SLOUGH MULTIFUEL EXTENSION PROJECT

Planning Inspectorate Ref: EN010129

The Slough Multifuel Extension Order

Land at 342 Edinburgh Avenue, Slough Trading Estate, Slough

Document Ref: 7.2 - 2014 ES Volume 2 - Appendices

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(q)

Applicant: SSE Slough Multifuel Limited

September 2022

Slough Multifuel Combined Heat and Power (CHP) facility

Environmental Statement

Volume II - Technical Appendices

Prepared for:

SSE Generation Limited

September 2014

Project Title:	Slough Multifuel CHP Facility
Report Title:	Environmental Statement: Volume II: Technical Appendices
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Issue No:	Name	Signature	Date	Position
Prepared by	Laurence Copleston	*Laurence Copleston*	September 2014	Environmental Consultant
Checked by	Neil Titley	*Neil Titley*	September 2014	Associate
Approved by	Richard Lowe	*Richard Lowe*	September 2014	Technical Director

PREFACE

This document comprises the Volume II of the Environmental Statement Report that has been prepared in support of a Planning Application for the demolition/ construction and operation of Slough Multifuel CHP Facility.

The Environmental Statement comprises the following documents:

- The Non Technical Summary;
- Volume I: Environmental Statement; and
- Volume II: Technical Appendices.

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Appendix A-1

EIA Scoping Report and Scoping Opinions

Slough Heat and Power

Proposed Multifuel CHP Facility

Environmental Impact Assessment (EIA)

Scoping Report

Prepared for

SSE Generation Ltd

12th November 2012

Final Report

Project Title:	Slough Power Station – Multifuel CHP Facility
Report Title:	EIA Scoping Report
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Prepared by	Neil Titley	*Neil Titley*	12th November 2012	Principal Consultant
Checked and approved by	Richard Lowe	*Richard Lowe*	12th November 2012	Associate Director

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The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken between April 2011 and the date of this report and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

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1. INTRODUCTION

1.1. Background

SSE Generation Ltd (hereinafter referred to as 'the Applicant') will be seeking planning permission from Slough Borough Council (SBC) for the demolition and removal of redundant generating plant and buildings and the development of a multifuel combined heat and power (CHP) facility providing up to 40 megawatt (MW) gross electrical capacity and up to 20 MW of heat at the site (herein referred to as the *'Proposed Development'*).

The Proposed Development site is located within the existing Slough Heat and Power (SHP) Site within the Slough Trading Estate, 342 Edinburgh Avenue, Slough, SL1 4TU (Ordnance Survey (OS) grid reference SU953814), as shown in Figure 1. The boundary of the Proposed Development site, which will occupy an area of approximately 1 hectare (ha), and SHP Site are illustrated in Figure 2. An area of 0.2 ha covers the lorry access and egress routes.

The Applicant is a subsidiary of SSE plc, one of the UK's leading energy companies with around 10 million energy and home services customers and over 11,800 MW of generation, including over 3 gigawatts (GW) of renewable generation amongst other assets. Other interests include electrical distribution, gas networks and storage, water supply and other energy-related activities.

The Proposed Development will comprise a single unit multifuel generating plant that will convert fuel derived from selected processed waste into electricity and heat. The plant will be fully compliant with the Waste Incineration Directive 2000 (WID) (Directive 2000/76/EC), as transposed into the Industrial Emissions Directive (Directive 2010/75/EU). The Proposed Development will utilise up to 300,000 tonnes per annum (tpa) of Waste Derived Fuel (WDF).

The Proposed Development will consist of an enclosed bunker, grate and ash system, furnace with boiler passes (super-heater, evaporator and economisers), flue gas treatment plant, chimney (the existing south chimney is expected to be reused) and steam turbine. The Proposed Development will generate up to 40 MW of gross electrical output with up to 20 MW of heat to supply the existing Slough Trading Estate heat network. The existing two natural draught cooling towers at the SHP Site are expected to be retained; some additional auxiliary cooling may be provided within the Proposed Development site.

The Proposed Development is expected to maintain current employment at SHP, provide approximately 200 temporary jobs during the construction period and act as a catalyst for future development within the Slough Trading Estate.

URS Infrastructure & Environment UK Limited ("URS") has been appointed by the Applicant to undertake a Scoping Study and prepare this Scoping Report. This report accompanies the request by SSE to SBC for a Scoping Opinion which will inform the scope of the Environmental Impact Assessment (EIA) and content of the Environmental Statement (ES) that will accompany the planning application for the Proposed Development.

1.2. The Need for an Environmental Impact Assessment (EIA)

Applications for development that are covered by the Town and Country Planning Environmental Impact Assessment (England and Wales) Regulations 2011 (hereafter referred to as the EIA Regulations) are termed ‘EIA applications’.

Screening of developments to identify whether an EIA is necessary is based on the likelihood of significant impacts arising from the project. ‘EIA development’ comprises projects that are defined as Schedule 1 development or Schedule 2 development likely to have significant effects on the environment by virtue of factors such as its nature, size or location.

Schedule 1 of the EIA Regulations includes under paragraph 2(a) *“thermal power stations and other combustion installations with a heat output of 300 MW [megawatts] or more”*. Paragraph 10 of Schedule 1 includes *“Waste disposal installations for the incineration or chemical treatment (as defined in Annex IIA to Council Directive 75/442/EEC under the heading D9) of non-hazardous waste with a capacity exceeding 100 tonnes per day”*.

Schedule 2 development means development, other than exempt development, of a description mentioned in Column 1 of the table where any part of the development is to be carried out in a sensitive area, or any applicable threshold or criterion in the corresponding part of Column 2 of that table is exceeded or met in relation to that development.

The Proposed Development is considered to fall within the scope of paragraph 10 of Schedule 1 of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011 (as outlined above). The Regulations require an EIA to be undertaken in every case for a Schedule 1 development. As such, an EIA will be undertaken and an Environmental Statement (ES) produced and submitted to accompany the planning application.

EIA scoping refers to the activity of identifying those environmental aspects that may be significantly affected by the Proposed Development, in addition to presenting the argument for the exclusion of those aspects that are unaffected. In doing so, the potential significance of impacts associated with each environmental aspect becomes more clearly defined, resulting in the identification of a number of priority issues to be addressed in the EIA. This process focuses the assessment on the issues critical to the achievement of planning consent.

Regulation 13, under Part 4 of the EIA Regulations provides an applicant with the opportunity to ask the Local Planning Authority (LPA), in this case SBC, to state in writing its opinion as to the information to be provided in the ES (a "scoping opinion"). By this means key stakeholder engagement and consultation can begin at an early stage in the process.

The purpose of this document is to provide SBC, along with other consultees with sufficient information to allow SBC to give an opinion on the scope of works proposed for the EIA and the subsequent content of the ES.

1.3. Structure of the Scoping Report

The remainder of the Scoping Report is structured as follows:

Section 2 – describes the existing environment of the Proposed Development site and its setting;

Section 3 – describes the Proposed Development;

Section 4 – sets out the consultation process for the EIA;

Section 5 – sets out the EIA framework and key issues to be addressed;

Section 6 – provides an overview of the relevant planning policy context;

Section 7 – presents the proposed scope for assessing the key potential environmental impacts of the Proposed Development;

Section 8 – presents the proposed scope and approach to those environmental issues that are not considered to be significant;

Section 9 – describes the proposed structure of the ES;

Section 10 – lists the documents to accompany the planning application; and

Section 11 – provides a summary and conclusion to the Scoping Report.

Figure 1: Site Location

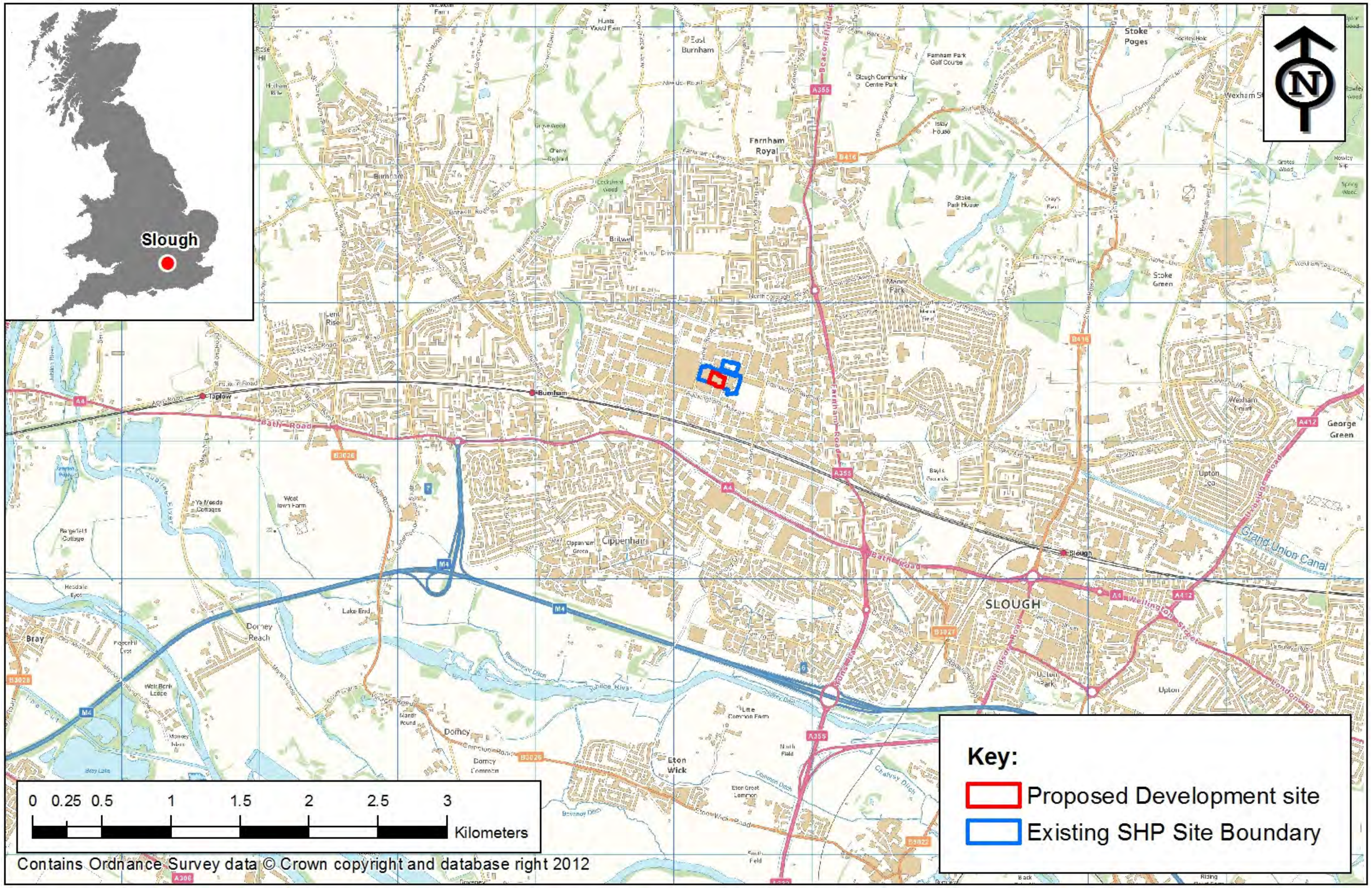
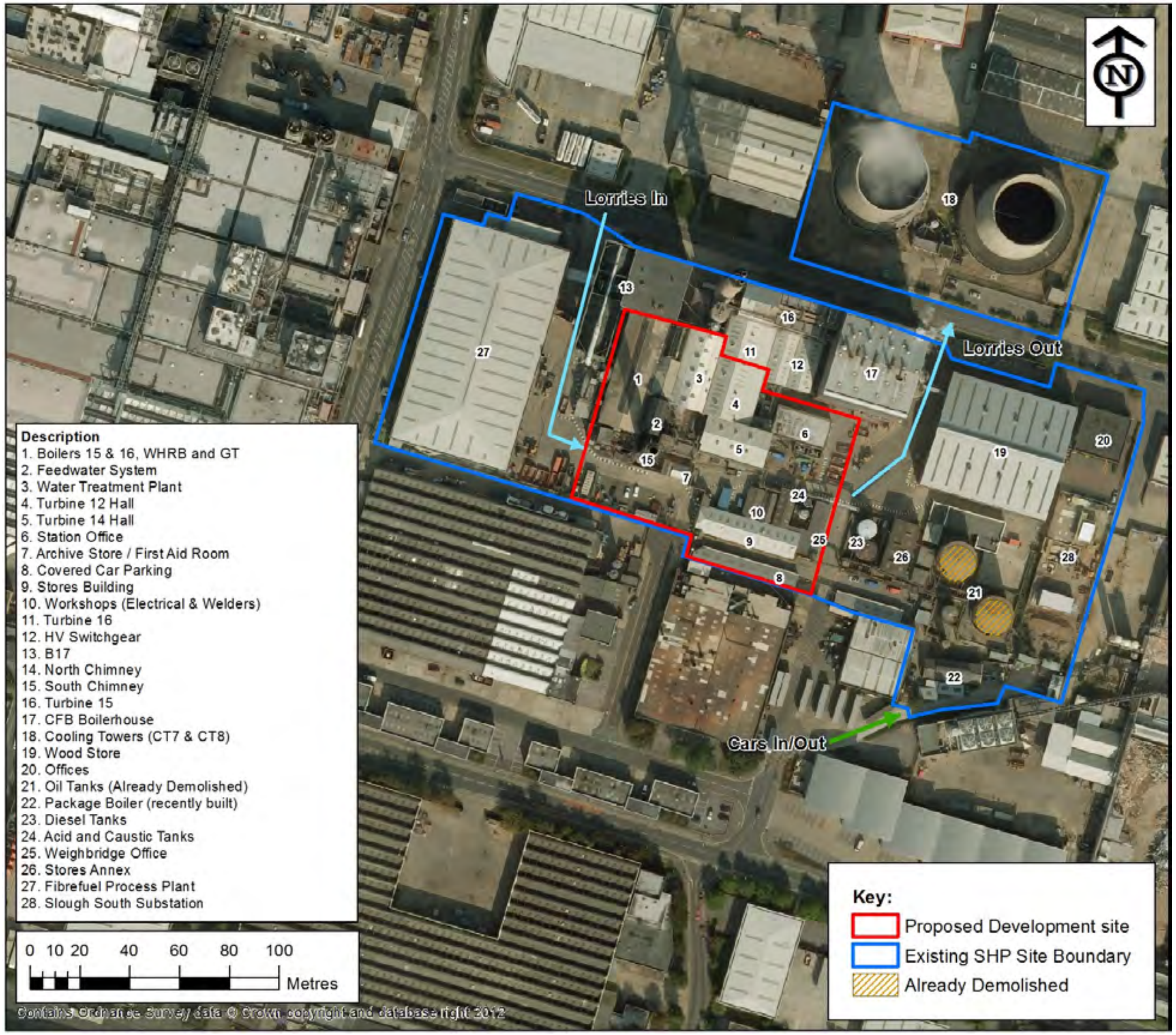


Figure 2: Proposed Development and SHP Site Plan



2. THE EXISTING ENVIRONMENT

2.1. Site Description

The Proposed Development site lies within the existing SHP Site boundary within the Slough Trading Estate. The SHP Site is mainly located on the south side of Edinburgh Avenue, while the two associated natural draught cooling towers occupy an area immediately to the north of Edinburgh Avenue. The SHP Site contains numerous industrial buildings with a variety of ages and structures, including boiler houses, turbine halls, fuel storage facilities, switchrooms, control rooms, offices and various other ancillary plant. The site is predominately surfaced with impermeable hardstanding.

The SHP Site contains a number of generating plant which share some common services such as water treatment, cooling and operations and maintenance. The generators comprise:

- A pair of fluidised bed boilers that utilise a combination of waste wood, biomass and coal to generate renewable energy through a dedicated steam turbine;
- A grate boiler that uses either wood waste or WDF and normally operates in CHP mode to deliver low carbon energy through a dedicated steam turbine; and
- A small gas fired package boiler recently installed to ensure security of supply of process steam and heat to the Trading Estate.

The renewable plant within the SHP Site are all permitted under the WID and operate independently with separate fuel stores and, together with the Proposed Development, will continue to retain separately metered output and discrete points of connection to the local electricity network. The Proposed Development will not support, or be reliant on, the existing generating stations on the SHP Site.

The Proposed Development will occupy an area of approximately 1 ha, most of which is currently occupied by the decommissioned gas fired plant, i.e. boilers 15 and 16, a gas turbine and associated Waste Heat Recovery Boiler (WHRB) and two steam turbines (12 and 14), as well as the water treatment system as shown in Figure 2. An additional 0.2 ha covers the lorry access and egress routes.

Existing plant within the SHP Site will be taken into account in the EIA in establishing the baseline conditions. The potential impacts associated with the Proposed Development will be assessed in terms of both the incremental change and the overall impact (existing and proposed) taking into account these existing facilities.

In addition 1 ha of land in the southeast of the SHP Site, formerly occupied by 3 large oil tanks, various buildings and car parking, will be the subject of a separate planning application to SBC for some new ancillary buildings and car parking. The potential for cumulative impacts when considering these ancillary buildings and car parking along with the Proposed Development will be assessed as part of the EIA (see Section 5.2 of this report for a description of the cumulative impact assessment).

2.2. Surrounding Area

The Proposed Development site lies in the Thames Valley, approximately 4 kilometres (km) north of the River Thames and is surrounded by the conurbation of Slough; Windsor is approximately 5km south of the site and Maidenhead is approximately 7km west of the site.

The topography at the Proposed Development site is predominantly flat and approximately 30 metres (m) above ordnance datum (AOD).

The area surrounding the SHP Site is occupied by various industrial, warehouse and retail businesses, both large and small, which is typical of much of the Trading Estate that covers an area of approximately 158 ha.

The nearest residential properties are located approximately 200m north of the Proposed Development on Bodmin Avenue, with the nearest park and green space area, Kennedy Park, situated approximately 400m northwest of the site.

There are no Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Site of Special Scientific Interest (SSSIs) or National Nature Reserves (NNR) within a 2km radius of the Proposed Development site. Two statutory designated nature sites lie within 2km of the Proposed Development site; these are Haymill Valley Local Nature Reserves (LNR), located 800m west of the Proposed Development site, and Cocksherd Wood, located approximately 1.4km northwest of the Proposed Development site. In addition, Boundary Copse Woodland Trust Reserve, which is a non statutory site, is located 1.3km north of the Proposed Development site.

The closest European Protected Site is Burnham Beeches SAC located approximately 2.9km north of the Proposed Development site. Also located within 10km of the Proposed Development site are Windsor Forest and Great Park SAC, approximately 6km south of the site, South West London Waterbodies SPA and Ramsar site located approximately 7.7km southeast of the Proposed Development site, and Chilterns Beechwoods SAC located approximately 9.9km to the northwest of the Proposed Development site.

The River Thames is the closest principal watercourse and is located approximately 4km south of the Proposed Development site, flowing in an easterly direction.

The nearest designated heritage asset is a railway bridge, approximately 500m to the southeast of the Proposed Development site. There are also three scheduled monuments within 2km of the Proposed Development, the nearest being the moated site at Cippenham Court which is approximately 1.5km to the south. Thirty three listed buildings and two registered parks exist within 2km of the Proposed Development site. Stoke Park

English Heritage registered park and garden is located approximately 1.5km to the northeast and Huntercombe Manor registered park and garden is approximately 2.2km to the southwest.

2.3. Site History

The Slough Trading Estate was established in April 1920 when the land was purchased from the War Office which had been using it for the repair and recycling of ex War Department Vehicles. At this point there was a small coal fired power station and approximately 30 buildings on the Estate. Over the subsequent decade the area was transformed into the Trading Estate and was largely occupied by industrial tenants. As the Estate grew so did the power station and its associated electricity/steam/potable water distribution infrastructure. Some infrastructure has also been removed over the years with direct rail deliveries of coal and oil to the power station ceasing in 1969 and 1973 respectively and the railway siding used for oil deliveries post 1973 surrendered in 2007.

A utility body was eventually set up as a separate business called Slough Heat and Power (SHP), but still owned by the Slough Trading Estate. Since this time the Estate has continued to evolve and the mix of tenants has changed over time and now includes knowledge based industries, warehouses and retail whilst the Estate still retains some manufacturing tenants. Over the years, the demand for energy has also constantly evolved as the customer base has changed.

The SHP Site has, therefore, been used for power and heat generation purposes for about ninety years. Power generation and the associated infrastructure were originally permitted under an Act of Parliament in 1925 for the Slough Trading Estate development. More recently in 2008 SHP was sold to SSE plc which continues to provide the same power generation services to the Trading Estate as its predecessor. Over the years, power generation at the site has evolved as markets have changed. New plant has been generally installed about every 10 years, with fuels varying from coal, oil and gas. However, in the last twenty years fossil fuels have been gradually replaced with newly available low carbon fuels. This evolution has now reached the stage where the three main power generation boilers that continue in service are fired on waste wood, biomass and waste derived fuels. A gas fired Package Boiler is the latest energy plant to be installed within the complex; it was commissioned in 2011 to ensure a secure heat supply to the Trading Estate. The Proposed Development continues this evolution including further provision for providing secure low carbon heat to the Trading Estate.

The Proposed Development will be in an area currently occupied by a number of gas fired units which have all reached the end of their operational life. Boiler 15 and Turbine 12 were constructed in 1966, and Boiler 16 and Turbine 14 were constructed in 1968; the gas turbine and WHRB were installed in 1980. These boilers and turbines have now all been decommissioned with the loss of 48 MW of net electrical generation. In addition, the site operation and maintenance services will be centralised in a new facility within the SHP Site and will be the subject of a separate planning application to SBC.

2.4. Previous Environmental Studies

In order to comprehensively evaluate the potential environmental impacts associated with the Proposed Development, it is important that any previous environmental studies for the site and the surrounding area are considered. Existing environmental studies for the SHP Site include:

- Burnham Beeches Air Quality Assessment (2001 -2004);
- Asbestos surveys of the SHP Site facilities (continually up-dated);
- Groundwater monitoring at the SHP Site (ongoing under PPC permit conditions);
- Ground Contamination Surveys on the site (1994 - 2011);
- Environmental Statement for the Fibre Fuel Production Plant (1994);
- Environmental Statement for the CHP Energy Recovery Project (1998);
- Annual Night-Time Environmental Noise Monitoring Around the Power Station and Fibre Fuel Plant (December 2011);
- Desk Study and Extended Phase 1 Habitat Survey for SHP Site (2011); and
- Soil contamination survey undertaken by Segro when the Heavy Fuel Oil (HFO) tanks (21 on Figure 2) were removed in 2009.

2.5. Potential Environmental Sensitivities/ Sensitive Receptors

When undertaking an EIA it is important to understand which receptors will be considered as part of the assessment. Based on a review of the study site, initial studies, and consultations, the following potential sensitive receptors to the Proposed Development have been identified:

- Kennedy Park, the nearest park and green space located approximately 400m northwest of the Proposed Development;
- Haymill Valley Nature Reserve, located approximately 800m west of the Proposed Development;
- Cocksherd Wood Nature Reserve, located approximately 1.4km northwest of the Proposed Development;

- Boundary Copse Woodland Trust Reserve, located approximately 1.3km north of the Proposed Development;
- Burnham Beeches SAC, located approximately 2.9km north of the Proposed Development;
- Salt Hill Stream is located 1.5km east of the site, the closest major surface water feature is the Jubilee River located approximately 2km south of the site, the River Thames is located approximately 4km south of the Proposed Development;
- Local residents - the nearest residential properties are located approximately 200m north of the site on Bodmin Avenue;
- Ecological receptors (bats and breeding birds);
- Pedestrians, cyclists and road users; and
- Key short, medium and long-distance views of the Proposed Development.

3. THE PROPOSED DEVELOPMENT

3.1. Proposed Development Description

The Proposed Development will require the demolition and removal of buildings housing redundant plant and ancillary infrastructure (including redundant boilers 15 and 16, the gas turbine and WHRB and steam turbines 12 and 14), to enable the development of a single unit multifuel CHP facility generating up to 40 MW of gross electrical output with up to 20 MW of heat to supply the existing heat network. The overall efficiency of the Proposed Development will be optimised and, as a minimum, will achieve an “R1” value of equal or greater than 0.65. The reference to R1 is a method of calculating plant efficiency as set out by Annex II of the Waste Framework Directive 2005 to demonstrate that the plant is a Recovery process.

Multifuel Facility

The Proposed Development will consist of an enclosed fuel storage bunker, grate and ash system, furnace with boiler passes (super-heater, evaporator and economisers), flue gas treatment plant, chimney (the existing south chimney is expected to be reused) and a single steam turbine - these main components required for the generation of electricity will be housed in buildings entirely separate from the existing buildings and generators on the SHP Site. In addition, auxiliary plant such as electrical switchgear and underground electrical connection, compressed air, water treatment plant and feed-water system and an effluent treatment plant will also be required and supplemental cooling may be installed. The proposed electrical connection will be at Slough South substation (Building 28 in Figure 2) which is located within the SHP Site immediately to the south of the SSE Offices (Building 20 in Figure 2).

Appendix 1 of this Scoping Report provides an indicative site layout of the Proposed Development, for the purposes of informing the Scoping Stage.

The proposed boiler will use a conventional reciprocating grate technology and is likely to include water cooling of the grate to enable low ash waste fuels such as wood waste to be used. Given the range of fuel types expected and the scale of plant, this is considered by the Applicant to be the most appropriate technology choice. The plant will produce two types of by-product streams; a flue gas treatment residue (approximately 15,000 tpa) which is a by-product of meeting the air emission limits set by the WID, and a wet bottom ash (approximately 40,000 tpa). Bottom ash generated in the boiler will be conveyed to a storage system. This ash will be recycled where possible, or otherwise disposed of to an appropriately licensed landfill offsite. Flue gas treatment residue will be stored in enclosed silos prior to being recycled or disposed off site by a suitably licensed waste contractor.

It is envisaged at this stage that the approximate height of the Proposed Development will be 47m (above ground level). From the north, the Proposed Development will be predominantly hidden by the existing cooling towers, Circulating Fluidised Bed (CFB) boiler house and turbine hall which are of similar height.

Fuel

The Proposed Development will have an estimated maximum capacity of 300,000 tpa of WDF including up to 4 days on site fuel storage capacity in a dedicated underground bunker. All WDF will be processed offsite to extract recyclable material, screened and delivered to site by road using Heavy Goods Vehicles (HGVs). Proposed vehicular access and egress to the SHP Site (as delineated by the blue line boundary in Figure 2) will be via three existing points of access/egress: one from the south via Harwich Road for cars and stores deliveries and two from the north on Edinburgh Avenue for the lorries "in and out". Access to the two offices at 6 and 342 Edinburgh Avenue will also be retained, as well as the residue offloading enclosure under the north chimney which is also accessed from Edinburgh Avenue. No upgrade works are anticipated along these access roads, and hence it is not considered necessary to include these roads within the Proposed Development site boundary, although the impact of all vehicular movements on these roads will be assessed as part of the EIA.

Only WDF that has been processed to meet a pre-determined fuel composition range will be sourced for the Proposed Development. The sources of the WDF will typically comprise:

- Solid Recovered Fuels (SRF) and Refuse Derived Fuel (RDF) which come from processing Municipal Solid Waste and Commercial and Industrial Waste; and;
- Non Hazardous Wood, including waste wood, but excluding hazardous (impregnated) waste, referred to as waste wood.

Emissions to Air

Emissions to air from the combustion process will be compliant with the WID across the full fuel composition range. This will be achieved through the appropriate design and continuous monitoring of the combustion plant and the installation of the following abatement and control systems:

- Hydrated lime, or suitable equivalent, and activated carbon injection for the abatement of hydrogen chloride, sulphur dioxide (SO_2), heavy metals and organic compounds;
- Bag filters will be installed to remove particulates, heavy metals and the reacted lime and activated carbon; and
- Selective Non Catalytic Reduction (SNCR) NO_X abatement will be installed (and operated as and when required).

Operation of the plant and ongoing compliance with emission limits and environmental regulations will be regulated by the Environment Agency through an Environmental Permit for the installation that will be applied for separately.

Water

Water will be supplied from SHP's existing groundwater boreholes and treated in an onsite water treatment plant to generate high quality boiler feedwater. Waste water will be discharged to the foul sewer or retained in underground tanks for later collection, removal and treatment offsite. It is a requirement of the WID that any potentially contaminated water is retained.

Cooling

A number of different options have been considered in order to provide adequate cooling for the new plant. The most likely solution will be to retain and optimise the performance of the two existing natural draft cooling towers (see item 18 on Figure 2). Supplemental cooling may, if required, be installed within the Proposed Development site to provide a satisfactory level of cooling in the form of either air cooling or small low plume hybrid cooling towers. The final cooling selection and technology design will demonstrate the use of Best Available Techniques (BAT).

Demolition

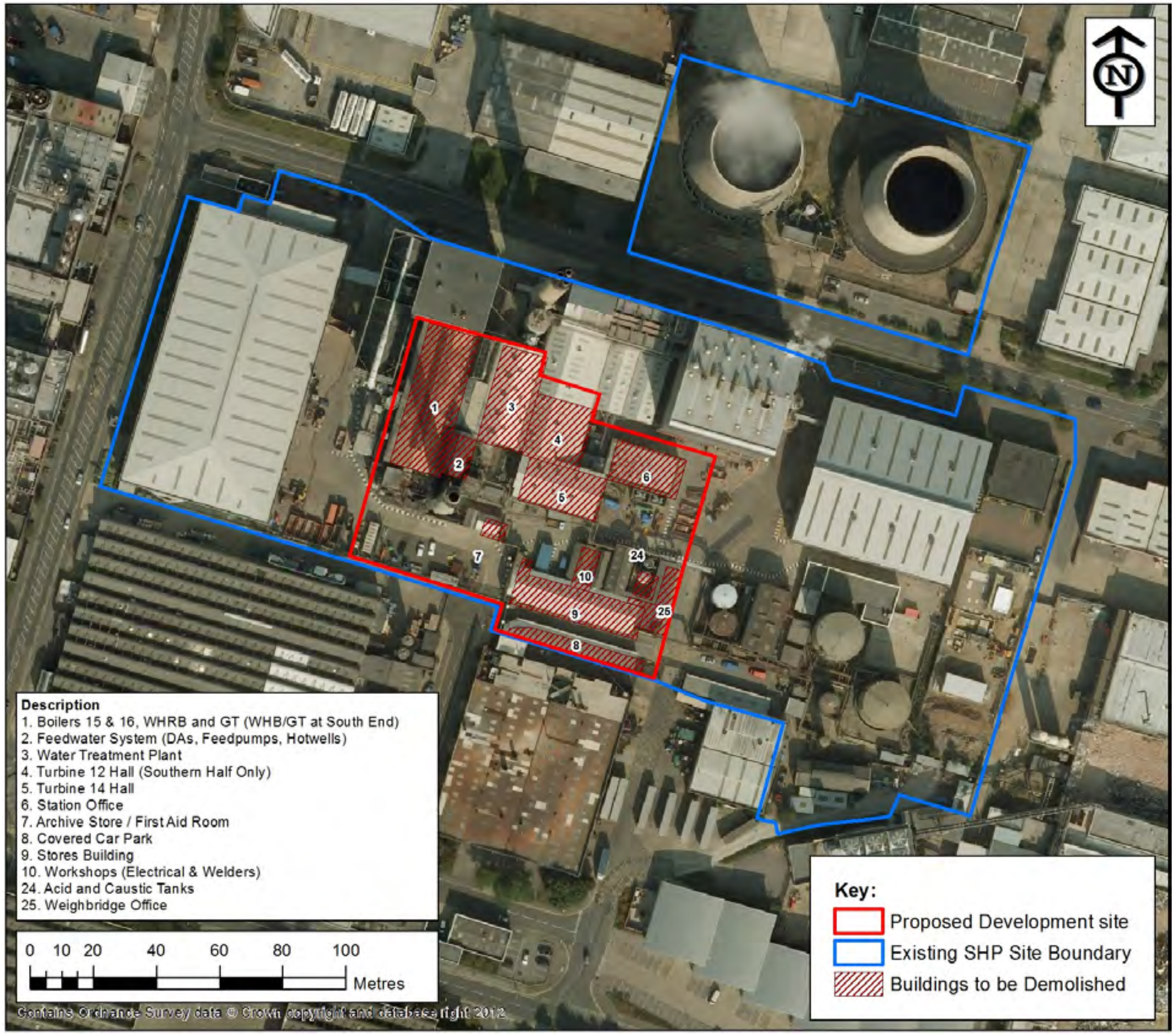
Redundant plant and ancillary infrastructure that currently occupies the Proposed Development site will be demolished as part of the Proposed Development. Table 1 indicates the plant and infrastructure that will be demolished as part of the Proposed Development and Figure 3 illustrates the location of each item of plant. Prior to any demolition works, a full asbestos survey will be commissioned and any asbestos identified will be removed by a specialist contractor to a suitably licensed facility and notification will be issued to Health and Safety Executive (HSE). A Demolition and Construction Method Statement (DCMS) will be prepared prior to commencing works onsite; this will identify all best practice environmental and health and safety procedures to be adhered to throughout the demolition and construction process. Where practicable, all recovered materials will be processed and re-used onsite.

Table 1: SHP Site Areas to be demolished as part of the Proposed Development

Building No. (see Figure 3)	**SHP Site Areas to be demolished**
1	Boilers 15,16, Waste Heat Recovery Boiler (WHRB) and Gas Turbine (GT)
2	Feedwater system (feed pumps, hotwells)
3	Water treatment plant area
4	Turbine 12 hall
5	Turbine 14 hall
6	Station office
7	Archive store/first aid room
8	Covered car parking area
9	Stores building
10	Electrical workshop and welders workshop
24	Above ground acid and caustic tanks
25	Weighbridge office

*Please note that the two oil tanks located in the south east corner of the site have already been demolished.

Figure 3: SHP Areas to be demolished as part of the Proposed Development



3.2. The Need for the Proposed Development

The Applicant's wider strategy is to ensure energy supplies to its customers, by providing energy generation from diverse sources including gas, coal, hydro, wind farms and other low carbon fuels. The proposed multifuel CHP facility at Slough is an important constituent of this strategy and will provide new low carbon electricity generation and heat.

The Proposed Development will utilise non hazardous materials diverted from landfill in accordance with the Waste (England and Wales) Regulations 2011 derived from the Waste Framework Directive 2006, 2008 and the Waste Strategy for England 2007. This will save landfill space and reduce the associated methane emissions, whilst providing low carbon 'green' electricity (in accordance with the Energy White Paper 2007, the UK Renewable Energy Strategy (2009), and National Policy Statements for Energy (2011). It is also important that the Proposed Development will be designed to deliver space heating and process steam to neighbouring properties on the Slough Trading Estate.

In summary, the Proposed Development will help to address the following:

1. Climate Change, which necessitates achieving reductions in greenhouse gas emissions (principally CO_2 and methane);
2. Security and Sustainability of Supply, through having a mix of energy generating technologies and diversity of fuels;
3. Energy Recovery, achieved from the processing of residual waste materials into a fuel suitable for use in the multifuel CHP facility;
4. Providing local authorities with an outlet for treated municipal waste in the form of RDF/SRF;
5. Complimenting existing 'reduce, reuse and recycle' measures by following waste hierarchy requirements and extracting recyclable material during the fuel processing stage;
6. Enabling Non Hazardous Materials to be diverted from landfill saving valuable landfill space and reducing subsequent greenhouse gas (methane) emissions generated from the breakdown of the material within the landfill;
7. Generating Low Carbon (non fossil fuel) electricity and heat that will supply businesses in the local area; and
8. Forming part of the continued modernisation of the Slough Trading Estate and green energy credentials of the SHP Site.

4. CONSULTATION

The process of consultation is important to the development of a comprehensive and balanced EIA process. Views of interested parties serve to focus the assessment process and to identify specific issues that require further investigation. Consultation is an ongoing process as part of the design development.

Given the scale and nature of the Proposed Development, key consultees will be involved in the evolution of the design and preliminary assessment of environmental impacts. These include, but are not limited to:

- Slough Borough Council (SBC);
- South Bucks District Council (SBDC);
- Royal Borough of Windsor and Maidenhead Council (BWMC);
- Segro (owners of Slough Trading Estate);
- Environment Agency (EA);
- Department of Energy and Climate Change (DECC);
- Natural England (NE);
- Highways Agency (HA);
- Health and Safety Executive (HSE);
- Thames Water;
- Network Rail;
- First Great Western (no direct impact);
- Crossrail (no direct impact);
- English Heritage (EH);
- Slough Primary Care Trust (PCT);
- Ofcom;
- Civil Aviation Authority (CAA); and
- Members of the public.

5. EIA METHODOLOGY

5.1. Introduction

The EIA will be carried out in accordance with the requirements in Schedule 4, Part 1 of the EIA Regulations 2011 identified in this report. For the EIA to be an effective decision-making tool, the ES will focus on the key environmental issues. The following sub-sections describe the works proposed to fulfil the requirements of the EIA Regulations.

5.2. Methodology and Cumulative Impact Assessment

The ES will describe the assessment of the direct effects of the Proposed Development, in addition to the potential effects that are:

- Indirect;
- Cumulative;
- Short, medium and long term;
- Permanent and temporary;
- National, Regional and Local in scale; and
- Beneficial and/or adverse in nature.

The mitigation measures envisaged in order to avoid, reduce or remedy significant adverse effects will be described, where applicable. The assessment will include the following scenarios:

- The existing site (the baseline) including the existing buildings and plant within the Proposed Development site and in the locality, such as the SHP Site;
- The Proposed Development (including construction, operational and decommissioning phases); and
- The Proposed Development in addition to any other, non-related schemes under development, as identified and agreed with the planning authority in order to assess cumulative impacts.

The concluding chapters will provide a summary of the cumulative and residual impacts.

