Roucan Road (see Figures 6.1 and 6.12).
- There are no views of the Site from the road linking Torthorwald Village (See Viewpoint 6, Figure 6.4) and the village of Collin. The point where the road crosses the Regional Scenic Area, is approximately 2.2km east of the Site (Viewpoint 7, Figure 6.5). There would be no views of the proposed building, as a combination of the landform and intervening vegetation screen the Development. However, there may be limited views of the stack (see Figures 6.1 and 6.12).
- There are no views into the Site from the A75, to the south (Viewpoint 9, Figure 6.6 and Viewpoint 11, Table 6.1). However, the stack may be visible from certain sections of this road, and on the roads leading to properties at Mid Dargavel and Nether Dargavel (see Figures 6.1 and 6.12).

6.4.5 Residential properties

Generally, the intervening landform and/or vegetation will screen views of the building from most residential properties. The impact from Barton's House and Ashwell has been assessed as moderate; however, the woodland adjacent to the properties, along the eastern boundary of the Site acts to mitigate this impact. The relatively close location of the woodland to Barton's House and Ashwell will also limit the visual intrusion arising from the stack as the angle of vision towards the skyline is high. The Development would also result in a moderate visual impact at the properties to the north of the A709, Houston's Cottage and Sandyknowe. Figure 6.3 illustrates the visibility of the proposed building from the roundabout junction to the west of the property. The Development has been assessed as having a low visual

impact from a number of more distant properties. Although the actual Site was not visible when assessed by field reconnaissance, the ZVI analysis shows that the stack or the upper part of the building may be at least partially visible. However, from all these identified viewpoints the distance to the Development is such that the potential impact has been assessed as low.

6.4.6 Public footpaths

A short section of the footpath along the north western boundary has open views into the Site (Viewpoint No 1, Table 6.1). The potential visual impact has been assessed as substantial. As the footpath progresses in a south westerly direction the visual impact reduces because of screening by topography and the coniferous plantation along the south western Site boundary (Viewpoint Nos. 2 & 12, Table 6.1). However, there would be partial filtered views of the stack on the skyline.

The visibility from more distant footpaths has not been assessed.

6.4.7 Night lighting

Lighting will be associated with down lights on the building and stand alone street lamps on the access road, which will be used as required for deliveries out of daylight hours. Although the extent and density of night-lights will increase as a result of the Development, the impact is considered marginal and would merge with other lighting within the industrial use buildings.

6.5 Mitigation

The assessment has shown that there will be a visual impact from the residential properties of Barton's House, Ashwell and to a lesser extent Houston's Cottage and Sandyknowe. In addition, the Development will also be visible from a short stretch of public footpath and from the A709 roundabout. However, it is considered that the potential visual impact can be partially mitigated by new hedge planting along the footpath edge and by additional woodland planting along the north eastern boundary of the Site. Details of the planting proposal are shown on Figure 6.10.

This would provide effective screening of the proposed building, in particular for Barton's House and Ashwell and for the properties to the north of the A709 roundabout. The impact of the proposed building has been assessed from the roundabout on the A709 using a rendered image from the Architect's design drawings (see Figure 6.3). The analysis demonstrates that the proposed building is similar in style to those existing at Dargavel Stores. The stack, shown at a height of 20m above ground level, forms a relatively small component of the overall building mass. The building group can been

seen to be beneficial in reducing the potential visual impact of the new building mass. A single chimney stack will project through the roof and will contain multiple flues within a colour-coated shell. The cooling system associated with the Plant will exhaust through the roof surface on the west side of the building

The external colour scheme includes a mixture of greens, buff and browns, which are sympathetic to the predominant landscape colours within the locality.

The general gradient of the existing land at the Site falls from north west to south east. The building design requires a flat development plateau and it is intended that the general level of the ground floor and perimeter areas will be approximately 2.5 - 3.0m lower that the present land level at the north end of the Site. Therefore, although the ridge of the building is approximately 14.5m higher than the floor level, the actual height of the building with respect to the surrounding landform will be lower.

At more distant properties, the effect of the landform and existing vegetation assists to limit visual intrusion. The visual intrusion associated with the building and chimney stack will be minimised by the quality of exterior materials, choice of colour and the use of a non-reflective surface.

6.6 Residual impacts

The Development is considered permanent and would therefore, represent change to the existing landscape character of the Site, albeit compatible with adjacent usage at Dargavel stores.

The use of appropriate building materials and proposed external landscape design measures should ensure that whilst the initial site construction activity may be visible, in the longer term the Development will be largely screened. Therefore, the actual extent of visibility will be minimised to the roof of the building and the stack.

Table 6.1 - Visual impact assessment

Viewpoint No	Approximate distance from the Site	Location	Description	Visual impacts
1	2m	Facing southeast towards the Site from the proposed access along the public footpath.	Open views across the Site. Views of the coniferous plantation along the south western boundary and the broad-leaved woodland to the east of the Site.	High importance, high magnitude = substantial impact. Mitigation: new planting alongside the Right of Way will achieve sense of enclosure and improve visual amenity.
2	0.13km	Facing north east towards the Site from the public footpath.	Partial filtered views of the farm/industrial buildings to the north of the Site. Intervening topography and vegetation screen views into the Site.	High importance, very low magnitude = slight/negligible impact. No mitigation required.
3	0.25km	View from A709 facing south towards the Site.	Open views of farm/industrial buildings north of the Site. Partial views into the Site of the Development.	High importance, medium magnitude = moderate impact. Mitigation: new planting along the northeastern boundary will provide effective screening and improve visual amenity.
4	0.45km	Facing southwest towards the Site from Lochar Bridge along the A709.	Mature vegetation, Barton's House and Ashwell visible in the foreground. Farm/industrial buildings visible in the background. No views into the Site currently, however the stack maybe visible.	High importance, low magnitude = slight/negligible impact. Mitigation: visual intrusion of stack minimised by choice of colour.
5	1km	View from Roucan settlement facing west towards the Site.	Views into the Site are screened by intervening topography and vegetation. Distant views of Barton's House and Ashwell in the background. No views into the Site currently, however the stack maybe visible.	High importance, low magnitude = slight/negligible impact. Mitigation: visual intrusion of stack minimised by choice of colour.
6	2.1km	Facing west towards the Site from the edge of Torthorwald village.	Intervening topography and vegetation screen views into the Site. No views into the Site.	High importance low magnitude = slight/negligible impact. No mitigation required.
7	2km	View from Trabeattie residential property facing west towards the Site.	Agricultural areas with characteristic field boundaries and widely distributed woodlands dominate the view. Distant views of urban fringe of Dumfries in background. No views into the Site currently, however the stack maybe visible.	High importance, low magnitude = slight/negligible impact. Mitigation: visual intrusion of stack minimised by choice of colour.
8	1.5km	Facing northwest towards the Site from the edge of Collin village.	Views into the Site are screened by mature vegetation in the foreground.	High importance, low magnitude = slight/negligible impact. No mitigation required.
9	1.3km	View from the A75 facing north towards the Site.	Views of agricultural areas with hedgerows and mature hedgerow tree forming field boundaries in foreground. Partial filtered views of Mid Dargavel farmstead in the background. Distant views of Torthorwald Ridge in the background. No views into the Site currently, however the stack maybe visible.	High importance, low magnitude = slight/negligible impact. Mitigation: visual intrusion of stack minimised by choice of colour.

Table 6.1 - Visual impact assessment

Viewpoint No	Approximate distance from the Site	Location	Description	Visual impacts
10	0.75km	Facing north towards the Site from Mid Dargavel.	Distant views of Site with farm/industrial buildings in the background. Wet sand and gravel workings in the foreground dominate the view. Building and stack maybe visible.	High importance, low magnitude = slight impact. Mitigation: Visual intrusion arising from the stack and the building will be minimised by choice of colour and by limiting height.
11	1.3km	View from the A75/A780 roundabout facing northeast towards the Site.	Agricultural areas with characteristic field boundaries dominate the view. Torthorwald Ridge visible in the background. No views into the Site.	High importance, low magnitude = slight/negligible impact. No mitigation required.
12	0.4km	Facing northeast towards the Site from the public footpath south of the Site.	Partial filtered views of the farm/industrial buildings. Vegetation filters the views into the Site. Torthorwald Ridge in the background dominates the view.	High importance, low magnitude = slight/negligible impact. No mitigation required.
13	1.1km	Facing east towards the Site from the A709.	Views into the Site are screened by screening mound along the northwestern boundary of Lochar Moss landfill Site. Torthorwald Ridge in the background dominates the view. No views into the Site.	High importance, low magnitude = slight/negligible impact. No mitigation required.
14	1.1km	View from Catherinefield Road adjacent to Dumfries Trading Estate facing south towards the Site.	Views of mature hedgerow trees along the road in the foreground. Partial filtered views of agricultural areas and woodland in the background. No views into the Site currently, however, the stack may be visible.	High importance, low magnitude = slight/negligible impact. Mitigation: visual intrusion of stack minimised by choice of colour.
15	1.3km	Facing southwest towards the Site from West Roucan residential property.	Agricultural areas with characteristic field boundaries and widely distributed woodlands dominate the view. No views into the Site.	High importance, low magnitude = slight/negligible impact. No mitigation required.
16	0.1km	View from Ashwell residential property facing southwest towards the Site.	Mature vegetation in the foreground dominates the view. Partial filtered views into the Site.	High importance, medium magnitude = moderate impact. Mitigation: new planting along the northeastern boundary will achieve sense of enclosure and improve visual amenity. Colour of building and stack.
17	0.15km	View from Barton's House facing southwest towards the Site.	Mature vegetation in the foreground dominates the view. Views of industrial buildings in the background. Partial filtered views into the Site.	High importance, medium magnitude = moderate impact. Mitigation: new planting along the northeastern boundary will achieve sense of enclosure and improve visual amenity. Colour of building and stack.
18	0.1km	As viewpoint 17.	Mature vegetation in the foreground dominates the view. Partial filtered views into the Site.	High importance, medium magnitude = moderate impact. Mitigation: new planting along the northeastern boundary will achieve sense of enclosure and improve visual amenity. Colour of building and stack.

Table 6.1 - Visual impact assessment

Viewpoint No	Approximate distance from the Site	Location	Description	Visual impacts
19	0.15km	Facing south towards the Site from agricultural field adjacent to industrial buildings north of the Site.	Open agricultural area in the foreground. Partial views of the Site in the background.	High importance, medium magnitude = moderate impact. Mitigation: new planting near the Site entrance will achieve sense of enclosure and improve visual amenity. Colour of building and stack.
20	0.55km	Facing southeast towards the Site from landfill entry adjacent to the A709.	Open agricultural area in the foreground. Views of farm/industrial buildings in the background. The stack maybe visible.	Medium importance, low magnitude = slight/negligible impact. Mitigation: visibility of stack minimised by choice of colour
21	0.3km	Facing southeast towards the Site from agricultural field adjacent to the A709.	Open agricultural area in the foreground. Views of farm/industrial buildings in the background. Building and stack maybe visible.	Medium importance, low magnitude = slight/negligible impact. Mitigation: visibility of stack minimised by choice of colour
22	2.7km	Facing southwest towards the Site from the A709 north of Torthorwald.	Farmyard near Torthorwald in the foreground. Urban area of Dumfries and upland landscape in the background dominates the view. Barton's House and Ashwell are just distinguishable. No views into the Site.	Medium importance, low magnitude = slight/negligible impact. No mitigation required.

7 TRAFFIC

7.1 Assessment criteria

This assessment has been performed to the guidance given in *Guidelines for Traffic Impact Assessment* (Institute of Highways and Transportation, 1994) and *Guidelines for the Environmental Assessment of Road Traffic* (Institute of Environmental Assessment), with reference to the relevant policies in the Dumfries and Galloway Structure Plan 1999.

7.2 Baseline conditions

The Site is located within the Lower Nithsdale area of Dumfries and Galloway, and lies to the west of Dumfries. The location of the Site is shown on Figure 1.1. The Site has access to the A709 Lockerbie Road through Dargavel Stores industrial estate.

The A709 is a principal distributor road and is considered by the Local Authority to be of more than local importance. It forms part of the local strategic route network that is used as a framework for freight movement by road. The A709 also provides direct access to the primary route network via roundabout junctions with the A74 (M) and A75, which are designated special and trunk roads. Figure 7.1 shows the setting of these roads in relation to the Site location.

7.2.1 Existing traffic flows

The Council's Operations Manager (Traffic) has provided estimates of the traffic flows along the A709, which are as follows:

1. The 24-hour average weekday, 2-way flow is approximately 5000 to 6000 vehicles.
2. The estimated HGV content is 10%, i.e. 500 to 600 vehicle movements per day.
3. Peak traffic flows were not available.

A survey of HGV movements, carried out by the Applicant, on weekdays between 3rd July 2000 and 14th July 2000 in and out of Dargavel Stores during the hours 0800 and 1700 showed that there was an average of 175 daily HGV movements. Estimates of HGV movements outwith these hours indicate a further 75 per day giving a total of 250.

7.3 Potential impacts

7.3.1 Assignment of development traffic

It is predicted that the Development will increase the number of HGV movements by an average of up to 26 movements per day (13 in / 13 out).

7.3.2 Highway impact

The Institute of Highways & Transportation recommends that an increase due to development traffic of 10% above the existing flow levels is normally considered to be the threshold in determining the need to undertake a detailed assessment of the impact on the road network of a proposed development. Similarly, the Institute of Environmental Assessment document considers a post development change in traffic levels of less than 10% to have little discernible environmental impact on a road network. The predicted development flows represent an increase in HGV movements of less than 5% on the road network. In terms of the operational capacity of the A709 the impact of the Development is therefore considered to be negligible. Considering HGV movements into and out of Dargavel Stores it is estimated that the Development will increase movements by 10%.

7.4 Mitigation

No direct mitigation measures are required because the traffic enters the Strategic Route Network at a suitable roundabout junction to the Dargavel Stores industrial estate.

The proximity principle detailed in the National Waste Strategy : Scotland means that waste should be treated or disposed of as near as possible to the point where it arises. The Development will accept and process wastes, 95% of which are produced within Dumfries and Galloway, thereby reducing the requirement for waste to be transported outside of the region. The Development would help to reduce the overall traffic levels associated with waste movement. As the waste will be derived locally, transportation distances will generally be small (see also discussion on waste and current disposal options in Appendix 4.1)

It is anticipated that where practicable, the hauliers will operate on a turnaround basis and vehicle movements will therefore be distributed evenly throughout the day.

7.5 Residual impacts

There are no residual impacts from traffic associated with the Development. The local Strategic Route Network is used as a framework for freight movement by road and the Site has direct access to the A709 that forms part of this network.

8 NOISE

8.1 Assessment criteria

Planning Advice Note (PAN) 56 *Planning and Noise* details the role of the planning system in preventing and limiting adverse effects of noise. PAN 56 does not give specific guidance in order to assess the noise impact of a proposed development, but refers to individual documents such as:

- BS4142: 1997: *Method for rating industrial noise affecting mixed residential and industrial areas*.
- BS5228: 1997: *Noise and vibration control on construction and open sites*.

This assessment has been performed to the guidance given in BS4142. This standard describes methods for determining noise levels outside residential buildings from industrial sources of noise, and evaluates the likelihood of complaint. BS5228 provides guidance concerning methods for the prediction of noise levels from mobile and static noise sources on construction and open sites.

For the purposes of this assessment, the potential noise impact from the Development has been addressed for the daytime (0700 to 1800), evening (1900 to 2300) and night-time (2300 to 0700) periods, as defined by PAN 56.

8.2 Baseline conditions

A single monitoring location was selected and agreed with the Environmental Health Officer (EHO) of the Council and SEPA to provide noise levels representative of the nearest residential property. Measurements were taken for a 24-hour period during 13 and 14 January 2000. The monitoring position location is shown on Figure 8.1 and is described below.