Criteria used for selecting cumulative schemes for consideration in the EIA will be based on development size, proximity, nature or environmental sensitivity and will be agreed with SBC. However, from an initial search of the planning register it is proposed that the cumulative schemes to be assessed include the following:

1. Leigh Road/Bath Road Central Core Planning Application, Slough Trading Estate (P/14515/000). SBC granted outline planning permission for the redevelopment of 21.9 ha of land at Leigh Road/Bath Road on the 30th September 2009 to include commercial offices, hotel and leisure facilities (LRCC1);

2. Leigh Road/Bath Central Core 2 Planning Application, Slough Trading Estate (P14515/3). An alternate planning application for the redevelopment of 21.9 ha of land at Leigh Road/Bath Road to include retail, commercial offices was submitted in May 2011; and

3. 1 ha of land in the south east of the SHP Site, formerly occupied by 3 large oil tanks, various buildings and car parking, will be the subject of a separate planning application to SBC for some new ancillary buildings and car parking. It is anticipated that this planning application will run in parallel with and be submitted at a similar time to the application for the Proposed Development.

The selection of schemes to be considered in the assessment of potential cumulative effects will be made in agreement with SBC.

As outlined, the ES will consider the direct effects of the Proposed Development in addition to the indirect, cumulative, short, medium and long-term, permanent, temporary, beneficial and adverse impacts. A description of the mitigation measures envisaged in order to avoid, reduce or remedy significant adverse effects will be included within each of the technical chapters in the ES. Where mitigation measures are identified to either eliminate or reduce adverse impacts, these will be incorporated into the project design. Where impacts remain following the incorporation of mitigation measures, the ES will identify these remaining or 'residual' impacts and classify them in accordance with a standard set of significance criteria which will be clearly presented in the ES.

The EIA process will include the identification and assessment of all impacts to potentially sensitive receptors resulting from the demolition, construction, operational and decommissioning phases of the Proposed Development and the redevelopment of the southeast corner of the SHP Site (which will form a separate planning application to SBC).

5.3. Design Evolution and Alternatives Assessment

The EIA process provides an opportunity to describe the evolution of the Proposed Development as well as alternative development options considered before a final decision is taken on the design including:

- The 'Do Nothing Scenario' – the consequences of no development taking place;
- 'Alternative sites' – examination of an alternative location for the Proposed Development and the rational behind the selection of the preferred site; and

- 'Alternative designs and technologies' – the ES will summarise the evolution of the design proposals, the modifications that have taken place to date and the environmental considerations which have led to those modifications. A summary of the main alternatives considered, such as alternative fuels, boiler technology and emissions abatement, as well as the option of a smaller boiler, will be presented together with a justification for the final design, including roof furniture and the need for it to be enclosed. This section will also consider the need for a new multifuel plant, why it has been sized as it has, and the reasons for the chosen fuel type and technology.

5.4. The Proposed Development

The EIA will include a description of the Proposed Development to enable a robust assessment of the likely significant impacts of the development including:

- Site layout and footprint;
- Building and structure elevation plans;
- Plant design and emission limits;
- Access/ egress points and road layout across the whole SHP Site;
- Utilities (i.e. gas, electricity, telecommunications, foul and surface water) requirements and provisions, including any connection to existing SHP Site ancillary services;
- Servicing and maintenance; and
- Proposals for landscaping.

5.5. Demolition and Construction Programme and Management

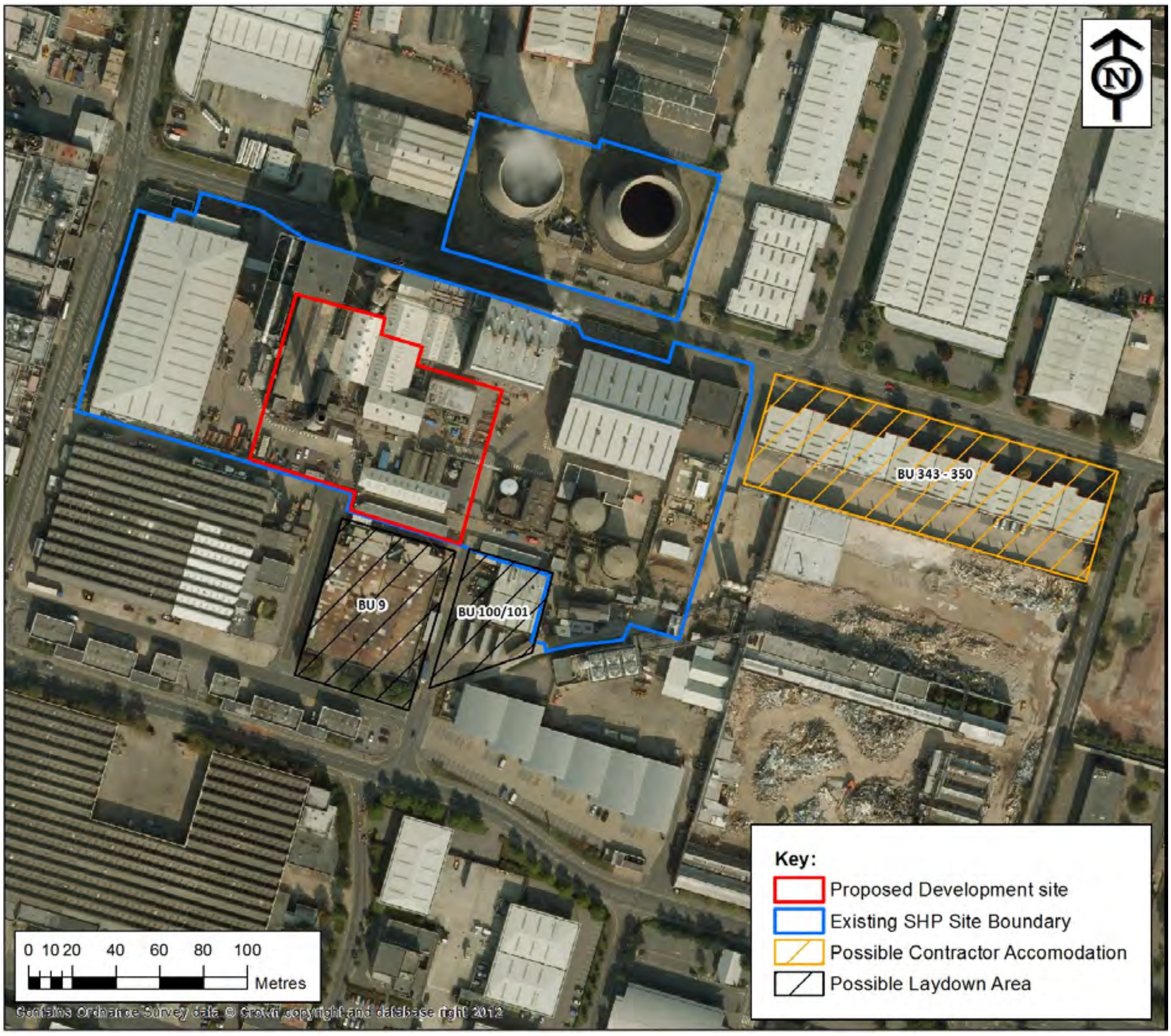
The ES will provide details of the proposed demolition and construction activities, their anticipated duration, along with an indicative programme of each phase of the works. The ES will provide a framework for the Demolition and Construction Method Statement (DCMS) and Construction Environmental Management Plan (CEMP), which will describe the specific mitigation measures to be followed to reduce nuisance impacts from:

- Use of land for temporary laydown areas, accommodation, etc. It is currently anticipated that Baden House (Buildings 343-350), Edinburgh Avenue will be used for the contractor accommodation, and the adjacent plots of former Building 9 and 100/101 for laydown areas during construction (or a similar alternative). The locations of these sites are shown in Figure 4 and lie approximately 125 m east and immediately south of the Proposed Development site, respectively. Although out with the proposed development site, the EIA will need to consider the impact of using this land for this purpose;

- Demolition and construction traffic (including parking and access requirements);
- Changes to access and temporary road or footpath closure (if required);
- Noise and vibration;
- Utilities diversion;
- Dust generation;
- Soil removal;
- Waste generation;
- Restricted working hours and a procedure for consenting exceptions;
- A Commissioning Plan and
- A Risk Management Plan.

The DCMS and CEMP will be produced following receipt of planning permission (for example, as part a condition attached to a future consent) and will identify all the procedures to be adhered to throughout demolition and construction. Individual trade contracts will incorporate environmental control, health and safety regulations, and current guidance. This will ensure that demolition and construction activities are sustainable and that all contractors involved with the demolition and construction stages are committed to agreed best practice and meet all relevant environmental legislation including: Control of Pollution Act 1974 (COPA), Environment Act 1995, Hazardous Waste Regulations 2005 and the Duty of Care Regulations 1991. Records will be kept and updated regularly ensuring that all waste transferred or disposed of has been correctly processed with evidence of signed Waste Transfer Notes (WTNs) that will be kept on-site for inspection whenever requested. Furthermore all demolition and construction works will adhere to the Construction (Design and Management) Regulations 2007 (CDM).

Figure 4: Indicative Locations of the Laydown Areas and Contractor Accomodation



6. PLANNING POLICY CONTEXT

As the Proposed Development will have a rated capacity of less than 50 MW electrical output a planning application will be submitted to SBC under the Town and Country Planning Act 1990 (as amended). The application will be accompanied by an ES prepared under the EIA Regulations.

The EIA process will consider national, regional and local planning policy sources of relevance to the Proposed Development, including those identified in Sections 6.1 and 6.2 below. Relevant guidance, policy and legislation relating to each technical aspect will be identified within each technical chapter of the ES.

A detailed examination of policies that relate to the Proposed Development will be provided in a Planning Policy Statement which will accompany the application. Where policies set compliance standards, or other statutory and non-statutory criteria, these will be identified.

6.1. National Planning Policy

The EIA will have regard to the following EU/ UK policy and guidance:

- The Renewables Obligation (2002) and subsequent reforms;
- Our Energy Future – Creating a Low Carbon Economy (2003);
- The Government's Strategy for Combined Heat and Power for 2010 (2004);
- The Energy Challenge – Energy Review (2006);
- Meeting the Energy Challenge – A White Paper on Energy (2007);
- UK Biomass Strategy (2007);
- Waste Strategy for England (2007);
- The UK Renewable Energy Strategy (2009);
- The UK Low Carbon Industrial Strategy (2009);
- The UK Low Carbon Transition Plan (2009);
- Annual Energy Statements (2010/2011);
- Statutory Security of Supply Report (2011);
- The Impact of Health of Emissions to Air from Municipal Waste Incinerators (2010);
- The Air Quality Standards Regulations (2010);
- Planning for Sustainable Waste Management Companion Guide to Planning Policy Statement 10 (2006);
- Planning Policy Statement 10: Planning for Sustainable Waste Management (Revised March 2011);
- Government Review of Waste Policy in England 2011;
- EU Waste Framework Directive (2008/98/EC);
- Waste (England and Wales) Regulations 2011;

- Overarching National Policy Statement for Energy (EN-1); and
- National Policy Statement for Renewable Energy Infrastructure (EN-3).

The assessment will also have regard to the National Planning Policy Framework (NPPF), which was published on 27 March 2012, replacing the previous Planning Policy Statements (PPS) and Planning Policy Guidance (PPG). However, the waste PPS remains until the publication of the National Waste Management Plan.

6.2. Local and Regional Planning Policy

The Government's intention is to revoke Regional Strategies (RS). The Secretary of State considers that the revocation of RSs has come closer following enactment of the Localism Act 2011, however, until revocation occurs RSs retain their development plan status.

Particular reference will also be made to policy and guidance contained within the following documents:

- Slough Local Development Framework Core Strategy 2006-2026 Development Plan Document;
- Slough Local Transport Plan (2011);
- Slough Local Plan 2004 (saved local polices);
- Slough Local Development Framework Site Allocations Development Plan Document (2010);
- Other relevant local Supplementary Planning Guidance/Documents;
- Waste Local Plan for Berkshire (1998) saved policies; and
- The South East Plan May 2009.

In particular, the ES will demonstrate how the Proposed Development complies with the principles of sustainable development, including the protection of the environment and the prudent use of natural resources.

7. KEY EIA ISSUES

The EIA and associated technical studies will reflect current best practice and will be carried out in accordance with statutory guidance including the requirements for the contents of an ES. For the EIA to be an effective decision-making tool the ES needs to focus on the most significant environmental issues.

The following sub-sections describe the proposed methodology and assessment criteria that will be used to assess the potential significance of the identified impacts.

7.1. Air Quality and Odour

SBC has declared four Air Quality Management Areas (AQMAs) within its borough, the nearest of which is located approximately 500m south of the Proposed Development site and incorporates the A355 Tuns Lane from junction 6 of the M4 motorway in a northerly direction to just past its junction with the A4 Bath Road and A355 Farnham Road, known as the "Three Tuns".

The Proposed Development, when operational, will emit known pollutants to air, via a chimney. These will include the combustion products nitrogen oxides, carbon monoxide and particulate matter, for which Air Quality Objectives have been set as part of the National Air Quality Strategy, as well as carbon dioxide (CO_2) and additional trace pollutants. The plant will be designed to be operated to be fully compliant with the emission limits specified in the WID, as transposed into the Industrial Emissions Directive 2010.

It is proposed that an air impact assessment be undertaken for the main point source emissions, utilising air dispersion modelling to assess the impact to air quality potentially brought about through the generation and dispersion of emissions from the proposed plant. The study would be desk-based and assess the combustion pollutants, and those specifically detailed in the WID, at a number of identified receptors (such as, residential homes, schools, nature/habitat sites etc) within the local area, and will consider the potential effect on the nearby AQMAs. A detailed dispersion model such as ADMS4 would be used, taking into account site specific meteorology, buildings and terrain features, where applicable. In addition, an assessment will be made of both nitrogen and acid deposition on Burnham Beeches.

The modelling will be based on Emission Limit Values set by the WID and at full operating load, thereby presenting a worst-case scenario in the ES. Should it be deemed appropriate to model lower loads, justification for this will be provided and the load clearly stated in the assessment. The dispersion modelling will confirm the suitability of the existing South stack and the need for any changes.

Baseline, or existing, background air quality will be determined using a nearby representative automatic monitoring station, supplemented by Local Authority diffusion tube sampling and DEFRA background air quality maps, where appropriate. Given the presence of local monitoring data, it is not proposed to conduct specific ambient air monitoring as part of this proposal, either as part of the baseline data collection or in order to validate the model findings, particularly given the inherent 25-30% margin of error associated with diffusion tube monitoring.

An air quality impact assessment will also be undertaken on the effects of road traffic on the local road network associated with the construction and operation of the Proposed Development, in accordance with the methods outlined in the guidance for local authorities (LAQM.TG09). However, it is currently proposed that the levels of traffic associated with the operational plant will not exceed levels that are consented for the SHP Site under existing permissions.

It is likely that some form of assessment will be required for the additional road traffic movements attributed to the Proposed Development, although this will depend on the estimated trip generation. The Highways Agency's (HA's) Design Manual for Roads and Bridges (DMRB) screening model or the detailed ADMS-Roads dispersion model would be used to assess vehicle emissions, depending on the likely magnitude of predicted traffic increase. Both models have been specifically designed to assess the impact of road traffic emissions in urban areas in the UK (taking into account the recent changes to nitrogen oxide factors). The modelling would require local traffic data attained during the proposed traffic and transport assessment, including traffic numbers, fleet composition, and average vehicle speeds, to calculate emission fluxes for the above listed pollutants from each road source. A number of traffic scenarios will be modelled using the designated HGV routes, including present-day, and a given future date both with and without the Proposed Development and with specific reference to the AQMAs.

The air quality impact assessment will determine the suitability of the Proposed Development site for the new CHP plant and the severity, extent, and duration of predicted impacts to local air quality attributed to the operation of the Proposed Development.

A separate Human Health Risk Assessment (HHRA) will also be undertaken and included as an appendix to the ES. This information will inform the air quality assessment and will consider the effects of any change to air quality as a result of the Proposed Development.

In addition, potential impacts and nuisance from demolition and construction dust and mobile plant exhaust emissions generated during the construction phase will be considered using a basic screening assessment and supplemented by case studies where appropriate. There is also the potential for dust emission arising from the movement of WDF onsite and through the movement of vehicles transporting the WDF to/from site.

Where necessary, mitigating measures will be recommended for the control of dust and site plant emissions during demolition and construction works and the operational phase to minimise or remove the potential impacts.

Given the subjectivity that often occurs when attempting to assign a level of significance to a given air quality impact, URS has produced a set of quantitative significance criteria for air quality matters. These are based on:

- The Environment Agency EPR Horizontal Guidance Note H1: Environmental Risk Assessment, Annex (f) Air Emissions December 2011;
- The Environmental Protection UK "Development Control: Planning for Air Quality" 2010 update; and
- The HA's DMRB, which outlines numerical criteria for determining significant and non-significant impacts of vehicular emission sources.

As the fuel being used at the Proposed Development will be predominantly derived from processed waste, there may also be the potential for odour generation from the fuel storage and handling operations, as well as from the vehicles transporting the waste to site. Potential odour sources will be identified and suitable control measures employed and documented in an Odour Management Plan

7.2. Ecology

An extended Phase 1 Habitat Survey was undertaken for the SHP Site in June 2011. In addition, records of statutory and non-statutory sites, UK Biodiversity Action Plan Priority Habitats and records of protected and notable species were reviewed for the Proposed Development site and surrounding area to a 2km radius.

The data search identified that there are no nationally designated sites within the boundary of the Proposed Development site, although two statutory and three non-statutory sites exist within 2km of the site. There were no bat records within 2km of the site. Green woodpecker (*Picus viridis*) was the only notable or protected bird species recorded within 2km of the site over the past 10 years. A number of notable invertebrate species have also been recorded within the search area. Within 10 km of the Proposed Development site there are four European Protected Sites referred to in Section 2.2.

The Proposed Development site contains a range of industrial buildings and surrounding habitats. The industrial buildings are connected with energy generation, including boiler houses, turbine halls, fuel storage facilities, switch rooms, a control room, offices and various other ancillary buildings and structures. There are areas of amenity planting around the perimeter of the Proposed Development site. There are also some scattered trees, a species-poor hedgerow and areas of introduced shrub. The cooling towers site to the north of Edinburgh Avenue contains two natural draught cooling towers, surrounded by ephemeral/short perennial vegetation, bare ground and tall ruderal vegetation. The habitats recorded during the extended Phase 1 habitat survey are shown in Figure 5. The target notes that are shown on this figure are described in a separate Extended Phase 1 Habitat Survey Report, which will form part of the ES.

Certain buildings on the Proposed Development site were considered to offer potential roosting habitat for bats. As such, a bat roost scoping and inspection survey of buildings was undertaken in June 2012, to formally assess the potential of buildings to support bats and identify signs to indicate their presence, such as staining, droppings and feeding remains. This survey identified that some of the buildings on the site have, at most, a low potential to support roosting bats, although no signs to indicate their presence was noted. A subsequent emergence and return bat survey was undertaken in August 2012 to confirm the presence/absence of bats onsite. No bats were recorded during this survey.

The surrounding buildings, trees, dense scrub and introduced shrubs were found to provide potential nesting habitat for birds. This could include notable species, such as house sparrow and possibly black redstart (*Phoenicurus ochruros*). A pair of peregrine falcon (*Falco peregrinus*) do currently hold a breeding territory at the site. The ledges on the explosion relief vents (B12, shown on Figure 5) provide suitable nesting habitat for this species, as well as ledges on other buildings on the site, including the chimneys (B6 and B39, Figure 5). As such, a breeding bird survey was undertaken between April and June 2012. This survey confirmed that a pair of peregrine falcons currently maintains a territory on the Proposed Development site. The pair was also observed mating on one of the chimneys (B39, Figure 5). No evidence of breeding success was recorded, but it is likely that the pair will attempt to breed on the site during future years. As such, appropriate mitigation measures will be employed to prevent disturbance to the pair and any young during the course of the Proposed Development, to ensure compliance with the Wildlife and Countryside Act 1981 (as amended). Black redstart was not recorded during the survey.

The results of the desk study, extended Phase 1 habitat survey, bat surveys and breeding bird survey will be included in the Ecology Chapter of the ES. Once the ecological baseline for the Proposed Development site has been fully described, any ecological receptors that are likely to be significantly impacted by the Proposed Development will be identified.

As outlined in the Air Quality section (Section 7.1) of this report, it is expected that the Proposed Development will emit a range of pollutants into the air, via a chimney, including nitrogen oxides and particulate matter and some trace species. As such, based on modelling presented in the Air Quality and Odour Chapter, the Ecology Chapter will consider whether there is a potential for these pollutants to significantly impact any designated sites in the surrounding area, including any European Protected Sites, specifically SACs. The nearest SAC is Burnham Beeches SAC, located approximately 2.9km north of the site. Potential pollutant impacts will be assessed both alone and in combination with other plans or projects, so as to conform to Conservation of Habitats and Species Regulations 2010 (as amended); if required, mitigation will be proposed and agreed, in consultation with the County Ecologist and Natural England, to ensure that there are no likely significant effects to the SAC (alone and in combination with other plans and projects).

Potential impacts on ecological receptors will be assessed using the Institute for Ecology and Environmental Management (IEEM) Ecological Impact Assessment Guidelines (2006). Any potentially adverse significant impacts will be mitigated or compensated for and a number of ecological enhancements will also be recommended where appropriate. Following the implementation of mitigation and compensation, the Ecology Chapter will identify the residual impacts on ecological receptors.

Figure 5: Phase 1 Habitats within the SHP Site

7.3. Ground Conditions

An assessment of impacts on existing ground conditions will be undertaken as part of the EIA, including the potential for the development of the Proposed Development site to lead to land contamination, as defined in the Environment Act 1995 Part 2A.

It is understood that historic contamination associated within the eastern and western sections of the Proposed Development site has been investigated through previous ground assessments and this information will be used where possible. In addition, a site specific Envirocheck® Report will be commissioned and geological and hydrogeological maps will be reviewed in order to inform the desk based assessment. No intrusive investigations are proposed at this stage for the EIA.

For the purposes of the EIA, the desk based assessment will include a review of the underlying geology and local hydrogeology together with an account of how potential impacts associated with the construction and operation of the Proposed Development will be prevented or minimised.

This desk based assessment will identify the potential for land contamination and potential pathways to sensitive receptors on and off the site. In particular, the Proposed Development includes an underground fuel bunker, which will be considered in terms of its potential to mobilise existing pollutants in the ground and create new pathways,

It is noted that the current surface cover at the site comprises predominantly hardstanding. The assessment will take into account identified historical, existing and proposed operations/services within the development boundary. The assessment will be supplemented by a site walkover to obtain more information on potential site sources of contamination if appropriate. A Conceptual Site Model for the demolition, construction and operational phases of the development will be included as part of the desk based assessment.

Based on the assessment of the baseline and the identification of any potential impacts, the ES will make recommendations for mitigation measures. This may include the recommendation for further intrusive investigation works, quantitative risk assessment, remediation and validation. It will also make recommendations for mitigation should any previously unidentified contamination be encountered during the construction phase which should be employed to minimise the risk of their mobilisation. Similarly, mitigation measures will be employed to eliminate the risk of mobilising contaminants during demolition, should it be determined that there is the potential for contaminants onsite.

7.4. Hydrology, Hydrogeology and Flood Risk

A site visit will be undertaken to establish the local drainage and hydrology of the site and local area. Consultation will be undertaken with the Environment Agency, the local

Councils, the British Geological Society and Thames Water in order to obtain all relevant flood risk, drainage, water resource quality and water use related information.

Additionally, the Envirocheck® Report discussed in Section 7.3 will be referenced for additional data such as licensed surface water and groundwater abstraction and discharge consents.

The potential impacts of the Proposed Development on the water environment will also be assessed. This includes the impacts during demolition, construction and operation and includes an assessment of impacts on all controlled waters.

The development site does not lie within an Environment Agency Flood Protection Zone and there is no known history of flooding on the site.

In relation to changes in drainage regime, the magnitude of this impact will depend on the extent of any increase in hardstanding and the implication on run-off rates within the development area. The significance of this impact will be assessed as part of the ES. The proposals will ensure that an appropriate degree of attenuation is provided for surface water run-off in accordance with relevant local and national legislation and policies, so as to minimise the potential risk of flooding. The volume of attenuation that will be provided on-site will be informed by the results of the surface water runoff study as part of the Flood Risk Assessment (FRA).

The assessment will identify any adopted surface water sewers that might be affected by the Proposed Development, considering appropriate protective easements that need to be maintained or the need for sewer diversions.

The demand for water during cooling and discharge of waste water to the foul sewer will also be considered as part of the assessment.

7.5. Transportation and Access

A preliminary assessment has been undertaken to establish the level of traffic that is likely to be associated with the Proposed Development. The principal vehicle movements are associated with the delivery of fuel and the collection of solid residues from the plant.

A number of existing permissions related to lorry movement conditions for the SHP Site were relaxed by SBC in 2007, which gave permission for up to 252 lorry movements per day (in and out) and on a 24/7 basis with some night time restrictions. The lorry movements from the Proposed Development, together with those required to service the existing three boilers are not expected to exceed the existing site permission on a monthly average.

For the purposes of the EIA, consideration will be given to both the current baseline trip generation from the entire SHP Site, and the permitted maximum.

For the purposes of the EIA it is assumed that all fuel deliveries will be via road as rail access to the site is no longer a viable option since the removal of the rail connection in the early 1970s. The proposed plant will burn up to 300,000 tonnes of WDF, whilst operating at nominal performance levels. It has been estimated that the delivery of fuel to the site for the Proposed Development could generate up to 600 HGV movements per week. There are two movements associated with each delivery: the loaded vehicle bringing the fuel to the site and then the empty vehicle departing. The removal of residues from the site could account for up to 100 HGV movements per week. As part of the transport assessment these weekly projections of HGV movements would be converted to daily and peak hour flows. In particular, the change in vehicle movements associated with the Proposed Development will be compared with currently consented vehicle movements to and from the SHP Site, in order to identify whether total vehicle movements will remain within previously consented limits.

Once the Proposed Development has been completed it is intended that a new one way system will be operated around the site for all lorry deliveries associated with the generation plant. Lorries would enter the site towards the northwest corner via the existing ‘Fibre Fuel’ access road off Edinburgh Avenue. A one way system would then run along the southern boundary of the site, including some on site lorry parking, before running north through the existing wood fuel yard to exit back on to Edinburgh Avenue towards the northeast of the site. The Harwich Road entrance would no longer be used for fuel deliveries but a new dedicated access for staff cars and stores deliveries would be created for access to the southeast area of the SHP Site. The anticipated advantages of the new layout are as follows:

- Segregation of large fuel lorries and cars;
- Onsite waiting of lorries thus reducing congestion on roads;
- A single point of entry for lorries for improved security; and
- Relocation of the wood shed entrance thus reducing fugitive dust.

The Transport chapter of the ES will comprise an assessment of the effects of the Proposed Development on the existing transport infrastructure, including both construction and operation traffic. The assessment will be based on the effect of fuel deliveries by road, truck and private car movements, and pedestrian and cycle movements. The Transport chapter will:

- Consider alternative means of transport of imported fuel to the Proposed Development site;
- Address changes to local traffic flows during the demolition, construction and operation phases;

- Address potential disruption to local pedestrians, cyclists and road vehicle users during the demolition and construction phases;
- Provide information on transport conditions both before (up to 5 years) and after the Proposed Development has been built; and
- Ensure suitable access is maintained for the delivery of “Abnormal Loads” (e.g. transformers, generators) during the construction period.

A Transport Assessment (TA) will be provided as part of the EIA, based on the likely trip generation associated with the Proposed Development. The TA will take into account guidance as provided by the NPPF and HA, the Institution of Highways and Transportation, the former Department of the Environment, Transport and the Regions and the Institute of Environmental Management and Assessment (IEMA).

Consultations with various parties will be ongoing during the design of the Proposed Development and the TA. The scope of work for the TA will be agreed directly with the relevant Transportation Officers at SBC, though it is envisaged that it could comprise:

- Establishment of baseline conditions for all modes of transport including movement flows for road traffic based on available data and recent surveys;
- An outline of the site context including consideration of accessibility by all main transport modes;
- A review of highway safety issues including examination of personal injury accident data;
- Establishment of construction traffic flows;
- Assessment of the transport implications of the Proposed Development in combination with consented development and highway schemes, including the impact on local AQMAs;
- An assessment of the travel demands expected to arise from the development;
- A review of major developments at the Slough Trading Estate that may have an impact;
- Consideration of the sweep required by abnormal loads during the construction phase;
- A forecast of the likely distribution of trips across the catchment area;
- Projections of the modal splits anticipated;

- A review of walking and cycling issues for employees including those related to the highways surrounding the site;
- A description of the parking and servicing proposals;
- A framework of measures to be included in development travel plans if necessary; and
- A summary of the residual and cumulative impacts and consideration of mitigation measures where appropriate to reduce adverse effects of changes in trip generation and distribution.

7.6. Noise and Vibration

The following potential impacts are likely to be associated with the Proposed Development:

- Noise from the demolition of existing plant and buildings;
- Construction (and associated traffic) noise;
- Operational noise impacts from the new plant; and
- Operational noise impacts from vehicular traffic, including during night-time hours.

Based on the distance between the site and the nearest residential receptors, vibration impacts associated with site activity are considered unlikely (though will still be considered as part of the EIA).

URS has conducted a review of available existing data as part of this Scoping Report. A previous (1998) ES for development at the SHP Site indicates that previous development proposals have been subject to noise planning conditions stipulating that 'the external noise level at 1.2m above ground level at the site boundary, shall not exceed a noise level of 60 dB(A) Reference application no: P/00987/013'.

The previous ES's for the Fibre Fuel Production Plant (1994) and CHP Energy Recovery Project (1998) provide information regarding the nearest noise sensitive locations, assessment methodology, dominant noise sources in the surrounding area and potential impacts from the development.

Extensive night-time noise monitoring has been carried out in the local residential area to the north of the SHP Site on an annual basis since 1991, as a condition of planning from 1989 for the existing site operations. The results of the noise monitoring identify any changes to the ambient night-time levels that are associated with the SHP Site operations.

The EIA noise and vibration methodology will be driven by input from the following principal standards and guidelines for the assessment of impacts from the Proposed Development:

- The NPPF, 2012;
- Environment Agency, 2004. Integrated Pollution Prevention and Control (IPPC), H3 Horizontal Guidance for Noise, Part 1 – Regulation and Permitting;
- BS5228: Noise and vibration control on construction and open sites;
- BS6472 Guide to evaluation of human exposure to vibration in buildings;
- BS7385 Evaluation and measurement for vibration in buildings;
- BS4142: Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas (1997); and
- Department of Transport, 1988. Calculation of Road Traffic Noise.

The most recent off-site noise measurements were conducted in December 2011. It is considered that this data is suitable for use to establish the night-time baseline ambient noise environment at receptors nearby the site. It is not proposed therefore that additional night-time monitoring will be undertaken specifically for the Proposed Development.

For input into the construction and operational noise assessments, a daytime noise survey will be undertaken at the same receptors, consisting of a 15-minute measurement (of LAeq, LAmax and LA90 parameters) at each location.

Noise predictions at environmental receptors will be carried out for each phase of the development, based on plant and equipment to be used, distances to receptors and screening, together with the use of any potential noise control mitigation measures such as work procedures, screening, working hours and monitoring activities to determine reduction in noise and vibration and the residual impact. Predictions will be carried out using BS5228 methodology. Noise mapping using CadnaA noise mapping software may be used for noise predictions where significant benefits from screening are envisaged. Any proposed noise control mitigation measures will be incorporated into the model.

Potential effects of works vibration will be assessed against BS6472 and BS7385. The effects of construction or operational traffic noise will be predicted using CRTN methodology. Predicted noise levels will be assessed according to criteria from BS4142 and Environmental Agency Horizontal Guidance H3. Potential effects of works vibration will be assessed against BS6472 and BS7385.

7.7. Socio-Economics

For the purposes of the ES, due consideration will be given to the role of the Proposed Development in the generation of direct and indirect employment opportunities at the local and regional level, during the demolition, construction and operation phases.

A socio-economic assessment will be undertaken to assess the impact of the scheme on the baseline conditions within both the local and wider area. The methodology for assessing socio-economic impacts will follow standard EIA guidance and will involve:

- Review of relevant baseline conditions at the site and locality;
- Assessment of policy justification for the provision of additional employment space and the contribution of these activities to SBC's policy objectives;
- Estimate of employment generated during the construction and operational phase;
- Consideration of local policy, plans and development constraints; and
- Assessment of the likely scale, permanence and significance of impacts.

The social and economic policy context will identify relevant policy. The assessment will be carried out using a number of recognised data sources including, but not limited to the following:

- Office of National Statistics Labour Force and Neighbourhood Statistics;
- Annual Business Inquiry;
- Annual Population Survey;
- Census 2001; and
- Travel to Work Data.

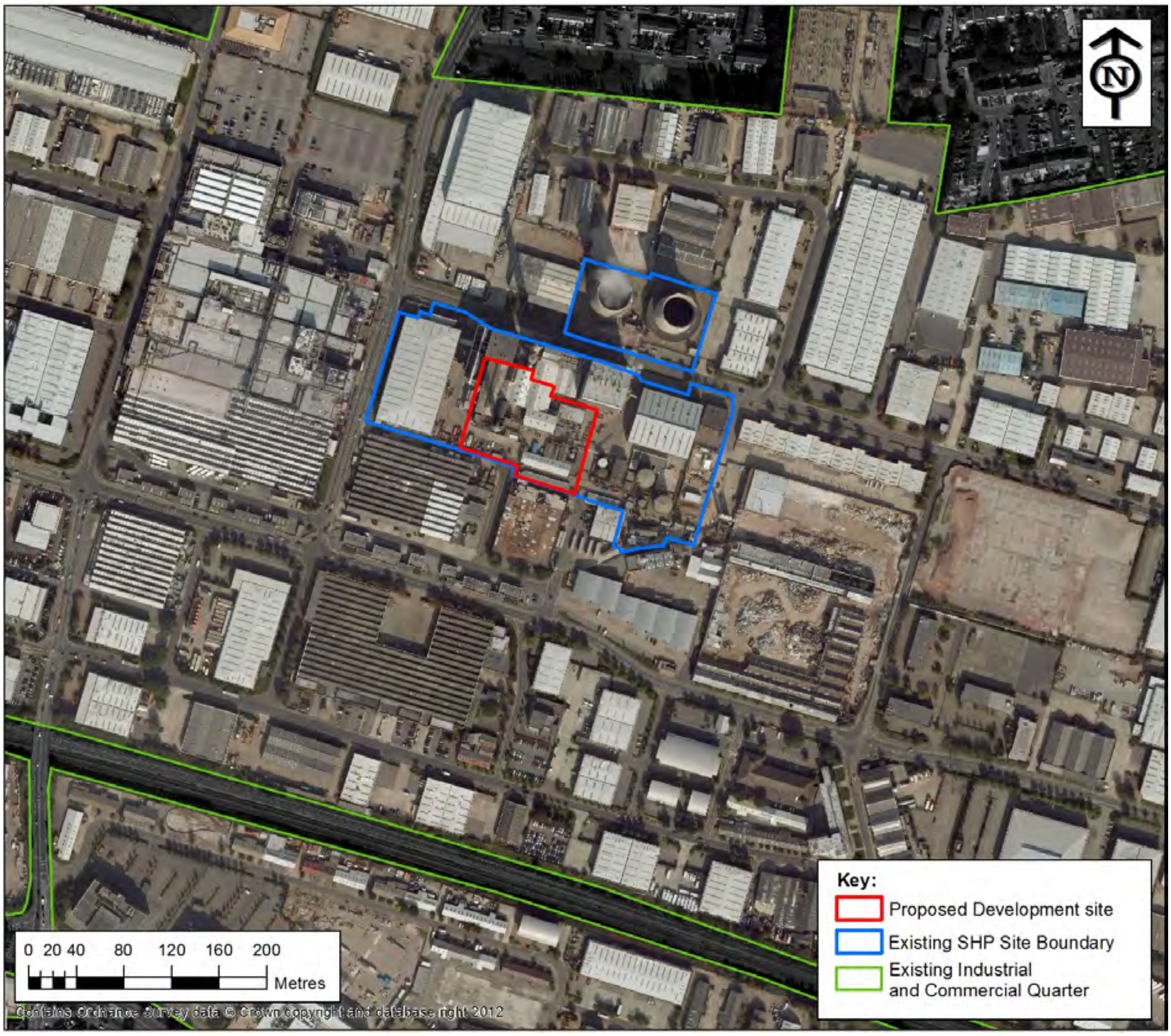
Wherever possible the impacts of the socio-economic assessment will be appraised against relevant national standards such as those provided by HM Treasury and English Partnerships. Where no standards exist, professional experience and judgement will be applied and justified. A summary will be provided of key residual impacts of the Proposed Development.

7.8. Landscape and Visual Impact Assessment

The landscape and visual impact assessment will examine the potential effects of the Proposed Development on the landscape and visual amenity of the site and surrounding area.

The Proposed Development site lies within the centre of a well established existing industrial and commercial quarter (see Figure 6 below). An existing railway link crosses through the existing industrial and commercial quarter.

Figure 6: Existing Industrial and Commercial Quarter and Railway Cutting



Bounded on all edges of the Trading Estate is an existing residential area. The nearest residential properties to the Proposed Development site are located approximately 200m away at Bodmin Avenue to the north. These properties are screened by a grassed area with mature trees. Glimpses of the SHP Site can be seen through the trees from these properties.

The aim of the Proposed Development is to produce a facility that optimises the balance between technical, economical, social and aesthetic considerations whilst incorporating the scheme within the context and tight constraints of the existing SHP Site operations.