Barton's House and Ashwell

These two individual properties lie approximately 150m to the northwest of the Development. A monitoring position in the garden of Ashwell was taken as representative of the two properties. Daytime ambient noise levels at these properties are influenced by the passing local and commercial traffic on the nearby A709 road, traffic to the sand and gravel quarry, operations at the neighbouring industrial units and intermittent air traffic. The night time period noise levels continue to be influenced by the intermittent traffic passing along the A709.

Monitoring was undertaken in accordance with BS 4142:1997. The noise measurement equipment was calibrated by an external laboratory, and on-site before and after the noise measurements. The microphone was mounted on a tripod 1.5m

above the ground and more than 3.5m away from the nearest reflecting surface to enable free field measurement. 15-minute measurements were taken continuously throughout a 24-hour period, and averaged to give 1-hour values. Weather conditions during the day time measurements were generally fine with occasional brief showers and light winds measured at less than $1ms^{-1}$ at the microphone. The night time measurements were taken in dry, clear conditions with light winds of less than $1ms^{-1}$, increasing to $2ms^{-1}$ by the morning. Evening readings have been reported separately covering the hours of 1700 – 2300. The survey results of the averaged hourly measurements are given in Table 8.1. Details of the individual measurements are presented in Appendix 8.1.

Table 8.1
Hourly noise survey results

Location	Date	Time	Noise Level dB(A)				Wind Speed ms^{-1}
			$L_{Aeq, 1 hour}$	$L_{A10, 1 hour}$	$L_{A90, 1 hour}$	L_{MAX}	
Ashwell	14/01/00	07:00	51	53	45	75	
	14/01/00	08:00	51	56	50	78	1 - 2
	13/01/00	09:00	54	56	50	72	0 - 1
	13/01/00	10:00	51	53	47	74	
	13/01/00	11:00	51	53	47	71	
	13/01/00	12:00	50	51	45	71	
	13/01/00	13:00	49	51	43	74	
	13/01/00	14:00	52	52	46	78	0 - 1
	13/01/00	15:00	51	53	47	68	
	13/01/00	16:00	54	56	49	79	
	13/01/00	17:00	53	55	49	75	
	13/01/00	18:00	52	55	48	68	
Averaged daytime values			**52**	**54**	**47**		
	13/01/00	19:00	51	54	45	75	0 - 1
	13/01/00	20:00	49	51	42	74	
	13/01/00	21:00	49	52	42	69	
	13/01/00	22:00	47	50	39	73	
Averaged evening values			**49**	**52**	**42**		
	13/01/00	23:00	43	46	34	60	
	14/01/00	00:00	43	45	32	88	0 - 1
	14/01/00	01:00	41	44	31	57	
	14/01/00	02:00	40	42	31	60	
	14/01/00	03:00	40	41	31	64	
	14/01/00	04:00	42	45	34	62	
	14/01/00	05:00	42	45	34	58	
	14/01/00	06:00	45	48	38	58	
Averaged night time values			**42**	**45**	**33**		

8.3 Potential impacts

The working of fixed and mobile machinery is likely to generate noise. Mobile machinery, such as loading shovels and road lorries produce noise levels, which fluctuate as the distance between the source and receiver changes. The Plant itself will be static, although noise may fluctuate depending upon output requirements.

8.3.1 Site construction and decommissioning

Work required for the development of the Site will generate noise during earth moving and building construction. Construction noise can be controlled by means of a Prior Consent Notice under Section 61 of the Control of Pollution Act 1974. Conditions can be imposed by the Planning Authority to limit site noise to acceptable levels and operating hours to minimise noise impact. Piling operations, if employed during the construction of the Facility, will also have an impact at residential properties. Conditions relating to vibration can also be issued under the Prior Consent Notice to control the impact from vibration. An example of appropriate conditions is given in Appendix 8.2. These conditions could also apply to noise levels for building maintenance and the eventual decommissioning procedure at the end of the Facility's working life.

8.3.2 Operations within the Facility

Proposed operations have been described in detail in Section 3. All waste handling and operations required to operate the energy from waste Facility will be within the building. At this stage the individual noise emission elements of the Plant cannot be categorised as a full data set is not available from the Avonmouth plant. There will be certain activities that are external to the building and these potential noise sources are considered in the following sections.

8.3.3 Potential noise sources

The main source of noise will be associated with road vehicles and on-site HGV movements.

Waste will be delivered to the Facility by HGV but the proposed vehicle movements will not have a significant effect upon the local noise environment. Road lorries currently enter and exit the Dargavel Stores industrial estate, and the increase resulting from the operations, which would be, on average, 3 vehicle movements per hour. This level of activity would not have a significant impact upon the ambient noise environment at the nearest residential properties. HGVs will discharge loads within the building once the automatic doors have closed.

Other external noise sources include occasional access by forklift truck, air ventilation fans in the roof of the building and stack noise.

8.3.4 Effects of noise

Noise from new developments can have an impact upon the residents in the surrounding community. The level at which a noise nuisance is perceived can be a

subjective issue, and the level of ambient noise will influence the degree of tolerance of the community.

8.3.5 Noise criteria levels

BS4142 describes a methodology for rating industrial noise, and the likelihood of complaint from industrial developments. This is appropriate when noise levels created by the operation are continuous, such as the fixed operations at the Site. The methodology for assessing the likelihood of complaint is interpreted as follows:

1. The likelihood of noise from an industrial source provoking complaints depends upon its predicted level relative to the background noise levels, and whether or not there are audible characteristics associated with the source that may enhance its relative level.
2. Factors such as the local attitude to the type of noise source may affect the likelihood of complaint. These should not be included in the assessment.
3. The difference between the measured background level and the rated noise source can be used to assess a noise source in comparison with the background levels as follows:
    - a difference of -10dB(A) is a positive indication that complaints are unlikely;
    - a difference of +5dB(A) is of marginal significance;
    - a difference of +10dB(A) or higher indicates that complaints are likely.

8.4 Mitigation

The majority of the operations at the Facility will take place in a building that has been designed to provide acoustic attenuation in order to contain the noise emissions. The Company is also committed to maintaining internal noise levels for all operational working areas, requiring access by personnel, within the first action level of the Noise at Work Regulations 1989. This would preclude the need for ear defenders in the work place environment for all operational areas. There would be a few restricted zones, subject to acoustic screening, where ear defenders would be needed if access were required while the Plant was operational. The acoustic properties of the external building materials should provide up to 35dB(A) attenuation, as there are no windows onto operational work areas. Therefore, the maximum external noise levels should not exceed 50 dB(A) outside the building.

External noise sources such as cooling fans, intake fans and the steam turbine will also be housed in acoustically clad enclosures in order to minimise their potential

impact. These will be located at the south western side of the building, at the furthest distance from the nearest residential properties. The main access to the building and fan intakes will also be orientated away from the direction of the nearest residential properties.

Operations such as waste delivery, and some handling, will take place outside the proposed building. However these operations will be screened from the neighbouring residential properties by earth bunding and tree planting. Unloading, handling and sorting of incoming waste will take place inside the building, as described in Section 3.

Waste delivery will not take place after 1800 hours on weekdays, 1200 on Saturday and all day Sunday, to ensure that external noise levels from the operation are minimised during the evening and night periods. A tyre storage hopper will be used, of sufficient size to feed the Plant for a period of up to 72 hours so that it is able to operate through the night and during Sundays.

8.5 Residual impacts

An overall design noise limit has been designed for the Facility as the technical noise data is not available for all items of equipment. The limit has been calculated so that operational noise from the process ($L_{Aeq\ 1\ hour\ freefield}$) would not exceed the background noise level at each residential location. Using this criteria, noise impact will be minimised.

The operational noise limit for the Facility has been calculated using the following expression:

$$L_{Aeq}(10m) = (L_{A90\ (measured)}) + 25 \times \log_{10}(\text{distance in metres to receiver}/10) - 2$$

Consideration has also been given to the impact from mobile plant operations, such as delivery vehicles, the loading shovel and/or forklift truck. These will have a noise impact in addition to that of the Plant and must be included when calculating the overall noise level from the Facility. The sound power levels of mobile plant used in calculations have been taken from the general guidance given in BS 5228: 1997.

Some further incidental noise attenuation will be achieved due to screening by the surrounding buildings, but in this case residential properties are only screened from the Site by the existing planting, and so soft ground attenuation has been calculated.

The assessment gives an operational noise limit attributable to both the Plant and associated operations within the Facility, that will result in an impact of marginal significance at the residential properties when compared to the ambient conditions. The calculated operational noise level from the sum of all site activities is such that the background noise level at properties will not be exceeded, and is summarised in Table 8.2. This resultant noise level provides some limited flexibility, as BS4142 guidance provides for new development not to exceed the background noise level by more than 3dB(A). The approach adopted for this Development has been agreed with the EHO and allows for deterioration in the noise specific to new Plant over time, thus providing a buffer capacity for the operator. In addition, the approach adopted protects local residents against rising background noise levels in the event of other new development in the vicinity.

The sound power level for daytime operations includes a proportion of the noise attributable to the action of mobile plant and equipment such as the delivery of waste to the Facility, and the operation of a loading shovel to handle the waste outside the building. It is assumed, however, that these operations will not continue through the night period.

Table 8.2
Resultant noise levels assuming the design criteria is achieved, effective at the Site boundary

Location	Noise levels dB(A)		
	Day Time	Evening	Night Time
	$L_{Aeq\ 1\ hour\ (freefield)}$	$L_{Aeq\ 1\ hour\ (freefield)}$	$L_{Aeq\ 5\ minute\ (freefield)}$
Site boundary (~10m from building)	69	65	55
Ashwell (3.5m freefield)	43	39	29

The resultant values represent the noise levels on the outside of the acoustic shielding provided by the building housing the pyrolysis Plant. Daytime predictions have also accounted for the noise emissions from ancillary plant and machinery, such as HGV delivery and waste loading, and are listed in Appendix 8.3. The resultant noise levels provides a noise criteria for monitoring noise emissions at the Site boundary. During the commissioning works at the Avonmouth facility noise emissions will be monitored and the data used to inform the detailed design requirements for acoustic cladding for the Facility.

9 AIR QUALITY

9.1 Assessment criteria

In this section the air quality impact of the Facility has been evaluated by modelling the ground level concentrations of pollutants likely to be emitted from the Facility in a 5km radius from the Site. Maximum resultant ground level concentrations of key pollutants are predicted and these are then compared to Local Background Ambient Air Quality Data and the National Air Quality Objectives and Standards.

The scenario used in the dispersion model was that two pyrolysis units and three gas combustion units will emit at maximum permitted emission limits via three flues combined in one stack. The stack is assumed to have a height of 20m above ground level.

Emission rates are derived from the emission limits set out in the EC Hazardous Waste Incineration Directive (94/67/EC) and other references such as the Environment Agency IPC Guidance Note S2 5.01 Waste Incineration (see Table 9.1). The data in the table compares emission limits from a number of EU countries and allows comparison with actual emissions from Compact Power's prototype facility at Finham. A discussion of the process in relation to air emissions is given in Appendix 3.1. Further more detailed presentation of stack emission data from Finham is presented in Appendix 9.1.

Table 9.1
Emission limit values (ELVS) (mg/m^3)

Substance	Current* IPC limits >3T/h MSW	Proposed EC limits*** for MSW incinerator (DAV) *****	Dutch (HAV)****	German best practice DAV	Typical ** modern mass burn incinerator	Compact Power (MSW)
Particulates	30	10	5	0.05-5/5-30(HAV)	0.2-0.4	0.2
VOC's as carbon	20	10	0	1-5	<3	trace
NO_X	-	200	70	40 / 200 (HAV)	393	<37
HCI	50	10	10	0.3-5	5	4
HF	2	1	1	0.05-5	<0.1	<0.1
SO_2	300	50	40	1.3-15 / 25 (HAV)	59	25
CO	100	50	-	-	15-30	trace
Cd +Ti	-	0.05	0.05	0.002-0.005	<0.03	0.006
Hg	-	0.05	0.05	0.01-0.02	<0.05	0.006
Pb+Cr+CU+Mn+Ni+ As+SB+Co+V+Sn	-	0.5	1	0.004-0.1	<0.5	0.006
Dioxins TEQ (ng/Nm^3)	-	0.1	0.1	0.001-0.05	<0.4	0.03

* Limits according to Directive 89/369/EEC adopted for UK IPC Guidance, (7 day average).
**Currently Achieved MWI releases, S2 5.01 'Processes Subject to Integrated Pollution Control', Environment Agency 1996
*** Proposed limits in the Draft Directive on the Incineration of Non-Hazardous Wastes, Apr 97 (24hr average).
**** Hourly Average Value.
***** Daily Average Value.

The data collected from the Finham trials provides information on the emission characteristics of the process without the benefit of additional emission abatement technology.

The Applicant is confident that due to the nature of the process and additional state of the art abatement technology they will consistently achieve emission levels lower than the estimates derived from the Finham demonstration results. Comparable emission data will be made available during the course of further trials planned at the Avonmouth facility. These will be included in the IPPC application, should planning consent be granted.

Emissions have been modelled using the U.S. EPA approved Industrial Source Complex Model ISCST3 (ISCView, version 2.25) provided by Lakes Environmental. This is a PC-based model of dispersion in the atmosphere based on the Gaussian theory of plume dispersion.

The model has been used in this case with local ground terrain data obtained from the Ordnance Survey (Land-Form PANORAMA) and 5 years of sequential meteorological data from the Prestwick Meteorological Station on the west coast of Scotland. In this regard, the suitability of this meteorological data was discussed with the Scottish Environment Protection Agency (SEPA) as providing the most representative data for modelling atmospheric dispersion for the Site.

The impact of the Development is assessed by comparison with the national air quality objectives now detailed in the Air Quality (Scotland) Regulations 2000.

Because of the nature of the Plant and emissions known to be associated with such a process, the following gaseous pollutants are relevant to the air quality impact study:

- Nitrogen oxides, particularly nitrogen dioxide;
- Sulphur dioxide;
- Particulate matter particularly PM_{10} (particles with a mean diameter of less than 10 μm);
- Carbon monoxide.

Modelling of dioxins and heavy materials (including lead) has not been undertaken at this stage because of the very low emission characteristics identified from the Finham trials. Further data will be made available during the course of the Avonmouth commissioning works and included in the subsequent IPPC licence application.

9.2 Ambient air quality

Ambient air quality in the Dumfries area has been monitored for a number of years. Independent consultants, CORDAH, have produced a review of ambient air quality on behalf of the local authority, which is available on the public record, and the relevant section of the report is presented in Appendix 9.2.

The monitoring programme included six stations, three of which were situated in the Dumfries area. The closest monitoring station to the Site was located at Heathhall, 2.5km to the north west of the Site. The monitoring points are shown on Figures 9.4-9.10. Monitoring data for NO_2 and SO_2 is reported in Table 9.2.

Table 9.2
Data obtained in Dumfries and Galloway Air Quality review
Monthly mean data August 1998 – January 1999

Heathhall	Average	Range
SO_2 µg/m^3	1.99	<1 – 4.77
NO_2 µg/m^3	18.5	10 - 29
Source: Report by CORDAH to Dumfries and Galloway Council		
Note: More recent data from June 1999 to May 2000 is awaiting inclusion on the public record. Inspection of this data confirms that values of NO_2 do not exceed NAQS objective. SO_2 values remain generally low and are within all standards.		

Site specific data on NO_2 has been obtained during the summer months (see Table 9.3 and Appendix 9.3). The location of the NO_2 diffusion tubes, used from monitoring is shown on Figure 9.1. The tubes were left in position for a period of 33 days, with the original results being calculated as NO_2 concentration in ppb. Data in Table 9.3 has been converted to concentration in µg/m^3 to enable comparison with other reported data.

Table 9.3
NO_2 measurements taken at the Site during the period July - October 2000

	Measured NO_2 concentration µg/m^3	
Location	Average	Range
Dargavel A	7.2	5.8 - 9.8
Dargavel B	6.2	3.5 - 7.7
Dargavel C	6.7	5.8 - 7.4
Dargavel D	5.7	2.6 - 8.4
All Results	6.4	2.6 - 9.8
Source: Analysis performed on behalf of The Applicant by TES Bretby Detailed results given in Appendix 9.3		
Note: See Figure 9.1 Results reported in parts per billion (ppb) and converted to µg/m^3 using a conversion factor of 1.913 at 20ºC		

This background data demonstrates that concentration of NO_2 is considerably lower at the Site than that reported elsewhere in Dumfries and Galloway. The data provides a

reliable indication of NO_2 concentration away from the influence of the major road network.

Lead concentration has been monitored at Eskdalemuir as part of the national network of monitoring (see Appendix 9.2). The data has shown a significant decrease in lead concentrations since 1985, and during the 1990s have been within the range 5–15 ng/m^3. The value for Eskdalemuir is below the EC Framework Directive limit and the National Air Quality Standards limit.

Smoke and particulates have not been monitored within the district within the report published by CORDAH (see Appendix 9.2). Alternative data sources which include:

- a single measurement of PM_{10} taken in the period 28th May 1999 to 11th June 1999 of 18.5 μg/m^3 (24 hour mean) (Appendix 9.4); and
- an analysis of three regional stations obtained from the DETR website in the period up to 1998 (see Table 9.4),

This data indicates that values for PM_{10} in the Dumfries and Galloway region are within National Air Quality Standards limits.

Data on air quality generally has also been obtained from three regional stations in the North West of England and Central Scotland (Carlisle, Whitehaven and Lanark). Table 9.4 shows a summary of data obtained from the DETR website for the period 1995-1998.

Table 9.4
Background ambient air quality data

	SO_2 Arithmetic mean [μg/m^3]	**NO_2 Mean annual concentration [μg/m^3]**	**Black Smoke, Arithmetic mean [μg/m^3]**	**PM_{10} calculated using the Black Smoke method PM_{10} = BS/0.85 [μg/m^3]**
95 Lanark Carlisle Whitehaven	8		9	10.5
96 Lanark Carlisle Whitehaven	7	13.3 (B) 36.1 (I) 23.75 (B)	11	12.9
97 Lanark Carlisle Whitehaven	4	9.5 (I) & (B) 32.3 (I) 19 (B)	10	11.7
98 Lanark Carlisle Whitehaven		9.5(I) 7.6(B) 39(I) 22.2(B)		
Range [μg/m^3]	4-8	9.5-39	9-11	10.5 – 12.9

(I) Intermediate measurements (20-30 m from busy road)
(B) Background measurements (>50 m from any busy road)
Note: the 97 value for NO_2 at Lanark was monitored in a location between those defined as intermediate and background
Information was extracted from http://www.aeat.co.uk/netcen/airqual/data

Pollutant concentration mapping, also published on the DETR website, shows calculated annual mean concentrations for sulphur dioxide and PM_{10} (1996) and predicted annual mean concentrations for nitrogen dioxide (2005) and PM_{10} (2004) on a 1x1km grid across the UK. The data for the closest reference position (Dumfries and Galloway, NGR 301500, 577500) with regard to the Site is shown in Table 9.5.

Table 9.5
Pollutant concentration mapping
(calculated for 1996 and predicted for 2004/5)

Calculated secondary PM_{10} for 1996 [$\mu g/m^3$]	8.8
Predicted PM_{10} for 2004 [$\mu g/m^3$]	18.6
Calculated SO_2 concentration for 1996 [$\mu g/m^3$]	3.9
Calculated NO_x concentration for 2005 [$\mu g/m^3$]	6.9
Data from http://www.aeat.co.uk/netcen/airqual/laqm/index.html	

Analysis of the local ambient air quality data confirms that the region currently enjoys good air quality. The Dumfries area is not heavily industrialised and is relatively remote from the national motorway network. Prevailing winds are from the Irish Sea and there are few industrial sources in the locality that might affect air quality. Periodic incidents of elevated air pollution levels, (or in certain cases exceedence of National Air Quality Standards) have been identified as:

- domestic coal burning in winter (although generally low values are reported at Heathhall);
- kerbside NO_2 concentration at Buccleuch Street, due to traffic.

Additional site specific data for NO_x is currently being monitored for representative summer and winter periods. This data will be made available in due course.

9.3 Meteorological data

Data for the air dispersion model has been obtained from Prestwick Meteorological Station for a five year period between 1987 and 1992, the most recent years when sequential data was available. Data from Prestwick Meteorological Station used to input into the model has been shown graphically for wind direction and speed, see Figure 9.2 and in Table 9.6, for average monthly temperatures. There is also a meteorological station located at Drungans approximately 7km to the south west of the Site. Representative data has also been obtained for this station for the ten-year period up to 1999 (see Figure 9.3 and Table 9.6). The data from the two sites illustrates a relatively consistent pattern with respect to wind speed, direction, temperature and rainfall.

The wind data from the Drungans Meteorological Station showed a greater proportion of wind from the south westerly quadrant, than the data from Prestwick. There was also correspondingly less wind from the easterly quadrant recorded at Drungans, possibly related to the more coastal setting of Prestwick. As a proportion of all winds, the Drungans station records a greater influence of wind speeds up to 3m/s for all directions except for east to south easterly quadrants. The difference in recorded wind speed and related atmospheric stability will have an impact on the actual air dispersion as opposed to the modelled predictions. However, based on the difference between the two meteorological stations, at Prestwick and Drungans, these differences are considered small and unlikely to significantly alter the predictions calculated in this analysis.

There is little difference between the two stations with respect to average monthly temperature and rainfall (see Table 9.6). The original source data for both meteorological stations is given in Appendix 9.5.

Table 9.6
Temperature and rainfall data from Prestwick and Drungans meteorological stations

Prestwick 1987-1992	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Annual**
Temperature ^{0}C:													
Average monthly max	12.1	12.5	13.4	14.1	21.0	25.4	25.8	28.5	25.7	20.9	14.6	13.8	28.5
Average daily mean	4.6	4.8	6.2	7.6	11.1	12.9	15.3	14.6	12.3	9.3	6.2	5.1	9.2
Average monthly min	-4.0	-3.6	-3.3	-2.5	0.9	2.9	5.8	5.0	1.6	-0.5	-4.3	-4.4	-6.5
Precipitation mm:													
Monthly average	102	99	111	61	45	63	72	110	89	119	88	91	1050
Wettest month	156.2	180.6	131.7	90.2	67.9	86.4	119.4	144.2	119.8	165.7	184.3	113.9	1188.7
Driest month	34.0	55.7	69.8	40.9	14.0	28.4	42.8	42.4	43.9	89.6	26.9	60.0	883.9
Drungans 1990-1999													
Temperature ^{0}C:													
Average monthly max	11.9	11.8	14.1	18.1	22.9	24.1	25.5	25.2	22.1	18.1	14.1	12.1	27.0
Average daily mean	4.2	5.0	6.5	8.0	11.8	13.4	15.6	15.3	12.7	9.5	6.2	4.0	9.5
Average monthly min	-4.5	-4.4	-2.4	-.1.9	0.9	4.1	6.9	5.3	3.2	-1.2	-3.9	-7.9	-8.0
Precipitation mm:													
Monthly average	131	127	97	77	65	62	68	65	74	127	113	145	1151
Wettest month	213.9	257.5	152.8	150.0	111.5	97.2	111.0	156.4	129.1	237.6	151.9	250.0	1242.6
Driest month	13.7	13.8	19.3	20.7	6.4	22.7	39.5	19.0	37.7	53.7	43.9	42.9	997.8

9.4 National Air Quality Standards and the National Air Quality Strategy

The National Air Quality Strategy is a statement of Government policy on the assessment and management of ambient air quality. The development of such a strategy came about as the result of a requirement to implement the EC Air Quality Framework Directive 96/62/EC and the statutory requirements contained in the Environment Act 1995.

The National Air Quality Strategy lays down air quality standards and objectives for eight pollutants with the aim of protecting human health from environmental exposure.

The distinction between a "standard" and an "objective" recognises that aspirations of environmental quality may not yet be realistically achievable for all areas of the UK. The pollutants covered by the National Air Quality Strategy are:

- benzene;
- 1, 3-butadiene;
- carbon monoxide;
- lead;
- nitrogen dioxide;
- ozone;
- fine particles;
- sulphur dioxide.

In January 1999, the Government published its first review of the National Air Quality Strategy. The review reflected progress made in the understanding of ambient air quality and was also intended to bring National Air Quality Standards and Objectives more in line with the requirements of the EC Air Quality Framework Directive. The findings of this review have now been incorporated into the Air Quality (Scotland) Regulations 2000. The following provides a commentary on the new standards for air quality.

In the case of carbon monoxide the proposed air quality standard is unchanged by the review but the objective is now to achieve compliance with a 10 ppm (11,600 $\mu g/m^3$) 8 hours running average standard by 31 December 2003 rather than 31 December 2005.

In the case of nitrogen dioxide, the proposed changes are more involved because the existing 150 ppb (287 $\mu g/m^3$) 1 hour air quality standard would be replaced by a more stringent 104.6 ppb (200 $\mu g/m^3$) standard but with the proviso that the limit can be exceeded for a maximum of 18 times per year. The National Air Quality Standard for NO_2 would therefore become 200 $\mu g/m^3$ (99.8 %ile) to be achieved by 31 December 2005.

The annual average NO_2 standard is unchanged.

For sulphur dioxide additional objectives have been introduced namely a 1 hour objective of 131 ppb (350 $\mu g/m^3$), not to be exceeded more than 24 times per year, and a new 24 hour objective of 46.8ppb (125 $\mu g/m^3$), not to be exceeded more than 3 times per year, and these are to be achieved by 31 December 2004. These changes

have been introduced to ensure compliance with EC Air Quality Framework Directive.

There have also been some changes for PM_{10} medium and long term objectives. In the medium term, a new annual objective of 40 µg/m^3 and a 24-hour objective of 50 µg/m^3, not to be exceeded more than 35 times per annum, have been introduced and are to be achieved by 31st December 2004. The 50 µg/m^3 as 99^{th} percentile of daily maximum running 24 hr means is to be retained as an indicative level for 31 December 2005. In the long term a new indicative annual level of 20 µg/m^3 and a 24-hr level of 50 µg/m^3 (maximum of 7 exceedences) has been introduced with a target date of 31 December 2009 when the levels should be achieved.

The review of the National Air Quality Strategy also includes a proposal to introduce a new standard for the protection of vegetation and ecosystems. This again stems from provisions contained in the EC Air Quality Framework Directive. The proposed nitrogen oxide (i.e. nitric oxide and nitrogen dioxide) air quality standard for the protection of vegetation and ecosystems is an annual average of 15.7 ppb (30 µg/m^3) to be achieved by 31 December 2000. Superficially, this suggests that the standard for vegetation and ecosystems is more stringent than the annual average NO_2 standard for human exposure. However, the Air Quality Strategy Review document makes it clear that the vegetation and ecosystem standard would apply to rural background sites. These are sites that are located at least 5km from small urban areas (>5000 population) and greater than 5km from either industrial sources (regulated under Part 1 of the Environmental Protection Act, 1990) or motorways. The standard would not therefore apply in the vicinity of the Facility.

Table 9.7 summarises the current and proposed revisions to the National Air Quality Standards for nitrogen dioxide, sulphur dioxide, PM_{10} and carbon monoxide.

Table 9.7
Current air quality objectives identified in the Air Quality (Scotland) Regulations 2000

Substance	Air quality objective levels	Air quality objective dates
Benzene	16.25 micrograms per cubic metre or less, when expressed as a running annual mean	31st December 2003
1.3 – Butadiene	2.25 micrograms per cubic metre or less, when expressed as a running annual mean	31st December 2003
Carbon monoxide	11,600 micrograms per cubic metre or less, when expressed as a running 8 hour mean	31st December 2003
Lead	0.5 micrograms per cubic metre or less, when expressed as a running annual mean	31st December 2004
	0.25 micrograms per cubic metre or less, when expressed as a running annual mean	31st December 2008
Nitrogen dioxide	200 micrograms per cubic metre or less, when expressed as an hourly mean, not to be exceeded more than 18 times a year	31st December 2005
	40 micrograms per cubic metre or less, when expressed as a running annual mean	31st December 2005
PM_{10}	50 micrograms per cubic metre or less, when expressed as a 24 hour mean, not to be exceeded more than 35 times a year	31st December 2004
	40 micrograms per cubic metre or less, when expressed as a running annual mean	31st December 2004
Sulphur dioxide	125 micrograms per cubic metre or less, when expressed as a 24 hour mean, not to be exceeded more than 3 times a year	31st December 2004
	350 micrograms per cubic metre or less, when expressed as a an hourly mean, not to be exceeded more than 24 times a year	31st December 2004
	266 micrograms per cubic metre or less, when expressed as a 15 minute mean, not to be exceeded more than 35 times a year	31st December 2005

The Expert Panel on Air Quality Standards (EPAQS), consisting of independent experts, continues to advise the Government on air quality standards. In deriving a recommended standard for each of the pollutants, the EPAQS assesses published research including work undertaken by the World Health Organisation (WHO). The aim is always to derive exposure limits at which the risk to the public is exceedingly small. The current standards therefore, represent an acceptable level of exposure, and short-term exceedence of any of the standards does not imply a health risk.

9.5 Design and operational scenarios

The Plant will comprise two pyrolysis units feeding three gas fired combustion units emitting via three flues combined in one stack located to the southern end of the building. Thus the model was run for three flues emitting to a single stack. Emission limits for the stack have been modelled at the maximum permitted emission levels set out in the Hazardous Waste Incineration Directive (94/67/EC) and the Environment Agency IPC Guidance Note S2 5.01 Waste Incineration. These emission values are substantially greater than those recorded at the Finham trials using Compact Power Technology (See Appendix 9.1). The effect of these actual results, and the use of

abatement devices for certain pollutants, have been taken into account in the discussion of the potential emissions associated with the Facility at Dargavel.

It is assumed that the Plant will operate 24hr a day for 365 days a year. This is a conservative approach which is intended to exaggerate the predictions relating to annual average ground level concentration but will not impair the accuracy of short-term (1hr, 8hr, 24hr) maximum ground level concentrations.

Model inputs

For the purpose of this modelling exercise the operational parameters detailed in Table 9.8 are assumed. The emission rates for the individual pollutants are based on maximum permitted emission levels set out in the EC Hazardous Waste Incineration Directive (94/67/EC) and provisional emission limits for NO_x published in the IPC Guidance Note S2 5.01 Waste Incineration.

The discharge heights are assigned provisional stack heights based on the calculation method contained in HMIP Technical Guidance Note D1 (see Appendix 9.6). Stack heights have been calculated in accordance with the usual conventions and on the basis that the stack is an individual emission point.

Table 9.8
Input parameters for the iscst3 air dispersion model

Stack location		**Stack Parameters (identical for all three stacks)**							
Eastings	Northings	Stack height [m]	Gas exit velocity [m/s]	Gas exit temperature [K]	Stack inside diameter [m]	Emission rate [g/s]			
						NO_x	SO_2	PM_{10}	CO
301352	577218	20	15	473	1.92	4.17**	1.04*	0.208*	1.04*

* based on a normalised volume flow of 75 000Nm^3/hr and EC Hazardous Waste Incineration Directive daily average emission limits (94/67/EC)

** based on a normalised volume flow of 75 000Nm^3/hr and provisional emission limits published in the IPC Guidance Note S2 5.01 Waste Incineration

9.6 Results

The ISCView interface has been run for the two scenarios described in order to derive maximum ground level pollution concentrations. For short term averaging times such as 1hr, 8hr and 24 hr the maximum ground level concentration will be that which occurs under most unfavourable atmospheric conditions.