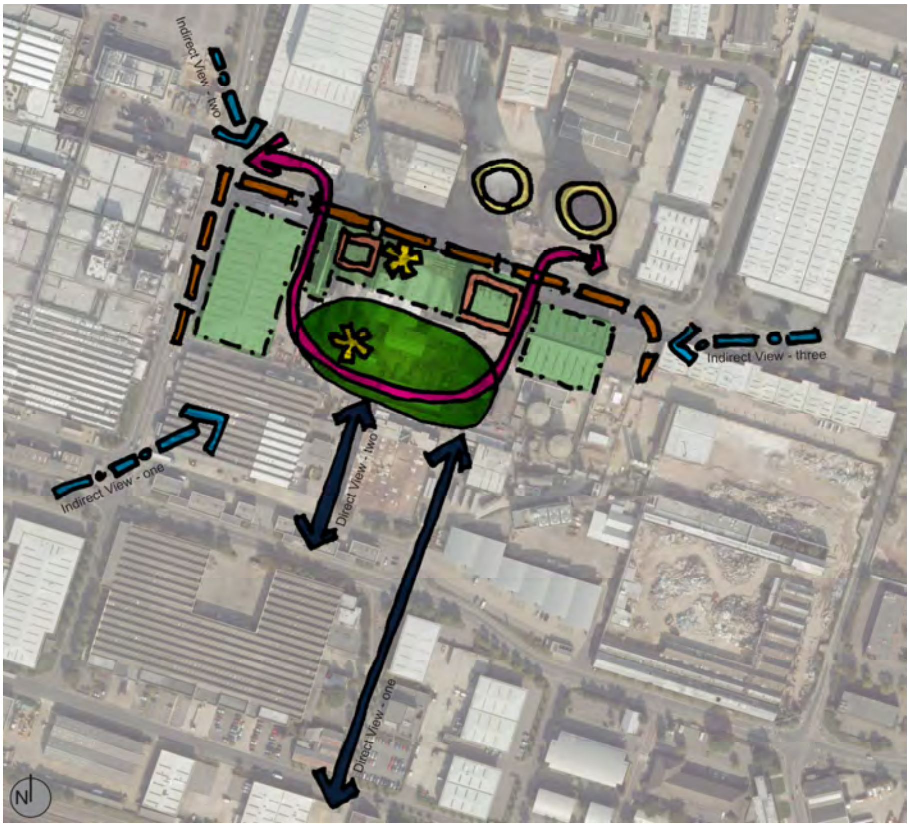
This has led to the inclusion of the following concepts in the design:

- Incorporation and reuse of an existing chimney and cooling towers on site;
- Masterplan to remove and improve the visual aspect of the existing buildings to the south side of the site;
- To successfully deliver a new facility on a brownfield site;
- Improve the visual appearance of the site from distant and surrounding views; and
- Cohesively incorporate the existing facilities with the Proposed Development to provide an efficient and well structured facility.

The height of the Proposed Development is expected to be approximately 47m. The Proposed Development will be designed with careful consideration to the quality of buildings, massing and scale, choice and specification of materials.

The existing SHP Site buildings straddle the northern Site boundary; due to their height and massing these existing structures will reduce the visual impact of the Proposed Development from the north. The key views of the Proposed Development will primarily be from the south with indirect views from the east and west. Figure 7 shown below, illustrates the existing opportunities and constraints of the site and the direction of existing direct and indirect views.

Figure 7: Existing Site Analysis Opportunities and Constraints



Proposed Development.

Indirect view of the SHP Site.
These locations provide a possible glimpse of the Proposed Development.

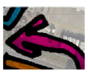
Direct view of the SHP Site.
These locations provide a clear line of site to the Proposed Development.

Existing Chimneys.
There are two existing concrete chimneys on the SHP Site.

Existing Concrete Cooling Towers.
There are two 49m high existing concrete cooling towers on the SHP Site.

Retained Buildings on the SHP Site outwith the Proposed Development.

High Points of existing building.
There are two existing building high points. The west point is 30 m and east 43 m tall.



Possible Traffic Route.
This arrow identifies the possible traffic flow through the site.

Building Edge.
The existing buildings straddle the Proposed Development boundary and provides a hard edge to the northern part of the site.

A series of locations will be identified for the assessment of views as part of the ES. The selection of views will be based upon guidance provided by the Landscape Institute, and potential visibility of the site from key viewpoints, including local designated green belt areas together with landscape designations of the immediate and surrounding areas.

It is proposed that this study will include the views presented below, subject to agreement with SBC and any feedback from the consultation process. Figures 8 and 9 show some direct views and Figures 10-12 show some indirect views that are proposed will be assessed.

In addition, the use of verified photomontages/ wireframes (as appropriate) to show existing and proposed views will provide the key presentational information to support the assessment. The assessment will include the effects of potential plume visibility from the South stack, light pollution, seasonal changes (i.e. wintertime views), and will detail proposed mitigation measures as required to reduce any potentially significant effects.

Figure 8: Direct View One

Figure 9: Direct View Two

Figure 10: Indirect View One

Figure 11: Indirect View Two

Figure 12: Indirect View Three

The assessment will concentrate on the key landscape and visual issues comprising effects on:

- Landscape character and designated landscapes;
- Residential areas;

- Main roads and tourist routes; and
- Popular recreational areas and heritage assets.

Consideration will also be given to the following impacts of the Proposed Development when operational:

- Plume visibility arising from the South stack; and
- Lighting, reflection and night-time views.

The assessment will describe the mitigation measures recommended and incorporated within the Proposed Development.

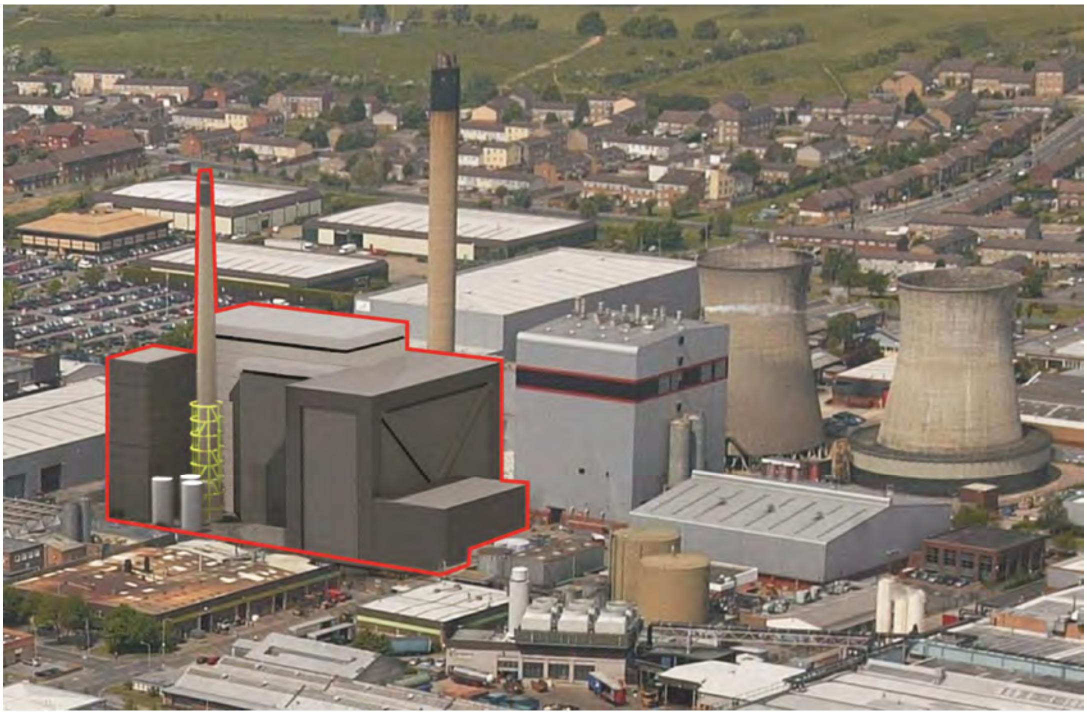
The landscape and visual impact assessment will be based on guidelines provided in:

- Guidelines for Landscape and Visual Impact Assessment (Landscape Institute and Institute of Environmental Management and Assessment) 2002; and
- Landscape Institute Advice Note 01/04.

The production of a computer-generated Zone of Theoretical Visibility (ZTV) will be combined with fieldwork to identify potential viewpoints. A viewpoint analysis of the potential effects on the landscape and visual amenity arising from the Proposed Development at each of the selected viewpoints will be carried out. This analysis will involve the production of computer generated 3D wirelines and/or photomontages to predict the views of the Proposed Development from each of the agreed viewpoints. The existing and predicted views from each of these viewpoints will be analysed to identify the predicted magnitude of change, the sensitivity of relevant receptors and the resultant effects on landscape character and visual amenity. An assessment of the residual effects taking account of the mitigation measures will be carried out to determine the impact of the Proposed Development in this locality in relation to the landscape and visual amenity, noting any significant effects.

Figure 13 provides an early illustration of the relationship between the Proposed Development against the existing SHP Site. Ultimately, the final design will be driven by technical and functional requirements

Figure 13: Illustration showing the Relationship between the Proposed Development against the existing SHP Site



7.9. Archaeology and Cultural Heritage

Given that the site has been previously developed as a power station, and with its deep foundations, it is expected that the potential for archaeological features beneath the ground onsite is low. However it will be important to also consider the indirect effects of the Proposed Development on the setting of heritage assets within 1km of the site.

The nearest designated heritage asset is located approximately 500m to the southeast of the site. Due to the scale of the Proposed Development there is the potential for the setting of designated heritage assets to be impacted by the proposed scheme; therefore setting impacts for designated assets will be assessed in relation to the scheme Zone of Theoretical Visibility (ZTV) (to be undertaken as part of the landscape and visual impact assessment). The impact of the Proposed Development on designated and non-designated heritage assets will be assessed within a 1km study buffer area based upon the site centre. A desk-based archaeological assessment will determine, as far as is reasonably possible from existing records, the nature of the archaeological resource within the study area and will be used to identify any impacts that the Proposed Development may have on the receptors. An inventory of all heritage assets will be cross-referenced to drawings (base maps) and the report narrative.

The assessment will follow current professional good practice and guidance including that produced by the Institute for Archaeologists (IfA) and English Heritage (EH):

- EH (2008) – Conservation Principles: Policies and Guidance for the sustainable Management of the Historic Environment;
- IfA (2008) - Standard and Guidance for archaeological desk-based assessment; and
- IfA (2010) – Code of Conduct.

Any potential mitigation strategies required will be considered and recommendations made. The significance of residual impacts remaining after mitigation will be assessed according to accepted criteria for assessing archaeological and historic sites.

7.10. Sustainability and Climate Change

National, regional and local policy guidance promotes sustainability principles, particularly with regard to the reuse of land and buildings, air quality and land contamination issues, energy conservation, materials and water usage. The ES will incorporate an assessment of the design against established sustainability criteria to take into account the following:

- Land, materials and natural resource use;
- Energy consumption and energy efficiency;
- Waste minimisation and implementation of the waste hierarchy, including a waste management plan covering the construction and operational phases of the Proposed Development;
- Materials specification and usage in relation to carbon dioxide (CO_2) emissions and ozone depletion;
- Sustainability of the generation and sourcing of the proposed fuel stock; and
- The aims of the Berkshire Biodiversity Action Plan.

The carbon emissions/ carbon footprint from the combustion and transport of waste derived fuel and proposed mitigation measures will be assessed in a standalone Climate Change Impact Report.

8. OTHER EIA ISSUES

The aim of the Scoping Stage is to focus the EIA on those environmental aspects that may be significantly affected by the Proposed Development. In so doing, the significance of impacts associated with each environmental aspect becomes more clearly defined, resulting in certain aspects being considered ‘non-significant’. The following section provides a summary of those issues, which have been considered during the preparation of this Scoping Report, but are not considered key to the EIA and will therefore not be considered in detail in the ES.

8.1. Waste

A description of the potential streams of construction waste and estimated volumes will be described within the Demolition and Construction Programme and Management chapter of the ES, along with a description of the requirements under the Site Waste Management Plan (SWMP) Regulations.

In addition to this, the CEMP, which will be produced following receipt of planning permission, will set out how waste will be managed on site, and opportunities to recycle waste will be explored.

For the operational Proposed Development, an analysis of the main waste streams will be provided. This Waste Management Strategy will be produced in accordance with the current local standards and policies. A Servicing Strategy will also be produced as part of the Transport Assessment.

Taking the above into account, it is not deemed necessary that a separate waste chapter should be produced as part of the ES.

8.2. Electronic Interference

An assessment of electronic interference has been conducted at the site in the past and the impact of the Proposed Development on electronic interference has been considered again as part of this scoping exercise. However, given that the proposed maximum building heights and expected temporary construction cranage will be lower than the existing south chimney, an assessment of the Proposed Development's effect on electronic interference is unlikely to be required.

Further to this, analogue signals have ceased to be transmitted and have been replaced by digital signals. As such, the Proposed Development's potential to interfere with television, radio (both analogue and digital) and mobile phone reception is considered negligible. Nonetheless, a screening assessment will be undertaken to determine the existing effect of the current buildings onsite, and likely extent and severity of any impacts arising from the Proposed Development. Based on this, and if necessary, a full and detailed assessment will be undertaken; however it is not envisaged at this stage that this will be necessary and therefore has not been scoped for at this stage.

8.3. Aviation

Heathrow Airport is located approximately 11km southeast of the site. However, the proposed building height of approximately 47m and expected temporary construction cranage will be lower than the existing south stack, and as such, it is not expected that a detailed assessment of aviation impacts will be required as part of the EIA.

8.4. Daylight, Sunlight, Overshadowing and Light Pollution

Given the massing and location of proposed buildings (and of the existing buildings on the SHP Site), and distance to the nearest sensitive receptor (the nearest residential receptor is located approximately 200m away) daylight, sunlight, overshadowing and light pollution impacts are unlikely to be significant. As such, it is considered that daylight, sunlight, overshadowing and light pollution can be scoped out of further assessment in the EIA.

8.5. Soils and Agriculture

Given the nature of the existing land use on site (the operational area of an existing power station), and the fact that the Proposed Development would not alter this, it is recommended that this aspect is scoped out of the EIA.

8.6. Accidental Events

The description of the Proposed Development in the ES will be written to provide sufficient information to allow the key issues identified in Section 7 of this report to be adequately assessed. Accidental events such as the potential for fuel spillages and abnormal air emissions, and how the risk of these events will be minimised, will be discussed in the relevant chapter of the ES. The risk and potential impacts of a fire onsite would also be considered in the Human Health Risk Assessment (HHRA).

Accidental events will be covered by a brief risk assessment in the ES, which will include reference to SSE's overarching principles of emergency management. The majority of emergency response plans and contingency measures will be dealt with in the Environmental Permit, which is regulated by the Environment Agency.

9. PROPOSED STRUCTURE OF THE ENVIRONMENTAL STATEMENT

The ES will comprise the following set of documents.

Non-Technical Summary (NTS): this document will provide a summary of the key issues and findings of the EIA. The NTS will be presented in non-technical language to assist the reader to understand the site context, the Proposed Development, the design alternatives, the environmental issues arising, and proposed mitigation measures.

Volume I: Environmental Statement: This will contain the full text of the EIA with the proposed chapter headings as follows:

- Introduction;
- Assessment Methodology and Significance Criteria;
- Alternatives and Design Evolution;

- Planning Policy Context;
- The Proposed Development;
- Demolition and Construction Programme and Management;
- Air Quality;
- Ecology;
- Ground Conditions;
- Hydrology, Hydrogeology and Flood Risk;
- Transportation and Access;
- Noise and Vibration;
- Socio-Economics;
- Landscape and Visual;
- Archaeology and Cultural Heritage;
- Sustainability and Climate Change;
- Non-Significant Issues;
- Cumulative Impact Assessment; and
- Residual Impact Assessment and Conclusions.

Volume II: Technical Appendices. This will provide supplementary details of the environmental studies conducted during the EIA including relevant data tables, figures and photographs.

10. PLANNING APPLICATION DOCUMENTS

At this stage of the application process, it is considered that in addition to the ES, the planning application will be accompanied by, but not be limited to, the following documents:

- Relevant Application documents including covering letter, forms and schedules;
- Planning Statement;
- Plans, Sections and Illustrations forming the Application Drawings;

- Design and Access Statement;
- Statement of Community Involvement; and
- Completed application forms and notices.

The exact provision of supplementary documentation is subject to confirmation, and will be determined following the outcomes of the EIA and design evolution process.

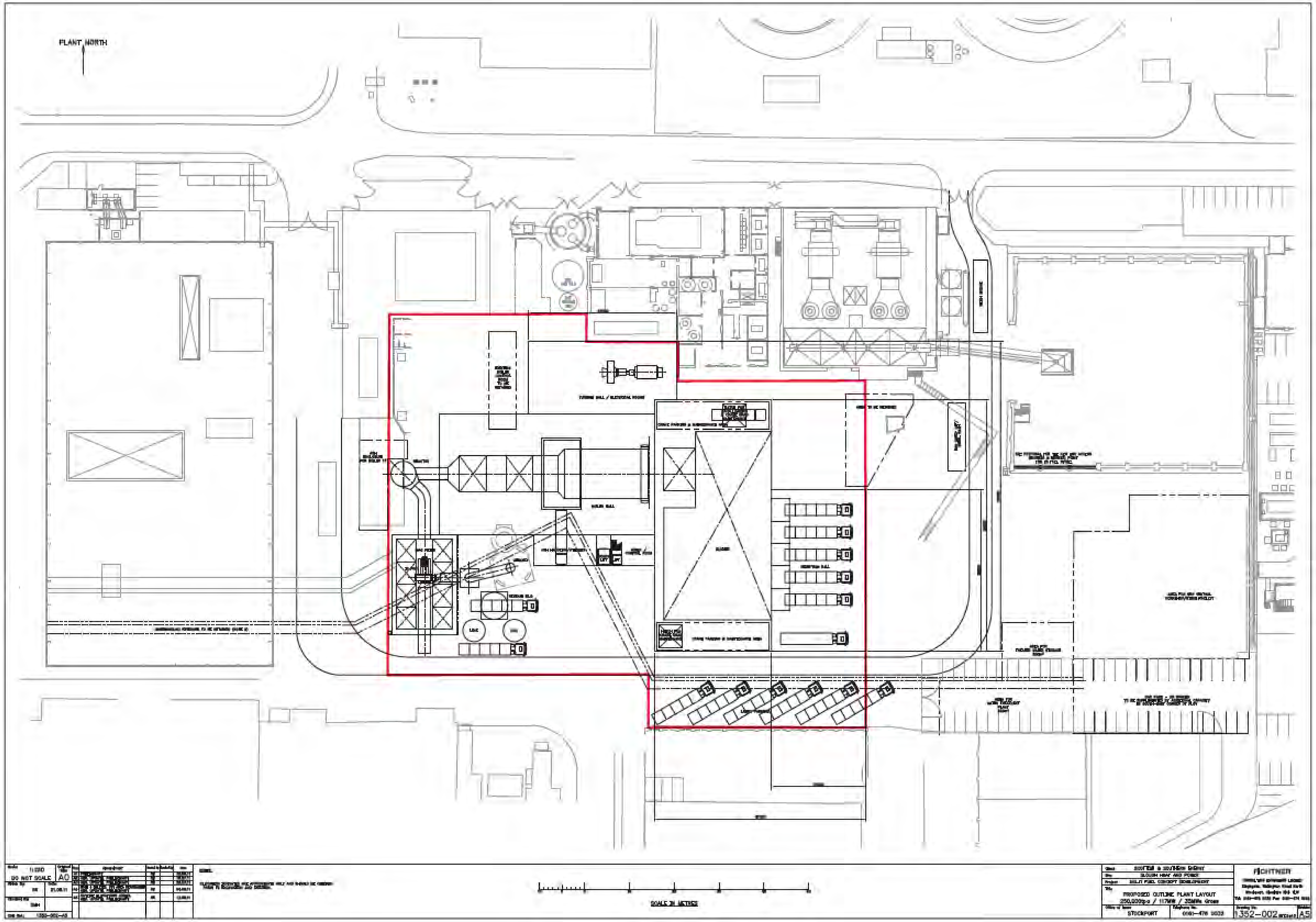
11. SUMMARY AND CONCLUSIONS

This Scoping Report requests the Scoping Opinion of SBC pursuant to Regulation 13 of the EIA Regulations. It has outlined a comprehensive scope of work proposed for the EIA based on previous experience of the assembled team of specialists and existing baseline studies of the Proposed Development site. SBC and other consultees are invited to consider the contents of this Report and comment accordingly within the five-week period prescribed by the EIA Regulations.

Glossary

ADMS	Advanced Dispersion Modelling System
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
BAT	Best Available Techniques
BCC	Berkshire County Council
BREEAM	Building Research Establishment Environmental Assessment Method
BREF	BAT Reference Documents
BWMC	Royal Borough of Winsor and Maidenhead Council
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
DEFRA	Department for the Environment, Food and Rural Affairs
DCMS	Demolition and Construction Method Statement
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EH	English Heritage
EIA	Environmental Impact Assessment
ES	Environmental Statement
FRA	Flood Risk Assessment
GT	Gas Turbine
HA	Highways Agency
HFO	Heavy Fuel Oil
HSE	Health and Safety Executive
IEEM	Institute for Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
LAQM	Local Air Quality Management
LDF	Local Development Framework
LNR	Local Nature Reserve
LPA	Local planning Authority
NBN	National Biodiversity Network
NE	Natural England
NO_X	Nitrogen Oxides
NTS	Non-Technical Summary
PB	Package Boiler
PPG	Planning Policy Guidance Note
PPS	Planning Policy Statement
RDF	Refuse Derived Fuel
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SHP	Slough Heat and Power
SNCR	Selective Non-Catalytic Reduction
SPA	Special Protection Area
SBC	Slough Borough Council
SBDC	South Bucks District Council
SRF	Solid Recovered Fuel
SSI	(Local) Site of Special Interest
SSSI	Site of Special Scientific Interest
TA	Traffic Assessment
tpa	tonnes per annum
UDP	Unitary Development Plan
WW	Wood Waste Fuel
WHO	World Health Organisation
WDF	Waste Derived Fuel
WHRB	Waste Heat Recovery Boiler
WID	Waste Incineration Directive
ZTV	Zone of Theoretical Visibility

APPENDIX 1: INDICATIVE SITE LAYOUT


PLANT NORTH
DO NOT SCALE
A0
SCALE IN METRES
SLOUGH HEAT AND POWER
PROPOSED OUTLINE PLANT LAYOUT
FICHTNER
STOCKPORT
1352-002
A5

The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011

Scoping Opinion

FOR THE PROPOSED MULTIFUEL POWER STATION, EDINBURGH AVE, SLOUGH

1.0 Introduction

1.1 SSE Generation Ltd, a subsidiary of SSE plc, is to seek planning permission for the demolition and removal of redundant generating plant and buildings on part of the existing Slough Heat and Power (SHP) site and to develop a proposed Multifuel Facility (the Proposed Development). The Proposed Development will use existing accesses to the Proposed Development site shown on drawing 7784/1. SSE has requested a formal Scoping Opinion about its proposed scheme. These proposals would be additional to the current two large power generating units operating on the northern half of the SHP site. A small standby gas-fired boiler has recently been granted planning permission and completed. Certain site services plant will be integrated with the Proposed Development although the power generating units will remain separate and electricity separately metered.

1.2 Following the request by SSE to seek a formal scoping opinion about its Proposed Development, Slough Borough Council (the Council) has undertaken a preliminary assessment including responses from statutory consultees.

1.3 Following written submissions received from SSE and its accompanying SSE legal opinion about the validity of a determination as a S70 application, the Council has sent a written reply accepting that a planning decision can be determined under this section of the Planning Acts.

1.4 Furthermore, the Council has since produced a Screening Opinion confirming that the Proposed Development should be treated as a Schedule 1 development under the above-mentioned Regulations, requiring an Environmental Statement (ES).

1.5 After consideration of the details submitted by SSE, this Council requires the scheme description to be as follows:

Erection of a 40 MW Multifuel (Waste Derived Fuel and Biomass) CHP Generating Facility.

Note: Waste derived fuel is hereafter referred to as WDF.

It is also necessary to identify the site of the Proposed Development to be shown edged red and any further area where SSE has an interest in the land (edged blue).

1.6 Much of the information required to undertake the EIA/ES will be common to the EA Permit process. It is strongly recommended that the two processes are run in parallel.

1.7 The Scoping Opinion sets out the key environmental issues and proposed methodology to be used in the Environmental Assessment, in accordance with the relevant guidance and good practice advice. The applicant is requested to meet the requirements in full.

2.0 <u>The Need for an Environmental Statement</u>

2.1 This project is a Schedule 1 development. Schedule 1 of the EIA Regulations includes under paragraph 2(a) *"thermal power stations and other combustion installations with a heat output of 300 MW [megawatts] or more."* Paragraph 10 of Schedule 1 includes *"Waste disposal installations for the incinerator or chemical treatment (as defined in Annex IIA to Council Directive 75/442/EEC under the heading D9 of non-hazardous waste with a capacity exceeding 100 tonnes per day"*.

2.2 The accompanying screening opinion statement sets out the significant features.

3.0 <u>Outline of Environmental Statement</u>

3.1 The Scoping Opinion has outlined the policy context within which the application should be considered. The following documents should also be considered:

- National Planning Policy Framework (2012)
- National Policy Statement for Renewable Energy Infrastructure (2011)
- Saved Policies from Waste Local Plan for Berkshire (1998)
- Slough Local Development Framework, Core Strategy 2006-2026 (2008)
- Slough Local Transport Plan (2011)
- South-East Plan (2009) [1]

3.2 In particular it will be necessary to demonstrate how the proposal complies with the principles of sustainable development including the protection of the environment and the prudent use of natural resources.

4.0 <u>General</u>

4.1 The EIA should be concerned with 'likely' significant effects; there may be potential effects but if these are not likely, then the EIA need not address them.

5.0 <u>Description of Development and Application Site Boundary</u>

5.1 The planning application should include the site of the Proposed Development together with internal access areas up to the public highway. Where the operational requirements of the proposed scheme utilise site

[1] The Localism Act 2011 obtained its Royal Assent in December 2011.The South-East Plan will remain in effect until its formal abolition.

services and structures elsewhere on the SHP site, the perimeter of these should be shown in blue, along with the proposed site services area which will be the subject of a separate application by SSE, to be submitted in parallel with the application for the Proposed Development. The appropriate Notices should be served on parties with interests in the land edged red and blue on drawing 7784/1 and the appropriate certificates supplied to this Council. Where any proposed construction area falls outside the application site, then any requirements of these operations should be included in the ES sufficiently to consider the effects. It is noted that the construction laydown area/s may be liable to change and therefore should be assessed accordingly.

6.0 Characteristics of the Development

6.1 Approximately 2.ha of the whole site is proposed for a new power generating plant, including fuel storage, flue gas treatment plant, chimney (likely to utilise the existing southern chimney), steam turbine, and auxiliary plant such as electrical switchgear, water treatment plant, feed-water system and effluent treatment plant (the Proposed Development). The whole SHP site is approximately 4.5.ha in size.

6.2 One of the major new buildings will enclose the new boiler using a conventional reciprocating grate technology. It will use a range of Waste Derived Fuels for generating up to 40 MW electrical generation and 20 MW of thermal heat. The 2 cooling towers on the SHP complex and nearby water supply will remain and are expected to integrate with the proposed generating unit. Supplemental cooling may, if required, be installed within the Proposed Development site to provide a satisfactory level of cooling in the form of either air cooling or small low plume hybrid cooling towers. Otherwise each of the existing generating units operates with separately metered output and connections to the local network.

6.3 The Proposed Development will be constructed on land previously used for generation and associated development.

6.4 This Proposed Development site is part of a larger site with two operational major power generating units and a smaller gas fired boiler. The two larger power generating units use low carbon technology designed for waste wood, biomass and WDF. One is still capable of using coal.

6.5 Water is supplied from SHP's existing groundwater boreholes and treated to generate feedwater. Waste water will be discharged by foul sewer, retained in underground tanks for later collection, removal or treated off-site.

6.6 As stated in the Scoping Report (Section 8.1 page 11) only WDF that has been processed to meet a pre-determined fuel composition range will be sourced for the Proposed Development. The sources of the WDF will typically comprise:

- Solid Recovered Fuels (SRF) and Refuse Derived Fuel (RDF) which come from processing Municipal Solid Waste and Commercial and Industrial Waste, and

- Non Hazardous Wood, including waste wood but excluding hazardous (impregnated) waste, referred to as waste wood.

All of the WDF fuel supply will be delivered to the site and waste residues removed by lorry using 2 identified entrances. The applicant should describe the volume of the waste fuel bunker and residue storage together with an indication of the number of days of fuel reserves available on site.

6.7 For this operation within the Proposed Development site to fall within the Recovery category (R1) of the Annex II of the Waste Directive Framework 2008, its measure of efficiency of the R1 value is required to be equal or greater then 0.65. This will come from a comprehensive ‘acceptance test’ from initial R1 status calculated during the planning/construction stage and later at a specified time after operational data becomes available. No current data has yet been supplied and it is essential to include this.

6.8 Residue solid waste will require disposal but no details has yet been supplied. It will be removed from the site by lorry.

6.9 In terms of emissions from the process, the air quality impact will be from:

1) stack emissions

The EA is the process regulator issuing Permits for Stack emissions. The Council’s statutory local air quality management duties cover 7 air pollutants covering certain stack emissions and traffic emissions. The EA cover other emissions as well as well as looking at the wider regional impact (in consultation with Slough BC).

2) traffic emissions

One of the most significant impacts on local air quality is the impact of the quantity of vehicles delivering waste to the facility and transporting ash off site following combustion.

3) impact on air quality/odour from unloading/storage and the construction phase.

6.10 Environmental studies in respect of the above have covered a variety of issues during other previous applications for planning permission. New studies will be required and updated to incorporate the existence of 2 new designated AQMAs at Tuns Lane and the town centre.

6.11 The quantity and type of operational traffic with their operational hours and transport routes should be modelled in the light of other traffic movements and particularly to determine the impact upon the new AQMAs.

7.0 <u>Location of the Development</u>

7.1 The topography of the site is predominantly flat and approximately 30m above the ordinance datum (AOD).

7.2 The site lies in the Thames Valley, approximately 4 km north of the River Thames and is part of the existing SEGRO Trading Estate occupied by various industrial, warehouse and retail businesses in an area approximately 158 ha in size and surrounded by the Slough urban area. The nearest residential properties are located approximately 200 m north of the application site on Bodmin Avenue. There is a nearby large food manufacturing plant.

Windsor and Maidenhead urban areas are approximately 5 km and 7 km distant respectively.

7.3 There are no SAC, SPA SSSIs and NNRs within 2 km of the Proposed Development site but Kennedy Park, two statutory designated Nature Reserves and three other non statutory reserves are within 2 km of the site. The closest European Protected site is Burnham Beeches Special Area of Conservation located 2.9 m north of the site. Also in the locality are Windsor Forest and Great Park SAC (6 km), South London Waterbodies SPA and Ramsar site (7.7 km) and Chiltern Beechwoods (9.9 km) away. It is largely open countryside beyond the outskirts of Slough with some views of the existing high power station buildings.

The nearest designated heritage asset is a railway bridge (Leigh Road Bridge) approximately 500 m to the south-east. There are three scheduled monuments within 2 km, the nearest being the moated site at Cippenham Court approximately 1.5 km to the south. There are eighteen heritage assets within 2 km of the site.

8.0 <u>Identification of Baseline</u>

8.1 The applicant is requested to agree the baseline for the EIA with the Council. To ensure a robust EIA process, the baseline should incorporate the existing situation going back 5 years to 2008 taking into account any committed developments (i.e. with planning permissions). Furthermore, SSE will be required to describe all emissions arising from the existing plant on site and provide details of baseline monitoring. Reference should be made about data collection for heavy metals, dioxins, furans, PM2.5 etc. Any decommissioned plant should not form part of this baseline.

8.2 Para 5.3 sets out the content to be included in the Design Evolution and Alternative assessment. It should add option(s) regarding:

1) housing a smaller boiler and fuel store
2) examining options that lessen the general bulk of the building by alternative design such as lowering the floor level.
3) necessary roof plant and any proposed measures for roof plant enclosure.
4) visual treatment(s) of exterior
5) design for different technologies using waste derived fuels

8.3 Section 4 in the Scoping Report sets out organisations which should be approached as part of the consultation process to identify baseline information.

9.0 Characteristics of Likely Impacts Provision of Low Carbon Electricity Generation Stations

9.1 The planned use of Low Carbon technology in the Combined Heat and Power Plant would be part of the new generation of power stations designed to comply with the far-reaching new technological requirements either in place or planned for across Europe and beyond. They are designed to conform to Climate Change regulations, namely:

1) reductions in greenhouse gas emissions (principally CO_2 and methane),

2) ensure continuity of energy generation and security of supplies as part of the wider Company's strategy for developing energy generation from diverse sources including windfarms and hydros elsewhere in UK.
3) maintain the established association between electricity generation and thermal heat and the increase of the local capacity for usage of electricity generation from Low Carbon fuels
4) achieve energy recovery using processed residual waste as a fuel consistent with requirements of the Waste Hierarchy Framework involving diversion away from landfill space and associated methane emissions from landfill.

9.2 It will be necessary to demonstrate that this proposed development can operate within the regulatory provisions in place or planned for. These cover a variety of environmental factors aimed at minimising environmental pollution to protect public health. It should also demonstrate that the choice of location can best serve forecast local need, having regard for the distribution and number of the type of plants in this area.

9.3 There are two main operating electricity generating units, which remain elsewhere on the site. These also generate electricity from Low Carbon Fuels.

9.4 This new planned Low Carbon Generating Station will burn Waste Derived Fuels. The fuel type, quality and source will be selected by the operator procuring this fuel under market conditions. General information should be supplied about types of fuel suppliers to inform this assessment. Where there are suitable alternative technologies capable of generating similar amounts of energy, it will be necessary to present evidence about these alternative(s). This can be used to assess the degree of impact from these energy generation options.

Air Quality and Odour

9.5 The proposed generating unit is capable of burning a wide range of processed waste in this location near to sensitive receptors such as Burnham Beeches SAC, residential properties, the nearest being within 200m of this site and designated Air Quality Management Areas. It will be necessary for environmental assessments to be undertaken for each scenario as set out in paragraph 9.7. It should also deal with associated features such as different traffic volumes. It will require different data to examine differences of impact, including those affecting air quality, odour or atmospheric pollution. It may be possible to reduce this work where the operator offers to restrict the waste fuel types.

9.6 A study of prevailing winds and potential pollution dispersion modelling will determine the height of the stack to minimise any air quality and potential impacts from the plant on the designated AQMAs and the wider area.

9.7 It will be necessary to identify air quality scenarios to determine fuel composition variances, different stack heights (subject to what is required in the EA Permit) and plant operating at capacity and reduced load. It should also include the effects of dispersion of large buildings in the vicinity. All pollutants to be modelled should be listed. All sensitive receptors should be listed. It will be necessary to undertake a Human Health Risk Assessment covering public health issues.

9.8 The link between quantity and type of operational traffic and air quality needs to be thoroughly covered in the light of other traffic movements and particularly to determine the impact upon the new AQMAs and 200m either side of suggested traffic routes.

Transport

9.9 A full transport assessment will be necessary as part of section 7. This should include information about existing lorry routing restrictions to and from this site and future proposals in and around Slough. Any future modelling shall take account of any planning commitments or recently built schemes.

9.10 On the basis that all fuel deliveries will be via road, then it will be necessary to establish baseline evidence from data over the past five years. It will be necessary to clarify the level of transport activity from the whole site with accompanying information about the status of each power generating unit during that period.

9.11 The quantity and type of operational traffic with their operational hours and transport routes should be modelled in the light of other traffic movements and particularly to determine the impact upon the new AQMAs.

9.12 The ES should report on the potential for means of alternative transport of fuel for this proposal now and potentially at some future date.

9.13 For the planning application process itself, the scope of the transport assessment and travel plan should be agreed in advance with the Local Planning Authority.

Noise and Vibration

9.14 The baseline evidence needs to be updated and incorporated into this section of the ES.

Waste

9.15 A waste management plan framework should be prepared covering all aspects of the development, including construction through to completion and ongoing use. This matter will also be subject to conditioning to be imposed by the Council as necessary.

Landscape and Visual Impact assessment/ Impact upon Openness of Green Belt

9.16 In view of the height and bulk of the proposed buildings, it will be necessary for the Landscape and Visual assessment report to comply with the requirements set out by Guidelines for Landscape and Visual Impact Assessment: Second edition (Spon). This will be a two stage process to expedite the identification of positions to assess the sensitivity of public views. The Councill would welcome an early approach on this. It will be necessary to consider winter views as well. A separate statement about any impact upon the designated Green Belt land outside of the urban envelope should also be addressed in the ES. The applicant should draw upon the available baseline evidence about the bulk and design of the existing buildings. The study should identify any alternative(s) capable of reducing the overall height and bulk of the Proposed Development upon its immediate setting and further afield. Consideration should also be given to the effects of plumes under various weather conditions.

Ecology

9.17 You are advised to make early contact with Natural England to identify their response over Burnham Beeches SAC.

Archaeology and Cultural Heritage, Ecology, Ground conditions, Hydrology

9.18 You have set out requirements appropriate for these sections.

9.19 Records of protected species are obtainable from Thames Valley Environmental Records Centre (TVERC) and Buckinghamshire and Milton Keynes Environmental Records Center (BMERC) for zone of influence. Species records should also be obtained from the relevant local groups. It is also recommended that a Phase 1 habitat survey is undertaken; results of this will determine whether any further species surveys are required. It is agreed with the Draft Scoping Reports that IEEM Guidelines and best practices from relevant specialist organisations. Where protected species are identified and affected by the development, Natural England should be consulted and involved in any mitigation strategies.

9.20 The applicants should have regard to the aims of the Berkshire Biodiversity Action Plan when designing avoidance, mitigation and enhancement measures for diversity.

Demolition and Construction Programmed, Commissioning and Management

9.21 The ES should include the site proposed for temporary construction depot.

9.22 The submission of the Method Statement should include proposed working times listed below and any work outside of those hours will require consent from the Local Authority under Section 61 of the Control of Pollution Act 1974.

9.23 A Method Statement should contain the Commissioning Plan for all aspects of the boiler start up in full compliance with statutory requirements and any accompanying publicity arrangements.

9.24 The submission of a Management Plan to cover Risks associated with incidents from fire and spillage particularly when involving release of gases into the atmosphere, hot water into the surface water system or onsite stored materials.

Non-significant EIA issues

10.1 You have set out appropriate requirements under this section.

Conclusion

11.1 The Council considers that these are reasonable requests and should be included in the ES.

11.2 This Scoping Opinion has been adopted by Slough Borough Council.

………………………………………….. … ……………………………….
Head of Planning Policy and Projects Date

ERECTION OF PROPOSED MULTIFUEL CHP FACILITY ,EDINBURGH AVE., SLOUGH

SCOPING OPINION BY SLOUGH BOROUGH COUNCIL

SUMMARY OF RESPONSES FROM STATUTORY CONSULTEES

1. Natural England

Natural England is a non-departmental public body. Our statutory purpose is to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development.

Case law[1] and guidance[2] has stressed the need for full set of environmental information to be available for consideration prior to a decision being taken on whether or not to grant planning permission. Appendix A (attached)to this letter provides Natural England's advice on the scope of the Environmental Impact Assessment(EIA) for this development.

Should the proposal be amended in a way which significantly affects its impact on the natural environment then, in accordance with Section 4 of the Natural Environment and Rural Communities Act 2006, Natural England should be consulted again.

We would be happy to comment further should the need arise but if in the meantime you have any queries please do not hesitate to contact us. For any queries relating to specific advice in this letter only please contact Stewart Coles on 0300 060 4922.

1 Harrison,J in R v Cornwall County Council ex parte Hardy(2001)

2 Note on Environmental Impact assessment Directive for Local Planning Authorities Office of the Deputy Prime Minister(April 2004)

Annex A – Advice related to EIA Scoping Requirements

1. General Principles
Schedule 4 of the Town & Country Planning (Environmental Impact Assessment) Regulations 2011, sets out the necessary information to assess impacts on the natural environment to be included in an ES, specifically:

- A description of the development – including physical characteristics and the full land use requirements of the site during construction and operational phases.
- Expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed development.
- An assessment of alternatives and clear reasoning as to why the preferred option has been chosen.
- A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors.
- A description of the likely significant effects of the development on the environment – this should cover direct effects but also any indirect, secondary, cumulative, short, medium and long term, permanent and temporary, positive and negative effects. Effects should relate to the existence of the development, the use of natural resources and the emissions from pollutants. This should also include a description of the forecasting methods to predict the likely effects on the environment
- A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.
- A non-technical summary of the information.
- An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information.

It will be important for any assessment to consider the potential cumulative effects of this proposal, including all supporting infrastructure, with other similar proposals and a thorough assessment of the 'in combination' effects of the proposed development with any existing developments and current applications. A full consideration of the implications of the whole scheme should be included in the ES. All supporting infrastructure should be included within the assessment.

2. Biodiversity and Geology

2.1 Ecological Aspects of an Environmental Statement
Natural England advises that the potential impact of the proposal upon features of nature conservation interest and opportunities for habitat creation/enhancement should be included within this assessment in accordance with appropriate guidance on such matters. Guidelines for Ecological Impact Assessment (EcIA) have been developed by the Institute of Ecology and Environmental Management (IEEM) and are available on their website.

EcIA is the process of identifying, quantifying and evaluating the potential impacts of defined actions on ecosystems or their components. EcIA may be carried out as part of the EIA process or to support other forms of environmental assessment or appraisal.

The National Planning Policy Framework sets out guidance in S.118 on how to take account of biodiversity interests in planning decisions and the framework that local authorities should provide to assist developers.

2.2 Internationally and Nationally Designated Sites
The ES should therefore thoroughly assess the potential for the proposal to affect designated sites. European sites (e.g. designated Special Areas or Conservation and Special Protection Areas) fall within the scope of the Conservation of Habitats and Species (Amendment) Regulations 2012. In

addition paragraph 169 of the National Planning Policy Framework requires that potential Special Protection Areas, possible Special Areas of Conservation, listed or proposed Ramsar sites, and any site identified as being necessary to compensate for adverse impacts on classified, potential or possible SPAs, SACs and Ramsar sites be treated in the same way as classified sites.

Under Regulation 61 of the Conservation of Habitats and Species (Amendment) Regulations 2012 an appropriate assessment needs to be undertaken in respect of any plan or project which is (a) likely to have a significant effect on a European site (either alone or in combination with other plans or projects) and (b) not directly connected with or necessary to the management of the site.

Should a Likely Significant Effect on a European/Internationally designated site be identified or be uncertain, the competent authority (in this case the Local Planning Authority) may need to prepare an Appropriate Assessment, in addition to consideration of impacts through the EIA process.

Sites of Special Scientific Interest (SSSIs) and sites of European or international importance (Special Areas of Conservation, Special Protection Areas and Ramsar sites)
The following designated nature conservation sites should be considered as part of the EIA process:

- Burnham Beeches SSSI
- Windsor Forest & Great Park SSSI
- Wraysbury No.1 Gravel Pit SSSI
- Wraysbury & Hythe End Gravel Pits SSSI

- Burnham Beeches SAC
- Windsor Forest & Great Park SAC
- South West London Waterbodies SPA/Ramsar

- Further information on the SSSI and its special interest features can be found at [redacted] The Environmental Statement should include a full assessment of the direct and indirect effects of the development on the features of special interest within these sites and should identify such mitigation measures as may be required in order to avoid, minimise or reduce any adverse significant effects.

- Natura 2000 network site conservation objectives are available on our internet site here

2.3 Regionally and Locally Important Sites
The EIA will need to consider any impacts upon local wildlife and geological sites. Local Sites are identified by the local wildlife trust, geo-conservation groups or a local forum established for the purposes of identifying and selecting local sites. They are of county importance for wildlife or geodiversity. The Environmental Statement should therefore include an assessment of the likely impacts on the wildlife and geodiversity interests of such sites. The assessment should include proposals for mitigation of any impacts and if appropriate, compensation measures. Contact the local wildlife trust, geo-conservation group or Local Sites body in this area for further information.

2.4 Protected Species - Species protected by the Wildlife and Countryside Act 1981 (as amended) and by the Conservation of Habitats and Species (Amendment) Regulations 2012
The ES should assess the impact of all phases of the proposal on protected species (including, for example, great crested newts, reptiles, birds, water voles, badgers and bats). Natural England does not hold comprehensive information regarding the locations of species protected by law, but advises on the procedures and legislation relevant to such species. Records of protected species should be sought from appropriate local biological record centres, nature conservation organisations, groups and individuals; and consideration should be given to the wider context of the site for example in terms of habitat linkages and protected species populations in the wider area, to assist in the impact assessment.

The conservation of species protected by law is explained in Part IV and Annex A of Government Circular 06/2005 *Biodiversity and Geological Conservation: Statutory Obligations and their Impact within the Planning System*. The area likely to be affected by the proposal should be thoroughly surveyed by competent ecologists at appropriate times of year for relevant species and the survey results, impact assessments and appropriate accompanying mitigation strategies included as part of the ES.

In order to provide this information there may be a requirement for a survey at a particular time of year. Surveys should always be carried out in optimal survey time periods and to current guidance by suitably qualified and where necessary, licensed, consultants. Natural England has adopted standing advice for protected species which includes links to guidance on survey and mitigation.

2.5 Habitats and Species of Principal Importance

The ES should thoroughly assess the impact of the proposals on habitats and/or species listed as as 'Habitats and Species of Principal Importance' within the England Biodiversity List, published under the requirements of S41 of the Natural Environment and Rural Communities (NERC) Act 2006. Section 40 of the NERC Act 2006 places a general duty on all public authorities, including local planning authorities, to conserve and enhance biodiversity. Further information on this duty is available in the Defra publication 'Guidance for Local Authorities on Implementing the Biodiversity Duty'.

Government Circular 06/2005 states that Biodiversity Action Plan (BAP) species and habitats, 'are capable of being a material consideration...in the making of planning decisions'. Natural England therefore advises that survey, impact assessment and mitigation proposals for Habitats and Species of Principal Importance should be included in the ES. Consideration should also be given to those species and habitats included in the relevant Local BAP.

Natural England advises that a habitat survey (equivalent to Phase 2) is carried out on the site, in order to identify any important habitats present. In addition, ornithological, botanical and invertebrate surveys should be carried out at appropriate times in the year, to establish whether any scarce or priority species are present. The Environmental Statement should include details of:

- Any historical data for the site affected by the proposal (e.g. from previous surveys);
- Additional surveys carried out as part of this proposal;
- The habitats and species present;
- The status of these habitats and species (e.g. whether BAP priority habitat);
- The direct and indirect effects of the development upon those habitats and species;
- Full details of any mitigation or compensation that might be required.

The development should seek if possible to avoid adverse impact on sensitive areas for wildlife within the site, and if possible provide opportunities for overall wildlife gain.

The record centre for the relevant Local Authorities should be able to provide the relevant information on the location and type of BAP habitat for the area under consideration.

2.6 Contacts for Local Records

Natural England does not hold local information on local sites, local landscape character and local or national biodiversity priority habitats and species. We recommend that you seek further information from the appropriate bodies (which may include the local records centre, the local wildlife trust or other recording society and a local landscape characterisation document).

3. Designated Landscapes and Landscape Character

Landscape and visual impacts

The EIA should include an assessment of the potential impacts of the development on local landscape character using landscape assessment methodologies. We encourage the use of Landscape Character Assessment (LCA), based on the good practice guidelines produced jointly by the Landscape Institute and Institute of Environmental Assessment in 2002. LCA provides a sound basis for guiding, informing and understanding the ability of any location to accommodate change and to make positive proposals for conserving, enhancing or regenerating character, as detailed proposals are developed.

In order to foster high quality development that respects, maintains, or enhances, local landscape character and distinctiveness, Natural England encourages all new development to consider the character and distinctiveness of the area, with the siting and design of the proposed development reflecting local design characteristics and, wherever possible, using local materials. The Environmental Impact Assessment process should detail the measures to be taken to ensure the building design will be of a high standard, as well as detail of layout alternatives together with justification of the selected option in terms of landscape impact and benefit.

The assessment should also include the cumulative effect of the development with other relevant existing or proposed developments in the area. In this context Natural England advises that the cumulative impact assessment should include other proposals currently at Scoping stage. Due to the overlapping timescale of their progress through the planning system, cumulative impact of the proposed development with those proposals currently at Scoping stage would be likely to be a material consideration at the time of determination of the planning application.

The assessment should refer to the relevant National Character Areas which can be found on our website. Links for Landscape Character Assessment at a local level are also available on the same page.

Heritage Landscapes
You should consider whether there is land in the area affected by the development which qualifies for conditional exemption from capital taxes on the grounds of outstanding scenic, scientific or historic interest. These are considered to be designated landscapes of national importance and the impact of your plan on these should be assessed where appropriate. An up-to-date list may be obtained at www.hmrc.gov.uk/heritage/lbsearch.htm and further information can be found on Natural England's landscape pages here.

4. Air Quality

Air quality in the UK has improved over recent decades but air pollution remains a significant issue; for example over 97% of sensitive habitat area in England is predicted to exceed the critical loads for ecosystem protection from atmospheric nitrogen deposition (England Biodiversity Strategy, Defra 2011). A priority action in the England Biodiversity Strategy is to reduce air pollution impacts on biodiversity. The planning system plays a key role in determining the location of developments which may give rise to pollution, either directly or from traffic generation, and hence planning decisions can have a significant impact on the quality of air, water and land. The assessment should take account of the risks of air pollution and how these can be managed or reduced. Further information on air pollution impacts and the sensitivity of different habitats/designated sites can be found on the Air Pollution Information System [redacted]. Further information on air pollution modelling and assessment can be found on the Environment Agency website.

5. Climate Change Adaptation

The England Biodiversity Strategy published by Defra establishes principles for the consideration of biodiversity and the effects of climate change. The ES should reflect these principles and identify how the development's effects on the natural environment will be influenced by climate change, and how ecological networks will be maintained. The NPPF requires that the planning system should contribute to the enhancement of the natural environment "by establishing coherent ecological networks that are more resilient to current and future pressures" (NPPF Para 109), which should be demonstrated through the ES.

6. Cumulative and in-combination effects

A full consideration of the implications of the whole scheme should be included in the ES. All supporting infrastructure should be included within the assessment.

The ES should include an impact assessment to identify, describe and evaluate the effects that are likely to result from the project in combination with other projects and activities that are being, have been or will be carried out. The following types of projects should be included in such an assessment. (Subject to available information):

a. Existing completed projects
b. Approved but uncompleted projects
c. Ongoing activities
d. Plans or projects for which an application has been made and which are under consideration by the consenting authorities
e. Plans and projects which are reasonably foreseeable, ie projects for which an application has not yet been submitted, but which are likely to progress before completion of the development and for which sufficient information is available to assess the likelihood of cumulative and in-combination effects.

Environment Agency

<u>Potential Contamination of Groundwater</u>

Groundwater Quality have reviewed the URS Environmental Impact Assessment (EIA) Scoping Report for the Proposed Multifuel CHP Facility dated 12 November 2012. We are pleased to see that it is proposed in item 7.3(Ground Conditions) that an assessment of impacts on the existing ground conditions will be undertaken as part of the EIA. However, item 2.5 Potential Environmental Sensitivities/ Sensitive Receptors does not mention the Taplow Gravel formation as a sensitive receptor under the site. The Taplow Gravel Formation is classified as a Principal Aquifer and this formation likely underlies the Langley Silt(Unproductive Stratum). This aquifer should be factored into the Conceptual Model for the site.

The report does not state that the demolition process will remove the current concrete hardstanding, if this pad is not to be removed then this needs to be clarified. Mention has been made of three large oil tanks on an additional 1 hectare of land southeast of the SHP Site which will be subject of a separate planning application. However, as a potential source of contamination, we need to know if these are underground or above ground tanks. Whilst we are happy that the impact of these tanks will be assessed as part of the EIA, considering that the power station was oil fired for some time, we need clarification of whether there were any other fuel tanks on site.

We have archive information that solvents have been found in the soils of an adjacent building and therefore the potential for off-site sources of contamination must also be addressed in the EIA.

<u>Flood Risk</u>

The proposed development is located in Flood Zone 1 (low probability) based on our Flood Zone map. Whilst development may be appropriate in Flood Zone 1, paragraph 103(footnote 20) of the National Planning Policy Framework (NPPF) sets out a Flood Risk Assessment should be submitted for all developments over one hectare in size.

As part of the Planning application you should therefore prepare a surface water drainage strategy for the site and include this within the Flood Risk Assessment.

We are operating a risk based approach to planning consultations where the site falls between 1 and 5 hectares and are not providing detailed comments on surface water. Instead we are issuing to Local Authorities a guidance note and pro-forma which the developer and submit this with your planning application. We have attached a copy of the guidance note and pro-forma.

The pro-forma asks the developer/applicant to confirm that the following surface water flood risk principles have been followed:

- That surface water runoff from the development will not increase flood risk to the development or third parties. The pro-forma asks for confirmation that surface water discharge will not be increasing and how any increases in discharge volume are being attenuated etc.

- That Sustainable Drainage Systems (SuDS) have been explored and used to attenuate to at least pre-development discharge rates and volumes or where possible achieving betterment in the surface water runoff regime.

- That an allowance for climate change has been incorporated, which means adding an extra amount to peak rainfall which relates to the life time of the development. See table 5 of Technical Guidance for NPPF.

- That the residual risk of flooding has been addressed should the failure or exceedance of the drainage system occur. This could include measures to manage residual risk such as raising ground or floor levels where appropriate.

This should assist you in preparing the surface water strategy for the proposed development. We recommend that you liaise with the Local Authority Land Drainage Engineer if you have any additional queries in respect of surface water.

<u>Environmental Permitting</u>

Information submitted for this Scoping Opinion has been reviewed by the PPC team. To date the PPC team report that they regard this as a variation of the environmental permit and discussions are taking place. We do not make formal comments regarding issues outside of our remit within the planning system. The main reason for a consultation with our PPC team at this stage was to ascertain whether there were any issues which could be a show stopper, in terms of an environmental permit, at which point we would have an obligation to pass this information to the applicant.

Berkshire Archaeology

The Environmental Impact Assessment Scoping Report rightly highlights that developments within the Slough Trading Estate area have potential archaeological implications and we note the statement regarding likelihood of past impact.

A desk-based assessment to assess the archaeological potential of the site, levels of past impact and the perceived impact of the proposed project will be an appropriate first phase in the appraising of these implications. Previous work has already identified the potential of this area to some degree and therefore we would expect a Desk Based Assessment to focus on site-specific impact(both previous and future) on any archaeological deposits which may be present, as well as re-appraisal of previous conclusions. Depending upon the results of this present work, it may be necessary for further phases of field evaluation to be undertaken, potentially utilizing methodologies which have been developed to assess the archaeological potential of other development sites within this area.

The archaeological consultant undertaking this appraisal should liaise with Berkshire Archaeology in order to assess up-to-date information and to ensure that the archaeological implications are addressed in the most effective manner.

Berkshire NHS

It is too early to ask for a NHS response as this is an EIA at this stage. A formal response will be given when this becomes an application and an HIA is required.

Ministry of Defence Defence Infrastructure Organisation

The MOD has no safeguarding objections to this proposal.

Highways Agency

The HA is an executive agency of the Department of Transport. We are responsible for operating, maintaining and improving England's strategic road network (SRN) on behalf of the Secretary of State for Transport

The HA will be concerned with proposals that have the potential to impact, The safe and efficient operation of the SRN, which in this case would be the M4. The Scoping Opinion would appear to be appropriate. We would recommend that measures are considered to encourage trips to and from the site outside of peak hours to minimise the impacts to the M4 from the proposal.

English Heritage

It is recommended that the application should be determined in accordance with national and local policy guidance, and on the basis of your specialist advice.

Department of Energy and Climate Change

DECC has no comment on the Scoping Report

Pipeline Route Enquiries

This planning application will not affect BPA's Pipeline interests in this area. Please treat as No Where Near reply to your enquiry.

Thames Water

The provision of water and waste water is essential to any infrastructure.

It is unclear at this stage what the net increase in demand on our infrastructure will be as a result of the proposed development. Thames Water is concerned that the network in the area may be unable to support the demand anticipated from the development. The developer needs to consider the net increase in water and waste water demand to serve the development and also any impact the development may have off site further down the network, if no/low water pressure and internal/external sewerage flooding of properly property to be avoided.

It is unclear as to how the building will be constructed. Thames Water is concerned that water mains and sewers immediately adjacent to the site may be affected by vibration as a result of piling, possibly leading to water main bursts and/or sewer collapses.

We would therefore recommend that any EIA report should be expanded to consider the following:

- The developments demand for water supply and the network infrastructure both on and off site and can it be met
- The developments demand for sewerage treatment and network infrastructure both on and off site and can it be met.
- The surface water drainage requirements and flood risk of the development both on and off site and can it be met.
- Any piling methodology and will it adversely affect neighbouring utility services

Our Developer Services department can be contacted on 0845 850 2777.

Network Rail

Network Rail has a statutory obligation to ensure the availability of safe train paths and as such we are required to take an active interest in any development adjacent to our infrastructure that potentially could affect the safe operation of the railway.

On specific matters, clearly our key interest is to protect the physical railway infrastructure and the EIA should demonstrate that railway infrastructure will not be compromised and be adequately protected. It is suggested that a section of the environmental statement demonstrates this. Network Rail would need to be consulted on any planning application submitted as our primary concern is the safety of the adjacent railway.

Heathrow Aerodrome Safeguarding

The proposed site sits beneath one of the associated Obstacle Limitation Surfaces(OLS) for Heathrow Airport Ltd, known as Outer Horizontal Surface(OHS). The OHS is a flat surface that is established 150m Above Airport Datum (22.93m Above Mean Sea Level) which equates to 172.93m Above Ordnance Survey (AOD). It is important that any future design of the proposal is such that it does not go above this height as Heathrow Airport Ltd would not accept any penetration of this surface.

Please be advised that the advice given is informal and without prejudice to the consideration of any planning application which may be referred to us pursuant to Planning Circular 01/2003 in consultation under Planning Circular 01/2003 will necessarily coincide with any informal advice now given. We will not have any liability to you or third parties who may follow this advice.

It should be clear that provision of this advice does not constitute support for the development nor an opinion that the development is acceptable under local planning policy.

South Bucks District Council

This Council wishes to make the following comments on the Scoping report:

The EIA should include an assessment of the proposals impact on South Bucks District. The key EIA issues for South Bucks District include Air Quality and Odour, Ecology, Transportation and Access, and a Landscape and Visual Impact assessment.

In considering the impacts of the proposed development on South Bucks District the EIA should include reference to the relevant policies set out in the South Bucks Core Strategy (adopted February 2011) and the saved policies in the South Bucks District Local Plan(adopted March 1999).

Burnham Beeches, a Special Area of Conservation(SAC) , a National Nature Reserve (NNR) and a Site of Special Scientific Interest(SSSI) lies approximately 2.9 km to the north of the site. The main reason for its designation as a European site (SAC) is the acid beech forest with its shrub layer, which together is rich in invertebrates and epiphytes (plants that live on other plants). Many of the invertebrates and epiphytes, some of which are nationally rare are dependent on the ancient trees, along with good air quality and land management for their survival. Stoke Common, which covers an area of 80 hectares and lies approximately 4km northeast of the site is also an SSSI. Burnham Beeches and Stoke Common are important sites and both owned by the City of London. It will therefore be necessary to involve them in any consultations in relation to this proposed development.

Farnham Common has ancient woodland situated about 2.9km to the north of the application site. There is also a Local Wildlife Site situated in Park Road, Farnham Royal approximately 2km to the north east of the site. Large areas of South Bucks District are also designated as Biodiversity Opportunity Areas.

Whilst Burnham Beeches SAC has been identified as a potential sensitive receptor to the proposed development other sites listed above have not been included and should be considered as potential sensitive receptors to the proposed development in terms of air quality. Whilst the ecology chapter will consider whether there is potential for these pollutants to significantly impact on any designated sites cited above should also be considered as possible ecological receptors in the ecology chapters.

An Air Quality Impact assessment on the effects of traffic associated with construction and operation of the proposed development should include the road network in South Bucks District.

The principal vehicle movements are associated with the delivery of fuel and the collection of solid residues fro the plant. The EIA and Transport Assessment(TA) needs to include an assessment of existing and proposed vehicle movements associated with the development on the road network of South Bucks District. Details of HGV routes will need to be provided and Buckinghamshire County Council , the Highway Authority, for South Bucks District will need to be consulted.

Stoke Park House, a Historic Park lie approx 1.5 km north east of the site. Huntercombe Manor , a Historic Park lie approx 2km southwest of the site. The existing site is visible from long distances and various viewpoints within South Bucks District including Historic Parks of Stoke Park and Huntercombe Manor, and from other vantage points in South Bucks District, including Dorney Common to the south west of the site.

Health and Safety Executive

Environmental Impact assessments are concerned with projects which are likely to have significant effects on the environment. HSE's principal concerns are the health and safety of people at work and those affected by work activities. Thereafter HSE cannot usefully comment on what information should be included in the environmental statement of the proposed development . However the environmental statements of the proposed developments should not include reasons that conflict with the requirements of the Health and safety at Work Act 1974 and the relevant statutory provisions.

Civil Aviation Authority

I gather that the tallest associated structures will be of a height of 47 metres (above ground level) and nearby existing cooling towers already exceed that height. On that basis I believe the following issues are worthy of consideration:

- Aerodromes. In respect of any potential aerodrome related issue, I should highlight the need to check any safeguarding maps lodged with relevant planning authorities to identify any aerodrome specific safeguarding issues. Noting that aerodrome safeguarding responsibility rests in all cases with the relevant aerodrome operator/licensee, not the CAA, it is important that the related viewpoints of relevant aerodrome license holders/operators is established and planning deliberations take appropriate consideration of any issues highlighted. I note the comment related to Heathrow Airport within the SR; the validity of the assessment contained at SR 8.3 needs to be validated through consultation with BAA

- Aviation Warning Lighting. Given the height of associated structures the CAA would not in isolation make any case for aviation warning lighting. That said any aerodrome-perceived requirement need to be established through developer or Council consultation with BAA. For background:

  In the UK , the need for aviation obstruction lighting on 'tall' structures depends in the first instance upon any particular structure's location in relation to an aerodrome. If the structure constitutes an 'aerodrome obstruction' it is the aerodrome operator that will review the lighting requirement. For civil aerodromes, they will, in general terms, follow the requirements of CAP 168 –Licensing of Aerodromes. This document can be downloaded from the CAA website-Chaper 4(12.8) refers to obstacle lighting.

  Away from aerodromes Article 219 of the UK Air Navigation Order(ANO) applies. This Article requires that for en-route obstructions (i.e. away from aerodromes) lighting only becomes legally mandated for structures of a height of 150m or more. However, structures of lesser height might need aviation obstruction lighting if, by virtue of their location and nature, they are considered a significant hazard.

  Gas venting and/or Flaring. It is assumed that the facility is not intended to vent or flare gas either routinely or as an emergency procedure such as to cause a danger to overflying aircraft. If that is not the case parties are invited to use myself as an appropriate point of contact for any further related discussion.

  Aviation Promulgation. There is a civil aviation requirement I the UK for all structures over 300 feet high to be charted on aviation maps. It follows that, at 47m(154 feet) high, there is no on-route (i.e. non-aerodrome specific) civil aviation charting requirement.

  Military Aviation. For completeness, the Ministry of Defence position I regards to the proposed development and military aviation activity should be established.

  I should also add that due to the unique nature of associated operations in respect of operating altitudes and potentially unusual landing sites,it would also be sensible to establish the related viewpoint of local emergency services air support units.

  Any associated Environmental Statement/development Consent Order(or equivalent / similar) would be expected to acknowledge and where applicable address the issues highlighted above and accordingly any scoping opinion should make related comment.

Whilst none of the above negates any aforementioned need to consult I line with Government requirements associated with safeguarding of aerodromes and other technical sites (Government Circular 1/2003 refers), I hope this information matches your requirements. Please do not hesitate to get in touch if the Council requires any further comment or needs clarification of any point.

Prepared by Roger Kirkham
January 2013

Appendix A-2

EIA Comparison of Scoping Methodologies and Revised EIA Scoping Opinion

Overview of Changes to Scoping Requirements for the Slough Multifuel Project Consultation November 2012 to November 2013

Proposed Development	**Project Description at Scoping Nov 2012**	**Nov 2013 Project Changes**	**Key Changes to plant**
	A single unit multifuel CHP generating plant to utilise up to 300 kt/a of waste derived fuel (WDF), generating up to 40MWe gross electrical output. Three other solid fuel boilers (Boiler 17 and two CFB boilers) would remain in service, utilising WDF, waste wood and biomass giving a total requirement of some 670 kt/a of solid fuel	Two multifuel configurations under consideration need to be assessed: • Demolition of the CFB boilerhouse and associated wood store • a single 300 kt/a multifuel line to the existing South stack and c40MWe output • a twin line 480 kt/a multifuel plant to a new South stack and <50MWe output • Both configurations fit within the proposed building envelope • One other retained 120 kt/a solid fuel boiler • Maximum solid fuel requirement c600 kt/a for the SHP site	• New multifuel plant covers nearly twice the area but with the lorry manoeuvring area enclosed • Access ramps required to access tipping hall • Single line requires a 3m south stack extension (up to 85m) versus a new twin flue stack a further 5m higher (up to 90m) to achieve comparable effects on AQ • Main boilerhouse now 48m compared to 47m at Scoping • Opportunity to integrate the site buildings new and old • Additional staff required to operate the multifuel plant

Technical Discipline	**Methodology for 40MWe 1Ha Single Line Multifuel Plant presented in the Scoping Report November 2012**	**Change in Methodology for 50MWe Multifuel Plant Proposed November 2013**	**Key Changes in Effects Associated with 50MWe Multifuel Plant**
Chapter 6: Socio-Economics	Construction • Assessment of direct and indirect employment, spending and leakage generated during the construction phase. Operation • Assessment of direct and indirect employment, spending and leakage generated during the operational phase.	Construction • No change in methodology Operation • No change in methodology	 • Plant workforce likely to increase by c20 staff

Technical Discipline	Methodology for 40MWe 1Ha Single Line Multifuel Plant presented in the Scoping Report November 2012	Change in Methodology for 50MWe Multifuel Plant Proposed November 2013	Key Changes in Effects Associated with 50MWe Multifuel Plant
Chapter 7: Traffic and Transport	Construction • Transport Assessment based on likely trip generation associated with the construction of the Proposed Development, including establishment of baseline conditions, traffic flows and a review of highway safety issues; • Assessment of construction traffic and the effects of the Proposed Development on the existing transport infrastructure; • Transport conditions both before (up to 5 years) and after the Proposed Development has been built; • Potential disruption to pedestrians, cyclists and road vehicle users during the demolition/construction phase; • Transport implications of the Proposed Development in combination with consented development, including the impact on local AQMA's; • Review of walking and cycling issues for employees related to the highways surrounding the site. Operation • Transport Assessment based on likely trip generation associated with the operation of the Proposed Development; • Assessment of operational traffic and the effects of the Proposed Development on the existing transport infrastructure.	Construction • No change in methodology Operation • No change in methodology	• An increase in HGV movements for fuel, reagents and residues with the increase of capacity for the 50MWe configuration. • Although HGV deliveries have increased for the 50MWe configuration, overall the lorry movements for the SHP site will be less than that proposed at Scoping • The redline boundary extended to consider all HGV access and egress points along Edinburgh Av

Technical Discipline	Methodology for 40MWe 1Ha Single Line Multifuel Plant presented in the Scoping Report November 2012	Change in Methodology for 50MWe Multifuel Plant Proposed November 2013	Key Changes in Effects Associated with 50MWe Multifuel Plant
Chapter 8: Air Quality	<u>Construction</u> • Assessment of dust and mobile plant exhaust emissions from demolition/construction; • Assessment of construction traffic – DMRB or ADMS-Roads, with specific reference to the AQMA's. <u>Operation</u> • Air Impact Assessment, including air dispersion modelling; • Dispersion modelling to confirm the suitability of the existing South stack and the need for any changes; • Assessment of nitrogen and acid deposition on Burnham Beeches; • Assessment of impact on AQMA's; • Assessment of operational traffic – DMRB or ADMS-Roads, with specific reference to the AQMA's; • Assessment of dust from movement of WDF (fuel) onsite; • Human Health Risk Assessment (HHRA); • Odour Assessment.	<u>Construction</u> • No change in methodology <u>Operation</u> • No change in methodology	• The larger site area includes additional buildings that require demolition; the South stack would be demolished for the twin line. • The stack heights for the single line (approximately 40MWe) and twin line (up to 50MWe) configurations were determined to give comparable effects in terms of air quality. • A single-line configuration is the worst-case scenario for odour management control using air extraction from the bunker through to the boiler and this has not changed for the 50MW twin-line configuration.
Chapter 9: Noise and Vibration	<u>Construction</u> • Noise assessment of demolition/construction plant using CadnaA; • Noise from mobile plant during construction using using CRTN methodology; • Vibration assessment. <u>Operation</u> • Noise assessment of operational phase of the Proposed Development using CadnaA mapping software; • Noise from vehicular traffic (including night-time) using CRTN methodology.	<u>Construction</u> • No change in methodology <u>Operation</u> • No change in methodology	• The larger site area includes additional buildings that require demolition. • Noise from lorries using a ramp considered • Lorries manoeuvring mainly in an enclosed tipping hall produces less noise

Technical Discipline	Methodology for 40MWe 1Ha Single Line Multifuel Plant presented in the Scoping Report November 2012	Change in Methodology for 50MWe Multifuel Plant Proposed November 2013	Key Changes in Effects Associated with 50MWe Multifuel Plant
Chapter 10: Ground Conditions	Construction • Assessment of impacts on existing ground conditions, including potential for contamination during demolition/construction. The assessment will take into account identified historical, existing and proposed operations/services within the development boundary; • A site specific Envirocheck® Report will be commissioned; • Review of the underlying geology and local hydrogeology; • Proposed Development includes an underground fuel bunker, which will be considered in terms of its potential to mobilise existing pollutants in the ground and create new pathways; • A Conceptual Site Model for the demolition, construction and operational phases of the development will be included. Operation • Assessment of impacts on existing ground conditions, including potential for contamination during the operational phase.	Construction • No change in methodology Operation • No change in methodology	• Larger area to assess, but still within the SHP site • The boiler and bottom ash bunker now has the potential to be constructed partly below ground level, but no deeper than the fuel bunker.
Chapter 11: Water Resource/Flood Risk	Construction • Consultation with the EA, Thames Water, SBC; • Assessment of licensed surface water and groundwater abstraction and discharge consents; • Impact assessment of water resources from demolition/construction phase, including impacts on controlled waters in the area; • Flood Risk Assessment and surface water runoff study; • Assessment of attenuation for surface water run-off; • Assessment of any adopted surface water sewers that might be affected; • Water resource/demand assessment; • Waste water.	Construction • No change in methodology	• Increase in size of site, but the need for a FRA was already included in the Scoping Report

Technical Discipline	Methodology for 40MWe 1Ha Single Line Multifuel Plant presented in the Scoping Report November 2012	Change in Methodology for 50MWe Multifuel Plant Proposed November 2013	Key Changes in Effects Associated with 50MWe Multifuel Plant
	<u>Operation</u> • Impact assessment of water resources from the operational phase, including impacts on controlled waters in the area.	<u>Operation</u> • No change in methodology	
Chapter 12: Cultural Heritage and Archaeology	<u>Construction</u> • Setting impacts for designated assets will be assessed in relation to the scheme Zone of Theoretical Visibility (ZTV); • Assessment of impacts on designated and non-designated heritage assets within a 1km buffer area; • A desk-based archaeological assessment; • An inventory of all heritage assets will be cross-referenced to maps and the report narrative. <u>Operation</u> • As above, for the completed development.	<u>Construction</u> • No change in methodology <u>Operation</u> • No change in methodology	• There is the need to consider the effect of a new, 90m stack replacing the existing 82m South Stack (still below the height of the existing 104m SHP North stack)
Chapter 13: Ecology	<u>Construction</u> • An extended Phase 1 Habitat Survey undertaken in June 2011 (Updated in September 2013); • Desk study and review of records of statutory and non-statutory sites, UK Biodiversity Action Plan Priority Habitats and records of protected and notable species reviewed for the Proposed Development Site and surrounding area to a 2km radius; • Bat roost scoping/inspection survey, and subsequent return bat survey; • Breeding Bird Survey; • Assessment of potential impacts on ecological receptors due to air quality, including surrounding designated sites, i.e. European Protected Sites, specifically SACs.	<u>Construction</u> • No change in methodology	• Increase in size of site and number of buildings to be demolished; however the extension to the site and buildings were covered by the original extended Phase 1 Habitat Survey and subsequent update in September 2013, which surveyed the entire SHP site. • The demolition of the CFB boilerhouse required consideration of the relocation of the peregrine falcon nesting habitat in addition to avoiding specific demolition and construction activities during the breeding season

Technical Discipline	Methodology for 40MWe 1Ha Single Line Multifuel Plant presented in the Scoping Report November 2012	Change in Methodology for 50MWe Multifuel Plant Proposed November 2013	Key Changes in Effects Associated with 50MWe Multifuel Plant
	<u>Operation</u> • As above, for the completed development.	<u>Operation</u> • No change in methodology	
Chapter 14: Landscape and Visual Impact Assessment	<u>Construction</u> • Assessment of the Proposed Development on the landscape and visual amenity of the site and surrounding area; • Production of a computer-generated ZTV to identify potential viewpoints; • A series of locations will be identified, subject to agreement with SBC, for the assessment of views; • Viewpoint analysis will be carried out, involving the production of computer generated 3D wirelines and/or photomontages to show existing and proposed views. The images will be analysed to predict the magnitude of change, the sensitivity of relevant receptors and the resultant effects on landscape character and visual amenity from the Proposed Development; • Assessment of the effects of light pollution, reflection and night-time views. <u>Operation</u> • As above, for operation. Plus viewpoint analysis will be carried out, involving the production of computer generated 3D wirelines and/or photomontages to show existing and proposed views. The images will be analysed to predict the magnitude of change, the sensitivity of relevant receptors and the resultant effects on landscape character and visual amenity from the Proposed Development.	<u>Construction</u> • No change in methodology <u>Operation</u> • No change in methodology	• The potential for a new 90m high stack will require slightly larger cranes during construction • The twin line, 50MWe configuration requires a new 90m stack to replace the existing 82m South Stack. The single line (approximately 40MWe) plant proposed in the Scoping Report requires a 3m extension to the existing South Stack. The ZTV was reviewed and sent to SBC on 10th October 2013/6th November 2013. SBC confirmed on 1st December 2013 that the representative viewpoints, as revised, are accepted for the 90m high replacement stack configuration).

Technical Discipline	Methodology for 40MWe 1Ha Single Line Multifuel Plant presented in the Scoping Report November 2012	Change in Methodology for 50MWe Multifuel Plant Proposed November 2013	Key Changes in Effects Associated with 50MWe Multifuel Plant
Chapter 15: Sustainability and Climate Change	<u>Construction</u> • An assessment of the design of the Proposed Development against established sustainability criteria, i.e. land, materials and natural resource use; energy consumption and energy efficiency; waste minimisation and implementation of the waste hierarchy, including a waste management plan covering the demolition/construction phase of the Proposed Development. <u>Operation</u> • An assessment of the design of the Proposed Development against established sustainability criteria, i.e. land, materials and natural resource use; energy consumption and energy efficiency; waste minimisation and implementation of the waste hierarchy; • Materials specification and usage in relation to carbon dioxide (CO_2) emissions and ozone depletion; • Sustainability of the generation and sourcing of the proposed fuel stock • Climate Change Impact Report.	<u>Construction</u> • No change in methodology <u>Operation</u> • No change in methodology	- -

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Date 21 January 2014

Department: Customer and Community Services
Contact Name: Roger Kirkham
Contact No: [redacted]
Fax:
Email:
Our Ref:
Your Ref

Mr K Dalton
Dalton Warner Davis LLP
LONDON
EC4V 2AU

Dear Mr Keith Dalton

Pre-Application Advice request by SSE
Erection of a Multifuel CHP Generating Station of up to 50MWe Edinburgh Ave, Slough

Further to the submission of details about a new Proposed Development for erection of a Multifuel CHP generating station of up to 50MWe, I am writing to confirm our decision about the correct planning procedure for the above-mentioned scheme.

You will be aware of our previous decision confirming that the then proposed 40MWe Multifuel CHP Generating Station can be treated as a S70 application under the Planning Acts. I have now assessed your latest proposal for a Multifuel CHP Generating Station of up to 50MWe to decide about the correct planning procedure.