The annual average ground level concentration is the arithmetic average of five years worth of meteorological data from the years 1987, 1988 and 1990 to 1992. Maximum resultant ground level concentrations are summarised in the Table 9.9 and illustrated in a series of contour plots (Figures 9.4 - 9.10). The discussion provides a

commentary of the maximum ground level concentrations (Table 9.9) with respect to the stated air quality objectives for each pollutant. In all cases, the maximum ground level concentration is predicted to occur in close proximity to the Facility. A secondary peak concentration has also been predicted associated with Torthorwald ridge for the 1 hour and annual average NO_x distribution (Figure 9.4 and 9.5), 1 hour average SO_2 distribution (Figure 9.6), annual average PM_{10} distribution (Figure 9.9) and 8 hour average CO distribution (Figure 9.10).

Table 9.9
Maximum ground level concentrations [µg/m^3]

Pollutant	1 hr	8 hr	24 hr	Annual
NO_x	178	-	-	3.5
SO_2	44.5	-	15	-
PM_{10}	-	-	3	0.2
CO	-	25	-	-

9.7 Discussion

9.7.1 Nitrogen oxides

The maximum 1-hour ground level concentration of NO_x is predicted to be 178 µg/m^3 (see Table 9.9 and Figure 9.4). This assumes that the Plant is emitting nitrogen oxides continuously at the maximum permitted rate of 200 mg/m^3. A combination of Compact Power technology and the fitting of a de-NO_x catalyst will however limit NO_x emissions to approximately one fifth of the predicted value. More realistically therefore the maximum 1 hour ground level concentration of NO_x is likely to be significantly less than that predicted in the model.

The current air quality objective for NO_2 is 200 µg/m^3 expressed as an hourly mean not to be exceeded more than 18 times per year. Thus, with continuous operation of the 3 units, the maximum ground level concentration arising from the process would be within the standard even without the benefit of Compact Power technology and de-NO_x catalyst. Allowing for the existing ambient NO_2 concentration (range 10 – 29 µg/m^3, see Table 9.2 and 2.6 - 9.8 µg/m^3, within the Site, see Table 9.3), the predicted environmental concentration is unlikely to exceed the 200µg/m^3 objective of the National Air Quality Standard for NO_2.

The maximum annual ground level NO_x concentration is predicted to be 3.5 µg/m^3 (see Figure 9.5). This again assumes continuous emission at the maximum permitted rate and, for the reasons previously outlined, the actual NO_x discharge rate is likely to be only 1/5 of the discharge limit. This compares very favourably with the 40 µg/m^3 air quality objective for NO_2 and indicates only a very minor addition to the existing ambient levels, which range (10 to 29 µg/m^3) identified in the CORDAH report

(Table 9.2) and the range 2.6 to 9.8µg/m^3 identified in site monitored concentrations (Table 9.3).

It should be noted that in the assessment it has been assumed that all NO_x at the point of interest is present as NO_2 whereas a high proportion of the exhaust gas emission will be present as the more benign nitric oxide (NO).

Nitric oxide undergoes further oxidation to NO_2 in the atmosphere but this conversion is unlikely to be complete at the point of exhaust plume grounding. Therefore, the "worst case" predicted ground level concentrations of NO_x are therefore in themselves an overestimate.

For the reasons stated therefore, the impact of the process in terms of NO_2 air quality will be minimal.

9.7.2 Sulphur dioxide

The maximum predicted ground level concentration of SO_2 is 44.5 µg/m^3 (1 hour) (see Table 9.9 and Figure 9.6). This again assumes continuous emission at the maximum permitted rate of 50 mg/m^3 whereas Compact Power technology and a sodium bicarbonate (Na_2CO_3) scrubbing system will limit actual emissions to approximately 50% of the permitted value. A more realistic maximum ground level concentration resulting from the process would be significantly less than that predicted.

The Air Quality (Scotland) Regulations 2000 standard is 350 µg/m^3 (1 hour) not to be exceeded more than 24 times per year. It is evident therefore that the process contribution, together with the existing background concentration (range 1 – 5 µg/m^3), will not present a problem in terms of the potential to breach of any relevant standard.

The SO_2 emissions have also been modelled in terms of the 24 hour average concentration (see Figure 9.7) and here the maximum predicted value is 15 µg/m^3 (24 hour). Again this compares favourably with the relevant air quality standard which is 125 µg/m^3 24 hour mean, not to be exceeded more than 3 times a year. Taken in combination with existing background levels of SO_2, there is again no evidence to suggest that the relevant air quality objective will be breached.

The ISC View model is unable to reliably predict maximum ground level concentrations over a 15 minute period and, in fact, all dispersion models become progressively less reliable as averaging time is reduced. However, it is clear that, as the maximum ground level 1 hour concentration of SO_2 is unlikely to exceed

23µg/m^3, there is no reason to suppose that the maximum 15 minute value in any given hour would reach 266 µg/m^3, which is the relevant 15 minute air quality objective, not to be exceeded more than 35 times per year.

Therefore, in terms of SO_2 air quality, and taking account of the relevant 15 minute, 1 hour and 24 hour air quality objectives, there is no risk that introduction of the process will lead to a breach of any of the targets.

9.7.3 PM_{10}

The maximum predicted 24-hour ground level concentration of PM_{10} is predicted to be 3 µg/m^3 (see Table 9.9 and Figure 9.8). As previously, this assumes continuous operation of the 3 units at the maximum permitted discharge rate of 10 mg/m^3 in the exhaust gas. Compact Power technology and high efficiency bag filtration will ensure that actual process releases will be significantly less than those used in the model.

The air quality objective for PM_{10} is 50 µg/m^3 (running 24 hour mean) not to be exceeded more than 35 times per year or 40 µg/m^3 as an annual average. The process contribution plus prevailing background level (c. 18.5 µg/m^3) therefore indicate that there is no risk of breach of the air quality objective as a result of introduction of the process.

By the same token, the maximum annual ground level concentration arising from the process, 0.2 µg/m^3 (annual) is only a very small faction of the 40 µg/m^3 annual air quality objective (see Table 9.9 and Figure 9.9). This would represent a very small additional loading (c 1.1%) in comparison with existing ambient levels.

9.7.4 Carbon monoxide

Carbon monoxide emissions are minimal in a combustion process where careful control is exercised over temperature and air supply. Thus the concentration of CO in exhaust gas emissions from the Facility is likely to be minimal. An assumed emission rate of 50 mg/m^3 has however been used for modelling purposes, based on the maximum permitted discharge rate. The resultant maximum 8-hour ground level concentration is predicted to be 25 µg/m^3 (8 hour) (see Table 9.9 and Figure 9.10). In contrast, the air quality objective for CO is 11,600 µg/m^3 (8 hour) and therefore, the impact of the process in comparison with the air quality standard is negligible.

9.8 Other emissions from the Compact Power process

Potentially polluting emissions to air from the Plant are minimised by a combination of the process itself, an effective design strategy and the use of technology for certain

pollutant abatement systems (see Appendix 9.1 for details of the results of air pollutant monitoring from the Finham trials).

The combination of pyrolysis and gasification minimises the initial formation of gaseous pollutants and any residual pollutants are captured or abated by a system of acid gas scrubbing with sodium bicarbonate, high efficiency bag filtration and finally by an exhaust gas catalyst which removes nitrogen oxides.

A primary concern with all, high temperature, waste treatment processes is to ensure that dioxins and similar organic micro-pollutants are eliminated from the exhaust gases. Increased knowledge regarding the chemistry of dioxin formation has enabled modern high temperature waste treatment plants to be designed to ensure that efficient destruction of dioxins occurs and also that reformation (*de novo* formation) in the process is prevented. In this respect, the Compact Power process is particularly efficient. In the initial pyrolysis stage, the waste stream is heated to a temperature of 600-900 ^{o}C for 30 minutes, where it thermally degrades to produce a high temperature pyrogas and carbon char mixed with ash. The resulting char/ash mix passes into the gasifier where a high temperature reaction with steam and air produces a water gas (consisting of carbon monoxide and hydrogen), leaving residual ash.

The combined pyrogas and water gas (or off-gas) then passes to the thermal reactor where a temperature of 1250ºC is maintained in a turbulent, oxygen rich atmosphere for more than two seconds. The near complete burn out of carbon, the retention of metal chlorides in the pyrolyser residue, and the very low carryover of particulate to the thermal reactor will tend to minimise the potential for reformation of dioxins. (Refer to Appendix 3.1 for further details).

Exhaust gases are rapidly cooled after the thermal oxidiser by passage through a waste heat boiler and this further minimises the opportunity for dioxin formation within the optimal temperature range for *de-novo* dioxin formation of 200-450ºC.

Maximum dioxin removal is guaranteed by passing the exhaust gases through high efficiency bag filters. In addition, research shows that the de-NOx catalyst also acts as an efficient dioxin removal system as well as serving its primary purpose namely, the control of nitrogen oxide emissions.

Compact Power's abatement technology is described in more detail in Appendix 3.1. Further information and data on emissions will be made available during the course of monitoring the plant at Avonmouth.

9.9 Residual impacts

The principal residual impact from the process will be the release of carbon dioxide and water vapour, an unavoidable consequence of the combustion process. Carbon dioxide has little or no significance in terms of localised air quality but is a "greenhouse gas" and, as a consequence, there is an obligation to minimise emissions wherever possible.

The safe and controlled destruction of organic waste after initial removal of recyclable material is superior to landfilling where the subsequent generation of landfill gases including methane gives rise to odour and gases with a substantially greater global warming potential.

10 ODOURS

10.1 Baseline conditions

The Site is located in an area, which may be influenced by odours from existing activities. There is a landfill site at Lochar Moss located to the west of the Site. It is possible that there may currently be odours emitted from the landfill site although it is understood that this is largely controlled through the Waste Management conditions. The Dargavel Stores industrial estate itself is used for road haulage and is close to a main road network (A709 Lockerbie road). There may be odours emitted on occasion from activities at the industrial estate.

Odours are difficult but not impossible to quantify. However, in this case no baseline monitoring has been undertaken and evidence during inspections of the Site indicate that odour does not constitute a particular problem.

10.2 Potential impacts

The dispersion of odours from the Facility depends upon prevailing meteorological conditions. The production of odours is likely to be more frequent during hot weather conditions, but odours may be evident around the Site during still, cold weather when there is a temperature inversion. This will only occur where the waste is held on-site for any period of time in conditions that are favourable for odour emission and dispersal.

Within the range of municipal solid, commercial and industrial wastes accepted at the Facility there would be a variety of odours commonly associated with waste materials. Following waste collection and transportation to the Site it is possible that certain wastes will have begun to decompose and will generate a level of odour before the thermal processing can be undertaken. Other waste materials will also have to be held on-site before they are transferred into the pyrolysis chamber. This will allow time for organic materials to begin to decompose. The odorous compounds present in evolved gases from waste deposits will be derived both from biological breakdown of complex organic compounds, and from direct volatilisation of organic compounds within the wastes between the time of waste collection to their deposition within the building. In addition, some gases may be generated by chemical reactions between mixed waste deposits and/or by reaction with water or liquids produced during waste degradation.

Once the waste materials are introduced into the pyrolysis chamber gases associated the process are retained within the system until the products of gasification are combusted. Emissions to atmosphere have been considered in Section 9.

The potential odour emissions associated with Facility consist of:

- Waste materials arriving in HGVs to the Site.
- Handling and storage of wastes prior to feeding into the pyrolysis chamber.

There are no statutory or regulatory standards that relate to the assessment of odour nuisance. It is generally accepted that when odours become recognisable, and the longer and more frequently they are recognisable, the greater the potential for nuisance. The measurement of odours is extremely complex due to the great diversity of compounds, which can be present. The assessment of odours by individuals is very subjective and difficult to relate to gas measurements. Analytical instrument detection limits are often higher than the odour threshold limits of some compounds. The development of "odour threshold" values is based on subjective assessments often conducted by individuals or by a group of people forming an "odour panel".

10.3 Mitigation

Where appropriate, waste will be transported in sealed containers to contain waste and odour both in transit and storage. Heavy goods vehicles arriving at the Site to deliver waste materials will unload within the building. No handling or processing of organic or putrescible waste will occur outside the building. All waste will be stored within the designated waste reception area designed with extractive ventilation. All waste will be processed within an agreed time period. The management of potentially odourous waste will be facilitated by a just in time philosophy, whereby incoming waste will be transferred to the pyrolysis chamber as soon as practical after arrival and sorting. This philosophy can be maintained by ensuring that sufficient inert fuel feedstock in the form of tyre crumb will be stored in the Facility to maintain the Plant for a period of 72 hours.

The building has been designed to operate under negative air pressure to reduce odours from dispersing from the self-closing doorways and vehicle entrance. The circulation system throughout the building will entrain internal air into the pyrolysis/gasification process and draw fresh air from outside. Extraction points will be located above the waste storage area in the reception hall and directly into the waste feed hopper system to ensure effective control of odours. When the Facility is shut down extractive ventilation will still occur and the air filtered and treated for odour. All gaseous emissions from the process are released to atmosphere through a single stack, which has been designed to ensure dispersion of flue gases.

The waste handling floors will have a resistant finish to resist wear and prevent attack by the cleaning and disinfectant materials. Vehicles, containers, storage areas, loaders and

all equipment are designed so that clean and sterile conditions can be maintained. The use of impervious construction materials, combined with a weekly cleaning programme using disinfectants, will ensure odour is minimised.

10.4 Residual impacts

The mitigation measures have been designed to ensure that odours would not be detectable outside the boundary of the Site. Therefore, no residual impacts are predicted. In order to ensure that this is the case regular monitoring for odour will be undertaken in a Scheme to be agreed for the Waste Management Licence.

11 WATER RESOURCES

11.1 Assessment criteria

Water resources include ditches, streams, rivers, ponds, lakes and groundwater and have been identified using OS maps and by a site inspection. Four groundwater-monitoring boreholes have also been installed within the Site. Figure 11.1 shows the location of nearby surface waters and the on-site groundwater observation boreholes.

This section addresses issues relating to the following:

- The determination of baseline ground and surface water quality prior to site establishment/development in order to protect the Applicants against future contamination liabilities. There are known landfill and vehicle repair activities in the locality and these have been taken into account in the assessment of baseline conditions.
- The determination of groundwater level beneath the Site prior to development, for the purposes of foundation design, waste water management and site drainage design.
- The potential impacts that may occur upon water resources in connection with the Development. Potential impacts may arise in relation to surface drainage, wastewater produced by the Development and contamination of water resources during operation. Suitable mitigation is detailed in order to reduce potential impacts, this follows recommendations given in PPG1 '*General guide to the prevention of water pollution*' and PPG4 '*Disposal of sewage where no mains drainage is available*'.

11.2 Baseline conditions

11.2.1 Nearby surface waters

Nearby water resources have been identified using OS maps and by site inspection. There are no ditches, streams or ponds located within the Site boundary, however there is a small drainage ditch approximately 30m northeast of the Site. This joins the Dargavel Burn, which flows in an eastward direction, approximately 40m to the south of the Site.

The Lochar Moss landfill is situated approximately 200m to the west of the Site and surface water from the landfill drains towards the Dargavel Burn upstream of the Site.

There is a fishing lake located approximately 200m south of the Site. This is a former sand and gravel pit, now flooded, although mineral extraction still occurs to the south of the lake. Figure 11.1 shows the location of these surface waters.

Samples for water quality analysis have been taken from Dargavel Burn and the Lake. (See Table 11.1 and Appendix 11.1). The sample from the fishing lake can be described as of good quality. Dargavel Burn was similar with the exception of elevated levels of K, Fe, Mn and hardness. There was no identifiable source for the chemical composition of Dargavel Burn. However, the burn accepts water from a number of surface drains in the vicinity and these may influence the chemical nature of water in the burn.

11.2.2 Groundwater

Four groundwater-monitoring boreholes were installed around the perimeter of the Site during January 2000, following consultation with SEPA and the architect (see Figure 11.1 for location). These monitor the depth to groundwater beneath the Site and have been used to assess groundwater quality prior to development. They are also to be used on a regular basis during site operations for audit purposes. The boreholes are installed to a depth of 5m below ground surface and the water table was found to be at between 0.4m and 2.3m below ground level immediately following installation.

The local groundwater flow is in a general north west to south east direction. The adjacent landfill (200m west of the Site) may therefore influence groundwater quality beneath the Site.

11.2.3 Groundwater quality

Water samples were taken to establish the baseline water quality beneath the Site and in watercourses near to the Site. The results are shown in Table 11.1. The results of this sampling show that water samples generally have low levels of metals, as defined by drinking water standards, with the exception of iron and manganese, which were elevated in most water samples taken. Water taken from piezometer 2 had an acidic pH (4.1).

A number of samples showed low levels of $CaCO_3$, which is a reflection of the softness of water in the area (i.e. less than 70mg/l $CaCO_3$).

Water taken from the adjacent Dargavel Burn exhibited elevated ammonia, potassium, iron, manganese, alkalinity and hardness.

Additionally, recent groundwater quality results have been obtained from the Council for the Lochar Moss landfill. These results are shown in Appendix 11.2 and indicate that groundwater within the landfill area has elevated levels of Mn, Fe and ammoniacal nitrogen (NH_4-N). An inference can thus be made between Mn, Fe and

NH_4-N generation beneath the landfill site and the occurrence in groundwater beneath the Development Site.

11.3 Potential impacts

11.3.1 Site drainage

On-site surface water drains (i.e. land drains and road drains) '*should carry only uncontaminated rainwater as they will lead directly to a local river, stream or soakaway*' (PPG1). Surface water collected from on-site drains can however carry silt and oil, which can pose a threat to both surface watercourses and groundwater.

11.3.2 Foul sewage

There is no public sewer system readily accessible, therefore any foul sewage arising from the Site requires on-site treatment and disposal.

11.3.3 Groundwater

The removal of soil to allow for construction will effectively reduce the depth of unsaturated ground over the water table, thereby increasing the potential for silts and, in the event of accidental spillage, oils to migrate to groundwater. There will thus be a short-term risk to groundwater from this source during the construction phase.

11.3.4 Site operations

The delivery and handling of specific waste categories and chemicals used during on-site processes may impact upon water resources. The potential for accidental spillage of chemicals or waste must therefore be minimised by the adoption of best practice, to be agreed in the Waste Management Licence.

11.4 Mitigation

11.4.1 Site drainage

The risk posed by silt and accidental oil spillages being carried through surface drains to water resources will be mitigated by the careful design of the drainage system and hardsurfaced areas, with a suitable interceptor or settlement tank and soakaway area being incorporated. These systems will be maintained and monitored by the operator on a regular basis and will follow guidance given in PPG1 and in '*A Guide to Sustainable Urban Drainage*' (SEPA/Environment Agency Publication).

11.4.2 Foul sewage

The design of the waste/foul water treatment system and discharge will follow guidance given in EA/SEPA PPG4 *'Disposal of sewage where no mains drainage is available'*.

The preferred option in this case is a Sequential Batch Reactor as described in Section 3.7.2.

11.4.3 Groundwater

The Development is to be constructed at a minimum height of 1m above the water table in order to protect groundwater from disruption and contamination. Groundwater will be protected from accidental spillage of fuel and oils by the surface drainage system and hardstanding areas around the Site. Additionally, water resources will be protected from accidental spillage by the adoption of best practice techniques including:

- the storage of chemicals in a designated area;
- the inclusion of cut-off valves and interceptor tanks in site drainage;
- specific waste handling routines;
- the use of bunds capable of containing 110% of any stored oils or fuels.

Periodic groundwater monitoring will be undertaken in order to assess the impact of the Development upon groundwater level and quality. The monitoring will also allow the assessment of nearby activities upon the Site (i.e. landfill, fuel and oil storage). The monitoring programme will follow recommendations given in Waste Management Paper 4 '*Licencing of Waste Management Facilities'*, relating to the frequency of sampling and the range of analytes, and will be agreed with both the Planning Authority and SEPA.

11.5 Residual impacts

The Development does not require a specific discharge to a receiving water course. Therefore, no residual impacts are predicted for surface waters. Protection of groundwater has been implemented by the design of a Sequential Batch Reactor for treating sewage and site drainage. The efficiency of the system will be audited by periodic analysis of groundwater quality. Sampling of adjacent surface water should also be undertaken periodically to audit the design parameters.

Table 11.1
Water quality results

Analyte		pH	SO_4^{2-}	As	Cd	Cr	Cu	Hg	Pb	Ni	Se	Zn	B	CN_{tot}	S^{2-}	Mineral oils	phenol
Unit		**units**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
Drinking water standards		**5.5-9.5**	**250**	**0.05**	**0.005**	**0.05**	**3**	**0.001**	**0.05**	**0.05**	**0.01**	**5**	**2**	**N/A**	**N/A**	**0.01**	**0.0005**
Sample ID	**Date**																
Dargavel Burn	20.01.00	7.1	0.01	<0.001	<0.002	<0.05	<0.008	<0.003	<0.05	<0.05	<0.003	0.004	0.7	<0.1	<0.2	<1	<0.01
Fishing lake	20.01.00	7.3	0.01	<0.001	<0.002	<0.05	<0.008	<0.003	<0.05	<0.05	<0.003	<0.001	0.5	<0.1	<0.2	<1	0.01
Piezo 1	01.03.00	6.9	0.02	<0.001	<0.002	<0.05	0.031	<0.003	<0.05	<0.05	<0.003	0.094	0.2	<0.1	<0.2	<1	<0.01
Piezo 2	01.03.00	**4.1**	0.13	<0.001	<0.002	<0.05	0.046	<0.003	0.052	<0.05	<0.003	0.159	0.2	<0.1	<0.2	<1	<0.01
Piezo 3	01.03.00	6.2	0.02	<0.001	<0.002	<0.05	0.040	<0.003	0.051	<0.05	<0.003	0.139	0.2	<0.1	<0.2	<1	<0.01
Piezo 4	01.03.00	6.6	0.04	<0.001	<0.002	<0.05	0.036	<0.003	0.071	<0.05	<0.003	0.095	0.3	<0.1	<0.2	<1	<0.01

Table 11.1
Water quality results contd.

Analyte		**EH**	**EC**	**DO**	**BOD**	**COD**	**NH_4-N**	**Cl^-**	**TON**	**TOC**	**Na**	**K**	**Ca**	**Fe**	**Mn**	**Alkalinity**	**Hardness**	**Suspended solids**	**NO_3^-**	**NO_2^-**	**PO_4^-**
Unit		**mV**	**µS/cm**	**%**	**N/A**	**N/A**	**mg/l**	**mg/l**	**N/A**	**mg/l**	**Mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**Ca mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
Drinking water standards		**N/A**	**1500**	**N/A**	**N/A**	**N/A**	**0.5**	**400**	**N/A**	**N/A**	**150**	**12**	**250**	**0.2**	**0.05**	**30 min**	**60 min**	**1500**	**50**	**0.1**	**N/A**
Sample ID	Date																				
Dargavel Burn	01.03.00	-	-	-	1.0	62	**9.3**	70	<0.1	194	65.8	**19.1**	32.8	**4.9**	**0.25**	175	164.3	16	<0.1	<0.05	<0.1
Fishing lake	01.03.00	-	-	-	2.0	52	<0.1	40	<0.1	45	14.2	1.8	17.2	**0.2**	<0.05	55	**35.5**	<5	<0.1	<0.05	<0.1
Piezo 1	01.03.00	+18	370	35	<1	<15	<0.1	20	<0.1	125	18.2	6.5	22.3	**1.2**	**0.88**	100	**45.4**	45	<0.1	<0.05	<0.1
Piezo 2	01.03.00	+141	440	26	<1	<15	**1.9**	40	<0.1	27	15.3	2.4	25.0	**0.4**	**2.34**	**<3**	**38.2**	<5	<0.1	<0.05	<0.1
Piezo 3	01.03.00	+10	288	39	1.0	36	**0.5**	30	<0.1	86	11.5	7.3	30.5	<0.1	<0.05	115	**28.7**	74	<0.1	<0.05	<0.1
Piezo 4	01.03.00	+12	365	43	<1	16	**1.2**	30	<0.1	43	37.1	5.3	23.4	<0.1	**1.32**	100	92.6	<5	<0.1	<0.05	<0.1

12 LAND USE, SOILS AND AGRICULTURE

12.1 Assessment criteria

This Section assesses the baseline land use, soil resources and agricultural activity in and near to the Site, and addresses issues relating to the following;

- *The potential disruption, disturbance and loss of agricultural land associated with the Development.* The potential impacts of the Development upon agricultural land and businesses are assessed, relating especially to the protection and conservation of 'prime quality' land (i.e. Land Capability Classification for Agriculture (LCCA) classes 1, 2 and 3_1).
- *The potential impact of the Development upon soil resources*. Such impact can include compaction, loss of soil structure, reduction in nutrient status and loss of soil fauna, which can occur during soil stripping, storage and replacement. This Section proposes mitigation to minimise harmful practices during soil movement.
- *The assessment of baseline ground contamination*. Potential contamination may already be present within the Site and this may have come from several sources, including earlier on-site activities, nearby industrial and landfill operations and aerial deposition. The ground contamination parameters are intended to establish the baseline level of specific contaminants (e.g. metals, oils, dioxins) prior to the commencement of the Development. Ongoing monitoring during the construction and operation of the Development is required to audit the effectiveness of mitigation measures.

12.2 Baseline conditions

12.2.1 Land use on site

The Site is restored pasture used for grazing. The area of pasture is divided by the access road to Dargavel Quarry, located approximately 250m to the south of the Site (see Figure 2.1). A ridge of sand and gravel has been quarried previously from the Site and the restored pasture is now well established.

12.2.2 Adjacent land use

The land adjacent to the Site is used for agriculture (pasture) and industrial activity including road haulage, truck sales and a fuel depot. There is woodland to the north east, south and west of the Site. The block to the south and west is a semi-mature (established) coniferous plantation whereas the woodland to the northeast is of naturally occurring, mature mixed woodland. There is also a small area of low-lying wet ground to the immediate east of the Site containing ungrazed rushes and grass.

12.2.3 Soils

The 1:250,000 Soil Survey of Scotland Sheet 7 (South East Scotland) shows the soil association of the Site as belonging to the Yarrow/Fleet soil association. The accompanying reference book states that this soil association consists of brown forest soils, peat and peat-alluvium component soils developed over fluvioglacial gravels and sands.

The description of a typical Yarrow/Fleet soil is given as '*Brown forest soils developed on sands. Stone free, sandy loam topsoil underlain by loamy sand horizons and by coarse sands in the deeper subsoil. The natural drainage is very free or excessive, the moisture retaining capacity of the soils is low and in dry periods crops are affected by drought*'.

Soils on the Site consist of a restored soil profile, typically of a shallow (5-10cm) humus layer containing numerous grass roots and decomposing vegetation over approximately 40cm of brown, sandy loam or loamy sand subsoil. This subsoil overlies coarse sand, becoming fine towards the base of the profile. There is a lens of peat located beneath the sand horizon in the western corner of the Site, which is typical of ground conditions in the region (i.e. wind blown sand deposits over peat). The soil profile demonstrates no mottling or gleying and is very slightly gravelly.

12.2.4 Drainage

There were no formal drainage provisions identified during the site inspection. Water percolates freely through the sandy subsoils to groundwater.

12.2.5 Land capability classification for agriculture (LCCA)

Gradient, soil structure and stoniness do not limit LCCA class at the Site. The 1:625,000 plan '*Assessment of climatic factors in land classification for agriculture in Scotland*' identifies the Site as being located within Zone 2 'minor climatic constraints'.

The soil profile is slightly droughty for grass and very slightly droughty to non-droughty for cereal crops and potatoes. However, taking into consideration the thin covering of topsoil across the Site, and the sandy subsoil beneath, the Site is considered unsuitable for arable cropping and is therefore considered as having an LCCA of Class 5.1.

12.2.6 Other farming interests

The Scottish Executive Rural Affairs Department is unable to make public information on those farms in the area that have applied for entry to the Organic Aid Scheme, a Government sponsored scheme which offers grants to assist with the conversion of farms from modern methods of production to organic methods. However, some information is available from a number of organisations with which organic farmers have to register for marketing purposes.

Scottish Organic Producers Association Limited records no member farms within 5km of the Site but three within 10km (Figure 12.1). The Soil Association has one member 'in the Dumfries area' and three in total within Dumfries & Galloway. The Biodynamic Agricultural Association (BAA) has two members in Dumfries & Galloway, both beyond 10km of the Site. It is thought that some 70 – 80 farms in Dumfries & Galloway are currently going through the conversion process (*Maggie Gordon BAA SW Scotland personal communication*) and that this could gather pace. The effect of this will be to increase the number of organic farms in the vicinity, which could be affected by the Facility.

12.2.7 Ground contamination

Samples of soil were taken from across the Site to determine baseline contamination levels. The parameters analysed included metals, dioxins and PCBs. The results are summarised in Table 12.1 and reported in full in Appendices 12.1 and 12.2.

These results show that soils within the Site are not significantly contaminated, although soil taken from Piezometer 4 in the west of the Site exhibited some Cu, Zn and oil contamination probably related to accidental spillage of oil during previous site activities or agricultural operations. The occurrence of this 'hotspot' is not considered as limiting the Development. There are no constraints to the Development related to acidity or sulphate content.

Table 12.1
Analytical results, soil samples

Analyte	Sample date	unit	ICRCL threshold value*	ICRCL action value*	Piezometer 1	Piezometer 2	Piezometer 3	Piezometer 4
pH	20/01/00	Units	<5	<3	8.1	8.0	7.6	8.6
B	20/01/00	mg/kg	3	Not specified	0.4	0.6	0.4	1.2
Cd	20/01/00	mg/kg	15	Not specified	<0.2	<0.2	<0.2	<0.2
Cr	20/01/00	mg/kg	1000	Not specified	30	25	28	73
Cu	20/01/00	mg/kg	130	Not specified	15	7	8	**259**
Ni	20/01/00	mg/kg	70	Not specified	29	21	24	41
Pb	20/01/00	mg/kg	2000	Not specified	6	5	3	595
Zn	20/01/00	mg/kg	300	Not specified	46	23	25	**1421**
SO_4^{2-}	20/01/00	mg/kg	2000	10000	<100	<100	100	100
Hg	20/01/00	mg/kg	20	Not specified	<0.3	<0.3	<0.3	<0.3
Se	20/01/00	mg/kg	6	Not specified	<0.3	<0.3	<0.3	<0.3
As	20/01/00	mg/kg	40	Not specified	3	5	4	5
Phenols	20/01/00	mg/kg	5	1000	<0.5	4.8	0.5	<0.5
Cyanide (total)	20/01/00	mg/kg	N/A	N/A	<1	<1	<1	<1
TEM/CEM (oils)	20/01/00	mg/kg	Not specified	Not specified	260	740	580	**7720**
S^{2-}	20/01/00	mg/kg	250	1000	<10	36	33	54
Dioxins and Furans	01/03/00	ng/kg	Not specified	Not specified	The total dioxin/furan content of the sample was 1300ng/kg, with a toxicity equivalent of 2.5			
PCBs	01/03/00	µg/kg	Not specified	Not specified	All PCB results were below the detection limit of 20µg/kg			

* NB values given are for parks, playing fields and open spaces or landscaped areas

A representative topsoil sample was analysed for PCB, dioxin and furan. PCB levels were below detection limits and dioxin/furan concentration was 1300ng/mg. The primary constituent of the dioxin/furan analysis was octachlorodibenzo-p-dioxin (OCDD) which has a very low toxicity equivalence factor. These results can be considered as an indicative background level for the area caused by general industrial development.