On the basis of submitted evidence, I write to confirm that this Council will accept this proposal as a S70 application. I have also based our findings upon your previously submitted SSE legal advice and relevant government advice.

I also enclose our Scoping Opinion for this Proposed Development scheme.

I trust this reply is of assistance to you.

Your [redacted]

pp
Paul F Stimpson
Strategic Lead ,Planning Policy

The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011

Scoping Opinion

FOR THE PROPOSED MULTIFUEL POWER STATION, EDINBURGH AVE, SLOUGH

1.0 Introduction

1.1 SSE Generation Ltd, a subsidiary of SSE plc, is to seek planning permission under the Town and Country Planning Act 1990 from Slough Borough Council (the Council) on part of the existing Slough Heat and Power (SHP) site for the development of a multifuel combined heat and power (CHP) generating station (the Proposed Development).

1.2 On 12.11.12 SSE requested the Council to issue a scoping opinion in respect of approximately one hectare of the SHP site for the development of a multifuel CHP generating station of up to 40 megawatts (MWe), for which the Council issued a scoping opinion on 07.02.13, including responses from statutory consultees. In March 2013 SSE announced the closure and decommissioning of two aging fluidised-bed biomass fuelled generating units (CFB 1 and 2) and associated buildings thereby releasing additional land within the SHP site.

1.3 SSE has now brought forward a design for a larger plant of up to 50MWe, showing two boiler units ("twin line"). This would vary the building footprint and massing from the design previously considered, as well as demolition of the existing south stack and the construction of a 90 metre replacement stack (an increase of some 8 metres). The Proposed Development will continue to use the 2 main existing HGV accesses.

1.4 Following SSE's 2012 request for a Scoping Opinion, it is considered necessary by the Council to prepare a fresh Scoping Opinion to address any material revisions to the Proposed Development. The revisions to the Proposed Development were subject to public consultation in November 2013 as described by information on the SSE Project Website at www.sse.com/sloughmultifuel.

1.5 The Council has previously confirmed that the Proposed Development of 40MW could be addressed under S70 of the Town and Country Planning Act 1990. The Council also previously confirmed in its 2013 Screening Opinion that the then Proposed Development should be treated as Schedule 1 development under the 2011 EIA Regulations

1.6 SSE has proposed a description of development for the modified Proposed Development as follows:

"*the erection of a multifuel CHP generating station of up to 50MWe*";

The revised scheme is described in Section 6 of this Scoping Opinion.

1.7 Much of the information required to undertake the EIA/ES will be common to the EA Permit process. It is strongly recommended that the two processes are run in parallel.

1.8 This Scoping Opinion sets out the key environmental issues and proposed methodology to be used in the Environmental Assessment, in accordance with the relevant guidance and good practice advice. The applicant is requested to meet the requirements in full.

2.0 <u>The Need for an Environmental Statement</u>

2.1 This project is a Schedule 1 development. Schedule 1 of the EIA Regulations 2011 includes under paragraph 2(a) *"thermal power stations and other combustion installations with a heat output of 300 megawatts or more."* Paragraph 10 of Schedule 1 includes *"Waste disposal installations for the incineration or chemical treatment (as defined in Annex IIA to Council Directive 75/442/EEC under heading D9) of non-hazardous waste with a capacity exceeding 100 tonnes per day".*

2.2 The 2013 Screening Opinion statement sets out the significant features.

3.0 <u>Outline of Environmental Statement</u>

3.1 The 2013 Scoping Opinion outlined the policy context within which the application should be considered, namely:

- National Planning Policy Framework (2012)
- National Policy Statement for Renewable Energy Infrastructure (2011)
- Saved Policies from Waste Local Plan for Berkshire (1998)
- Slough Local Development Framework, Core Strategy 2006-2026 (2008) incorporated into the Composite Local Plan for Slough, July 2013.
- Slough Local Transport Plan (2011)

Consideration will be given to other aspects of national policy relevant to the application, which the applicant is invited to discuss with the Council.

3.2 In particular it will be necessary to demonstrate how the Proposed Development complies with the principles of sustainable development including the protection of the environment and the prudent use of natural resources.

4.0 <u>General</u>

4.1 The EIA should be concerned with 'likely' significant effects; there may be potential effects but if these are not likely, then the EIA need not address them. SSE has requested that the Council in compiling its Scoping Opinion consider the Proposed Development on the basis of it being of up to 50MW. It is also asked to take into account any material changes identified in the public consultation documents and a schedule known as "Overview of the Changes to Scoping Requirements for the Slough Multifuel Project Consultation November 2012 to November 2013 submitted to the Council in December 2013 suggesting the matters to be covered in this Scoping

Opinion. Slough BC will set out the requirements for the ES in this Scoping Opinion.

5.0 Description of Development and Application Site Boundary

5.1 The planning application should include the site of the Proposed Development together with internal access areas up to the public highway. Where the operational requirements of the Proposed Development utilise site services and structures elsewhere on the SHP site, the perimeter of these should be shown in blue, along with the proposed site services area which will be the subject of a separate application by SSE, to be submitted in parallel with the application for the Proposed Development. The appropriate Notices should be served on parties with interests in the land edged red and blue as illustrated in the Proposed Development Site Layout and the appropriate certificates supplied to this Council. Where any proposed construction area falls outside the application site, then any requirements of these operations should be included in the ES sufficiently to consider the effects. It is noted that the construction laydown area/s may be liable to change and therefore should be assessed accordingly.

6.0 Characteristics of the Development

6.1 The Proposed Development will be constructed on land previously used for generation and associated development. A single major power generating unit and a smaller gas fired boiler remain operational on the SHP site.

6.2 It is now intended to redevelop approximately 1.9ha of the SHP site for a new generating station, including enclosed tipping hall and fuel bunker, up to two furnaces where the waste derived fuel (WDF) will be combusted and a CHP boiler unit/s to raise steam, a steam turbine to generate electricity, up to two flue gas treatment (FGT) plants to clean the flue gas and a possible new stack for discharge of cleaned flue gas which will replace the existing south stack of the SHP site. Auxiliary plant such as electrical switchgear, cooling, water treatment plant, feed-water system and effluent treatment are separate from the generating station itself. The whole SHP site is approximately 4.5ha in size. SSE has advised that the ES will establish clearly defined parameters within which the development will take place. The Council recommends that the developer should assess the range of possible effects taking into account the flexibility sought in any application. It can be expected that conditions will be imposed to ensure that the Proposed Development remains within the parameters for which planning permission may be sought.

6.3 One of the major new buildings will enclose the boiler house to accommodate either a single or twin line arrangement using conventional grate and boiler technology. A range of WDFs will be used to produce up to 50 MW electrical generation and 20 MW of thermal heat. The 2 cooling towers on the SHP complex and nearby water supply will remain and are expected to service the proposed generating unit. SSE state that supplemental cooling is not expected to be necessary. The proposed generating unit(s) will operate with separately metered output and connections to the local electrical network.

6.4 The Proposed Development will be designed with a fuel throughput of approximately 400,000 tonnes of WDF per year and a maximum capacity of 480,000 tonnes at the lowest average calorific value. WDF comprises material that would otherwise have been disposed to landfill.

6.5 Water is supplied from SHP's existing groundwater boreholes and treated to generate feedwater. Waste water will be discharged by foul sewer or retained on site for treatment prior to disposal.

6.6 The revisions to the Proposed Development include buildings and chimney heights slightly larger than the previous scheme. Their visual appearance and impact will be an important part of the assessment.

6.7 All WDF supplied to the Proposed development will be processed off site and will be supplied to meet a pre-determined fuel composition range. The sources of WDF will typically be made from municipal solid waste, commercial and industrial waste and non hazardous waste wood. All of the WDF will be delivered to the site, and waste residues removed, by lorry using 2 identified entrances. The applicant should describe the volume of the waste fuel bunker and residue storage together with an indication of the number of days of fuel reserves available on site.

6.8 For this operation within the Proposed Development site to fall within the Recovery category (R1) of the Annex II of the Waste Directive Framework 2008, its measure of efficiency of the R1 value is required to be equal or greater then 0.65. This will come from a comprehensive 'acceptance test' from initial R1 status, calculated during the planning/construction stage and later at a specified time after operational data becomes available. No current data has yet been supplied and it is essential to include this.

6.9 Residual solid waste will require disposal but no details have yet been supplied. It will be removed from the Site by lorry.

6.10 In terms of emissions from the process, the air quality impact will be from:

1) stack emissions

The EA is the process regulator issuing Permits for Stack emissions. The Council's statutory local air quality management duties cover 7 air pollutants covering certain stack emissions and traffic emissions. The EA cover other emissions as well as well as looking at the wider regional impact (in consultation with Slough BC).

2) traffic emissions

One of the most significant impacts on local air quality is the impact of the quantity of vehicles delivering waste to the facility and transporting ash off site following combustion.

3) impact on air quality/odour from unloading/storage and the construction phase

6.11 It is intended that environmental studies in respect of the above have covered a variety of issues during other previous applications for planning permission. New studies will be required and updated to incorporate the existence of 2 new designated AQMAs at Tuns Lane and the town centre.

6.12 The quantity and type of operational traffic with operational hours and transport routes should be modelled in the light of other traffic movements, particularly to determine the impact upon the new AQMAs.

7.0 Location of the Development

7.1 The topography of the site is predominantly flat and approximately 30m above the ordinance datum (AOD).

7.2 The site lies in the Thames Valley, approximately 4 km north of the River Thames and is part of the existing SEGRO Trading Estate occupied by various industrial, warehouse and retail businesses in an area approximately 158ha in size and surrounded by the Slough urban area. The nearest residential properties are located approximately 200m north of the application site on Bodmin Avenue. There is a nearby large food manufacturing plant. Windsor and Maidenhead urban areas are approximately 5km and 7km distant respectively.

7.3 There are no SACs, SPAs, SSSIs and NNRs within 2 km of the Proposed Development site but Kennedy Park, two statutory designated Nature Reserves and three other non statutory reserves are within 2 km of the site. The closest European Protected site is Burnham Beeches Special Area of Conservation located 2.9m north of the site. Also in the locality are Windsor Forest and Great Park SAC (6km), South London Waterbodies SPA and Ramsar site (7.7km) and Chiltern Beechwoods (9.9km) away. It is largely open countryside beyond the outskirts of Slough with some views of the existing high power station buildings.

The nearest designated heritage asset is a railway bridge (Leigh Road Bridge) approximately 500m to the south-east. There are three scheduled monuments within 2km, the nearest being the moated site at Cippenham Court approximately 1.5km to the south. There are eighteen heritage assets within 2km of the site.

8.0 Identification of Baseline

8.1 The applicant is requested to agree the baseline from the EIA with the Council. To ensure a robust EIA process, the baseline should incorporate the existing situation in 2008 together with any committed developments (i.e. with planning permissions or in an adopted spending programme for highways). The baseline should also identify likely routes for the delivery of fuels and non-road alternatives. Furthermore, SSE will be required to describe all emissions arising from the existing plant on site and provide details of baseline monitoring. Reference should be made about data collection for heavy metals, dioxins, furans, PM2.5 etc. Any decommissioned plant should not form part of this baseline.

8.2 In its 2013 Scoping Opinion, Slough BC required the following content to be included in the Design Evolution and Alternative assessment. Slough BC consider that these remain applicable and option(s) should be therefore still be covered, namely

1) housing a smaller boiler and fuel store
2) examining options that lessen the general bulk of the building by alternative design such as lowering the floor level.

3) necessary roof plant and any proposed measures for roof plant enclosure.
4) visual treatment(s) of exterior
5) design for different technologies using waste derived fuels

8.3 Reference should be made to responses previously received from organisations who responded to the previous consultation to identify baseline information.

9.0 Characteristics of Likely Impacts Provision of Low Carbon Electricity Generation Stations

9.1 The planned use of Low Carbon technology in the Combined Heat and Power Plant would be part of the new generation of power stations designed to comply with the far-reaching new technological requirements either in place or planned for across Europe and beyond. They are designed to conform to Climate Change regulations, namely:

1) reductions in greenhouse gas emissions (principally CO2 and methane),
2) ensure continuity of energy generation and security of supplies as part of the wider Company's strategy for developing energy generation from diverse sources including windfarms and hydros elsewhere in UK.
3) maintain the established association between electricity generation and thermal heat and the increase of the local capacity for usage of electricity generation from Low Carbon fuels
4) achieve energy recovery using processed residual waste as a fuel consistent with requirements of the Waste Hierarchy Framework involving diversion away from landfill space and associated methane emissions from landfill.

9.2 It will be necessary to demonstrate that this proposed development can operate within the regulatory provisions in place or planned for. These cover a variety of environmental factors aimed at minimising environmental pollution to protect public health. It should also demonstrate that the choice of location can best serve forecast local need, having regard for the distribution and number of the type of plants in this area.

9.3 There is a single main operating electricity generating unit, remaining elsewhere on the site. This also generates electricity from Low Carbon Fuels.

9.4 This new planned Low Carbon Generating Station will burn Waste Derived Fuels. The fuel type, quality and source will be selected by the operator procuring this fuel under market conditions. General information should be supplied about types of fuel suppliers to inform this assessment. Where there are suitable alternative technologies capable of generating similar amounts of energy, it will be necessary to present evidence about these alternative(s). This can be used to assess the degree of impact from these energy generation options.

<u>Air Quality and Odour</u>

9.5 The proposed generating unit is capable of burning a wide range of processed waste in this location near to sensitive receptors such as Burnham Beeches SAC, residential properties, the nearest being within 200m of this site and designated Air Quality Management Areas. It will be necessary for environmental assessments to be undertaken for each scenario. It should also deal with associated features such as different traffic volumes. It will require different data to examine differences of impact, including those affecting air quality, odour or atmospheric pollution. It may be possible to reduce this work where the operator offers to restrict the waste fuel types.

9.6 A study of prevailing winds and potential pollution dispersion modelling will determine the height of the stack to minimise any air quality and potential impacts from the plant on the designated AQMAs and the wider area.

9.7 It will be necessary to identify air quality scenarios to determine fuel composition variances, different stack heights (subject to what is required in the EA Permit) and plant operating at capacity and reduced load. It should also include the effects of dispersion of large buildings in the vicinity. All pollutants to be modelled should be listed. All sensitive receptors should be listed. It will be necessary to undertake a Human Health Risk Assessment covering public health issues.

9.8 The link between quantity and type of operational traffic and air quality needs to be thoroughly covered in the light of other traffic movements and particularly to determine the impact upon the new AQMAs and 200m either side of suggested traffic routes.

<u>Transport</u>

9.9 A full transport assessment will be necessary. This should include information about existing lorry routing restrictions to and from this site and future proposals in and around Slough. Any future modelling shall take account of any planning commitments or recently built schemes.

9.10 On the basis that all fuel deliveries will be via road, then it will be necessary to establish baseline evidence from data over the past five years. It will be necessary to clarify the level of transport activity from the whole site with accompanying information about the status of each power generating unit during that period.

9.11 The quantity and type of operational traffic with their operational hours and transport routes should be modelled in the light of other traffic movements and particularly to determine the impact upon the new AQMAs.

9.12 The ES should report on the potential for means of alternative transport of fuel for this proposal now and potentially at some future date.

9.13 For the planning application process itself, the scope of the transport assessment and travel plan should be agreed in advance with the Local Planning Authority.

<u>Noise and Vibration</u>

9.14 The baseline evidence needs to be updated and incorporated into this section of the ES.

Waste

9.15 A waste management plan framework should be prepared covering all aspects of the development, including construction through to completion and ongoing use. This matter will also be subject to conditioning to be imposed by the Council as necessary.

Landscape and Visual Impact assessment/ Impact upon Openness of Green Belt

9.16 In view of the height and bulk of the proposed buildings, it will be necessary for the Landscape and Visual assessment report to comply with the requirements set out by Guidelines for Landscape and Visual Impact Assessment: Third edition (Spon). This will be a two stage process to expedite the identification of positions to assess the sensitivity of public views. The Councill would welcome an early approach on this. It will be necessary to consider winter views as well. A separate statement about any impact upon the designated Green Belt land outside of the urban envelope should also be addressed in the ES. The applicant should draw upon the available baseline evidence about the bulk and design of the existing buildings. The study should identify any alternative(s) capable of reduce the overall height and bulk of the Proposed Development upon its immediate setting and further afield. Consideration should also be given to the effects of plumes under various weather conditions.

Ecology

9.17 You are advised to make early contact with Natural England to identify their response over Burnham Beeches SAC.

Archaeology and Cultural Heritage, Ecology, Ground conditions, Hydrology

9.18 You have set out requirements appropriate for these sections.

9.19 Records of protected species are obtaineble from Thames Velley Environmental Records (TVERC) and Buckinghamshire and Milton Keynes Environmental Records Center (BMERC) for zone of influence. Species records should also be obtained from the relevant local groups. It is also recommended that a Phase 1 habitat survey is undertaken; results of this will determine whether any further species surveys ere required. It is agreed with the Scoping Reports that IEEM Guidelines and best practices from relevant specialist organisations will apply. Where protected species are identified and affected by the development, Natural England should be consulted and involved in any mitigation strategies.

9.20 The applicants should have regard to the aims of the Berkshire Biodiversity Action Plan when designing avoidance, mitigation and enhancement measures for diversity.

Demolition and Construction Programmed, Commissioning and Management

9.21 The ES should include the site proposed for temporary construction depot.

9.22 The submission of the Method Statement should include proposed working times listed below and any work outside of those hours will require consent from the Local Authority under Section 61 of the Control of Pollution Act 1974.

9.23 A Method Statement should contain the Commissioning Plan for all aspects of the boiler start up in full compliance with statutory requirements and any accompanying publicity arrangements.

9.24 The submission of a Management Plan to cover Risks associated with incidents from fire and spillage particularly when involving release of gases into the atmosphere, hot water into the surface water system or onsite stored materials.

<u>Non-significant EIA issues</u>

10.1 You have set out appropriate requirements under this section.

<u>Conclusion</u>

11.1 The Council considers that these are reasonable requests and should be included in the ES.

11.2 This Scoping Opinion has been adopted by Slough Borough Council.

[redacted]

Strategic Lead,Planning Policy

21/1/2014
Date

Appendix B-1

Framework Construction and Environmental Management Plan

Slough Multifuel CHP Facility

FRAMEWORK CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

Prepared for

SSE Generation Ltd

June 2014

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Prepared by	Natalie Williams	*Natalie Williams*	2 June 2014	EIA Consultant
Checked by	Neil Titley	*Neil Titley*	2 June 2014	Principal Consultant
Approved by	Richard Lowe	*Richard Lowe*	2 June 2014	Technical Director

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CONTENTS

1. INTRODUCTION

1.1 Purpose

This document presents a framework for the Construction Environmental Management Plan (CEMP), which will be produced for the Slough Multifuel Combined Heat and Power (CHP) facility following receipt of planning consent.

Several potential impacts have been identified through the Environmental Impact Assessment (EIA) process and are reported in the Environmental Statement (ES), which has been submitted along with the Planning Application for the Proposed Development. This framework CEMP demonstrates how these commitments in the ES will be implemented. It also sets out the monitoring and auditing activities designed to demonstrate that such mitigation measures are carried out and that they are effective.

This document provides the likely structure of the CEMP, some preliminary information relevant to the CEMP, and indicates what additional information might be included under each sub-section within the CEMP.

The CEMP will be produced in line with this framework CEMP following receipt of planning consent and would be agreed with Slough Borough Council in advance of starting demolition or enabling works onsite.

1.2 Scope

The CEMP will cover the principal demolition and construction activities and will include the following key elements:

- An overview of the Proposed Development and associated construction programme;
- Prior assessment of environmental impacts (through the EIA);
- Minimisation of potential impact through design and other mitigation measures;
- Monitoring of effectiveness of mitigation measures;
- Corrective action procedure; and
- Links to other complementary plans and procedures.

In summary, the CEMP will identify how commitments made in the EIA will be translated into actions on-site and includes a schedule for implementing the actions through allocation of key roles and responsibilities.

The 'Principal Contractor' for the development is [TBC in the CEMP], who will oversee and manage the construction phase for [PHASE / ACTIVITIES TBC].

All contractors will be responsible for working in accordance with the environmental controls documented in the CEMP. The overall responsibility for implementation of the CEMP will lie with the 'Applicant', which is SSE Generation Ltd.

The CEMP will be designed with the objective of compliance with the relevant environmental legislation and the commitments for mitigation measures documented within the ES. It covers the activities described in the Demolition and Construction Method Statement (DCMS) and should be read alongside the DCMS and the ES (which was submitted in support of the planning application – Reference number and date TBC in the CEMP).

2. THE DEVELOPMENT AND CONSTRUCTION PROGRAMME

2.1 Overview of the Proposed Development

The Proposed Development will comprise a multifuel generating plant that will convert pre-prepared fuel derived from selected processed waste into low carbon electricity and heat, with a design capacity of up to 400,000 tonnes per annum of Waste Derived Fuel (WDF).

2.2 Demolition and Construction Programme

The current expectation is that demolition works and construction of the Proposed Development would take approximately 48 months.

Allowing sufficient time to receive planning permission and to discharge expected planning conditions, it is anticipated that the earliest that demolition and enabling works onsite for the Proposed Development would start is in mid-2015, with an expected operational start date of mid-2019.

A simple overview of the likely construction programme is presented in Figure 1.

Figure 1: Indicative Construction Programme

Year	**2015**		**2016**				**2017**				**2018**				**2019**	
Quarter	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**
Design and Procurement																
Demolition Works																
Site Enabling																
Construction of multifuel power station																
Main Civil Works																
Mechanical and Process Installation																
Commissioning of multifuel power station																

Construction works would be 24 hour, although noisier activities will be avoided during the quieter times.

The following activities will be restricted to daytime hours of Monday to Friday 07:30 – 18:30 and Saturday 08:30 – 14:30:

- To be confirmed in the CEMP

3. SITE CONTEXT

The Proposed Development Site is shown in Figure 2.

The Site occupies a total area of approximately 1.9 hectares (ha) and is located on land within the existing SHP site on the Slough Trading Estate (342 Edinburgh Avenue, Slough, SL1 4TU). The approximate National Grid Reference of the centre of the Site is SU 953 814.

The Site lies within the Thames Valley, approximately 4km north of the River Thames and is surrounded by the conurbation of Slough; Windsor is approximately 5km south of the site and Maidenhead is approximately 7km west of the Site.

The topography at the Proposed Development Site is predominantly flat and approximately 30m above ordnance datum (AOD).

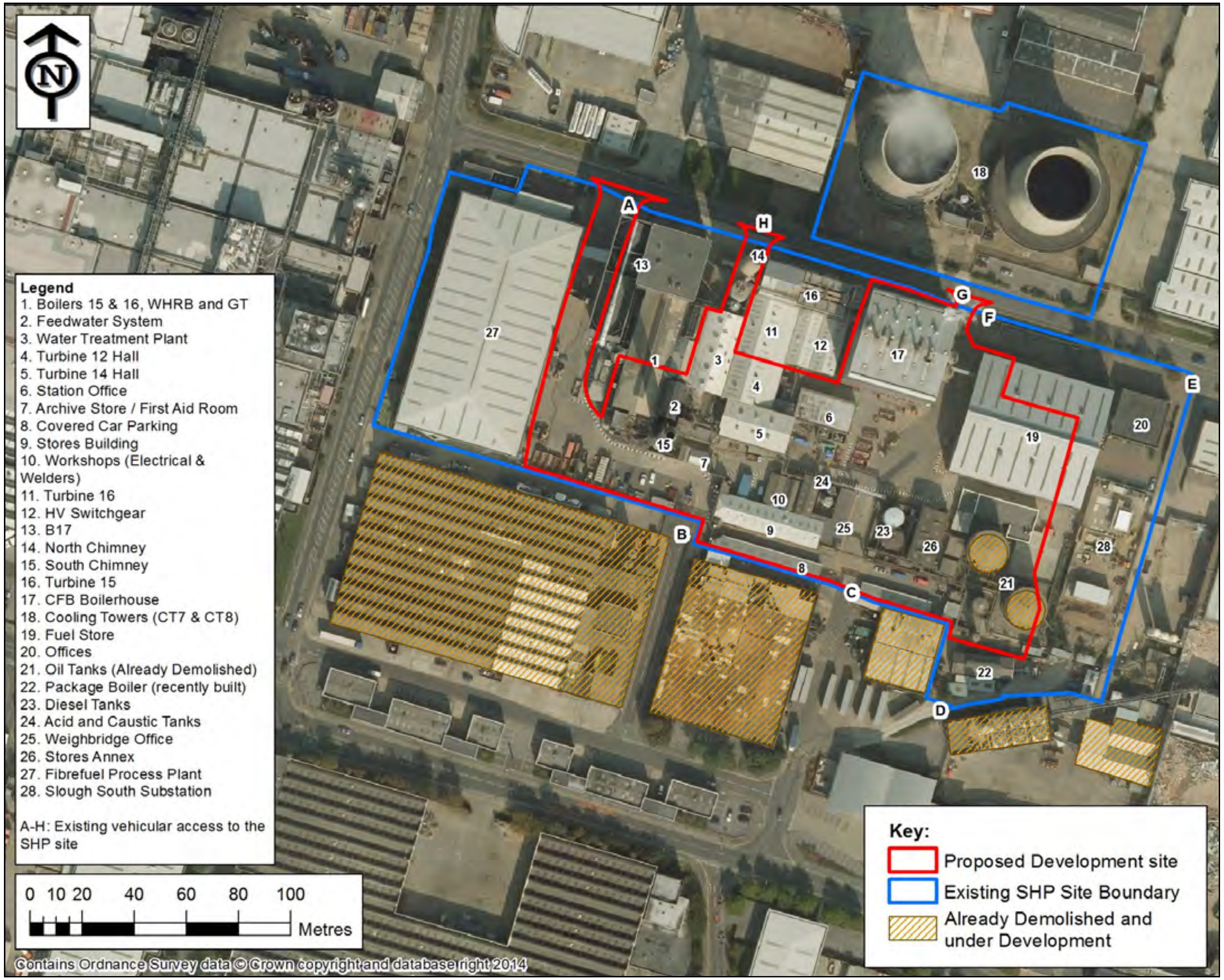
There are no protected habitats onsite or protected species known to inhabit the site, according to the ES. Peregrine falcon are known to use the blast vents on the CFB building for perching and appropriate mitigation measures for this species will be outlined in the later sections of the CEMP (see Section 7).

There are no Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Sites of Special Scientific Interest (SSSIs) or National Nature Reserves (NNR) within a 2km radius of the Site. The closest European Protected Site is Burnham Beeches SAC located approximately 2.9km north of the Proposed Development Site. The nearest statutory site – Haymill Valley Local Nature Reserve – is 0.88km west of the Site.

Ground conditions are considered of moderate sensitivity, due to the groundwater being classed as a Secondary A aquifer and the groundwater vulnerability zone classification of 'major aquifer high'. Borehole measurements onsite suggest resting groundwater lie between 4.1m and 4.7m below ground level (bgl). Appropriate mitigation measures are outlined in Section 7 of the CEMP.

There are no archaeological records onsite or other environmental sensitivities identified in the ES onsite.

Figure 2: Proposed Development Site Boundary



4. PARKING PROVISIONS AND OFFSITE FACILITIES

The parking provisions onsite, such as access/egress and location will be detailed in this sub-section in the CEMP. It will also include a description of any offsite laydown areas or contractor accommodation areas.

Figure 3 illustrates the construction layout, showing the following:

- Parking of Site Operatives and Visitors Vehicles;
- Temporary Access Routes/ Gates;
- Loading and Unloading Areas for Plant and Materials;
- Storage of Plant and Materials;
- Wheel Washing Facilities;
- Management of Construction Traffic and Access/ Haul Routes

Figure 3: Construction Layout

[A figure will be included in the final CEMP]

5. OFFSITE DELIVERY ROUTES

The CEMP will provide details of any designated routes for HGV movements and worker car movements, supplemented by a Figure illustrating these routes. It will also detail any measures designed to minimise travel during peak hours, which traffic surveys have identified to be 0800 to 0900 and 1700 to 1800.

Figure 4: Delivery Routes to and from Site

[A figure will be included in the CEMP once agreed with Slough Borough Council]

6. RECYCLING AND DISPOSING OF WASTE

In order to control the waste generated on site during demolition and construction [NAME OF PRINCIPAL CONTRACTOR TBC] will undertake a skip segregation system to separate the main waste streams on site, prior to them being taken to a waste facility for recycling.

A Site Waste Management Plan will be set up, which will allow for waste streams to be estimated and monitored and goals set with regards to the waste produced.

All waste to be removed from site will be undertaken by fully licensed waste carriers and taken to licensed waste facilities.

7. MANAGEMENT AND MITIGATION PLAN

This section of the final CEMP will set out the mitigation and management measures identified from the ES. It will also illustrate how the monitoring strategy will be set out and the responsible party identified for each mitigation/enhancement measure or monitoring requirement.

It is envisaged that the management and mitigation plan will be presented in tabular form, as shown in the example below.

NAME OF ENVIRONMENTAL DISCIPLINE TBC			
Potential Effect	**Mitigation/Enhancement Measure**	**Monitoring Requirements**	**Responsibility**
The identified effect will be summarised here in the final CEMP	The mitigation or enhancement measure will be described in this cell in the final CEMP. Where applicable it will provide a greater level of detail than presented in the ES.	The monitoring requirements, if any, will be described in this cell in the final CEMP. This will include the nature of monitoring (e.g. an overview of the type of equipment or qualified person), frequency and duration, and the location of monitoring. If required further information will be presented in an appendix.	The person /role responsible for the mitigation/enhancement measure or monitoring will be named here in the final CEMP.

8. COMPLEMENTARY PLANS AND PROCEDURES

In addition to the CEMP, a suite of complementary plans and procedures may be developed. These plans and procedures would build on the principles and procedures detailed in this CEMP, and include:

- [OTHER PLANS WILL BE LISTED HERE IN THE CEMP, e.g. A SITE WASTE MANAGEMENT PLAN, AND CONSTRUCTION PHASE TRAVEL PLAN]

9. CONCLUSIONS

This framework CEMP has provided the likely structure and content of the CEMP.

The diagram overleaf will summarise the roles, responsibilities and frequency of monitoring outlined in the CEMP.

As part of the monitoring process the Principal Contractor will allocate a designated Environmental Site Officer(s), who will be present onsite throughout the demolition and construction process and when new activities are commencing. The Environmental Site Officer will observe site activities and report any deviations from the CEMP in a log book, along with the action taken and general conditions at the time. The Applicant will be informed of any deviations from the CEMP as soon as possible following identification of such issues. The Environmental Site Officer would also act as day-to-day contact with Slough Borough Council and other regulatory agencies such as the Environment Agency.

A brief report will be produced and submitted to Slough Borough Council at the end of each key activity shown in Figure 1, and following completion of commissioning. This will summarise the monitoring process, observed deviations from the CEMP and the corrective actions taken.

[AN ORGANOGRAM WILL BE INCLUDED IN THE CEMP ILLUSTRATING TEAM MEMBERS & RESPONSIBILITIES]

Appendix B-2

Human Health Risk Assessment

URS

Slough Multifuel CHP Facility

Human Health Risk Assessment

April 2014

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Prepared for:
SSE Generation Ltd

UNITED KINGDOM & IRELAND

REVISION SCHEDULE

Rev	Date	Details	Prepared by	Reviewed by	Approved by
0	October 2013	Final	Alexandra Ewan Matthew Hill Assistant Air Quality Specialists	Garry Gray Associate – Air Quality	Garry Gray Associate – Air Quality
1	April 2014	Update	Matthew Hill Assistant Air Quality Specialists	Garry Gray Associate – Air Quality	Garry Gray Associate – Air Quality

URS Infrastructure & Environment UK Limited
12 Regan Way
Chetwynd Business Park
Chilwell
Nottingham
NG9 6RZ

Tel +44 (0)115 907 7000
Fax +44 (0)115 907 7001

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1 INTRODUCTION

This is an assessment of the risk of effects on Human Health from the proposed Slough Multifuel Combined Heat and Power (CHP) Facility (the *Proposed Development*) for SSE Generation Ltd (the Applicant). Within this report the '*proposed facility'* refers specifically to the Slough Multifuel CHP Facility itself. Emissions modelled in this assessment are from the proposed facility, and exclude emissions from the wider Proposed Development, such as traffic. The Proposed Development Site (the Site) is located within the existing Slough Heat and Power (SHP) site within Slough Trading Estate, 342 Edinburgh Avenue, Slough, SL1 4TU. The study area for this assessment extends 10 kilometres (km) from the Site and includes the Borough of Slough, the majority of South Bucks District, Royal Borough of Windsor and Maidenhead (RBWM), Runnymede District, Spelthorne District, as well as the London Borough (LB) of Hounslow and LB Hillingdon. A 10km radius from the Site also includes parts of the surrounding authorities, namely Bracknell Forest, Chiltern, LB Ealing, Elmbridge, LB Richmond Upon Thames, Three Rivers, and Wycombe Districts.

The potential health effects associated with emissions to air from the proposed facility have been assessed on the conservative basis that emissions from the proposed facility will be at the Industrial Emissions Directive (IED) Emission Limit Values (ELVs) for plants combusting waste derived fuels. In practice, the mitigation employed to ensure compliance with permitted emission rates is expected to deliver average emissions concentrations that are lower than the ELVs during normal operation over the life time of a plant. This assessment is therefore conservative and likely to overestimate the actual effect on human health.

The Industrial Emissions Directive (IED) 2010/75/EU[1] entered into force on 7th January 2011 and recast a number of directives, including the Waste Incineration Directive (WID)[2], into a single overall directive. It was transposed into UK law on 20th February 2013 within the Environmental Permitting Regulations (England & Wales) 2013, and applies to all new installations developed after 6th January 2013. The ELVs and operating conditions specified within WID have been retained within the IED and continue to be applied to installations regulated under WID.

The health effects associated with exposure to air pollutants has been considered at the population level and in terms of the potential effect on hypothetical individuals experiencing maximum levels of exposure. These different elements of the assessment require the application of distinct assessment methods and are reported here as separate sections of the report.

Section 2 provides an overview of the assessment methodology and how the magnitude of the predicted change in concentrations of particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), metals and organic substances due to emissions from the proposed facility have been estimated using dispersion modelling techniques. The current health of the population of the area surrounding the proposed facility is summarised in Section 3. The predicted annual mean pollutant concentration values for one of the inputs used in the assessment of population level health effects are discussed in Section 4. Finally the potential for the predicted change in concentrations to affect the total risk for carcinogenic and non-carcinogenic effects is considered in Section 5.

[1] European Union (2010) Directive 2010/75/EU on Industrial Emissions (integrated pollution prevention and control) (recast)
[2] European Council (2000) Directive on the Incineration of Waste, 2000/76/EC

2 ESTIMATED POLLUTION CONCENTRATIONS

2.1 Overview

One of the required data inputs to the risk assessment is the predicted change in annual mean concentrations of PM_{10}, $PM_{2.5}$, sulphur dioxide, nitrogen dioxide, metals and organic substances across the assessment domain, due to the operation of the proposed facility. In this instance, the dispersion model outputs have been taken from an ADMS dispersion model used to assess the air quality effects of the proposed facility, as presented in *Chapter 8: Air Quality* of the Environmental Statement. The results have been provided as a spatial output for use with the Geographical Information System (GIS) and human health modelling software. This section provides a summary of the inputs to the dispersion model.

2.2 Dispersion Model Setup

The assessment of emissions from the main stack serving the facility has been undertaken using ADMS 5.1. ADMS is a dispersion model that has an extensive published validation history for use in the UK[3]. This model has been extensively used throughout the UK to demonstrate regulatory compliance.

The physical properties of the main stack and the emissions data for input to the model were obtained from the design parameters for the proposed power station. The modelled pollutant emission rates (in grams per second (g/s)) are based on the ELVs set out within Annex VI of the IED, and have been calculated by multiplying the IED daily average ELV by the design volumetric flow rate. The data is based on 100% Maximum Continuous Running (MCR) case when firing on the design fuel.

The meteorological site that was selected for the assessment was Heathrow Airport, located approximately 9km southeast of the Site, in flat terrain. The modelling for this assessment has utilised meteorological data for the period 2008-2013, with 2008 providing the worst-case results for long term effects. The dispersion modelling output for each pollutant from this year was used as input for the GIS and health modelling software.

The Site is located to the west of Slough centre in an industrial trading estate (the Slough Trading Estate) with the closest residential receptor approximately 200m to the north of the Site. A surface roughness of 0.5m, corresponding to parkland and open suburbia, has been selected to represent the local terrain, which is consistent with previous dispersion modelling assessments that have been carried out for the Site.

Emissions of NO_x from the main stack will consist mainly of nitric oxide (NO) at the point of release, oxidising within the atmosphere to form NO_2 as it moves downwind. The modelling assessment has assumed a 70% NO_x to NO_2 conversion rate at ground level in the calculation of long-term annual mean calculations. Emissions have been modelled such that they are not subject to dry and wet deposition or depleted through chemical reactions. This results in an over-estimation of effects at receptors.

2.3 Receptor Grid

The contribution of emissions from the main stack to ambient concentrations of pollutants have been modelled at points forming a Cartesian grid, in order to enable the generation of the spatial model output required for use with the GIS and health modelling software. A variable resolution grid was used in order to provide a higher resolution in the immediate area surrounding the facility. The receptor grid is centred on the main stack, the details for which

[3] Cambridge Environmental Research Council (2013), ADMS Roads Validation Papers, Accessed from: [redacted] (Accessed on 16/09/2013).

are presented in Table 1. The grid extends to 10km from the stack in all directions. The height of receptors within the grid was set at 1.5m for effects through respiration or at 0m for effects through other potential pathways.

The modelled receptor resolutions shown below are the required variable resolutions for input into the IRAP model, a commercially available risk assessment modelling tool, and therefore differ slightly from the receptor grid resolution used to assess air quality effects in *Chapter 8: Air Quality* of this ES. A grid spacing that is appropriate for the respective study area has been chosen and the IRAP model them interpolates between the grid points to generate the values used for the subsequent calculations.