12.3 Potential impacts

12.3.1 Agricultural units

The Development will result in the permanent loss of approximately 1.6ha of restored agricultural land. A 200m length of access track, equivalent to approximately 0.1ha, will be re-routed around the eastern perimeter of the Site.

The Development will require the movement of approximately 6,800m^3 of topsoil, based on an average topsoil depth of 40cm across the Site. Subsoil will be generally left in situ.

12.3.2 Drainage

No formal drainage systems were identified on site or in the adjacent agricultural land. Therefore no significant impact is anticipated upon drainage of the surrounding agricultural land.

12.3.3 Soil resources

The movement and handling of soil has the potential to impact upon its texture, structure, biotic activity and fertility. The degree of damage to soils depends upon the soil handling techniques utilised during the construction and landscaping of the Site.

Some of the topsoil stripped from the proposed building footprint area will be used around the Site perimeter. This soil will be stripped and replaced in one movement, thereby negating the requirement for temporary stockpiling. The soil is unlikely to become degraded once landscape planting has been established on the screening mound. Soils stripped from the Site and not required for landscaping purposes or screening will be used off site possibly for the reclamation of the mineral workings to the south.

12.3.4 Land capability classification for agriculture

Development of the Site will result in the permanent loss of approximately 1.6ha of LCCA Class 5.1 land.

12.3.5 Other farm interests

The nature of the farm activity in the immediate locality of the application boundary is considered not particularly sensitive to the type of development. The nearest identified organic farms are located at sufficient distance not to be influenced either directly by the Facility or as a result of gaseous and particulate emissions from the stack. This issue is also considered with respect to ecological areas in Section 13.

12.4 Mitigation

12.4.1 Farm viability

The Site is currently used as grazing land by the landowner. The loss of this grazing land will not affect the viability of the farm holding.

12.4.2 Soil handling

Soil handling will accord with the best available techniques. In particular topsoil will be lifted using a tracked D6 dozer or similar and used for landscaping/screening purposes. The planting of the landscaping/screening mound with appropriate vegetation will ensure the protection of the soil from wind and rain erosion and will maintain biotic diversity and nutrient status. Handling will be undertaken when the soil is in a dry and friable state (i.e. below the plastic limit of the soil).

12.4.3 Drainage

The Site currently has no drainage, however, once constructed, the surface drainage system for the Site will either outfall to the Dargavel Burn or discharge to groundwater via a soakaway area and will include a suitable interceptor/settlement tank.

12.4.4 Land capability classification for agriculture

There are no measures proposed to mitigate the permanent loss of approximately 1.6ha of LCCA class 5.1 land.

12.5 Residual impacts

No residual impacts are predicted for the loss of agricultural land and adjacent land drainage.

Residual impacts associated with soil contamination will be directly influenced by the mitigating design of emission to air and water. The effectiveness of these mitigation measures can, therefore, be independently corroborated by periodic analysis of soils from sampling adjacent to the Site. A programme for sampling will be implemented as devised in the Waste Management Licence.

13 FLORA AND FAUNA

13.1 Assessment criteria

This section identifies sensitive habitats or species associated with the Site, or near to the Site, which may be affected by the Development and describes measures to minimise impact. All types of habitat and species are considered, including terrestrial and aquatic, animal and plant.

Guidance is taken for this Section from NPPG 14 *'Natural Heritage'*, which gives guidance on Government policies relating to the conservation and enhancement of Scotland's natural heritage. Consultation has been sought with Scottish Natural Heritage, the Scottish Wildlife Trust, the Royal Society for the Protection of Birds, Dumfries & Galloway Farming and Wildlife Advisory Group and Dumfries & Galloway Council's Biodiversity Officer to determine whether any sensitive habitats or species may be affected by the Development.

13.2 Baseline conditions

13.2.1 The Site

The Site consists of approximately 1.6ha of restored pasture used for grazing with a further 0.3ha of access road. The pasture is defined entirely by post and wire fence and there are no hedgerows present within this boundary.

13.2.2 Immediate vicinity

There is an established, semi-mature coniferous plantation located to the immediate south and west of the Site (see Figure 2.1). This plantation is approximately 170m by 100m in size and has an estimated age of 20 years. The plantation is predominantly non-native Sitka spruce with some larch, ash and alder interspersed. There is no significant herbaceous understorey beneath the tree canopy.

To the immediate north of the Site is a short length of bridleway with sparse hedgerow alongside. This hedgerow, approximately 50m in length, contains gorse and broom with a herbaceous understorey. The hedgerow also has a number of Sitka spruce and leylandii planted within it. The bridleway continues to the north east of the Site and mature hedgerow containing hawthorn, elder and beech with a herbaceous understorey delineate this section.

An area of wet ground is situated to the east of the Site, with a small burn running through it. This area contains unmanaged grass and rush species. To the immediate east of this area, there is a band of mature trees, mainly birch but also containing some

pine and spruce. This strip of woodland is approximately 30m in width and 200m in length.

The small burn that runs to the east of the Site flows into the Dargavel Burn, which passes within 40m of the southern boundary of the Site. This watercourse is of poor quality as it receives leachate draining from the Lochar Moss landfill site to the west. The bank side of the burn consists of typical waterside herbaceous species.

13.3 Nature conservation context

13.3.1 The Site

Because agriculture is such a dominant industry within Dumfries and Galloway, farmland is classified as one of a number of a local priority habitats within the Dumfries & Galloway Local Biodiversity Action Plan 1999 (the LBAP). This means that it has been identified as amongst the most in need of conservation action.

Farmland comprises a mosaic of habitats, many created and maintained by farming practices. These include improved pasture, wood pasture, marshy grassland/rush pasture, single trees, shelter belts/field corner plantings, scrub, arable stubble and arable weeds, grass headlands, cereal field margins, water margins, boundary features such as hedgerows and dykes, road and track margins, beetlebanks, ponds and farm buildings. Of these, only improved pasture, grass headlands and track margins feature on the Site.

Each priority habitat in the LBAP has a number of key species associated with it. These may be plants, birds, animals, or insects, which are categorised as being of Local Conservation Concern and may comprise species which are locally rare or under threat or simply those that are 'typical' or characteristic of the area. Of the 34 key species associated with farmland habitat, only the kestrel, buzzard and barn owl are know to frequent the Site. Of these, the barn owl is categorised as a Local Priority Species ie. one to which is attached the highest local importance and for which a separate Species Action Plan will be written (not written at June 2000).

The Site does not lie within a nationally designated Environmentally Sensitive Area (ESA) designed to help conserve specific areas of the countryside where landscape, wildlife or historic interest is of particular importance. Nor is the Site managed under the Countryside Premium Scheme, which, like ESA's, encourages land managers to adopt environmentally friendly farming practices and to manage specific habitats and features in the interests of conservation.

The Site is not part of a farm, which has converted to organic methods of food production.

13.3.2 Local areas of ecological importance

The Consultative Draft Local Plans for both Nithsdale (December 1999) and Annandale & Eskdale (February 2000), and Scottish Natural Heritage's Inventory of Ancient, Long Established and Semi-natural Woodland (1989) identify a number of sites of international, national and local conservation importance which contain lichens and mosses which are particularly sensitive to air pollution.

Locharbriggs Quarry, a Site of Special Scientific Interest (SSSI) and a Nature Conservation Site of National Importance, lies within 5km of the Site. Whitehill East Wood is also located with 5km, and is a Site of Local Nature Conservation Importance. The Scottish Wildlife Trust's Nature reserve at Fountainbleu and Ladypark is a fen with recent native woodland colonization on mineral rich water where the Bottle Sedge (*Carex Rostrata*) thrives. This site is not officially listed but is noted nevertheless.

There are a number of other sites of conservation interest located within 10 km of the Site. These are identified on a habitat map produced by Scottish Natural Heritage (see Figure 13.1) as follows:

- The Inner Solway Estuary to the west. This is a RAMSAR Site of International Importance and a Special EC Protection Area for the Conservation of Wild Birds. A part of this estuary habitat comprises the Upper Solway Flats and Marshes SSSI, and a candidate Special Area of Conservation (SAC);
- Longbridgemuir and Lochar Moss candidate SAC to the south;
- Castle Loch, a RAMSAR Site of International Importance and a designated Special Protection Area located to the east of the Site. This is also a SSSI, as are the neighbouring and associated Lochmaben Lochs;
- Hightae Mill Loch, a Local Nature Reserve close to Lochmaben Lochs;
- Black Loch SSSI to the north;
- Kirkconnel Flow to the south west, a raised mire with SSSI status and a Local Nature Reserve;

Also within 10 km are a number of other Sites of Nature Conservation Interest. These include:

- Carnsalloch Shingle Bank to the west;

- Long Wood and Tower Wood, Dalscairth, Lochaber Loch Forest Enterprise Nature Reserve, and Holewood and Craigbill to the south west;
- Water of Ae (Shieldhill Bridge to Snade Ford) to the north.

Although they have designated status, raised mires at Craigs Moss, Racks Moss and Ironhurst Moss to the south west are considered important despite their being under coniferous plantation, not only because open space within the plantation allows mosses to continue to grow, but also because when the plantation is clear felled there will be an opportunity for these mosses to recover their former position. A similar situation exists with Lochar Moss to the north, which has recently been clear felled, and at the raised mire at Heathhall which is partially planted with conifers.

The existence of lichen growth on trees is considered to be most important in the context of ancient woodland in the area. Within 5 km of the Site to the north are Barr Shaw and Cotland Linn near Amisfield. To the north west is Milnhead near Kirkton, to the south east a wood at Greenlea, Collin, and to the north east Side Burn and Side Linn Woods near Tinwald. Within 10 km to the north west lie Quarrel Wood and three woodlands close to Portrack House and Cowhill Tower. To the south east lie Bankswood (near Bankend) and two areas of woodland close to Comlongan Castle, Clarencefield. To the north east are a number of small woodlands in the Shieldhill area.

Semi-natural woodlands and long established woodlands of plantation origin will support the growth of lichens. A number of long established woodlands within 5 km of Dargavel are shown in Appendix 13.1.

13.4 Potential impacts

13.4.1 The Site

Development of the Site will lead to a loss of 1.6ha of improved grassland. In the LBAP Proposals for Action for Farmland Habitats (LBAP page 70) it is recommended that improved grassland be used for potentially damaging activities in preference to more sensitive habitats. There will also be a loss of approximately 100m of grass headland and a further 100m of track margin. These are all potential feeding sites for kestrels, buzzards and barn owls. However there will be no loss of roosting, perching or breeding sites for these birds.

13.4.2 Regional habitats in the immediate vicinity and beyond

Potential impacts, which may occur, relate to air emissions from the stack and to changes in water quality arising from site drainage into the Dargavel Burn.

The Plant will release NO_X and SO_2 gasses into the atmosphere from its stack. This has the potential to impact upon soil characteristics, via deposition, and upon the growth and development of lichens and mosses, which are sensitive to air quality. However, the predicted ground level concentrations of NO_X and SO_2 are predicted to be significantly lower than the recommended concentrations specified in the air quality objectives for the protection of vegetation and ecosystems (see Section 9).

In addition, surface drains and foul sewage from the Site has the potential to impact upon the water quality of the receiving water and therefore aquatic habitats, if uncontrolled.

13.5 Mitigation

13.5.1 The Site

Approximately 1ha will be covered by the Development. The detailed plans that accompany the planning application show that, of the remaining 0.6 ha of undeveloped land, 0.4ha along the north eastern perimeter will be planted with a variety of native broadleaved trees and shrubs, namely scots pine, rowan, birch and broom. Along the north west perimeter there will be planted a hedge comprising hawthorn and dog rose. The farm road that currently runs through the Site will be re-routed to the east and will allow the re-establishment of the track margin vegetation. 0.2ha of open ground on the south eastern perimeter will be sown with a wild flower mixture to reflect the natural communities found in the surrounding area using seed of local provenance if possible.

These measures will result in a minor improvement in bio-diversity on the Site in keeping with the LBAP objective that there should be no net loss of biodiversity as the result of development.

13.5.2 Air emissions

Emissions from the Plant are minimised by the process technology and the flue gas abatement techniques employed. Further discussion of this is given in Section 9.

13.5.3 Discharges to watercourses

The Site surface drainage system will incorporate an interceptor tank and porous rock filled spillways. Foul water produced by the process will be collected in underground vessels before being piped back into the process Plant within the building. Regular monitoring of surface waters and groundwater from around the Site for audit purposes will ensure the continued protection of aquatic habitats.

13.6 Residual impacts

No residual impacts are predicted.

14 MATERIAL ASSETS

14.1 Assessment criteria

Assessment has been made to the general guidance given in PAN 42 *Archaeology, the Planning Process and Scheduled Monument Procedures,* NPPG 5 *Archaeology and Planning* and NPPG 18 *Planning and the Historic Environment.*

14.2 Architectural heritage

The Development will be situated on an area of land, which has been previously quarried for sand and gravel, and is now restored to agricultural land. There are no buildings within the Site, and the buildings in the neighbouring Dargavel Stores industrial estate are mainly modern portal frame buildings, and do not include any listed buildings. Therefore, there will be no direct impact associated with the Development.

Within the wider area, Torthorwald Castle, a Scheduled Ancient Monument, is the most significant site. The Development will not have a direct impact upon Torthorwald Castle. The visibility of the Facility from the Castle has been addressed in Section 6 of this Environmental Statement, and assessed as being of slight to negligible impact.

14.3 Archaeological heritage

The Development will not directly impact upon any known site of value. There are no records held on Dumfries and Galloway's Sites and Monuments Record for the area concerned.

14.4 Cultural heritage

A short section of footpath follows the north western boundary of the Site and has open views into the Site. This footpath is a public right of way used throughout the year and annually each summer during the Dumfries Riding of the Marches. There is a potential impact on public safety. This will be mitigated by routing the new access road to the quarry alongside and to the south of the Right of Way. HGV traffic will be advised to slow down as it approaches the entrance gateway to the Site by use of appropriate warning signs. Footpath users will have sight of any traffic approaching the footpath well in advance. The potential visual impact has been assessed in Section 6 of this Environmental Statement. The access road will cross the footpath to the east of the current access road to Dargavel Quarry.

No HGVs will move onto or off the Site as the annual Riding of the Marches ride-out passes the Facility. Therefore, the safety of footpath users will not be prejudiced.

15 OTHER ISSUES

15.1 Vibration

The operation of the Facility will involve moving machinery such as turbines, mobile plant for loading and lorry movements. The Plant itself will be constructed in order that ground borne vibration is minimised, by isolating vibrating machinery from direct contact with the ground. Vehicle movements will not create an adverse impact with respect to vibration due to the distance from the Site access to the nearest residential properties. Operation of any other machinery on Site, e.g. for handling waste, should not create ground vibration.

It is not anticipated that the operations will result in sufficient ground borne vibration reaching the neighbouring properties at Barton's House and Ashwell, and as such will not be a significant impact during continued operation.

Vibration impacts during construction and decommissioning will be addressed through conditions in a Prior Consent Notice.