Table 1: Modelled Domain - Variable Receptor Grid

Spacing (m)	Dimensions (m)	National Grid Reference of SW Corner of Receptor Grid
12.5	1,200 x 1,200	494671, 180846
50	4,800 x 4,800	492871, 179046
200	20,000 x 20,000	485271, 171446

3 BASELINE LOCAL HEALTH CONDITIONS

Health profiles are produced annually by the Association of Public Health Observatories (APHO) and these provide a summary of the health of people within defined areas and a comparison of local health with average values for all areas of England. Health profiles have been obtained for the local authority areas of Bracknell Forest[4], Chiltern[5], LB Ealing[6], Elmbridge[7], LB Hillingdon[8], LB Hounslow[9], LB Richmond upon Thames[10], Runnymede[11], Slough[12], Spelthorne[13], South Bucks[14], Three Rivers[15], RBWM[16], and Wycombe[17].

Table 2: Life Expectancy

Location	Female Average (years*)	Male Average (years*)
England	82.6	78.6
Slough	82.8	79.4
Bracknell Forest	84.3	79.8
Chiltern	85.0	80.7
LB Ealing	83.5	78.8
Elmbridge	84.1	81.8
LB Hillingdon	83.7	78.7
LB Hounslow	82.2	78.3
LB Richmond upon Thames	85.6	81.3
Runnymede	84.4	81.3
South Bucks	84.0	81.4
Spelthorne	84.3	80.2
Three Rivers	84.8	80.3
Windsor and Maidenhead	83.6	79.8
Wycombe	84.7	80.4

*Values at birth (2008-2010) sourced from the Health Profile for the individual local authority[5,,5,6,7,8,9,10,11,12,13,14,15,16,17]

Local average life expectancy for people living within each local authority tends to be slightly longer than the national average (see Table 2).

4 [redacted]

Various factors may contribute to an increase in the relative rates of deaths between summer and winter months (excess winter deaths). Excess winter death rates for the study area are not reported to be significantly different to the national average.

There are documented health inequalities between individual areas within each local authority. Male life expectancy in the most deprived areas within the Slough Borough Council (SBC) administrative area is on average 7.3 years shorter than in the least deprived areas (based on the Slope Index of Inequality[18]).

Table 3: Baseline Mortality Rates

	Health Outcome per 100,000 Population[a]				
Community	**Deaths from Smoking[b]**	**Early Deaths: heart disease and stroke[c]**	**Early Deaths: Cancer[c]**	**Road injuries and deaths[d]**	**Infant Deaths[e]**
England	211.0	67.3	110.1	44.3	4.6
Slough	204.0	87.4	110.4	34.5	5.2
Bracknell Forest	173.0	53.2	101.3	20.0	4.3
Chiltern	136.0	45.8	94.4	36.7	3.5
LB Ealing	184.0	82.6	104.4	34.1	3.8
Elmbridge	132.0	49.9	94.6	37.3	2.8
LB Hillingdon	191.0	64.7	103.2	35.3	4.8
LB Hounslow	195.0	71.9	106.4	42.7	4.6
LB Richmond upon Thames	165.0	49.4	87.1	33.9	2.8
Runnymede	170.0	50.8	99.0	52.0	3.4
South Bucks	154.0	48.4	80.2	76.6	1.4
Spelthorne	188.0	57.0	98.5	44.7	4.2
Three Rivers	166.0	53.3	92.7	37.1	3.5
Windsor and Maidenhead	183.0	59.8	96.6	42.4	2.4
Wycombe	157.0	51.3	92.5	37.9	4.5

[a] Sourced from the Health Profile for the individual local authority[4,5,6,7,8,9,10,11,12,13,14,15,16,17].
[b] Values expressed as per 100,000 population age 35+, directly age standardised rate 2008-2010 sourced from APHO and Department of Health, 2012.
[c] Values expressed as directly age standardised rate per 100,000 population under 75, 2008-2010.
[d] Values expressed as rate per 100,000 population 2008-2010.
[e] Rate per 1,000 live births 2008-2010 sourced from the Health Profile for the individual local authority[4,5,6,7,8,9,10,11,12,13,14,15,16,17].

Similar differences in the average male life expectancy were found between the most and least deprived areas of the local authority areas of Bracknell Forest (6 years), Chiltern (8.8

[18] APO (2011) Health Inequality Indicators for Local Authorities, Slope Index of Inequality for Life Expectancy by Deprivation Deciles-2006-2010

years), LB Ealing (6.2 years), Elmbridge (5.9 years), LB Hillingdon (7 years), LB Hounslow (6.8 years), LB Richmond upon Thames (5.9 years), Runnymede (5.3 years), South Bucks (7.1 years), Spelthorne (4.7 years), Three Rivers (7.7 years), RBWM (6.1 years) and Wycombe (8.8 years) (based on the Slope Index of Inequality[19]). Both the male and female average life expectancy values for all the local authority areas shown in Table 2 are within 4 years of the average life expectancy for males and females in England as a whole.

The health outcomes for people living in the different local authority areas of the region set out in Table 3 are contrasted against the England average and considered for each administrative area in turn in Sections 3.1 to 3.14.

An annual report on the health of the local population is undertaken on each administrative area in combination with the local National Health Service (NHS). This used to take the form of an annual report by the director of public health for the area but these are being gradually replaced by a Joint Strategic Needs Assessment (JSNA) report on the health and well-being of the local population. The health of the local population living within each local authority areas in the region is discussed in the following sections.

3.1 Administrative Area of Slough Borough Council

The health of people living within the Slough Borough Council (SBC) administrative area is mixed compared with the England average[12]. There are lower levels of deprivation across the SBC administrative area, but about 7,300 children reportedly live in poverty.

The JSNA covering the SBC administrative area for 2011/2012[19] highlighted that the area covered by NHS Berkshire East (which will become part of the NHS commissioning board in future) comprises the three Unitary Authority areas of Slough, Bracknell Forest and RBWM together with the Runnymede district in Surrey. The central ward of Slough contains many of the most deprived Lower Super Output areas (LSOAs) for older adults; however the population density maps show fewer older people live there. There are pockets of deprivation for older people in the wards of Haymill, Britwell, Cippenham Meadows, Chalvey, Baylis and Stoke, and Upton and Wexham Lea.

The NHS Berkshire East Annual Report and Accounts 2011/2012[20] highlights that the proportion of children living in poverty in Slough (24%) is considerably above the South East average (16%). In Slough, rates of early death from heart disease and stroke in people aged under 75 are higher than the rates for England as a whole.

Whilst the rate of death from all causes combined has decreased for both men and women over the last ten years, there are many indicators that are worse than the England average including people diagnosed with diabetes, new cases of tuberculosis, over 65s not in good health, physically active adults, and drug misuse[12]. While the early death rate from heart disease and stroke has fallen, it remains higher than the England average.

However some indicators of health for people living within the SBC administrative area are similar or better than the national and regional average e.g. rates of hip fractures and road injuries and deaths. Furthermore, levels of GCSE attainment, alcohol-specific hospital stays among those under 18, breast feeding initiation and smoking in pregnancy are better than the England average.

Health inequalities are being addressed within the SBC administrative area by prioritising actions on crime reduction (violent crime and domestic abuse) and on tackling childhood and adult obesity and cardiovascular disease in those aged under 75. Priorities for action in the

[19] NHS Berkshire East (2012) Joint Strategic Needs Assessment 2011-12, Slough Borough Council and Slough Clinical Commissioning Group, Slough Borough Council and Slough Clinical Commissioning Group.
[20] NHS Berkshire East (2012) Annual Report 2011/2012, Looking After the Health of our Population, NHS Berkshire East.

Local Area Agreement include people's participation in physical activity, early deaths from circulatory disease, vulnerable and older people, and tackling drug and alcohol misuse.

Over the year NHS Berkshire East has enhanced its Tuberculosis (TB) service to tackle the high number of infections which is a public health concern across the area particularly in Slough. The national rate is around 14 cases per 100,000 people, whereas for the past few years in Slough it has been 50 cases per 100,000[20].

3.2 Administrative Area of Bracknell Forest Council

The health of people in the Bracknell Forest Council (BFC) administrative area is generally better than the England average[4]. Deprivation is lower than average, however about 2,700 children live in poverty. Life expectancy for both men and women is higher than the England average. Over the last 10 years, all cause mortality rates have fallen and the early death rate from heart disease and stroke has fallen and is better than the England average.

Some indicators of health for people living within the BFC administrative area are similar or better than the national and regional average include the estimated level of adult smoking, rates of sexually transmitted infections, road injuries and deaths, smoking related deaths and hospital stays for alcohol related harm. Additionally, levels of teenage pregnancy, alcohol-specific hospital stays among those under 18, breast feeding initiation and smoking in pregnancy are better than the England average.

The 2012 JSNA[21] showed that Bracknell Forest is one of the least deprived areas of the country, ranked 291 out of 326 local authorities in England on the Index of Multiple Deprivation 2010. The overall picture of deprivation masks variations at LSOA level (an area containing a minimum of 1000 people). In BFC administrative area there is a west to east spread across Great Hollands South in the west to Harmanswater in the east, which also takes in all the central town wards of income deprivation. The same wards are also those with the greatest rates of domestic abuse. The most deprived LSOAs for older adults in Bracknell Forest are in the wards of Priestwood and Garth, Crown Wood and Harmanswater. Using five year estimates from the Health Profiles for 2011, there was a gap between the most affluent and the most deprived wards for males of 4.02 years and for females of 1.21 years in Bracknell Forest (based on 2005-9 data).

Using three year averages (based on all 2008-10 mortality data), the percentage of deaths from all cancers was statistically above national in Bracknell Forest at 29.57% compared to 27.71% nationally. Cancer deaths were statistically higher among females in the 65-84 year age band. Additionally, deaths from other causes were statistically higher than national in males aged 65-84. Cardiovascular disease mortality rates on the other hand were statistically lower than national yet cardiovascular disease in males and females remains among the top three categories in the Clinical Commissioning Group (CCG) (based on a single year extract from Annual District Deaths for 2010).

The BFC Annual Report 2012[22] identifies the six priorities set out by the council in 2010 including a town centre fit for the 21st century, protecting and enhancing our environment, promoting health and achievement, creating a borough where people are safe and feel safe, sustaining economic prosperity, and value for money. The priorities to tackle health inequalities include long term conditions, early intervention to reduce depression and promote mental health and well being and stroke prevention.

[21] NHS Berkshire East (2012) Joint Strategic Needs Assessment 2011-12, Bracknell Forest Council.
[22] Bracknell Forest Council (2012) Annual Report 2012, Bracknell Forest Council.

3.3 Administrative Area of Chiltern District Council

The health of people living within the Chiltern District Council (CDC) administrative area is better than the England average[5]. Deprivation is lower and life expectancy for both men and women is higher than the England average. All causes of mortality and early death rates from heart disease and stroke have fallen over the last decade. Indicators relating to health and lifestyle behaviour are generally better than the England average, such as smoking and obesity, estimated levels of adult 'healthy-eating', rates of sexually transmitted infections, smoking related deaths and hospital stays for alcohol related harm.

The Department of Health are currently conducting a consultation on how Health and Wellbeing Boards can use JSNA and Joint Health and Wellbeing Strategies (JHWS) to improve health and wellbeing outcomes and reduce inequalities, details end on the 28th September 2013.

Priorities in CDC include those outlined in Buckinghamshire's Joint Strategic Needs Assessment[23] and the Director of Public Health's Report. The wider determinants of health and wellbeing include education, employment, housing, income, social networks, and the environments in which people live and work.

Life expectancy continues to steadily increase in Buckinghamshire and remains significantly higher than the national average for men and women; male life expectancy is currently 80.5 years and increased 2.5 years between 2001-03 and 2008-10, and female life expectancy is 84.0 years, increasing 2.1 years over the same period. There were 3,793 deaths in Buckinghamshire in 2011, cardiovascular diseases accounted for 31%, cancer accounted for 20% and respiratory diseases accounted for 13% of all deaths.

The key health and wellbeing needs identified in the JSNA for Buckinghamshire include the need for a good start in life such as ensuring a healthy pregnancy for all, parenting support, and early year's education. Increasing the number of people with healthy lifestyles with a focus on physical activity, healthy eating, alcohol consumption and smoking at all ages and patient empowerment with increased support for self-care along with a focus on the growing numbers of people with multiple long term conditions are also key needs identified.

Additional needs include increasing support for carers, supporting people with dementia, addressing the health and wellbeing of groups with specific health needs, meeting the needs of the increasingly diverse population and ensuring safeguards are in place against risks of abuse and neglect.

Further needs include protecting the area's population from infectious diseases and environmental hazards, as well as improving health and wellbeing through continued action on the broader determinants of health such as education, income, employment, the built and natural environment, crime and social cohesion.

3.4 Administrative Area of London Borough of Ealing

Within the LB Ealing administrative area the health of the people living there is varied when compared to the average for England[6]. All causes of mortality rates and the early death rate from heart disease and stroke have fallen over the last decade, however are still worse than the England average. Whilst the estimated level of adult physical activity, rates or sexually transmitted infections and hospital stays for alcohol related harm are worse than the England average; estimated levels of adult 'healthy eating', obesity, rates of road injuries and deaths and smoking related deaths are better than the England average.

[23] NHS Buckinghamshire (2013) Executive Summary for Buckinghamshire's updated Joint Strategic Needs Assessment. Buckinghamshire County Council.

LB Ealing's JSNA 2012-13[24] was developed to inform and update the Health and Wellbeing Strategy and the commissioning plans for the new and emerging Clinical Commissioning Consortia (CCC) and showed that LB Ealing is ranked the 61st most deprived and within the top 20% most deprived English Local Authorities, based on the 2010 Index of Multiple Deprivation. A significant number of areas in the borough have become relatively more deprived over the last few years including Perivale, South Acton, Southall Broadway and Greenford Green.

Inequality within the area has been increasing gradually for females and reducing slight for men, however the gap remains larger for men at 10.7 years and 3.9 years for women. Inequality for both men and women has dropped by 0.4 years and 0.7 years respectively between 2005-09 and 2006-10.

Health inequalities are being addressed within LB Ealing administrative area by prioritising actions including child health (0-5 years), older people's health, long term conditions with a focus on cardiovascular disease, diabetes, respiratory and musculoskeletal conditions and mental health and alcohol. The key messages from the JSNA 2012-13 are to continue the focus on identified gaps, respond to the need for earlier diagnosis and to address inequalities and lifestyle choices that effect negatively on health and wellbeing within the area.

3.5 Administrative Area of Elmbridge Borough Council

The health of people in the Elmbridge Borough Council (EBC) administrative area is generally better than the England average[7]. Deprivation is lower and life expectancy for both men and women is higher than the England average. Within the last decade, all cause mortality rates have fallen, as well as the early death rate from heart disease and stroke and are all better than the England average. Estimated levels of adult 'healthy eating', smoking, physical activity and obesity, rates of sexually transmitted infections, road injuries and deaths, smoking related deaths and hospital stays for alcohol related harm are all better than the England average.

The 2011 JSNA for Surrey[25] indicates that across all Surrey local authorities, Elmbridge has the highest proportion of children under 16 years (21%). Elmbridge has a significantly higher fertility rate than England.

Health inequalities are being addressed in Elmbridge prioritising alcohol, skin cancer and hip fractures.

3.6 Administrative Area of London Borough of Hillingdon

Within the LB Hillingdon administrative area the health of the people living there varies when compared to the average for England[8]. Over the last decade, all cause mortality rates and early death rates from cancer, heart disease and stroke have fallen. Whilst the estimated level of adult 'healthy eating' and rates of road injuries and deaths and smoking related deaths are better than the England average; the estimated level of adult physical activity, rates of sexually transmitted infections and hospital stays for alcohol related harm are worse than the England average.

Male life expectancy in LB Hillingdon was estimated at 78.7 years in 2008-10, similar to the national and London averages[26]. Life expectancy for females was estimated at 83.7 and it was significantly higher than the national average but similar to the London average.

The 2011 JSNA[26] has three majors aims to provide planners with a prioritised list of recommended areas to address to improve the health of the population and/or reduce health

[24] NHS Ealing (2012) Joint Strategic Needs Assessment 2012-13, Executive Summary, London Borough of Ealing.
[25] Surrey(2011) Joint Strategic Needs Assessment. Date Accessed 20/09/2013 via http://www.surreyi.gov.uk/viewpdf.aspx?ResourceID=663

inequalities: to provide a good summary description of the current health and wellbeing in LB Hillingdon; and to provide an accessible timely authoritative database to specific needs assessment upon which the latter two aims are based.

Seven priority themes for action were identified and specific to promoting healthier lifestyle by developing a range of housing options that enable people to remain living affordably in their own home for as long as possible; addressing the demographic pressures which include school places, ageing population, children with complex health and social care needs; ensuring all children have a healthy start in life; and continuing to work in partnership to promote healthy lifestyles preventing harm especially from obesity, alcohol, drugs and smoking.

Health inequalities in LB Hillingdon are being addressed by prioritising early identification and intervention to prevent harm from long term conditions and tackling risk factors such as smoking, obesity, physical inactivity and alcohol. The 2011 JSNA indicates that tackling health inequalities in health outcomes such as life expectancy and mortality is best achieved through a universal approach in addressing the social determinants of health.

3.7 Administrative Area of London Borough of Hounslow

The health of the adults living in the LB Hounslow administrative area is varied compared with the England average[9]. Whilst deprivation is lower than the average, life expectancy for both men and women is similar to the England average and approximately 13,400 children live in poverty.

All cause mortality rates have fallen over the last decade, as well as early death rates from cancer, heart disease and stroke. Whilst the estimated levels of adult 'healthy eating', obesity and rate of smoking related deaths is better than the England average; the estimated level of adult physical activity, rates of hip fractures and hospital stays for alcohol related harm are worse than the England average.

The JSNA 2012-13[27] indicated that age-standardised mortality rates are on a downward trend in LB Hounslow with 19% fewer male deaths and 15% fewer female deaths since 2002. LB Hounslow has comparable mortality rates for coronary heart disease, stroke, chronic obstructive pulmonary disease (COPD), breast, cervical, colorectal and prostate cancers, and deaths due to road traffic accidents compared to London and England as a whole.

LB Hounslow is ranked as the 118th most deprived local authority (out of 326) in England, based on an average score for 139 small geographical areas in Hounslow, each of which has about 1500 people. Within the administrative area, there are specific groups of vulnerable and potentially marginalised people that often have a combination of social and health care needs. These include people with disabilities, the elderly frail, homeless rough sleepers and troubled families.

Health priorities being addressed in LB Hounslow include continued action to reduce obesity levels, investigate and address increases in alcohol related admissions and consider tobacco control measures.

3.8 Administrative Area of London Borough of Richmond upon Thames

The health of people living in LB Richmond upon Thames is generally better than the England average[10]. Deprivation is lower and life expectancy for both men and women is higher than the England average.

[26] London Borough Hillingdon (2011) Joint Strategic Needs Assessment, London Borough of Hillingdon.
[27] NHS Hounslow Clinical Commissioning Group (2012/13) The Hounslow Joint Strategic Needs Assessment 2012/13 Overview, London Borough of Hounslow.

Richmond LINk has participated as a member in the development of the Richmond Health and Wellbeing Board, a board still in its infancy[28]. Richmond LINK takes a firm interest in the development of the JSNA and is reinforcing its position with the development of that document.

Over the last decade, all cause mortality rates and early death rates from cancer, heart disease and stroke have all fallen and are better than the England average. Indicators that are better than health than the England average include estimated levels of adult 'healthy eating', physical activity, obesity, rates of road injuries and deaths, smoking related deaths and hospital stays for alcohol related harm.

Health priorities being addressed in Richmond upon Thames include giving all children a good start in life; improving integrated health and social care out of hospital for people with long-term conditions, including mental health problems.

3.9 Administrative Area of Runnymede Borough Council

Within the administrative area of Runnymede Borough Council (RBC), the health of the people living there is generally better than the England average[11]. Deprivation is lower and life expectancy for both men and women is higher than the England average.

The 2011 JSNA for Surrey[29] indicates that across all Surrey local authorities, Runnymede has the highest percentage (64%) of estimated working age population (16-59/64 years). Runnymede has the lowest (16%) proportion of children under 16 years. Runnymede's fertility rate is significantly lower than every other Surrey borough and district.

All cause mortality rates have fallen in the last decade, as well as the early death rate from heart disease and stroke. Other health indicators that are better than the England average include smoking related deaths, hospital stays for alcohol related harm and rates of sexually transmitted infections.

Health priorities in Runnymede include road injuries and deaths, alcohol and hip fractures.

3.10 Administrative Area of South Bucks District Council

The health of the people in South Bucks District Council (SBDC) administrative area is generally better than the England average[14]. Deprivation is lower and life expectancy for both men and women is higher than the England average.

Over the last decade, all cause mortality rates, early death rates from cancer, heart disease and stroke have fallen and are better than the England average. Some health indicators are better than the England average including estimated levels of adult smoking, physical activity and obesity, rates of sexually transmitted infections, smoking related deaths and hospital stays for alcohol related harm. However, the rate of road injuries and deaths is worse than the England average.

Health inequalities are being addressed in South Bucks by prioritising those outlined in Buckinghamshire's Joint Strategic Needs Assessment and the Director of Public Health's Report as stated in section 3.3[23].

[28] Richmond upon Thames LINk (2011/12) Richmond upon Thames LINk 4th Annual Report. Richmond upon Thames.
[29] Surrey-I (2011) Joint Strategic Needs Assessment. Surrey Council.

3.11 Administrative Area of Spelthorne Borough Council

The health of the people living in the administrative area of Spelthorne Borough Council (SBC) is varied compared with the England average[13]. Deprivation is lower than average and life expectancy for both men and women is higher than the England average.

Spelthorne is the local authority within Surrey with the highest number of LSOA in the most deprived areas, with 10.3% of its population living in the top two most deprived quintiles[25]. 13.5% of children in Surrey live in low income households with the largest proportion of those in Spelthorne (17.1%, 4900).

Over the last decade, all cause mortality rates and early death rates from cancer, heart disease and stroke have fallen and are better than the England average. Rates of sexually transmitted infections, smoking related deaths and hospital stays for alcohol related harm are also better than the England average. Additionally, the rates of statutory homelessness, long term unemployment and drug misuse are lower than average. However, an estimated 23.9% of adults smoke and 26.0% are obese.

Health inequality priorities in Spelthorne include diabetes, alcohol and smoking.

3.12 Administrative Area of Three Rivers District Council

The health of the people living in the Three Rivers District Council (TRDC) administrative area is generally better than the England average[15]. Deprivation is lower and life expectancy for both men and women is higher than the England average.

All cause mortality rates and the early death rate from heart disease and stroke have fallen over the last decade and are better than the England average. Other health indicators that lead to the generally better than England average include the estimated levels of adult 'healthy eating', obesity, rates of sexually transmitted infections, smoking related deaths and hospital stays for alcohol related harm.

Priorities in Three Rivers include physical activity and obesity, helping the expanding older population maintain their health and continuing to reduce levels of smoking.

3.13 Administrative Area of Royal Borough of Windsor and Maidenhead

Within the RBWM, the health of the people living in the administrative area is generally better than the England average[16]. Deprivation is lower and life expectancy for both men and women is higher than the England average.

Over the last decade, all cause mortality rates and the early death rate from heart disease and stroke have fallen and are better than the England average. The estimated levels of adult smoking, physical activity, obesity, rates of sexually transmitted infections, smoking related deaths and hospital stays for alcohol related harm are better than the England average. However, the rate of violent crime is higher than average.

The 2011-12 JSNA[30] indicates that RBWM is situated in the relatively affluent South East region and thus ranks 291 out of all local authorities in England (based on the Index of Multiple Deprivation 2010). The overall picture of deprivation in RBWM masks variations at LSOA level.

Key issues indicated by the JSNA include improving outcomes for children living in poverty; improving mental health across the lifecourse; long term conditions including cardiovascular

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[30] NHS Berkshire East (2011-12) Joint Strategic Needs Assessment 2011-12, Royal Borough of Windsor and Maidenhead Health and Wellbeing Board.

disease, coronary heart disease, diabetes, stroke and chronic kidney disease; cancers; end of life care; respiratory disease; smoking alcohol; substance misuse; obesity; physical activity; housing; education and skills development; domestic abuse; safeguarding children and adults and health protection.

Health inequalities in RBWM are being addressed by prioritising early detection of dementia, falls prevention, and crime reduction (violent crime and domestic abuse).

3.14 Administrative Area of Wycombe District Council

The health of people in Wycombe is generally better than the England average with deprivation lower and a higher life expectancy for both men and women compared with the England average[17].

Over the last decade, all cause mortality rates have fallen, as well as early death rates from cancer and from heart disease and stroke, all of which are better than the England average. Estimated levels of adult smoking, obesity, rates of sexually transmitted infections, road injuries and deaths, smoking related deaths and hospital stays for alcohol related harm are all better than the England average. The rate of violent crime however is similar to the RBWM, in that it is higher than average.

Health priorities in Wycombe include those outlined in Buckinghamshire's Joint Strategic Needs Assessment and the Director of Public Health's Report, as stated in section 3.3[23].

3.15 Summary

The predicted health effects in the assessment of exposure to PM_{10} and $PM_{2.5}$, NO_2 and SO_2 is considered in the context of observed rates of disease and observed life expectancies on a national level. The methods used in this assessment could make use of either national statistics or local level statistics if such data exists, but suitable local level data is not available. In this assessment national level statistics have been used, as there are benefits to determining baseline population disease rates on statistics that represent larger numbers of people. There may be differences in the values for the statistical parameters used between the local and national level datasets, but the associated difference in the calculated health effects under consideration would be small.

The assessment of health effects arising from the exposure to metals and organic substances associated with emissions to air from the proposed facility calculates the additional risk of developing carcinogenic and non-carcinogenic health effects for individual receptors within the exposed population.

The priority action areas for improving the health of people within each local authority area focus on bringing forward changes to the policies on the social determinants of health namely, drugs, alcohol, smoking and obesity. The four local authorities within the region have no priority policies for improving the health of the local population by targeting a reduction in air pollution specifically.

4 POTENTIAL FOR HEALTH EFFECTS FROM EXPOSURE TO PARTICULATE MATTER, NITROGEN DIOXIDE AND SULPHUR DIOXIDE

An assessment of the potential effects on human health due to the operation of the proposed facility has been carried out with respect to the predicted change in population exposure to particulate matter (PM_{10} and $PM_{2.5}$), SO_2 and NO_2 (Annex 1). This report applies approaches to the quantification of health effects from predicted pollutant concentrations published by the Department of Health's Committee on the Medical Effect of Air Pollutants (COMEAP) and the Clean Air for Europe (CAFE) programme.

The total population of an area extending 10km from the location of the proposed facility was considered in the assessment of acute effects associated with exposure to particulate matter, NO_2 and SO_2. The same total population was also used in the assessment of mortality effects associated with chronic exposure to fine particulate matter.

The assessment concluded that, for each pollutant under consideration, the effect of the emissions from the operational facility on particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide and sulphur dioxide on human health would be relatively small.

The main outcomes of the study are as follows.

An average of 7.5 minutes of life would be lost for the male population, and 3.8 minutes life lost for the female population, through exposure to the maximum concentration of $PM_{2.5}$ occuring during the life of the proposed facility, for cardiovascular and respiratory health effects. By comparison, the most recent report published by COMEAP in 2010 calculated that the mortality effects of long term exposure to particulate air pollution to be equivalent to 29,000 deaths in the UK associated with a loss of total population life of 340,000 years and a loss of life expectancy from birth of approximately 6 months per person.

The estimated number of extra chronic bronchitis events associated with the predicted change in concentration of particulate matter in the study area is 0.473 per annum, which represents an increase of 0.0053% on the corresponding baseline rates for the entire exposed population. Additional cases of hospital admissions for cardiovascular and respiratory symptoms are predicted to rise by 0.071 and 0.075 per annum respectively. The estimated increase in the occurrence of lower respiratory symptoms in children is 0.110 per annum, which represents a 0.000099% increase on baseline rates. This can be considered as a very slight effect on the health of the exposed population as a whole.

Rates of hospital admissions for cardiovascular symptoms associated with the predicted change in concentration of NO_2 in the study area are estimated to increase by 0.697 per annum which represents an increase of 0.0146% on the corresponding baseline rates for the entire exposed population. This is considered insignificant when compared to the total incidence of heart disease in the entire population of England, attributable to factors such as, diet and lifestyle. The estimated increase in hospital admissions for respiratory symptoms is predicted to increase by 0.0042% on a baseline rate of 2,652 admissions per year. The predicted effect for the measure death brought forward is an increase of 0.0039% on a baseline rate of 2,614 deaths brought forward per annum.

The predicted effect for the measure death brought forward associated with the predicted change in concentrations of SO_2 in the study area is an increase of 0.0025% on a baseline rate of 2,614 deaths brought forward per annum. Rates of hospital admissions for respiratory symptoms are estimated to increase by 0.055 per annum, which represents a 0.000021% increase on baseline rates. The change in SO_2 concentrations due to the proposed facility can be considered as a relatively small effect on the health of the exposed population.

5 HEALTH EFFECTS ARISING FROM EMISSIONS OF METALS AND ORGANIC SUBSTANCES

An assessment of the potential effects on human health due to the operation of the proposed facility has been carried out with respect to the predicted change in population exposure to Chemicals of Potential Concern (COPCs), which include metals and organic substances (Annex 2). This report applies approaches to the quantification of health effects from predicted pollutant concentrations published by the United States Environmental Protection Agency (US EPA) Human Health Risk Assessment Protocol (HHRAP). Tolerable Daily Intake (TDI) values published by the UK Committee on Toxicity (COT) have also been used where appropriate for the quantification of health effects at selected receptors.

The method used to quantify potential health effects associated with the proposed facility is presented in detail within Annex 2. Relevant receptor locations are shown on Figure 2.1 within this annex.

The assessment of health effects from exposure to metals and organic substances associated with the operation of the proposed facility are reported in turn.

The contribution of emissions from the proposed facility to soil concentrations of each metal and the total dioxins/furans are low. The effects represent an additional contribution of less than 0.4% of the respective soil guideline concentration values for metals and less than 0.004% of the soil guideline concentration values for total dioxins/furans;

A relatively low additional dietary intake of metals and dioxins/furans, when compared to the typical dietary intake values, is predicted to be associated with the operation of the proposed facility. The predicted additional dietary intake of lead in the hypothetical resident SL_3 receptor scenario of 6.47×10^{-3} µg kg-BW^{-1} d^{-1} is markedly less than the equivalent typical UK dietary value of 9.0×10^{-2} – 1.0×10^{-1} µg kg-BW^{-1} d^{-1}. The additional dietary intake of total dioxins/furans is predicted to be <6% of typical UK dietary values, with the daily intake predicted to be <2% of the Committee on Toxicity Tolerable Daily Intake value;

A low additional exposure to total dioxins/furans of infants via their mother's breast milk is predicted. Additional daily intake values are predicted to be <0.5% of the US EPA criteria and <14% of the UK COT TDI value.

Non-carcinogenic effects

The maximum predicted non-carcinogenic effect within an urban area would occur at the hypothetical receptor called SL_3 and the maximum predicted effect in a rural area would occur at the hypothetical receptor called RNW1_2. The locations of these two receptors and other receptors predicted to experience smaller effects are illustrated on Figure 1 within Annex 2. These receptors represent locations with larger risks of non-carcinogenic health effects predicted to be associated with the operation of the proposed facility than at any of the other resident and farmer receptor scenarios.

A range of chemicals of potential concern have been assessed and of these nickel, inorganic mercury and thallium are predicted as having the largest contribution to non-carcinogenic health effects via the inhalation and ingestion pathway. The exposure pathways predicted to contain the largest risk to non-carcinogenic health effects are the ingestion of home grown above ground vegetables for both the hypothetical resident receptor and the hypothetical farmer receptor. The total hazard indices for these hypothetical receptor locations are predicted to be approximately a factor of 10 below the reference dose at which there is an appreciable risk of health effects occurring over a 70 year lifetime.

Carcinogenic effects

The maximum predicted carcinogenic effect within an urban area would occur at the hypothetical receptor called SL_3 and the maximum predicted effect in a rural area would occur at the hypothetical receptor called RNW1_2. The hypothetical resident SL_3 receptor and farmer RNW1_2 receptor represent locations with larger risks to carcinogenic health effects predicted to be associated with the proposed facility than at any other of the other resident and farmer receptor scenarios.

A range of chemicals of potential concern have been assessed and of these cadmium and total dioxins/furans are predicted as having the largest contribution to carcinogenic health effects via the ingestion pathway. For hypothetical resident receptor scenarios, the largest risk of carcinogenic health effects is predicted to occur for cadmium via the inhalation exposure pathway. For the hypothetical farmer receptor scenarios, the ingestion of milk and inhalation are predicted to be the exposure pathways with the largest risk of carcinogenic health effects. The total lifetime risk at these locations is a 1 in 960,154 and 1 in 923,958 risk of developing cancer over the entire lifetime of an individual receptor, which translates into an annual risk of 1 in 67,210,754 and 1 in 64,677,077 respectively. This is well within the considered acceptable annual risk of 1 in 1,000,000 for UK industrial operations[31].

6 CONCLUSIONS

The predicted change in annual mean concentrations of particulate matter, NO_2 and SO_2, experienced by the population located within 10km of the proposed facility has been used to estimate effects on the health of the population as a whole. The assessment considers a total population of 340,000 within this highly urbanised study area. The health impacts that have been predicted to occur represent small to very small changes relative to the baseline rates of occurrence of these metrics. The assessment concluded that predicted effects associated with emissions of particulate matter, NO_2 and SO_2 do not represent a significant effect when compared to the local baseline health of the population in each local authority area.

The HHRA assessment protocol has been widely applied to quantify the carcinogenic and non-carcinogenic risk to human health from exposure of the local community to emissions of elemental (Sb, As, Cd, Cr, Hg, Pb and Ni) and organic (PCDD/F congeners and B[a]P) compounds of potential concern. The assessment concluded that the maximally exposed hypothetical individuals within the SBC and surrounding areas, would not be subject to a significant additional carcinogenic risk or non-carcinogenic risk as a consequence of being exposed to metals and organic substances emitted to air from the proposed facility at the concentration limits specified in the Industrial Emissions Directive. In practice, it is expected that actual annual average emissions from the proposed facility will be lower than these limits.

In order to deliver improvements to the quality of life and overall life expectancy of the local population, the local health authorities have identified a number of priority areas to target. The areas identified as being able to deliver the greatest benefit to public health do not specifically relate to exposure to pollutants in ambient air but instead focus on wider social and economic determinants of health. The magnitude of the effects predicted from the operation of the proposed facility is so small that they are not considered to represent a significant risk to the health of the local population.

[31] CIWEM (2001) Risk Assessment for Environmental Professional, CIWEM Publication, December 2001

Annex 1: Assessment of Health Effects from exposure to Particulate Matter, Nitrogen Dioxide and Sulphur Dioxide

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April 2014

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Prepared for:
SSE Generation Ltd

Slough Multifuel CHP Facility

Human Health Risk Assessment

Annex 1: Assessment of Health Effects from Exposure to Particulate Matter, Nitrogen Dioxide and Sulphur Dioxide

REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Reviewed by**	**Approved by**
	October 2013	Final	Matthew Hill, Alexandra Ewan Gareth Hodgkiss Air Quality Specialists	Garry Gray Associate – Air Quality	Garry Gray Associate – Air Quality
1	April 2014	Update	Matthew Hill Assistant Air Quality Specialists	Garry Gray Associate – Air Quality	Garry Gray Associate – Air Quality

URS Infrastructure & Environment UK Limited
12 Regan Way
Chetwynd Business Park
Chilwell
Nottingham
NG9 6RZ

Tel +44 (0)115 907 7000
Fax +44 (0)115 907 7001

GLOSSARY

The following terms and definitions relate to the meaning of these terms as used within this report.

Acute effect	An effect that occurs within a short time after exposure.
Air pollutant	A substance present in the atmosphere at concentrations that are elevated, usually by human activities. Most air pollutants occur naturally in the atmosphere at low concentrations.
Ambient concentrations	Concentrations of airborne substances in outdoor air.
Chronic effect	An effect that occurs over a long time period or following a long period of exposure.
Chronic bronchitis	A daily cough with production of sputum for 3 months, two years in a row.
Cohort study	A study in which a particular health effect is compared using groups of people who are alike in most ways but differ by a defined characteristic, such as exposure to a source of pollution for example.
Concentration – response function	An equation that represents, for example, the relationship between the predicted concentration of a pollutant in the air and the exposed population response.
Deaths brought forward	This does not constitute new/additional deaths but represents a reduction in life expectancy for those whose health is already seriously compromised, where one death brought forward represents a cumulative two to six month loss of life expectancy for the population exposed.
Emissions	The substances or mass of a substance emitted into the atmosphere.
Epidemiology	The study of populations in order to determine the frequency and distribution of disease and to measure risks.
Exposed population	The population exposed to a meaningful change in air pollutant concentrations.
Exposure	Inhalation of air containing substances at predicted concentrations.
Fine particulate matter	Size fractions of particulate matter smaller than PM_{10}. In this report represented by $PM_{2.5}$.
Hazard	Something (e.g. an object, a property of a substance, a phenomenon or an activity) that can cause adverse

	effects.
Life table	A way of summarising mortality rates for the age classes within a population.
Lower respiratory system	The human respiratory system below the larynx.
Morbidity	The incidence or prevalence of disease/ill health in a population.
Mortality	The incidence of death or the number of deaths in a population.
Nitrogen dioxide	A molecule composed of one nitrogen atom and two oxygen atoms, present in outdoor air as a gas.
Oxides of nitrogen	A collective term for all gases composed of nitrogen and oxygen, including nitrogen dioxide.
Particulate Matter	A solid or liquid particle (a droplet) that in the context of this report is small enough to be suspended in air.
PM_{10}	Mass per cubic metre of particles passing through the inlet of a size selective sampler with a transmission efficiency of 50% at an aerodynamic diameter of 10 micrometres.
$PM_{2.5}$	Mass per cubic metre of particles passing through the inlet of a size selective sampler with a transmission efficiency of 50% at an aerodynamic diameter of 2.5 micrometres.
PM_1	Mass per cubic metre of particles passing through the inlet of a size selective sampler with a transmission efficiency of 50% at an aerodynamic diameter of 1 micrometre.
Population	All people living in a defined area.
Predicted concentrations	Mass of pollutant per volume of air. Normally expressed as mean values over a defined time period, as calculated using dispersion models.
Relative risk	The likelihood of the event in an exposed group relative to those who have not been exposed.
Risk	The likelihood that a hazard will actually cause its adverse effects, together with a measure of the effect.
Sensitivity analysis	A procedure by which numerical estimates are tested to aid the interpretation of predicted values.
Years of life lost	A statistical measure of mortality effects at the population level.

ABBREVIATIONS

ACS	American Cancer Society
CAFE	Clean Air For Europe programme
COMEAP	Committee on the Medical Effects of Air Pollution
EC	European Commission
EU	European Union
GP	General Practitioner
IOM	Institute of Occupational Medicine
LRS	Lower Respiratory Symptoms
ONS	Office of National Statistics
WHO	World Health Organisation

CONTENTS

INTRODUCTION

The proposed Slough Multifuel CHP Facility (the '*Proposed Development*') is located within the existing Slough Heat and Power (SHP) site within the Slough Trading Estate, 342 Edinburgh Avenue, Slough, SL1 4TU. Within this report the '*proposed facility'* refers specifically to the Slough Multifuel CHP Facility itself. Emissions modelled in this assessment are from the proposed facility, and exclude emissions from the wider Proposed Development, such as traffic. The proposed facility will emit a mixture of substances, including particulate matter, oxides of nitrogen and sulphur dioxide into the atmosphere throughout the operational lifetime of the facility. The impact of the emissions from the proposed facility on the atmospheric concentrations of particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2) and sulphur dioxide (SO_2), which the local population would be exposed to, has been taken from the air quality dispersion modelling report. Further details are presented in *Chapter 8: Air Quality* of the Environmental Statement.

This report quantifies the human health effects associated with the exposure of the local community to the predicted change in the atmospheric concentrations of particulate matter, nitrogen dioxide and sulphur dioxide within a 10 kilometre (km) study area of the proposed facility.

The Clean Air for Europe (CAFE) programme[1] revisited the management of air quality within the EU and resulted in The Ambient Air Quality and Cleaner Air for Europe Directive[2]. This directive defines Limit Values for ambient concentrations of specified air pollutants, including sulphur dioxide, nitrogen dioxide and particulate matter (as PM_{10} and as $PM_{2.5}$). These limit values represent a minimum standard of ambient air quality that all member states of the EU are obliged to achieve, everywhere except for a small number of prescribed locations. At the present time, the limit values have been transposed into national legislation through the Air Quality Standards Regulations 2010[3].

The National Air Quality Strategy[4] brought forward Air Quality Objectives to assist National and Local Government in achieving the Limit Values to prescribed timetables. The setting of national air quality Objective Values and EU Limit Values, for the protection of human health, was based on a substantial body of scientific evidence. The need for the EC and for National Governments to consider the costs and benefits of proposed Limit Values resulted in the development of robust methodologies for the quantification of health effects associated with exposure to air pollution outside of the workplace.

This report applies approaches to the quantification of health effects from predicted pollutant concentrations published by the Department of Health's Committee on the Medical Effect of Air Pollutants (COMEAP) and the Clean Air for Europe (CAFE) programme. These methods are as set out in COMEAP's reports on the quantification of the effects of air pollution on health[5], the effect of long term exposure to air pollution[6], the mortality effects of long term exposure to particulate air pollution[7] and a cost benefit analysis methodology for CAFE[8]. COMEAP and CAFE both reviewed the scientific literature and took full account of this knowledge in the development of their methods for quantifying the health effects of air pollution. No further

[1] CAFE Programme, Accessed via URL http://ec.europa.eu/atoz_en.htm, date accessed 09/07/2013.
[2] European Commission (2008) Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe, Journal of the European Union
[3] H.M. Government (2010) The Air Quality Standards Regulations SI 1001, the Stationary Office
[4] Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland
[5] Committee on the Medical Effects of Air Pollutants (COMEAP) (1998) Quantification of the Effects of Air Pollution on Health in the United Kingdom, Department of Health, The Stationery Office, London.
[6] COMEAP (2009) Long term Exposure to Air Pollution: Effect on Mortality, June 2009.
[7] COMEAP (2010) The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom, 2010
[8] AEA Technology (2005) Methodology for the Cost Benefit Analysis for CAFE Volume 2: Health Impact Assessment, Accessed via URL [redacted]

consideration of the scientific literature, on the epidemiology of exposure to air pollution that underpins these methods, has been undertaken in support of this report.

The relationship between exposure to air pollutants, either singly or in combination, and the resulting effects on health remains a topic of active research. Exposure to increased concentrations of pollutants such as particulate matter and sulphur dioxide are associated with effects on the respiratory and cardiovascular system, leading to increased morbidity and such exposure may contribute to individual deaths through mechanisms that are not yet fully understood. The methods used are based on current understanding of the effect of exposure on health as reported in the cited publications.

It is likely that exposure to airborne pollutants can cause acute effects on human health in the short term and chronic effects over the longer term. The vulnerability of individuals to short term effects of air pollution can vary depending on their general health at the time of exposure, their lifestyle and on the presence of specific medical conditions. Exposure to air pollutants over the longer term may have a marginal effect that contributes to the progression of chronic diseases that have other causes.

The methodologies employed to quantify the health effect associated with the exposure of populations to predicted concentrations of air pollutants consider the effect on the affected population and not the effect on each individual living within that population. The health effects are reported as population statistics that should be considered appropriately[9] and in the context of the methods used to calculate them.

In this report the terminology used is of necessity technical and the meaning of the terms may differ from their use in conversational English. A glossary of the terms used is provided within this report.

[9] COMEAP specifically highlight the need for appropriate consideration of predicted effects on health in COMEAP (2000) Statement on the Applicability of time-series coefficients to areas affected by emissions of air pollutants from industrial sources, September 2000.

1 METHODOLOGY

1.1 Overview of the Approach

The approach to quantifying acute health effects is based on the use of a concentration-response function. The functions used by COMEAP and CAFE and the exposure-response coefficients used within them, are derived from reviews of the empirical evidence generated by epidemiological studies. This body of evidence is such that the World Health Organisation (WHO) and National bodies, with responsibility for public health, are convinced that the associations between exposure to polluted air and specific health outcomes (events) should be considered as causal.

The concentration-response function (Equation 2.1) combines the use of an exposure-response coefficient with details of the specific population affected and the predicted change in ambient pollutant concentrations that the population would be exposed to.

Equation 2.1 $$\Delta E = \beta \times \Delta C \times P \times E$$

Where:

ΔE = (change in) background rate of events (E);

β = exposure-response coefficient;

ΔC = change in concentration of pollutant;

P = population exposed.

The effect of exposure on health is described as a change in the rate of occurrence of specified events. For example an event might be a hospital emission. For each pollutant considered in this study, the specific events used to represent health effects are considered in turn in the following sections of this report.

The total population considered is the same for assessment of acute effects associated with exposure to particulate matter, nitrogen dioxide and sulphur dioxide. The same total population is also used in the assessment of mortality effects associated with chronic exposure to fine particulate matter.

The CAFE methodology adopts the relationship between mortality and long-term exposure to fine particulate matter ($PM_{2.5}$) based on a cohort study by the American Cancer Society[10] and expresses the results of the calculations in terms of life years lost by the population, rather than the numbers of deaths within the population. This approach has been adopted in this assessment as it is consistent with the current consensus view of the subject. It requires an alternative spreadsheet-based method to be employed based on life tables, instead of using Equation 2.1. This approach was employed by COMEAP in its most recent report on the quantification of the long term effects on mortality[11].

[10] Pope CA, Burnett RT, Thun MJ, Calle EE, Kreswki D, Ito K, Thurston GD (2002) Lung cancer, cardiopulmonary mortality and long-term exposure to fine particulate pollution. Journal of the American Medical Association **287** 1132-1141
[11] COMEAP (2001) Statement and Report on the Long Term Effects of Particles on Mortality, Accessed via URL:
[redacted]

Approach to Quantifying the Health Effects of Particulate Matter

Assessment of Mortality Effects

The IOM[12,13] has developed a series of spread sheets to predict the change in mortality based on the life table approach. This approach has the advantage of addressing the complicating issue of considering the link between death rates and surviving populations[14] when calculating impacts on chronic mortality.

In 2009, COMEAP[6] recommended coefficients which, when used in conjunction with methods developed for the Department of Health and the European Commission by the Institute of Occupational Medicine, allow the calculation of the potential impact on mortality and life expectancy of specified changes in concentrations of air pollutants presented in the 2010 COMEAP7. This quantification used the coefficients in the 2009 report to calculate that decreasing $PM_{2.5}$ by 1 µg/m^3 would save 4 million life years and increase life expectancy at birth by 20 days. The coefficients recommended by COMEAP in 2009 remain unchanged from those identified in the previous 2001 report11, however COMEAP reports that the evidence base relating to the effects of long-term exposure to air pollutants had strengthened since the publication of the 2001 report.

The dispersion model predictions of particulate matter concentrations can be treated as being either PM_{10} or $PM_{2.5}$. In practice, potentially most of the particulate matter emitted from the proposed plant will be in the size fraction 2.5 µm and less, because the fabric filter used will remove almost all of the particles with a larger diameter. For the purposes of this assessment of mortality associated with long term exposure to particulate matter, the predicted particulate matter concentrations are considered to relate to particles within the size fraction $PM_{2.5}$.

The population located within 10km of the proposed facility has been determined from census data using GIS methods. A study area boundary of 10km from the pollution source could be argued as being excessive for a study of this type, but as the data is already available from other elements of air quality impact assessment it is used here for consistency. Baseline life expectancies for the whole population are calculated based on data for male and female life expectancies. For a given change in the ambient concentration of $PM_{2.5}$ that the population are exposed to there is an associated change in the risk that the exposure will result in a decrease in life expectancy, or loss of life. The risk is expressed as an estimate of life years lost for the total population exposed from cardiovascular and respiratory health effects.

Assessment of Acute Health Effects

Acute health effects associated with exposure to airborne particulate matter are quantified using the concentration-response function presented as Equation 2.1. The health effects associated with exposure to particulate matter considered in this assessment as specific events are:

- Chronic bronchitis (adults);
- Respiratory hospital admissions;
- Cardiac hospital admissions;
- Lower respiratory system symptom days (children); and

[12] Miller B. and Hurley J., 2006, Comparing estimated risks for air pollutants with risks for other health effects, Research Report TM/06/01, Institute of Occupational Medicine.
[13] Miller B., 2011, IOMLIFET version 2013, Spreadsheets for life-table calculations, Institute of Occupational Medicine.
[14] Miller B, and Hurley J: Life table methods for quantitative impact assessments in chronic mortality *Journal of Epidemiology and Community Health.2003; 57: 200-206*

- Lower respiratory system symptom days (adults).

The respective concentration-response coefficients applied for each of the event classes are summarised in Tables 1 and 2.

Approach to Quantifying the Health Effects of Nitrogen Dioxide

The health effects associated with exposure to nitrogen dioxide that are considered in this assessment as specific events are:

- Respiratory hospital admissions;
- Cardiac hospital admissions; and
- Mortality.

The impact of exposure to nitrogen dioxide for respiratory hospital admissions are considered through the use of the relationship cited by COMEAP[15], of a 0.038% increase in the rate of the health event for every 1 µg/m^3 rise in NO_2 concentrations.

Acute mortality and respiratory hospital admissions from NO_2 are considered as an alternative to that used for particulate matter and not in addition. This is because NO_2 may be acting as a marker for the effect of locally emitted particulate matter[16] and there is therefore a risk of double counting the impact of local emissions on health. Likewise mortality and respiratory hospital admissions associated with SO_2 should not be added, as there may be some synergistic effects, i.e. the observed associations are not independent of each other.

The respective concentration-response coefficients applied for each of the event classes are summarised in Tables 1 and 2.

In this assessment it has been assumed that 70% of the predicted oxides of nitrogen concentrations contributed to total annual mean concentrations, are in the chemical form of nitrogen dioxide. In practice this is likely to be a very robust approach especially at receptors predicted to experience the greatest change in annual mean concentrations of oxides of nitrogen. The use of a 70% conversion rate for long term average concentrations is in line with Environment Agency recommendations[17].

Approach to Quantifying the Health Effects of Sulphur Dioxide

Health effects associated with exposure to sulphur dioxide that are considered in this assessment as specific events are:

- Respiratory hospital admissions; and
- Mortality.

The respective concentration-response coefficients applied for each of the event classes are summarised in Tables 1 and 2.

[15] Cardiovascular Disease and Air Pollution (2006) Department of Health A Report by the Committee on Medical Effects of Air Pollutants' cardiovascular sub-group
[16] COMEAP, 2009, Statement on the Quantification of The Effects of Long-Term Exposure to Nitrogen Dioxide on Respiratory Morbidity in Children
[17] Environment Agency, Conversion Ratios for NO_X and NO_2, Air Quality Modelling and Assessment Unit (AQMAU). Obtained from the Environment Agency website available at [redacted]

The impact of exposure to sulphur dioxide for respiratory hospital admissions are considered through the use of the relationship cited by COMEAP5, of a 0.05% increase in the rate of the health event for every 1 µg/m^3 rise in sulphur dioxide concentrations. The corresponding value of 0.06 % has been used for the change in the rate of mortality per 1 µg/m^3.

Summary of Concentration-Response Coefficients

Concentration-response coefficients for health events used in this study and applied to the increased exposure to air pollution are shown in Tables 1 and 2.

Table 1: Increases in Health Effect from Exposure to an Additional 1 µg/m^3 of $PM_{2.5}$

Health Event	Increase (based on relative risk)[(a)]	95 % Confidence Limits
Change in Mortality hazards	0.6 %	0.2 – 1.1 %

Table 2: Increases in Health Effects from Exposure to an additional 1 µg/m^3 of Pollutant

Health Event	Increase (based on relative risk)[(a)]	Pollutant
Particulate Matter - CAFE		
Chronic bronchitis (attack rates)	0.7%	PM_{10}
Cardiovascular hospital admissions	0.06%	PM_{10}
Respiratory hospital admissions	0.114%	PM_{10}
Consultation with GPs (asthma, April – Sept, 15 – 64 years age)	0.25%	PM_{10}
Lower respiratory symptoms (wheeze, shortness of breath, phlegm production) (in children)	0.0004%	PM_{10}
Lower respiratory symptoms (in adults)	0.0017%	PM_{10}
Nitrogen Dioxide – COMEAP		
Cardiovascular hospital admissions[15]	0.13%	NO_2
Respiratory hospital admissions[5]	0.038%	NO_2
Deaths brought forward[5]	0.035%	NO_2
*Sulphur Dioxide - COMEAP*5		
Deaths brought forward	0.06%	SO_2
Respiratory hospital admissions	0.05%	SO_2

(a) Relative risk is defined as the ratio of the incidence of disease in the exposed group divided by the corresponding incidence of disease in the non-exposed group.

1.2 Summary of Input Information

The calculation of health effects is based on the following project specific information:

Predicted changes in annual mean pollutant concentrations for sulphur dioxide, nitrogen dioxide and particulate matter, expressed as µg/m^3. The values are made available to this assessment as a variable Cartesian grid of receptor points, covering a model domain of 20km by 20km. The grid is centred on the location of the source of emissions under consideration;

- Population data, at the 'super output area level', based on the 2011 census[18];
- Background data on the rates of all relevant health outcomes (national and local). This input is considered in Section 3 of this report.

The exposed population has been defined as the area within 10km of the source of emissions. This circular boundary for the exposed population sits within the boundary of the dispersion model domain. The exposed population boundary encompasses an area that is large enough to capture the incremental reduction in meaningful effects. In setting this boundary there is a need to balance the requirement to provide adequate spatial coverage to capture the events under consideration, whilst avoiding the generation of values that are no more than an artefact of the method, caused by the inclusion of an unnecessarily large population.

The modelled pollutant emission rates (in grams per second (g/s)) are based on the ELVs set out within Annex VI of the Industrial Emissions Directive, and have been calculated by multiplying the IED daily average ELV by the design volumetric flow rate. These have been used in the air dispersion model to predict ground level concentrations of pollutants. These predictions are conservative as the plant is expected to deliver average emissions concentrations that are lower than the ELVs during normal operation.

The pollutant concentrations are plotted as isopleths (lines of equal value) that form a pattern of decreasing magnitude and this is overlaid onto the population data using GIS software. The total population is then subdivided into 'bands' on the basis of the magnitude of the change in concentrations of pollution that they are predicted to experience. The process is repeated for each pollutant. The pollutant concentration used to represent each band is taken as the highest isopleth bounding the band, or in the case of the worse case bands the highest value at any receptor is used.

The population of each band is then calculated, from the population density of the wards that make up the area within the band. This technique assumes that there is an equal distribution of people within each super output area and the number of people in each area is determined on a pro rata basis

This input information is illustrated in Figures A-1 to A-3 at the end of this report.

1.3 Summary of Output Information

This assessment reports numerical information for each of the health events at the total population level per annum. The numerical estimates for morbidity events for the total population are the sum of the values for each band as summarised in Tables B1-B3 at the end of this report.

[18] Obtained from the Office for National Statistics available at http://www.ons.gov.uk/ons/guide-method/method-quality/specific/index.html, Date accessed 09/07/2013

Results are expressed as numerical estimates for the morbidity outcomes described above over a 30 year period and this same information is also expressed as an estimate of the number of years operation that would give rise to a single new event.

Numerical estimates of life years lost are reported for the whole population for the effect on mortality.

1.4 Approach to Consideration of Additive Effects

The results for each pollutant are presented independently. In practice it is highly likely that the health effects estimated for each pollutant are not independent of each other. The approach taken to the calculation of the numerical estimates for the effect of exposure to each pollutant have taken a robust approach that already incorporates conservative values at several points in the calculation process. It is considered that adding together the individual health effect estimates for separate pollutants would result in an unreasonable over estimate of any health effects and therefore this has not been undertaken.

2 BASELINE CONDITIONS

2.1 The context

The predicted health effects are considered in the context of observed rates of disease and observed life expectancies in the UK. The method used could make use of either national statistics or local level statistics if such data exists. In this assessment national level statistics have been used, as there are benefits to determining baseline population disease rates on statistics that represent larger numbers of people. There may be differences in the values for the statistical parameters used between the local and national level datasets, but the associated difference in the calculated health effects under consideration, would be so small as to be insignificant.

The national statistics for disease rates and life expectancy used for this assessment, are presented in Table 3.

Use has been made of episode statistics sourced from surveys published by the Office of Population Censuses and Surveys (predecessor to the Office for National Statistics)[19]. Life expectancy at birth figures for England has been sourced from the Office of National Statistics (ONS)[20].

Table 3: Background Rates of Disease

Disease	Baseline Rate per 1,000 Population
Chronic Bronchitis	8
Cardiovascular hospital Admissions	14
Respiratory hospital admissions	7.8
GP Consultation Asthma	64.13
LRS Children	325
LRS Adults	204.44
Mortality – Deaths (non traumatic) brought forward	7.69
Life Expectancy for 2008 to 2010 (Men)	78.6 years
Life Expectancy for 2008 to 2010 (Women)	82.6 years

[19] Office of Population Censuses and Surveys (1995) Morbidity Statistics from General Practice, Fourth National Study 1991-1992.
[20] Office for National Statistics (2011) Life Expectancy at Birth and Age 65, England and Wales, 1991-1993 to 2008-2010 Spread sheet leew201_tcm77-23887[1].xls Accessed at URL: www.ons.gov.uk/ons/ Date accessed 12/07/2013

3 RESULTS

3.1 Particulate Matter

Life Years Lost Through Exposure to $PM_{2.5}$

Using the methodology described in Section 2, the assessment has calculated an average 0.000014 years of life per person lost due to the effects of exposure to a maximum concentration of 0.09 µg/m^3 of $PM_{2.5}$, for the male population. This represents a reduction of approximately 7.5 minutes per person averaged over the entire exposed male population. For the female population, the average number of minutes of life lost is 3.8. However these results would not be consistent over the entire exposed population, with the population group with the largest exposure being most susceptible to experiencing the above reduction in life years.

The latest Air Quality Strategy[4] produced by Defra estimates that the average loss of life expectancy at 2005 levels of exposure to all anthropogenic $PM_{2.5}$ is 8 months for each person in the UK. The most recent report published by COMEAP in 2010 calculates the mortality effects of long term exposure to particulate air pollution to be equivalent to 29,000 deaths in the UK associated with a loss of total population life of 340,000 years and a loss of life expectancy from birth of approximately 6 months per person. The predicted additional life years lost due to the emissions from the proposed facility of 7.5 minutes per person in the male population, and 3.8 minutes for the female population due to cardiovascular and respiratory health effects, can therefore be considered as low when taken in context with the background figure for $PM_{2.5}$.

A sensitivity analysis for the number of potential life years lost was performed based on the upper and lower 95% confidence levels for the concentrations-response coefficient for mortality due to $PM_{2.5}$ exposure (Table 1). This gave a range from 2.5 to 13.4 minutes of life lost across the male population, and 1.3 to 6.8 minutes of life lost for the female population. (These figures are based on average life expectancy for England and Wales (Table 3) and the 95% confidence values for the concentration response coefficient of 0.2% and 1.11% factored to the maximum $PM_{2.5}$ predicted concentration).

Morbidity Effects Associated with Exposure to Particulate Matter

Figure A-2 shows the exposed population affected by the change in concentration of particulate matter predicted to be due to the proposed facility. Table 4 shows the predicted change in the number of health events due to the change in concentration attributed to the proposed facility with the full set of results shown in Tables B1-B3.

The change in concentration of PM_{10} due to the proposed facility is predicted to produce a slight increase in the number of cases of all the acute health events per annum.

The baseline rate for each of the health events has been calculated for the entire exposed population (approximately 340,000 people) in this study. The extra number of health events generated due to the change in concentration of particulate matter from the proposed facility can be considered as less than 0.02% when compared to the baseline rate for the entire exposed population.

The largest impact on the number of health events is predicted to occur in GP consultation rates for asthma. Approximately 50 new cases (in the form of consultation events) would be expected in the estimated 30 year operating period of the proposed facility with first extra case anticipated to occur after approximately 7 months. This represents an estimated increase in the rates of GP consultation for asthma of 0.0077% on baseline rates. The lowest change is predicted to occur in lower respiratory symptoms for adults where the proposed facility would need to be operated for over 34 years for a single extra case to be observed.

This can be considered as a relatively small effect on the health of the exposed population as a whole.

Table 4: Predicted change in the number of health events due to the additional PM_{10} emitted from the Proposed Facility

Disease	Baseline Rate for total exposed population per annum	Extra cases per annum	Extra cases in 30 year period	Years of operation needed for one extra case	Extra cases per annum as % of baseline
Chronic Bronchitis	2,720	0.473	14.194	2.114	0.017396
Cardiovascular Hospital admissions	4,760	0.071	2.129	14.090	0.001491
Respiratory hospital admissions	2,652	0.075	2.254	13.311	0.002833
GP Consultation Asthma	21,803	1.680	50.390	0.595	0.007704
LRS Children	110,495	0.110	3.295	9.104	0.000099
LRS adults	69,506	0.029	0.881	34.055	0.000042

Nitrogen Dioxide

Figure A-1 shows the exposed population predicted to be affected by the predicted change in concentration of nitrogen dioxide due to emissions from the proposed facility. Table 5 shows the predicted change in the number of health events due to the change in concentration of nitrogen dioxide attributed to the proposed facility with the full set of results shown in Tables B1-B3.

Table 5: Predicted change in the number of health events due to the additional nitrogen dioxide emitted from the Proposed Facility

Disease	Baseline Rate for total exposed population per annum	Extra cases per annum	Extra cases in 30 year period	Years of operation needed for one extra case	Extra cases per annum as % of baseline
Cardiovascular Hospital admissions	4,760	0.697	20.916	1.434	0.014648
Respiratory hospital admissions	2,652	0.114	3.406	8.807	0.004282
Deaths (non-traumatic brought forward)	2,614	0.103	3.093	9.699	0.003944

The number of cardiovascular hospital admissions for the population as a whole is predicted to increase from a baseline rate of 4,760 admissions per year by 0.0146%. An alternative way of expressing this population statistic is as an additional admission within a time period of 1.4 years. This means that this very small impact is likely to occur.

Additional hospital admissions for respiratory symptoms are predicted to increase by 0.004% on a baseline rate of 2,652 admissions per year. The population statistic of deaths brought forward is an abstract concept where one death brought forward represents a cumulative two to six month loss of life expectancy for the population exposed. The predicted impact for the measure death brought forward is an increase of 0.0039% on a baseline rate of 2,614 deaths brought forward per annum.

These figures can be compared to the total number of Ischemic Heart Disease (Coronary Heart Disease) primary diagnoses obtained from Hospital Episode Statistics. In the year 2010-2011, 405,096 diagnoses, attributed to diet/lifestyle etc, were made in England[21]. The extra cases of cardiovascular hospital admissions estimated from the operation of the proposed facility are 0.697 per annum, which represents 0.00017% of the total cases in England. In comparison with the baseline rate for the entire exposed population, the proposed facility will cause a 0.0146% change in the number of cardiovascular hospital admissions.

When taken in context with the baseline rate for the health events of the entire exposed population and that of England, the impact on the number of health events associated with the change in nitrogen dioxide concentrations in the study area can be considered small.

Sulphur Dioxide

Figure A-3 shows the exposed population predicted to be affected by the change in concentration of sulphur dioxide due to emissions from the proposed facility. Table 6 shows the predicted change in the number of health events due to the change in concentration of sulphur dioxide attributed to the proposed facility with the full set of results shown in Tables B1-B3.

Table 6: Predicted change in the number of health events due to the Additional sulphur dioxide emitted from the facility

Disease	Baseline Rate for total exposed population per annum	Extra cases per annum	Extra cases in 30 year period	Years of operation needed for one extra case	Extra cases per annum as % of baseline
Deaths (non-traumatic brought forward)	2,614	0.065	1.962	15.294	0.002501
Respiratory hospital admissions	2,652	0.055	1.658	18.094	0.000021

The number of respiratory hospital admissions for the population as a whole is predicted to increase from a baseline rate of 2,652 admissions per year by 0.000021%. An alternative way of expressing this population statistic is as an additional admission within a time period of 18.1 years. The predicted impact for the measure death brought forward is an increase of 0.0025% on a baseline rate of 2,614 deaths brought forward per annum.

Throughout the estimated operating time period of the proposed facility less than four additional cases of the above health events are therefore predicted to occur.

[21] The Health and Social Care Information Centre (2011) Hospital Episode Statistics: Headline Figures, 2010-2011. Available at [redacted]

The change in the number of additional health events, associated with the predicted change in sulphur dioxide concentrations in the study area, can be considered as an insignificant effect on the health of the exposed population.

4 CONCLUSION

An assessment of the potential effects on human health due to the operation of the proposed facility has been carried out with respect to the predicted change in population exposure to particulate matter, sulphur dioxide and nitrogen dioxide. This report applies approaches to the quantification of health effects from predicted pollutant concentrations published by the Department of Health's Committee on the Medical Effect of Air Pollutants (COMEAP) and the Clean Air for Europe (CAFE) programme.

The total population of an area extending 10km from the location of the proposed facility was considered in the assessment of acute effects associated with exposure to particulate matter, nitrogen dioxide and sulphur dioxide. The same total population was also used in the assessment of mortality effects associated with chronic exposure to fine particulate matter.

The assessment concluded that, for each pollutant under consideration, the effect of the proposed facility emissions of particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide and sulphur dioxide on human health would be relatively small.

The main outcomes of the study are as follows:

- An average of 7.5 minutes of life is predicted to be lost by the male population of the study area, and 3.8 minutes of life would be lost by the female population through exposure to the maximum concentration of $PM_{2.5}$, for cardiovascular and respiratory health effects. By comparison, the most recent report published by COMEAP in 2010, calculated that the mortality effects of long term exposure to particulate air pollution to be equivalent to 29,000 deaths in the UK associated with a loss of total population life of 340,000 years and a loss of life expectancy from birth of approximately 6 months per person.

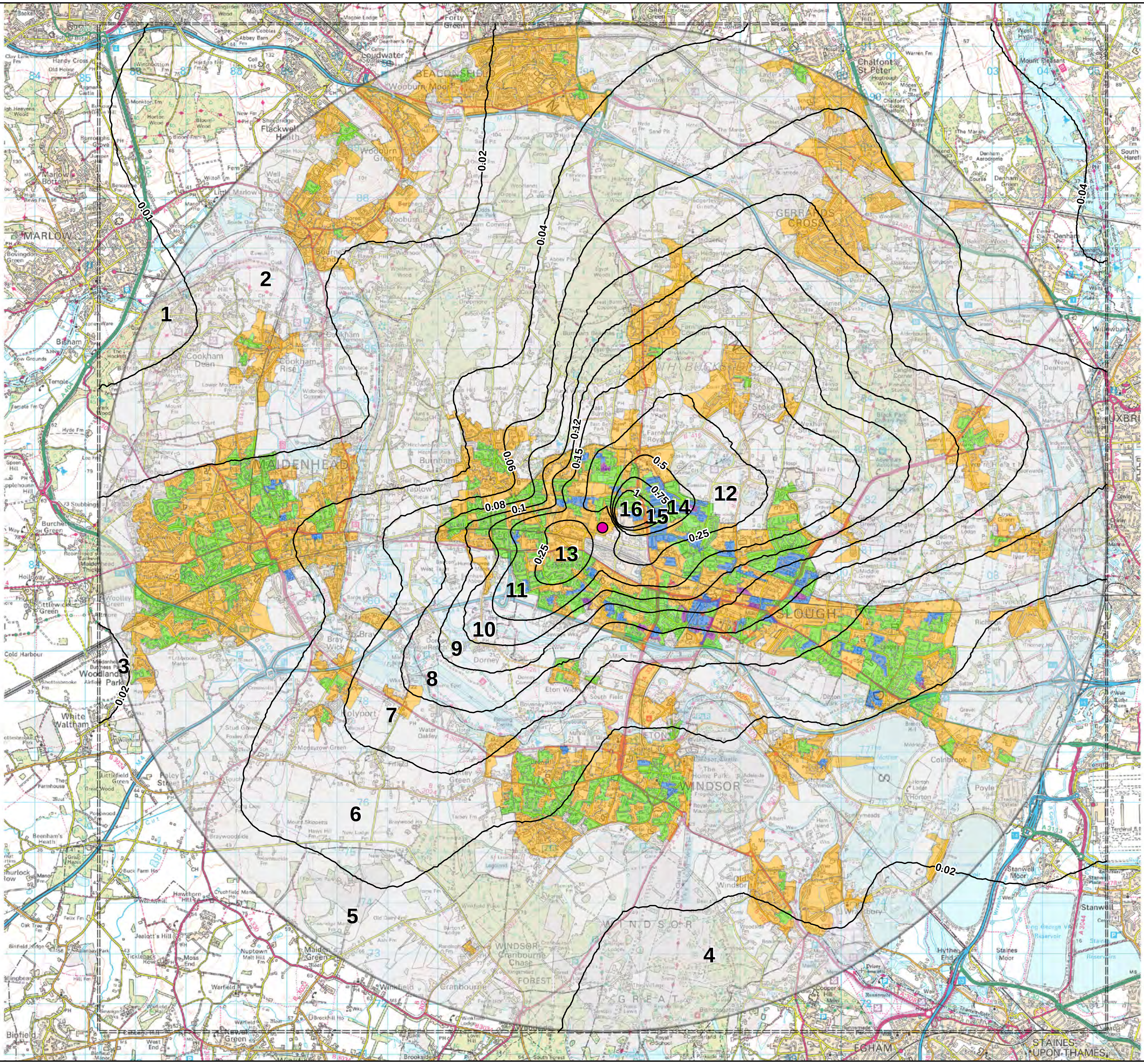
- The estimated number of extra chronic bronchitis events, associated with the predicted change in concentration of particulate matter in the study area, is 0.473 per annum, which represents an increase of 0.017% on the corresponding baseline rates for the entire exposed population. Additional cases of hospital admissions for cardiovascular and respiratory symptoms are predicted to rise by 0.071 and 0.075 per annum respectively. The estimated increase in the occurrence of lower respiratory symptoms in children is 0.110 per annum, which represents a 0.0001% increase on baseline rates. This can be considered as a relatively very slight effect on the health of the exposed population as a whole.

- Rates of hospital admissions for cardiovascular symptoms, associated with the predicted change in concentration of nitrogen dioxide in the study area, are estimated to increase by 0.697 per annum which represents an increase of 0.0146% on the corresponding baseline rates for the entire exposed population. This is considered insignificant when compared to the total incidence of heart disease in the entire population of England, attributable to factors such as, diet and lifestyle. The estimated increase in hospital admissions for respiratory symptoms are predicted to increase by 0.0043% on a baseline rate of 2,652 admissions per year. The predicted impact for the measure death brought forward is an increase of 0.0039% on a baseline rate of 2,614 deaths brought forward per annum.

- The predicted impact for the measure death brought forward, associated with the predicted change in concentrations of sulphur dioxide in the study area, is an increase of 0.0025% on a baseline rate of 2,614 deaths brought forward per annum. Rates of hospital admissions for respiratory symptoms are estimated to increase by 0.055 per annum, which represents a 0.000021% increase on baseline rates. The change in sulphur dioxide concentrations due to the proposed facility can be considered as a relatively small effect on the health of the exposed population.