15.2 Heat

The process by its nature produces heat. Additional heat, which is not utilised by the power generation turbines, will be dissipated using the roof mounted dry coolers. This technology completely removes the potential for pluming, which is often associated with non-enclosed systems such as cooling towers. The process machinery will be housed within the roof, and will be sufficiently insulated to ensure safe operation of the Plant, and safe conditions for staff. Thermal energy emissions from the process will not have a significant impact.

15.3 Radiation

Waste will be screened to ensure that the Facility does not accept radioactive wastes. The operation of the Plant will not generate radiation, and therefore, there will be no impact radiation.

16 ENVIRONMENTAL MANAGEMENT AND MONITORING

16.1 Environmental management

The Environmental Impact Assessment has highlighted the following areas where environmental management will form an integral part of the operational practices at the Facility. These are detailed as follows:

- protecting the amenity of residential areas from the impacts of noise and air emissions;
- landscaping measures to protect the visual amenity of residential properties, roads and footpaths;
- protecting local ecological habitats from the impact of emissions to air;
- protecting soils, surface and groundwater from contamination during construction, operation and decommissioning.

16.2 Register of effects and releases

The environmental management schemes will require that a programme of monitoring is implemented to document the effects on, and releases to, the environment associated with the Facility. Table 16.1 provides a monitoring strategy for the Facility.

Table 16.1
Monitoring effects and releases to the environment from the Facility

Potential impacts during	Monitoring	Comments
Construction	Noise and vibration	At nearest property in accordance with conditions suggested in Appendix 8.2
	Surface and groundwater	Monitoring through established piezometers
	Air emissions	Air quality monitoring
	Traffic	Record all traffic to the Site
Site operations	Noise	In compliance with IPPC authorisation
	Air emissions	In compliance with IPPC authorisation
	Surface and groundwater	Monitoring through established piezometers
	Soils	Comparison with baseline data
	Traffic	Record all traffic to the Site
Decommissioning	Noise and vibration	As for construction
	Surface and groundwater	Monitoring through established piezometers
	Air emissions	IPPC authorisation
	Traffic	Negligible
	Soils	Comparison with baseline data

16.3 Environmental management systems

The legal framework for monitoring emissions is set out in Part 1 of the Environmental Protection Act (1990) which introduced the concepts of Integrated Pollution Control (IPC) and Local Authority Pollution Control (LAPC). The proposed operations will now require authorisation to the Integrated Pollution Prevention and Control (IPPC) Regulations, following the introduction by the Scottish Parliament in August 2000 as a result of the enabling legislation, The Environment Act, 1995.

The IPPC permit will specify the methodology, frequency and analytical techniques to be used in programmes for monitoring releases from installations. To enable SEPA to check compliance with the conditions of the permit, the Applicant must regularly inform SEPA of the results of the monitoring programmes, and without delay, of any incidents or accidents that would significantly affect the environment.

The Applicant will operate the Facility to quality and safety management systems, as specified by Compact Power Limited. As such, environmental management will be integrated into the operational quality and safety management to give a single management system. The Applicant will seek certification to recognised national and international standards such as ISO 9001 *Quality Management Systems* and ISO 14001 *Environmental Management Systems*. Certification will be audited by a recognised accreditation service.

NON TECHNICAL SUMMARY

17 NON TECHNICAL SUMMARY

17.1 Introduction

In November 2000, BATNEEC (Dumfries) Limited, the Applicant, submitted a planning application for an advanced energy recovery facility at Dargavel, Lockerbie Road, Dumfries. BATNEEC (Dumfries) Limited is a joint venture company, combining the technical resources of Compact Power with the development focus of SHREWS Limited, a Scottish based company, to promote the use of an advanced thermal conversion technology for energy production and waste management.

This Environmental Statement has been prepared by Wardell Armstrong on behalf of the Applicant as a requirement of the Environmental Impact Assessment Regulations (Scotland) 1999, and in response to the scope of assessment requested by Dumfries and Galloway Council.

The Environmental Statement provides a detailed description of the Development, identifies the potential impacts on the environment and considers the alternative sites and options for handling the specified wastes.

17.2 Site description

The Site is an area of open land, currently used for agriculture to the south west of Dargavel Stores industrial estate. Dargavel Stores is located approximately 2.5 km to the east of Dumfries, adjacent to the A709 Lockerbie Road (see Figure 1.1). There are a number of different businesses operating from Dargavel Stores, which are generally related to the agriculture and haulage industries. These occupy a number of mainly older industrial and agricultural buildings and associated diesel storage tanks and open hard standing.

Access to Dargavel Stores is gained from the roundabout at the junction of the A709 Dumfries to Lockerbie Road and the unclassified Catherinefield Road. The Site is located some 250m south of the roundabout on land previously used for mineral extraction and now restored to agriculture (see Figure 2.1).

17.3 Description of the Development

The Development is an advanced thermal process designed to produce electricity from a range of solid wastes. The process of pyrolysis, gasification and high temperature oxidation converts solid wastes into simple gases, which can then be combusted to produce energy.

Compact Power Limited was established in 1992 and has developed a proprietary technology for the production of energy, (combined heat and power) from a range of wastes. The Technology has been designed as a small-scale facility to provide a local solution for waste management. In a prototype development it has been demonstrated that these processes can be controlled such that the highest relevant environmental standards on emissions can be achieved.

The first full-scale prototype plant was built in 1994 at Finham near Coventry. It comprised a single tube pyrolyser with a throughput capacity of 3,000 tonnes a year. Between 1994 and 1997 a series of trials were conducted on a variety of wastes, including de-watered sewage sludge, municipal solid waste (MSW), clinical waste, waste from vegetable oil refining, tyre crumb and coal slurry.

The first fully operational plant at Avonmouth, Bristol has been constructed and commissioned. The process units are modular in construction, with each unit capable of accepting 30,000 tonnes of waste per year. The facility at Avonmouth is based on a single unit.

The Development will have two pyrolysis units with three gas combustion streams capable of handling up to 60,000 tonnes of waste per year. The power production from the plant will generate up to 7.8 MW of electrical energy that will be supplied to the national grid.

The Development consists of the following elements (see also Figures 3.1, 3.2 and 3.3):

- A perimeter fence and entrance gate enclosing a 1.6ha development site
- Steel or aluminium profile panel clad building providing 4390m^2 of internal floor space. The height of the building to the apex of the roof is 15m. The building form is similar to others at Dargavel Stores, although larger in dimension.
- A flue stack of 20m in height that will protrude from the roof of the building.
- External car parking space and concrete hard standing storage space.
- External landscaping including woodland, hedging, and wildflower meadow.
- External lighting to be located on the building and at the perimeter fence.

The access road from Dargavel Stores to the Development will be upgraded to take road traffic.

The existing access to Dargavel Quarry will be re-routed to the east of the perimeter fence. These works to access roads amount to a further 0.3ha. The total area within the application boundary amounts to 1.9ha.

There are some solid and gaseous wastes produced, which will be of low hazard solid waste, principally ash will be disposed of to landfill if no other use can be made of it. Gaseous emissions will disperse into the atmosphere via a stack.

The Facility will operate 24 hours a day, but waste deliveries to the Facility by road will only take place between 0800 hours and 1800 hours Monday to Friday and between 0800 hours and 1230 hours on Saturday. The operation of the Facility will require 14 full time skilled and semi-skilled employees, and will create other jobs in the area for the servicing and maintenance. As a key element of an integrated waste management scheme up to 45 jobs could be created. Employment opportunities will also be created during the construction phase.

17.4 Planning policy guidance

The proposal is set within the context of EC, UK and Scottish policies on waste management and renewable energy, and allows the Council to meet its obligations under the Waste Management Licensing Regulations 1994. The proposal also meets the land use criteria expressed in National Planning Guidance and in the Council's Development Plan. The requirements of the Structure Plan and Draft Consultative Local Plans have been addressed in this Environmental Statement.

Alternative waste disposal technologies have also been assessed, and the technology has been analysed with respect to types of wastes for which the Facility provides the Best Practicable Environmental Option (BPEO).

The public has been consulted in the course of the development of this proposal prior to its submission for planning permission. It is intended that this process of public consultation will continue as the application is being determined.

A community liaison group will be set up to act as a channel for local people throughout the construction and operation of the Facility.

17.5 Scoping and consideration of alternative sites

The proposals have been subject to a scoping exercise when the main potential impacts were identified, and these have been addressed using standardised environmental impact assessment techniques.

The scoping exercise identified the following environmental factors that required further assessment:

- landscape and visual impact;

- traffic;
- noise;
- air quality;
- odour;
- surface and groundwater;
- land use;
- fauna and flora;
- material assets.

Alternative locations have been considered and judged on their advantages and disadvantages, and as a result of this process the site at Dargavel was identified as the preferred location.

17.6 Landscape and visual impact

The main elements of the Facility have been identified in the description of the Development. Other than the delivery, all wastes will be handled within the building, therefore the primary landscape and visual impacts are associated with the type of building structure, the stack and associated external works.

The assessment of the Development has been undertaken by a combination of field assessment and computer techniques to analyse visibility and the form of the building within the local landscape setting.

The visibility of the Development is restricted to a relatively small visual envelope. The proposed building will be visible from nearby vantage points, for example nearby residential properties and the adjacent footpath. Figure 6.3 provides an impression of the proposed building when viewed from the roundabout junction on the A709. The point from which the photograph was taken is identified on Figure 6.2. The existing buildings in the adjacent industrial estate are of a similar nature and it is considered that the additional building in this Development will result in relatively small change. From longer distances the building will merge with the other existing buildings. The flue stack will be a new element in the landscape, which would be identifiable and attributable to the Development, particularly when viewed from nearby positions. It is also possible that water vapour emissions from the stack, during occasional weather conditions would increase the visibility of the Facility particularly on higher ground to the east of the Site.

The existing adjacent landscape uses are of a similar nature and therefore it is considered that the siting of the Development will not detract from the landscape setting.

A mitigation strategy has been produced for the Development. This strategy includes additional woodland planting. The planting proposals will have a positive impact on the landscape whilst reducing the degree of visual impact for receptors to the east of the Site.

17.7 Traffic

The Site has access through Dargavel Stores to the A709, which forms part of the local strategic route network. The A709 also provides direct access to the primary route network via roundabout junctions with the A74 (M) and A75, which are designated special and trunk roads.

The additional traffic associated with the Development will not make a significant impact upon current road traffic volumes, as the majority of traffic journeys will be locally derived within Dumfries and Galloway. The Facility will reduce the volume of waste transported away from the local area for disposal.

The access to the Site will be upgraded to an acceptable standard for road traffic. The existing access to the quarry will be relocated to the eastern perimeter of the Site.

17.8 Noise

A noise survey has been performed to establish the existing, or baseline noise environment. The monitoring location was chosen to represent the nearest residential properties to the Facility, i.e. Barton's House and Ashwell. The survey, which continued through the day and night period, demonstrated that the area is quiet due to its essentially rural character. To a small extent, traffic noise contributed to the noise environment.

Noise from the Development will be primarily associated with HGV traffic delivering waste to the Site, because the majority of operations will be within the building except for occasional storage requirements outside.

The noise associated with the operation of the Development can be effectively mitigated by the design of appropriate acoustic cladding to the building and also location of fans and ventilation equipment. Data on the acoustic cladding, required for the building, will be made available following the implementation of a similar facility located in Avonmouth, Bristol.

Criteria for appropriate noise conditions to protect the noise environment have been specified for the construction and operational phases of the Development. During operation separate noise limits at the Site boundary have been recommended for day and night time periods.

17.9 Air quality

An assessment has been made of the potential air quality impacts arising from the operation of the Plant. This has been undertaken using emission rates set out in the European Council Directive on Hazardous Waste Incineration (94/67/EC). Data obtained from trials undertaken using a prototype plant established at Finham, Coventry has demonstrated that the emissions measured during the operation of comparable Compact Power Technology are well within the limits set out in the Directive.

Emissions have been modelled by using the USEPA-approved ISCView dispersion model based on 5 years of hourly sequential meteorological data from the Prestwick Meteorological Station. The use of data from this meteorological station was agreed with SEPA. The climate data has been compared with more recent data from a weather station at Drungans and shown to be comparable.

The analysis of the Compact Power process indicates that, taking account of modern abatement technology, emissions to air will result in minimal impact in terms of localised air quality. In particular the basic design of process and state of the art exhaust gas treatment will ensure very low emissions of the primary pollutants such as acid gases, particulates and carbon monoxide.

A comparison of worst case ground level concentrations arising from the process and recently adopted ambient air quality objectives reveals that the operation of the Plant will not compromise the existing and future good air quality in the surrounding area.

17.10 Odours

The Site is located in an area, which enjoys generally good air quality. There are two potential sources of odour from existing activities in the locality, namely Lochar Moss landfill site and transport and agriculture related activities at Dargavel Stores. The influence of these activities with respect to odours has not been quantified, as they are unlikely to be discernible to any appreciable degree at the Site.

Odours may result from decomposition of organic waste delivered to the Facility. The primary source of odours has been identified as waste handling and storage prior

to feeding into the pyrolysis chamber. These activities will be contained within the building.

The air within the building will be circulated through the pyrolysis & gasification system, introducing fresh air from outside. The building will be maintained under negative air pressure to minimise emissions. Self-closing doors for both pedestrians and vehicles would minimise the period when a potential pathway for odour dispersal exists. It is considered that as a result of these mitigation measures, the Development will not increase the potential for odour emissions.

17.11 Water resources

Surface water resources include a small drainage ditch located approximately 30m to the north east of the Site. This ditch enters the Dargavel Burn, which passes within 40m of the southern boundary of the Site. Groundwater is at a depth of approximately 1.6m below ground level.

Water quality has been determined for both groundwater and surface water. Groundwater samples have been taken from four monitoring boreholes, and compared against the results of groundwater analysis for the nearby Lochar Moss landfill site, to the west of the Site. Water samples have also been taken from the Dargavel Burn and from a small fishing lake located approximately 200m south of the Site. The findings of this analysis demonstrates that most parameters are within drinking water standards, with the exception of ammonia, iron, manganese and hardness. The occurrence of ammonia, iron and manganese in the groundwater may be linked to the generation of leachate, and its migration, from the adjacent Lochar Moss landfill site.

Potential impacts identified relate to the surface drainage, foul water (sewage) disposal and accidental spillage of oil, fuel and wastes around the Site.

Mitigation measures are in accordance with PPG1 '*General guide to the prevention of water pollution*' and PPG4 '*Disposal of sewage where no mains drainage is available*'. Further recommendations from '*A Guide to Sustainable Urban Drainage*' (SEPA/Environment Agency Publication) have been considered in the site design.

A periodic monitoring program will also be developed, in agreement with the local authority and SEPA, to assess changes in groundwater quality and depth, using four groundwater-monitoring boreholes installed around the Site perimeter.

17.12 Land use, soils and agriculture

The Site consists of approximately 1.6ha of restored pasture, currently used for grazing, a short length of unmetalled access road to the quarry and land required to divert the quarry access equivalent to approximately 0.3ha. Adjacent land uses include pasture, sand and gravel quarry, landfill site and road haulage contractor's premises. To the south and west of the Site is a semi-mature coniferous plantation and to the north east there is wet grassland and mature woodland.

The restored soil profile comprises approximately 5-10cm of dark brown loam over 40cm of brown sandy subsoil. The soils are situated over coarse sands, becoming finer with depth. A lens of peat has been identified beneath the sandy subsoil in the north west corner of the Site. There are no formal drainage provisions either on the Site or in the adjacent agricultural land. The Site is graded as LCCA Class 5_1 (unsuitable for arable agriculture) because of the thin topsoil and droughty subsoil.

Soil samples were analysed for a range of potential contaminants, including dioxins and PCBs. The results show that soils on the Site are not contaminated and will not constrain the Development.

The Development will result in the permanent loss of approximately 1.6ha of restored pasture and will require the re-routing of approximately 100m of access road. The remaining part of the application relates to upgrading of existing roadway within Dargavel Stores. Topsoil stripped during the development phase will be placed directly for landscaping purposes and there will be no significant impacts on soil resources, agricultural businesses or drainage.

17.13 Flora and fauna

The Development is situated on a site with low nature conservation value, which is part of restored sand and gravel workings now used for grazing.

No potential impacts have been identified with respect to the Site itself. The results from the air dispersion modelling have been assessed with reference to areas of known ecological interest in the locality and no potential impacts have been identified. Emissions to land, water and air have been assessed in other sections of the Environmental Impact Assessment where measures to minimise the impact of the Facility on adjacent areas of land are addressed.

Sensitive ecological areas have been identified within the wider area. However since no breaches in Air Quality Standards have been identified the impact on sensitive ecological sites is considered to be minimal.

The planting of native tree and shrub species and a wildflower mixture will ensure no net loss of biodiversity.

17.14 Material assets

The impacts of the Facility on the material assets of the Site have been addressed in terms of architectural, archaeological and cultural heritage. There will be no direct impact from the Development as the land is restored from quarry workings. The indirect impacts upon visibility from Torthorwald Castle and the adjoining footpath are not significant, and are likely to be reduced by the proposed planting along the Site perimeter. The safety of footpath users will be ensured by the use of an appropriate traffic management scheme.

17.15 Other issues

Remaining issues, which have not been individually assessed within the Environmental Impact Assessment, have been considered in this Section. The potential impact from vibration, heat and radiation are not significant and no specific mitigation measures identified. The issue of night lighting has been considered and appropriate mitigation measures have been incorporated into the design.

17.16 Environmental management and monitoring

The Environmental Impact Assessment has identified detailed mitigation measures that require implementation during the life of the Facility. These monitoring requirements have been scheduled, although it is anticipated that these may be modified or added to as a result of the application consultation process. The Integrated Pollution Prevention and Control authorisation will also require specific monitoring programmes devised in order to facilitate the control of impacts and provide suitable auditing measures during the operation of the Facility. This application to SEPA will be submitted in due course.

GLOSSARY OF TERMS

Air quality standards	National Air Quality Standards unless otherwise indicated
Ambient noise	The all encompassing A weighted sound pressure level over a given time interval, T
Background Ambient Air Quality Data	Data on background ambient air quality collected from the sources identified in Tables 9.2, 9.3, and 9.4
Background noise level, $L_{90,T}$	The A weighted sound pressure level of the residual noise at the Assessment position that is exceeded for 90% of a given time interval, T
Best Available Techniques	The level of pollution control required for sites regulated under the Environment Act 1995. Includes the technology and management of the site to prevent the release of prescribed substances, or to reduce the release to a minimum and to render harmless any other substances that might cause harm if released
Biodiversity	The variety of life forms found in a local area
Biodiversity Action Plans (BAP)	One of a family of initiatives arising from commitments entered into by the UK Government at the Earth Summit in Rio, 1992. The purpose of the plan is to develop a strategy for the conservation and sustainable use of biological diversity.
Black smoke method	A method of determining the concentration of suspended particulate matter
Calorific Value	The energy liberated by a substance when burned in oxygen expressed in calories
Clinical wastes	Arises from healthcare and other premises and are defined in the Controlled Waste Regulations 1992. Some clinical waste may be classified as special waste
Commercial waste	Waste from commercial premises, shops, offices etc
Countryside premium scheme	A scheme to enhance agricultural land by reducing intensive agricultural practice
Development Plan	Comprises any Structure Plan, Local Plan, Unitary Development Plan and any old style development plan currently in force in Dumfries and Galloway
Difficult wastes	Wastes which could be harmful, or which present handling problems during disposal, due to their physical, chemical or biological properties

Dumfries & Galloway Sites and Monument Record	A record of all known archaeological sites of merit
Environmental Impact Assessment	A rigorous and systematic analysis of the impacts of a development on the Environment
Environmental Statement	The report containing the finding of an Environmental Impact Assessment
ESA	Environmentally Sensitive Area
Facility	The proposed Development once it is fully operational
Gasification	The conventional “water gas” reaction
Groundwater	Water occurring in permeable underground strata, for example chalk and limestone
Hazardous waste	Wastes with one or more defined hazardous characteristics are defined as “hazardous waste” under the Hazardous Waste Directive (EC/689/EEC). The hazardous waste list includes over 200 wastes under 20 categories
Household waste	Domestic, solid waste or MSW
Industrial waste	Waste arising from industrial premises, this would also include waste arising from industrial canteens etc, which is similar to Municipal waste
Inert waste	Wastes that are non-reactive or that do not cause pollution when deposited. Examples of such waste include naturally occurring rocks and soil, ceramics, unused mineral products, uncontaminated masonry, brick, concrete or rubble
Integrated waste management	The development and delivery of waste management systems and services, which with a high degree of planned efficiency and an acceptable balance of cost and benefit, are capable of minimising the level and hazard of waste produced, maximising resource use efficiency and value recovery from the wastes that are produced whilst protecting the environment and human health
IPC	Integrated Pollution Control, now being phased out and replaced by IPPC (see below)
IPPC	Integrated Pollution Prevention and Control regulations brought into force by the Environment Act 1995
ISO14001	An information accreditation system for Environmental management systems

ISO9001	An information accreditation system for Quality management systems
$L_{Aeq,T}$	The equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that within a specified time interval, T has the same mean-squared sound pressure as a sound that varies with time
LAPC	Air Pollution Control under the control of the Local Authority (Part B processes)
LCCA	Land capability and classification for agriculture, a system for grading agricultural land in Scotland
Life cycle analysis	A tool in assessing the overall impact of a particular product or management option through its "life cycle"
Local nature reserve	Reserve identified in Local Plan, of local/regional importance
Local Plan	The development plan which sets out 1) policies arising from the principle of the Structure Plan. 2) Basis for development control. 3) Co-ordination and direction for the development and other use of land. 4) To bring local planning issues before the public
Local priority species	Identified in the BAP for conservation and enhancement
L_{WA}	The sound power level is the total amount of sound energy emitted by a particular noise source. It is the measure of sound energy output of a source, independent of the environment in which the noise source is measured.
National air quality objectives	Identified in the Air Quality (Scotland) Regulations 2000 as the future standards for local air quality
National air quality strategy	A formal statement of government policy to improve air quality, requires the assessment and management of ambient air quality. The initial phase includes extensive monitoring of air quality.
National Waste Strategy	A strategy determined by SEPA as a requirement of the Environment Act 1995
Nature conservation site of national importance	Identified by SNH and given protection in Local Plans
Non hazardous waste	Refers to waste with no particular hazard relating to its handling or disposal but with a reactive property, which means that it is not inert

NO_X	Generic term for nitrogen oxides, including nitrous oxide (N_2O), nitric oxide (NO) and nitrogen dioxide (NO_2)
NPPG	National planning policy guidance produced by the Scottish Executive
Oxidation	Introduction of air to the process. Thermal oxidation results in the complete combustion of organic matter
Planning Advice Notes (PAN)	Provide advice on good practice and other relevant information, issued by the Scottish Executive
PM_{10}	Particulate matter with a diameter of 10 micrometers or less
PPG	Planning policy guidance, produced by the DETR for authorities in England and Wales
Prior Consent Notice	A requirement of the Control of Pollution Act, 1975 for activities not normally controlled by condition
Priority Wastes	Tyres, rubber and organic wastes, including difficult wastes
Private Finance Initiative (PFI)	A method of securing funding for public services and developments through the private sector
Proximity Principle	To manage waste arisings as close to the source as possible to minimise further environmental risks
Pyrolysis	Decomposition by heat in an oxygen-free atmosphere
RAMSAR site	Convention on wetlands of international importance
Rating level	Defined in British Standard: BS4102: 1997 The specific noise level plus any adjustment for the characteristic features of the noise.
Reference time interval, T_r	The specified time interval over which a L_{Aeq} is measured. For night-time measurements, T_r = 5 minutes. For day time measurements, T_r = 1 hour
Renewable energy	A source of energy which does not use up the earths finite mineral resources
Residual noise	The ambient noise at a given position in a given situation when the specific noise source is suppressed to a degree that it does not contribute to the ambient noise
Riding Of The Marches	The traditional annual inspection of the boundaries of many Scottish Border towns and boroughs
RSA	Regional Scenic Areas

Scheduled Ancient Monument	Any monument included in the Schedule of Monuments compiled by the Scottish Ministers
Sequential batch reactor	A technique for treating sewage where there is no connection to the local sewer network
Site	The area of land with the planning application boundary
Site of local nature conservation importance	Identified in Local Plan, usually afforded protection by specific policies
Site of special scientific interest (SSSI)	An area of land which SNH has identified as being of special interest by reason of its flora, fauna or geological, physiographical features
SO_X	Sulphur dioxide and sulphur trioxide. Acid gases arising from the burning of sulphur containing materials
Special Area of Conservation (SAC)	A site of community wide interest because of its natural habitat and/or species living within it
Special Protection Area (SPA)	Identified in the Birds Directive to protect the designated site from deterioration and disturbance and to take steps to conserve the habitats of interest
Special waste	Also referred to as "priority waste". The UK legislation refers to Hazardous waste as "Special waste" under the 1991 Hazardous Waste Directive
Species Action Plan Note	Identified in the LBAP to provide guidance on the conservation and enhancement of a particular species
Specific noise level	The $L_{Aeq,T}$ at the assessment position produced by the specific noise source over a given period of time
Specific noise source	The noise source under investigation for assessing the likelihood of complaints
Strategic road network	Motorway, trunk and A road network
Structure Plan	Sets out the principle objectives for planning on a County or Region basis
Sustainable development	Development which meets the needs of the present without compromising the ability of future generations to meet their needs
The Best Practicable Environmental Option (BPEO)	The option that provides the most benefit or the least damage to the environment as a whole, at acceptable cost, in the long and short term. Refers to options within a specific existing process or development
Thermal reactor	A device in which a fission chain reaction is sustained and controlled in order to produce energy

Tyres	Identified as a "priority" waste stream. The Landfill Directive specifically bans landfilling whole tyres by 2003 and shredded tyres by 2006. Subject to a 4 year postponement in exceptional circumstances for individual member states
Volatile organic compounds (VOC)	A large range of hydrocarbon and organic substances which vaporise readily at normal temperatures and pressures. VOCs contribute to air pollution either directly or as a result of reactions with sunlight
Waste	Any substance or object which the holder discards or intends or is required to discard
Waste charging	Physical act of handling waste into process chambers
Waste Hierarchy	A method of ranking waste management options
Waste Strategy 2000	A strategy determined by the Environment Agency for England and Wales as a requirement of the Environment Act, 1995
Waste Strategy Area	A waste planning area identified in the National Waste Strategy: Scotland. Scottish South West Area includes Dumfries & Galloway and North, South & East Ayrshire. The catchment area for the Facility includes the main settlements within a 70 road mile radius of the Site

BIBLIOGRAPHY

A Guidance to Sustainable Urban Drainage (ESPA/Environment Agency Publication)

Air Quality (Scotland) Regulations 2000

Annandale & Eskdale Local Plan (consultation draft), 2000

BS4142: Method for rating industrial noise affecting mixed residential and industrial areas, 1997

BS5228: Noise and vibration control on construction and open site, 1997

Consultative Draft Nithsdale Local Plan (December 1999)

Control of Pollution Act, 1974

Dumfries & District Local Plan, 1993

Dumfries & Galloway Landscape Assessment, 1995

Dumfries & Galloway Structure Plan, 1999

Dumfries and Galloway Local Bio-Diversity Action Plan 1999 (LBAP)

EC Air Quality Framework Directive 96/62/EC

EC Framework Directive on Waste (75/422/EEC)

EC Hazardous Waste Incineration Directive 94/67/EC

Environment Act 1995

Environmental Impact Assessment Regulations (Scotland) 1999

Environmental Protection Act 1990

Guidelines for Landscape and Visual Impact Assessment, 1995

Guidelines for the Environmental Assessment of Road Traffic

Guidelines for Traffic Impact Assessment, 1994

HMIP Technical Guidance Note D1

Integrated Pollution, Prevention and Control (IPPC) Regulations, 2000

Inventory of Ancient, Long Established and Semi Natural Woodland, 1989

IPC Guidance Note S2 5:01 Waste Incineration

ISO 14001 Environmental Management Systems

ISO 9001 Quality Management Systems

Landfill Directive (99/31/EC)

Landscape Assessment, Principles and Practice, 1995

Less Waste. More Value (consultation paper)

Making Waste Work, 1995

National Waste Strategy: Scotland

Noise at Work Regulations, 1989

NPPG 5: Archaeology and Planning

NPPG 6: Renewable Energy, 1994

NPPG 10: Planning and Waste Management, 1996

NPPG14: Natural Heritage

NPPG 18: Planning and the Historic Environment

PAN 42: Archaeology, The Planning Progress and Scheduled Monument Procedures

PAN 45: Renewable Energy Technologies, 1994

PAN 56: Planning and Noise

Planning for Renewables, 1997

PPG 1: General Guide to the Prevention of Water Pollution

PPG 4: Disposal of Sewage Where No Main Drainage is Available

Renewable Energy in the UK, 1995

Royal Commission on Environment Pollution, Twelfth Report, Best Practical Environmental Option, 1985

Scottish Natural Heritage Inventory of Ancient Long Established and Semi-natural Woodland (1989)

Soil Survey Sheet 7: South East Scotland

Sustainable Development – the UK Strategy, 1994

This Common Inheritance, 1992

Waste Framework Directive (91/156/EEC)

Waste Management Licence Regulations 1994

Waste Management Paper 4: Licensing of Waste Management Facilities

COMPANIES & ORGANISATIONS

BATNEEC (Dumfries) Ltd	1 Medwin Drive, West Linton, Peeblesshire, EH46 7HW
British Standards Institute (BSI)	389 Chiswick High Road, London W4 4AL
Compact Power Ltd	Offices at: St Andrews House, St Andrews Road, Avonmouth, Bristol, BS11 9DQ, and 93 Knatchbull Road, Camberwell, London, SE5 9QU
Dumfries & Galloway Council	English Street, Dumfries, DG1 2HS
Dumfries & Galloway Farming and Wildlife Advisory Group	Studio 1, Hillhead Mill, Kirkgunzeon, Dumfries, DG2 8LA
Expert Panel On Air Quality Standard (EPAQS)	Standing committee that reports to the UK Government on air quality
Friends of the Earth Scotland (FoES)	72 Newhaven Road, Edinburgh, EH6 5QG
International Organisation for Standardisation (ISO)	International Organisation for Standardisation (ISO)
Scottish Executive Rural Affairs Department	Pentland House, 47 Robb's Loan, Edinburgh, EH14 1TY
Scotia Holdings in Renewable Energy and Waste Systems (SHREWS) Ltd	24 Lyne Park, West Linton, Peeblesshire, EH46 7HP
Scottish Natural Heritage	Carmont House, The Crichton, Bankend Road, Dumfries, DG1 2ZP
Scottish Organic Producers Association Ltd	Milton of Cambus, Doune, Perthshire, FK16 6HG
Scottish Wildlife Trust	Cramond House, Kirk Cramond, Cramond Glebe Road, Edinburgh, EH4 4NS
Scottish Environment Protection Agency (SEPA)	Rivers House, Ironegray Road, Dumfries, DG2 0JE
The Soil Association	Victoria Street, Bristol
Royal Society for the Protection of Birds	Moorglen, 22 Main Street, St John's Town of Dalry, Castle Douglas, Kirkcudbrightshire, DG7 3UW
World Health Organisation (WHO)	20 Avenue, Appia, CH-1211 Geneva 27, Switzerland