5 FIGURES

Figure A-1: Predicted Nitrogen dioxide Impacts and Population Density



NOTES

Stack

Population Density (People per Hectare)

< 10

10 - 50

50 - 100

100 - 150

150 - 200

> 200

Model Domain

Zone	Med. Conc $\mu g/m^3$	Total Pop People
1	0.005	614
2	0.015	25,285
3	0.015	53
4	0.015	2,492
5	0.030	99,958
6	0.050	60,572
7	0.070	31,812
8	0.090	28,468
9	0.110	16,655
10	0.135	16,778
11	0.200	28,252
12	0.375	12,313
13	0.500	4,622
14	0.625	6,115
15	0.875	3,466
16	1.400	2,529

Revision Details	By Check	Check Date	Suffix

Purpose of Issue

Final

Client

Applicant Name: SSE

Project Title

Slough Multi-fuel

Drawing Title

Predicted Nitrogen Dioxide Impacts and Population Density

Drawn	Checked	Approved	Date
GH	GG	GG	14/04/14

URS Internal Project No.	Scale @ A3
47066339	1:75,000

URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

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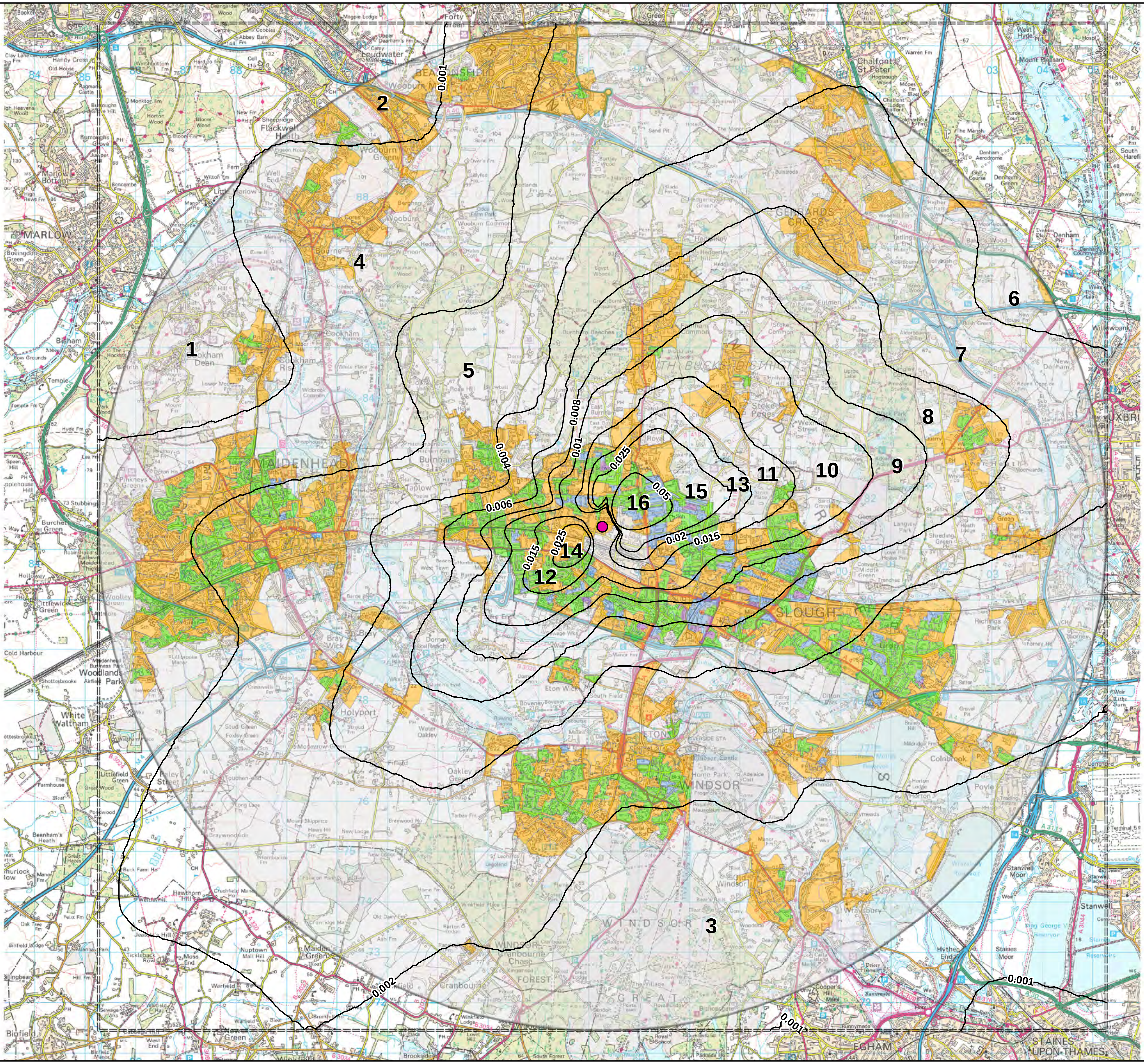
Drawing Number	Rev
Figure 2.1	1

Figure A-2: Predicted Particulate Matter Impacts and Population Density



N

NOTES

Stack

Population Density (People per Hectare)

- < 10
- 10 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200

Model Domain

Zone	Med. Conc $\mu g/m^3$	Total Pop People
1	0.0005	4,756
2	0.0005	5,345
3	0.0010	13,547
4	0.0015	47,499
5	0.0030	108,454
6	0.0030	1,104
7	0.0050	47,806
8	0.0070	32,001
9	0.0090	17,549
10	0.0125	25,723
11	0.0175	6,901
12	0.0200	5,625
13	0.0225	4,642
14	0.0375	1,693
15	0.0375	10,337
16	0.0900	6,999

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue

Final

Client

Applicant Name: SSE

Project Title

Slough Multi-fuel

Drawing Title

Predicted Particulate Matter Impacts and Population Density

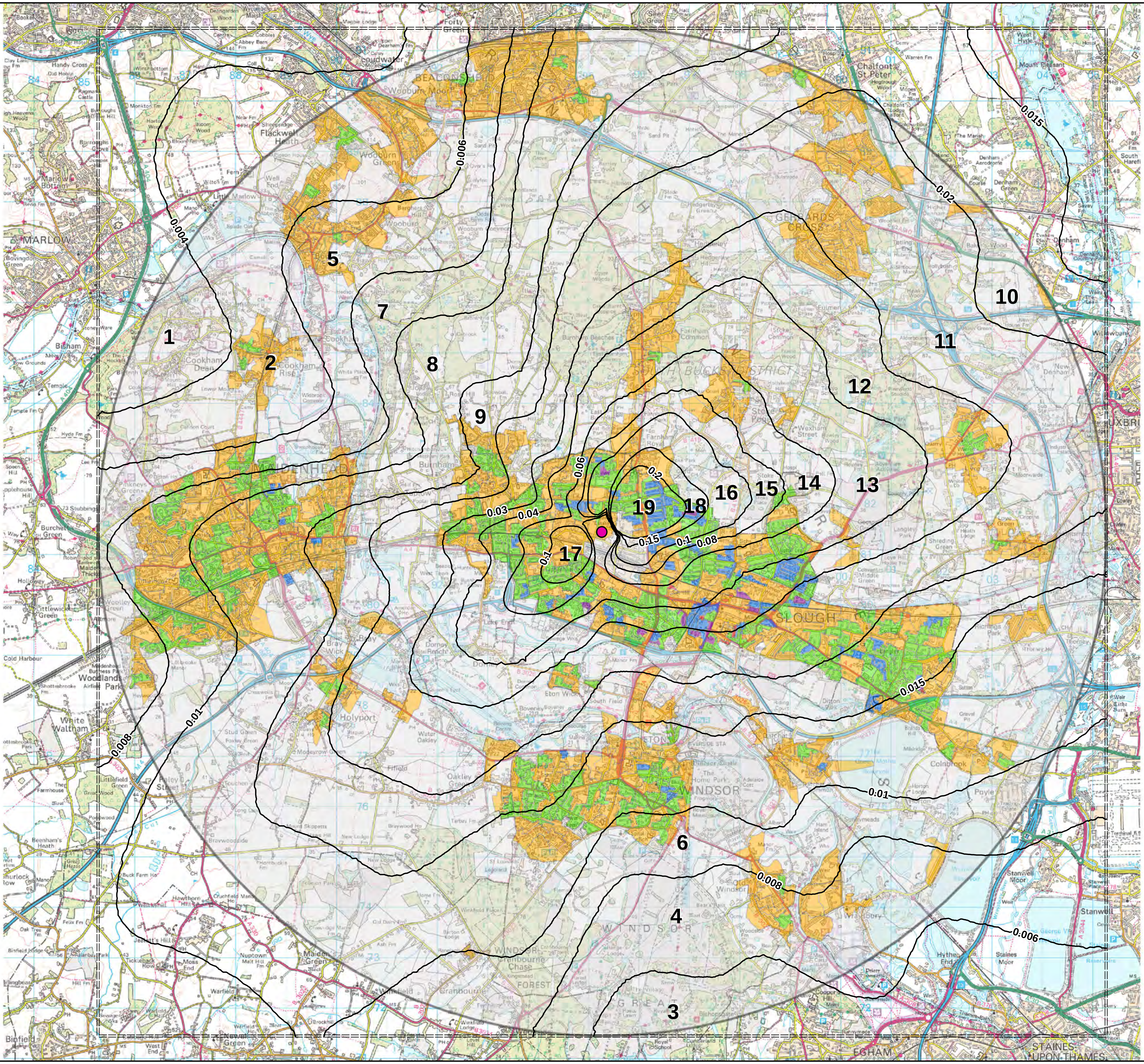
Drawn	Checked	Approved	Date
GH	GG	GG	14/04/14

URS Internal Project No.	Scale @ A3
47066339	1:75,000

URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

Drawing Number	Rev
Figure 2.2	1

Figure A-3: Predicted Sulphur Dioxide Impacts and Population Density



NOTES

- Stack

Population Density (People per Hectare)

- < 10
- 10 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Model Domain

Zone	Med. Conc µg/m^3	Total Pop People
1	0.0020	1,338
2	0.0050	15,851
3	0.0050	278
4	0.0070	6,280
5	0.0070	16,649
6	0.0090	6,813
7	0.0090	23,418
8	0.0125	66,130
9	0.0175	42,523
10	0.0175	1,062
11	0.0250	47,762
12	0.0350	32,132
13	0.0500	30,684
14	0.0700	18,627
15	0.0900	4,921
16	0.1250	7,815
17	0.1750	3,473
18	0.1750	3,589
19	0.4000	10,634

Revision Details	By / Check	Check Date	Suffix

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Applicant Name: SSE

Project Title

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Drawing Title

Predicted Sulphur Dioxide Impacts and Population Density

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URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
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Drawing Number	Rev
Figure 2.3	1

Number of Health Events at each Population Band for each Pollutant

TABLE B1 PREDICTED NUMBER OF ADDITIONAL CASES OF SELECTED DISEASES PER ANNUM IN THE EXPOSED POPULATION BASED ON ADDITIONAL NO_2

	Extra cases per annum in each exposed population zone																Total extra cases per annum
Disease	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
Cardiovascular Hospital Admissions	5.59 x10^{-5}	6.90 x10^{-3}	1.45 x10^{-5}	6.80 x10^{-4}	5.46 x10^{-2}	5.51 x10^{-2}	4.05 x10^{-2}	4.66 x10^{-2}	3.33 x10^{-2}	4.12 x10^{-2}	1.03 x10^{-1}	8.40 x10^{-2}	4.21 x10^{-2}	6.96 x10^{-2}	5.52 x10^{-2}	6.44 x10^{-2}	**0.697**
Respiratory hospital admissions	9.10 x10^{-6}	1.12 x10^{-3}	2.36 x10^{-6}	1.11 x10^{-4}	8.89 x10^{-3}	8.98x 10^{-3}	6.6 x10^{-3}	7.59 x10^{-3}	5.43 x10^{-3}	6.71 x10^{-3}	1.67x 10^{-2}	1.37 x10^{-2}	6.85 x10^{-3}	1.13 x10^{-2}	8.99 x10^{-3}	1.05 x10^{-2}	**0.114**
Deaths (non-traumatic brought forward)	8.26 x10^{-6}	1.02 x10^{-3}	2.14 x10^{-6}	1.01 x10^{-4}	8.07 x10^{-3}	8.15 x10^{-3}	5.99 x10^{-3}	6.90x 10^{-3}	4.93 x10^{-3}	6.10 x10^{-3}	1.52 x10^{-2}	1.24 x10^{-2}	6.22 x10^{-3}	1.03 x10^{-2}	8.16 x10^{-3}	9.53 x10^{-3}	**0.103**

TABLE B2 PREDICTED NUMBER OF ADDITIONAL CASES OF SELECTED DISEASES PER ANNUM IN THE EXPOSED POPULATION BASED ON ADDITIONAL SO_2

	Extra cases per annum in each exposed population zone																			Total extra cases per annum
Disease	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Respiratory hospital admissions	1.04×10^{-5}	3.09×10^{-4}	5.42×10^{-6}	1.71×10^{-4}	4.55×10^{-4}	2.39×10^{-4}	8.22×10^{-4}	3.22×10^{-3}	2.90×10^{-3}	7.25×10^{-5}	4.66×10^{-3}	4.39×10^{-3}	5.98×10^{-3}	5.09×10^{-3}	1.73×10^{-3}	3.81×10^{-3}	2.37×10^{-3}	2.45×10^{-3}	1.66×10^{-2}	0.046
Deaths (non-traumatic brought forward)	1.23×10^{-5}	3.09×10^{-4}	6.41×10^{-6}	2.03×10^{-4}	5.38×10^{-4}	2.83×10^{-4}	9.72×10^{-4}	3.81×10^{-3}	3.43×10^{-3}	8.58×10^{-5}	5.51×10^{-3}	5.19×10^{-3}	7.08×10^{-3}	6.02×10^{-3}	2.04×10^{-3}	4.51×10^{-3}	2.80×10^{-3}	2.90×10^{-3}	1.96×10^{-2}	0.054

TABLE B3 PREDICTED NUMBER OF ADDITIONAL CASES OF SELECTED DISEASES PER ANNUM IN THE EXPOSED POPULATION BASED ON ADDITIONAL PM_{10}

	Extra cases per annum in each exposed population zone																Total extra cases per annum
Disease	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
Chronic Bronchitis	1.33×10^{-4}	1.50×10^{-4}	7.59×10^{-4}	3.99×10^{-3}	1.82×10^{-2}	1.85×10^{-4}	1.34×10^{-2}	1.25×10^{-2}	8.84×10^{-3}	1.80×10^{-2}	6.76×10^{-3}	6.30×10^{-3}	5.85×10^{-3}	3.56×10^{-3}	2.17×10^{-2}	3.53×10^{-1}	0.473
Cardiovascular Hospital admissions	2.00×10^{-5}	2.24×10^{-5}	1.14×10^{-4}	5.98×10^{-4}	2.73×10^{-3}	2.78×10^{-5}	2.01×10^{-3}	1.88×10^{-3}	1.33×10^{-3}	2.70×10^{-3}	1.01×10^{-3}	9.45×10^{-4}	8.77×10^{-4}	5.33×10^{-4}	3.26×10^{-3}	5.29×10^{-2}	0.071
Respiratory hospital admissions	2.11×10^{-5}	2.38×10^{-5}	1.20×10^{-4}	6.34×10^{-4}	2.89×10^{-3}	2.95×10^{-5}	2.13×10^{-3}	1.99×10^{-3}	1.40×10^{-3}	2.86×10^{-3}	1.07×10^{-3}	1.00×10^{-3}	9.29×10^{-4}	5.65×10^{-4}	3.45×10^{-3}	5.60×10^{-2}	0.075
GP Consultation Asthma	4.73×10^{-4}	5.31×10^{-4}	2.69×10^{-3}	1.42×10^{-2}	6.47×10^{-2}	6.58×10^{-4}	4.75×10^{-2}	4.45×10^{-2}	3.14×10^{-2}	6.39×10^{-2}	2.40×10^{-2}	2.24×10^{-2}	2.08×10^{-2}	1.26×10^{-2}	7.71×10^{-2}	1.25	1.68
LRS Children	3.09×10^{-5}	3.47×10^{-5}	1.76×10^{-4}	9.26×10^{-4}	4.23×10^{-3}	4.31×10^{-5}	3.11×10^{-3}	2.91×10^{-3}	2.05×10^{-3}	4.18×10^{-3}	1.57×10^{-3}	1.46×10^{-3}	1.36×10^{-3}	8.25×10^{-4}	5.04×10^{-3}	8.19×10^{-2}	0.110
LRS adults	8.26×10^{-6}	9.29×10^{-6}	4.71×10^{-5}	2.48×10^{-4}	1.13×10^{-3}	1.15×10^{-5}	8.31×10^{-4}	7.79×10^{-4}	5.49×10^{-4}	1.12×10^{-3}	4.20×10^{-4}	3.91×10^{-4}	3.63×10^{-4}	2.21×10^{-4}	1.35×10^{-3}	2.19×10^{-2}	0.029

Annex 2: Assessment of Health Effects from Exposure to Metals and Organic Substances

April 2014

47066339

Prepared for:
SSE Generation Ltd

Slough Multifuel CHP Facility

Human Health Risk Assessment

Annex 2: Health Effects Arising from Emissions of Metals and Organic Substances

REVISION SCHEDULE

Rev	Date	Details	Prepared by	Reviewed by	Approved by
0	October 2013	Final	Matthew Hill and Alexandra Ewan Assistant Air Quality Specialists	Garry Gray Associate – Air Quality	Garry Gray Associate – Air Quality
1	April 2014	Update	Matthew Hill Assistant Air Quality Specialists	Garry Gray Associate – Air Quality	Garry Gray Associate – Air Quality

URS Infrastructure & Environment UK Limited
12 Regan Way
Chetwynd Business Park
Chilwell
Nottingham
NG9 6RZ

Tel +44 (0)115 907 7000
Fax +44 (0)115 907 7001

GLOSSARY

The following terms and definitions relate to the meaning of these terms as used within this report.

Acute effects	An effect that occurs within a short time after exposure.
Average Daily Dose	The estimated mean dose received by an individual over the course of a day.
Averaging Time	A reference time period e.g. an average daily dose is reported for an averaging time of one day.
Bioaccumulation	The process by which chemicals are taken up into an organism either directly by exposure or indirectly through consumption of contaminated material. Concentrations can accumulate higher up the food chain to levels significantly higher than the original exposure concentration.
Carcinogenic Slope Factor	An upper bound on the increased cancer risk from a lifetime of oral (ingestion) exposure to a substance based on the dose-response relationship of the substance.
Chemicals of Potential Concern	Substances identified through the risk assessment process as being of concern to human health.
Chronic effects	An effect that occurs over a long time period or following a long period of exposure.
Congeners	Substances with molecules that share slightly different chemical structures.
Dioxins/Furans	This is the abbreviated name for a family of toxic substances that share a similar chemical structure and a common mechanism of toxic action. They include the congeners polychlorinated dibenzo dioxins (PCDDs) and polychlorinated dibenzo furans (PCDFs).
Dose	The USEPA define 'Dose' as, the amount of a substance available for interaction with metabolic processes or biologically significant receptors after crossing the exchange boundary of an organism. An equivalent definition is, the amount of a substance taken up by an exposed individual following inhalation, ingestion or absorption across the skin.
Dose-response relationship	The relationship between the dose and the proportion of exposed individuals observed to demonstrate effects.
Emission	The substance or the mass of a substance emitted into the atmosphere.
Excess Lifetime Risk	The probability that an individual will develop cancer over a

	lifetime as a result of exposure to specific carcinogenic chemicals through multiple exposure pathways.
Exposure	The US EPA define 'exposure' as, the condition of a chemical contacting the exchange boundary of an organism. A broader definition is, the amount of a substance inhaled, ingested or present at the skin surface.
Exposure (Direct)	Inhalation of air containing substances at predicted concentrations.
Exposure (Indirect)	Results from contact of human and ecological receptors with soil, plants or water bodies on which emitted chemicals have been deposited.
Exposure Duration	The length of time that a receptor is exposed via a specific pathway.
Exposure Frequency	This is the amount of time a receptor is exposed to COPCs by all pathways. The HHRAP assumes that receptors are exposed 350 days a year, with a 2 week period away from the relevant exposure location.
Exposure Pathway	This is the route that a chemical takes from its source, through the environment to the individual being exposed.
Exposure Scenario	The combination of relevant exposure pathways to which an individual receptor may be exposed to specific substances.
Hazard	An impact to human health by chemicals of potential concern.
Hazard Index	The total chronic hazard attributable to exposure to all COPCs through a single exposure pathway.
Hazard Quotient	The comparison of oral and inhalation exposure estimates to reference dose and reference concentration values.
Human Health Risk Assessment Protocol	A structured approach to quantifying the risks to human health associated with exposure to compounds of potential concern.
Ingestion	The act of eating or drinking a substance that may then result in the substance being taken up via the digestive system.
Inhalation	The act of breathing in a substance that may then result in the substance being taken up via the respiratory system.
Industrial Risk Assessment Program	A commercially available computer programme developed to calculate excess life time risk and hazard index values following the requirements from the 2005 U.S. EPA-OSW Human Health Risk Assessment Protocol.
Industrial Emissions Directive	A directive of the European Union, the requirements of which will replace requirements of the Waste Incineration Directive (WID) by 2013.

International Toxic Equivalent

This weighs the toxicity of the less toxic compounds as a fraction of the toxicity of a reference compound. In the case of dioxins the toxicity of each individual congener is weighted to 2,3,7,8-TCDD, which is given a reference value of 1.

Lifetime

In estimating the average lifetime exposure of individual receptors or populations to substances, a lifetime is taken to be 70 years.

Lipophilic

A substance is considered lipophilic if it is readily dissolved in fat-like solvents.

Media

For the purposes of this assessment, media are parts of the wider environment that a substance could be contained within. This includes soil, water, air, biota etc.

Metals

The 12 metals, in their elemental form or contained within compounds, for which emission limit values are defined within the Waste Incineration Directive.

Nitrogen Dioxide

A molecule composed of one nitrogen atom and two oxygen atoms, present in outdoor air as a gas.

Oxides of Nitrogen

A collective term for all gases composed of nitrogen and oxygen, including nitrogen dioxide.

Particulate Matter

A solid or liquid particle (a droplet) that in the context of this report is small enough to be suspended in air.

PM_{10}

Mass of particles per cubic metre of air passing through the inlet of a size selective sampler with a transmission efficiency of 50% at an aerodynamic diameter of 10 micrometres.

$PM_{2.5}$

Mass of particles per cubic metre of air passing through the inlet of a size selective sampler with a transmission efficiency of 50% at an aerodynamic diameter of 2.5 micrometres.

Pathway

A term used to represent a series of sequential physical or chemical actions by which a substance is transported from a source, through the environment to a receptor. Typically described using a label that relates to the mechanism that receptors are exposed by, e.g. inhalation pathway.

Polycyclic aromatic hydrocarbons

A group of several hundred chemically related persistent organic compounds of various chemical structures and toxicity. Benzo[a]pyrene is used in National air quality regulations as a marker species for reporting concentrations of PAH in ambient air.

Population

All individuals living within a defined area.

Receptor

For the purposes of the human health risk assessment a receptor is, a hypothetical individual potentially exposed to chemicals of potential concern emitted to the atmosphere from

	the facility in question.
Reference Concentration	An estimated daily concentration of a chemical in air, the exposure to which over a specific exposure duration poses no appreciable risk of adverse health effects, even to sensitive populations.
Reference Dose	A daily oral intake rate that is estimated to pose no appreciable risk of adverse health effects, even to sensitive populations, over a 70 year lifetime.
Risk	An estimation of the probability that an adverse health impact may occur as a result of exposure to chemicals in the amount and by the pathways identified.
Sulphur Dioxide	A molecule composed of one sulphur and two oxygen atoms, present in outdoor air as a gas.
Threshold	The dose or exposure level below which no appreciable effects on human health are observed.
Tolerable Daily Intake	A World Health Organisation definition of the dose of a substance that an individual could be exposed to on each day of an entire lifetime, at which appreciable health risks do not occur. See similar ‘reference dose’ term used by USEPA.
Unit Risk Factor	The upper bound excess lifetime cancer risk estimated to result from continuous exposure to a substance at a concentration of $1 \mu g m^{-3}$ in air.
Waste Incineration Directive	A directive of the European Union that defines the minimum standard of environmental performance that must be achieved by installations burning waste or waste derived fuels.

ABBREVIATIONS

ADD	Average Daily Dose
COPC	Compound of Potential Concern
COT	Committee on Toxicology
CSF	Cancer Slope Factor
FSA	Food Standards Agency
HHRAP	Human Health Risk Assessment Protocol
HQ	Hazard Quotient
HI	Hazard Index
IED	Industrial Emissions Directive
IRAP	Industrial Risk Assessment Program
TEF	Toxic Equivalency Factor
PAH	Polycyclic aromatic hydrocarbon
PCDD	Polychlorinated di benzo(p)dioxin
PCDF	Polychlorinated di benzo furans
RfD	Reference Dose
RfC	Reference Concentration
SGV	Soil Guideline Values
TDS	Total Dietary Study
TDI	Tolerable Daily Intake
URF	Unit Risk Factor
US EPA	United States Environmental Protection Agency
WHO	World Health Organisation
WID	Waste Incineration Directive

CONTENTS

Section **Page No**

1 INTRODUCTION

URS has been appointed by SSE Generation Ltd (the Applicant) to prepare an assessment of health effects arising from the emissions of metals and organic substances from the proposed Slough Multifuel CHP Facility (the 'Proposed Development'). Within this report the '*proposed facility'* refers specifically to the Slough Multifuel CHP Facility itself. Emissions modelled in this assessment are from the proposed facility, and exclude emissions from the wider Proposed Development, such as traffic. The proposed facility will emit a mixture of substances, including particulate matter, oxides of nitrogen, sulphur dioxide, metals, polycyclic aromatic hydrocarbons (PAHs) and dioxin/furans into the atmosphere throughout the operational lifetime of the proposed facility. The effect of the emissions from the proposed facility, on the atmospheric concentrations of air pollutants and the methods used to calculate impacts have been reported in the Air Quality Dispersion Modelling Report, as discussed in *Chapter 8: Air Quality* of the Environmental Statement. A comparison of the predicted pollutant concentrations against short term Environmental Assessment Levels (EALs) has been made within the Environmental Statement. The human health effects associated with the exposure of the local population to the predicted change in atmospheric concentrations of particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide and sulphur dioxide has been quantified within another report[1].

This report quantifies the human health effects associated with the exposure of the local community, within 10 kilometres (km) of the proposed facility, to the predicted change in atmospheric concentrations of metals, PAHs and dioxins/furans.

The Waste Incineration Directive (WID)[2] regulated the burning of waste derived fuels and waste, where waste is used as a fuel or is disposed of at a plant where energy generation or production is the main purpose. The directive defines operating conditions for the incineration process, emission monitoring requirements and limit values for emission of substances to air and water. The WID directive was transposed into national legislation through the Environmental Permitting (England and Wales) Regulations 2010[3].

The Industrial Emissions Directive (IED) 2010/75/EU[4] incorporated a number of directives, including WID, into a single overall directive. All European Union member states are required to transpose the directive into national legislation within two years. The emission limit values and operating conditions specified within WID have been retained within the IED and will continue to be applied in respect of any new installation in England from 6th January 2013.

The methodology for assessing the effects on human health from such facilities is based on the United States Environmental Protection Agency (US EPA) Human Health Risk Assessment Protocol (HHRAP)[5] (as there is no UK equivalent protocol, and adoption of the US EPA protocol is standard practice in the UK). This provides a systematic and transparent protocol for undertaking site-specific risk assessments of human exposure to emissions from combustion facilities. The main steps within the HHRAP are:

- characterising the source of the hazard;
- identifying the relevant pathways via which receptors could be exposed;
- calculating concentrations of Compounds of Potential Concern (COPCs) in environmental media;

[1] Annex 1, Assessment of Health Effects from Exposure to Particulate Matter, Nitrogen Dioxide and Sulphur Dioxide (Document Ref: 47066339/COMEAP/Annex1/)
[2] European Commission (2000) Directive 2000/76/EC on the Incineration of Waste
[3] H.M. Government (2010) Environmental Permitting Regulations (England and Wales). SI 675, the Stationary Office
[4] European Union (2010) Directive 2010/75/EU on Industrial Emissions (integrated pollution prevention and control) (recast)
[5] US EPA Office of Solid Waste (September 2005) Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities

- calculating the magnitude of human exposure; and
- quantifying the risk of health effects.

This report applies the HHRAP methodology published by the US EPA to quantify the risks of human health effects from exposure to metals, PAHs and dioxins/furans, associated with the operation of the Facility. The HHRAP encompasses more than a decade of research into the risk assessment of combustion facilities on the subject of hazard identification and health risks. No further review of the underpinning medical literature has been undertaken in support of this document.

The relationship between exposure to air pollutants, either singly or in combination, and the resulting effects on health remains a topic of active research. Although emissions from the installation's stacks are initially airborne substances, inhalation is not the only relevant exposure pathway for some of the substances of concern. A more detailed assessment of all exposure pathways needs to be undertaken for the risks to be quantified and HHRAP adopts such a source – pathway - receptor approach.

Taking a generic example, where a stack is the source and the substance emitted into the atmosphere is a potential hazard to human health, the people that make up the population of the land surrounding the stack are receptors that may be exposed to a dose of the substance. The substance might move through the environment via a number of available pathways before the receptors are exposed to it. One pathway might be dispersion through the atmosphere followed by inhalation into the receptors lungs. Another pathway might be deposition from the atmosphere onto the ground, followed by uptake into plants that are then eaten by livestock, which are then in turn eaten by receptors.

If a receptor was to live their entire life at a location where they breathed the substance at the highest airborne concentrations and they only ate locally grown food and drank local water from the location where the concentrations of the deposited substance where highest, then they would experience the maximum hypothetical level of exposure.

Within HHRAP the health impact on the entire exposed population is characterised using six types of receptors to represent hypothetical maximum exposure scenarios:

- the resident (adult) and resident's child;
- the farmer (adult) and farmer's child; and
- the fisher (adult) and fisher's child.

The receptor locations within the assessment have been chosen for each receptor type, based upon the predicted maximum concentrations from the air quality dispersion modelling report. This enables the potential health effects for the exposed population to be quantified, based on the maximum dose that a representative receptor within the study area is likely to be exposed to.

The substances of potential concern (COPCs) considered within this report have the potential to induce long term, chronic effects on human health at environmental concentrations. For some of these substances there is no minimum concentration below which adverse health effects will not occur and it is therefore appropriate to consider the risk of effects occurring. The receptors considered in this assessment are representative of the maximum hypothetical lifetime risk of human health effects that members of the population would be exposed to. For the purposes of this assessment, risks are presented for lifetimes of 70 years duration for an adult receptor and 6 years duration for a child receptor. The assessment quantifies the risk for carcinogenic effects and for non-carcinogenic effects and reports these risks using internationally recognised metrics.

In this report the terminology used is of necessity technical and the meaning of the terms may differ from their use in conversational English. A glossary of the terms used is provided within this report.

2 METHODOLOGY

2.1 Introduction

This assessment considers the risk of effects on human health occurring within the local population when exposed to emissions to air from the Facility, located in the Slough Trading Estate, Slough. The approach to this assessment is as follows:

- Characterising the source of the hazard;
- Identifying the relevant pathways via which receptors could be exposed;
- Calculating concentrations of COPCs in environmental media;
- Calculating the magnitude of human exposure; and
- Quantifying the risk of health effects.

The hazard source consists of Compounds of Potential Concern (COPCs), which are substances emitted from waste treatment facilities at rates permitted under the IED. The hazard source has been previously quantified through a detailed dispersion modelling exercise that has reported on substances emitted and dispersed within the atmosphere, and the amount of COPCs deposited to ground.

The relevant exposure pathways are identified as either direct (inhalation) or indirect (ingestion of water, soil, vegetation and animal products contaminated through the food chain). The receptors are chosen based on the results of the maximum predicted concentrations from the air quality dispersion modelling report and surrounding site specific conditions.

The level of exposure and dose to COPCs via each pathway can be calculated for each receptor once the source, exposure pathways and receptors have been quantified. Ultimately a total risk for carcinogenic and non-carcinogenic effects occurring in each of the receptors from the various different exposure scenarios is calculated.

The current and future land use, the location of water bodies and associated watersheds and any special population characteristics (e.g. infants or elderly) are considered within the assessment of exposure to COPCs.

The risk of effects on human health arising from exposure to dioxins and furans, PAHs and metals emitted from the Facility are estimated for hypothetical worst case scenarios, including that of an individual exposed for a lifetime to the effects of the highest airborne concentrations and consuming mostly locally grown food.

The methods outlined in the US EPA HHRAP have been encompassed into a commercially available risk assessment modelling tool called the Industrial Risk Assessment Program (IRAP) by Lakes Environmental Software. URS holds a user licence for the latest version of this software (4.0), which has been used to conduct the assessment of the risks to humans via the method outlined above.

HHRAP has been specifically developed to enable the estimation of the level of exposure received by the local population via the combination of potential exposure pathways in a consistent and repeatable manner. HHRAP considers the fate and transport of substances through soil, water and biota (plant material) following deposition onto these surfaces. This is then used to calculate the potential uptake of these substances by the receptors affected by the relevant pathways.

Within HHRAP the receptors chosen are classified as either a resident, farmer or fisher receptor types. It is also necessary to distinguish between an adult and child receptors as children are considered to be at a greater risk of experiencing health effects from a specified dose due to their lower body weights. The farmer receptor is assumed to consume proportionally more locally grown food than a resident. This means that these receptors are at a greater risk of eating food contaminated by emissions from the source. A fisher receptor type is utilised where there is the potential for the consumption of locally caught fish from water bodies affected by emissions form the source to constitute the main source of protein within the receptors diet. For resident type receptors it is assumed that they are home gardeners within an urban area and as such consume locally grown produce with some incidental ingestion of soil. All receptor types are assumed to be present at the same location all year apart from a 2 week holiday period (350 days).

The air quality dispersion modelling report generates output files that are imported into the IRAP model to calculate concentrations of COPCs within each exposure pathway that are ultimately taken up by human receptors. In order to perform this calculation IRAP requires the following input parameters:

- physical and chemical properties of COPCs;
- site specific information e.g. precipitation rate, wind speed; and
- information for each receptor type e.g. body weight, consumption rates of food, exposure rates.

The HHRAP default values have been incorporated within IRAP and are used for the majority of input values, as discussed in the following sections.

2.2 Hazard Source

Throughout its operational lifetime the Facility will emit a number of different substances into the atmosphere via a stack, which are referred to in this assessment as Compounds of Potential Concern (COPCs). The IED specifies plant operating conditions (e.g. temperature and residence times) as well as emission limit values, which represent an upper limit on the permitted concentrations of COPCs that can be emitted from the Facility. The emission limits used within this assessment, as specified in the IED, are set out in Table 1.

Table 1: Daily Averaged Emissions Limit Values in the IED

Pollutant	Emissions Limit Value (mg/m^3)	Averaging Period
Total Dust	10	Daily mean
Gaseous and vaporous organic substances, expressed as total organic carbon	10	Daily mean
Hydrogen Chloride (HCl)	10	Daily mean
Hydrogen Fluoride (HF)	1	Daily mean
Sulphur Dioxide (SO_2)	50	Daily mean
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2), expressed as nitrogen dioxide for existing incineration plants with a nominal capacity exceeding 6 tonnes per hour or new incineration plants	200	Daily mean
Carbon Monoxide (CO)	50	Daily mean
Cadmium (Cd) and Thallium (Tl)	Total 0.05	All average values over the sampling period 30 minutes to 8 hours
Mercury (Hg)	0.05	
Antimony (Sb), Arsenic (As), Lead (Pb), Chromium (Cr), Cobalt (Co), Copper (Cu), Manganese (Mn), Nickel (Ni) and Vanadium (V)	Total 0.5	
Dioxins	0.1 ng I-TEQ / Nm^3	CEN method, sample period 6 to 8 hours

Compounds of Potential Concern (COPCs)

The COPCs of relevance to this assessment are permitted emissions under IED (shown in Table 1). Specific physical and chemical information on these substances is included within the US EPA HHRAP COPC companion database for the assessment of long term health effects. The particular substances considered with regards to the assessment of their effects on human health are listed below:

- Polychlorinated di benzo(p)dioxins/furans (PCDD/F) as individual congeners;
- Benzo(a)pyrene;
- Antimony (Sb);
- Arsenic (As);
- Cadmium (Cd);
- Chromium (Cr), trivalent and hexavalent;

- Mercury (Hg);
- Lead (Pb); and
- Nickel (Ni).

Benzo(a)pyrene has been included in the list of COPCs to represent polycyclic aromatic hydrocarbons (PAHs) emissions within this assessment. Although no emission limits are specified under IED, monitoring of these substances is required under the Directive.

The 2005 HHRAP excluded thallium (Tl) by virtue of there being no reference dose, reference concentration or cancer slope factors available for thallium. This is contrast to the draft 1998 HHRAP which did include compound specific parameter values for thallium in Annex A of the draft 1998 US EPA HHRAP[6]. The physical and chemical properties of thallium are well known and it has been considered appropriate to include thallium in the list of COPCs for the assessment of any human health effects. Therefore, the 1998 US EPA HHRAP6 reference data has been used to assess the risk to human health associated with exposure of the local population to thallium.

Emission Concentrations

The emission concentrations of the COPCs considered in this assessment have been reported in the air quality dispersion modelling report. The IED places limit values on the emissions of substances in the short term i.e. daily averages, which have been used as a conservative assumption within this assessment of long term health effects.

Table 2: Emission Concentrations and Rates of Metals used for the Human Health Risk Assessment

Metal Group defined in IED	Pollutant	Emission Concentration[(a)] (mg Nm^{-3})	Emission Rate (g s^{-1})
Group 1	Cadmium	0.05	0.003264
	Thallium	0.05	0.003264
Group 2	Mercury	0.05	0.003264
Group 3	Antimony	0.5	0.0326
	Arsenic	0.003	0.00020
	Total Chromium	0.033	0.002154
	Chromium (vi)	0.00069	0.000045
	Lead	0.5	0.03264
	Nickel	0.136	0.0089

(a) Emission concentrations for individual metals have been set at the group IED limit value apart from arsenic, nickel and chromium, which are set based upon the Environment Agency's Interim guidance on metals for waste incineration. Within this guidance note chromium has been assumed to be 97.9% Cr(iii) and 2.1% Cr(vi)

[6] US EPA (1998) Human Health Risk Assessment for Hazardous Waste Combustion Facilities, U.S. EPA Office of Solid Waste, Peer Review Draft, July 1998

The individual emissions concentrations and rates for each of the inorganic COPCs are shown in Table 2. Some of the metals with specified emission limits in the IED do no not pose a risk to human health in the long term and have not been included within the HHRAP e.g. cobalt, copper, manganese and vanadium. These metals have therefore been excluded from this assessment.

The concentration of mercury has been adjusted in order to take account of the loss of mercury to the global cycle. The default values within IRAP assume that 48% of total mercury is deposited as divalent mercury (mercuric chloride), 2% is deposited as elemental mercury and the rest being lost to the global cycle. IRAP assumes that the exposed population will only be exposed to elemental mercury through direct inhalation of the vapour phase whereas exposure to divalent mercury will occur via both direct and indirect inhalation of vapour and particle bound mercuric chloride. This leads to the following emission rates for elemental and divalent mercury:

Elemental mercury 6.53 x 10-6

Divalent mercury 1.57 x 10-3

As stated above, benzo(a)pyrene has been included in the list of COPCs as representative of all polycyclic aromatic hydrocarbons (PAHs) with an emission concentration of 0.001 mgNm-3 and an emission rate of 6.53 x 10-6 gs^{-1} as previously reported in the air quality dispersion modelling report.

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are organic substances formed as a by-product of combustion processes and in the manufacture of certain chlorinated organic chemicals. PCDD/Fs have been classified as persistent organic pollutants (POPs) with a significant potential to bioaccumulate[7]. The basic structure of the dioxin family is composed of benzene rings interconnected by two oxygen atoms. The degree and position of the chlorination to the basic structure determines the type of the individual dioxin with 75 individual compounds being possible. Furans are of a similar structure but with a carbon atom replacing one of the chlorine atoms yielding 125 individual furan compounds. Each individual compound is referred to as a congener and each has slightly different chemical and physical properties in the environment that are determined by the position and degree of chlorination within the molecule.

The assessment of the effect of PCDD/Fs on human health takes into account the affect of the different physical and chemical properties of the individual congeners on their behaviour in the environment. Individual congeners are used to conduct the assessment of the health risk from dioxins/furans. A standard PCDD/F emission profile for municipal waste incinerators has previously been derived by Her Majesty's Inspectorate of Pollution (HIMP)[8] and will be used to represent the congener emission profile in this assessment (Table 3). Toxic equivalency factors (TEF) are used to express the toxicities of the different PCDD/Fs in relation to the most toxic dioxin 2,3,7,8-TCDD. These TEFs have been used to generate toxic equivalent emissions (I-TEQ) for each congener based upon the standard emissions profile. The total TEQ for all PCDD/Fs has been assumed to be no more than that of the maximum IED limit of 0.1 ng I-TEQ Nm^{-3}.

[7] WHO (2010) Dioxins and their effects on human health, Factsheet No. 225, May 2010

[8] DOE (1996) Risk Assessment of Dioxin Releases from Municipal Waste Incineration Processes Contract No. HMIP/CPR2/41/1/181

Table 3: Congener Profile for the Facility for all of the PCDD/Fs

Congener	Annual Mean Emission Concentration (ng Nm^{-3})	I-TEF (toxic equivalent factors)[(a)]	Annual Mean Emission (ng I-TEQ Nm^{-3})
2,3,7,8-TCDD	0.0031	1.0	0.0031
1,2,3,7,8-PeCDD	0.025	0.5	0.0125
1,2,3,4,7,8-HxCDD	0.029	0.1	0.0029
1,2,3,6,7,8-HxCDD	0.026	0.1	0.0026
1,2,3,7,8,9-HxCDD	0.021	0.1	0.0021
1,2,3,4,6,7,8-HpCDD	0.17	0.01	0.0017
OCDD	0.4	0.001	0.0004
2,3,7,8-TCDF	0.028	0.1	0.0028
2,3,4,7,8-PeCDF	0.054	0.5	0.027
1,2,3,7,8-PeCDF	0.028	0.05	0.0014
1,2,3,4,7,8-HxCDF	0.22	0.1	0.022
1,2,3,6,7,8-HxCDF	0.081	0.1	0.0081
1,2,3,7,8,9-HxCDF	0.0040	0.1	0.00040
2,3,4,6,7,8-HxCDF	0.087	0.1	0.0087
1,2,3,4,6,7,8-HpCDF	0.44	0.01	0.0044
1,2,3,4,7,8,9-HpCDF	0.04	0.01	0.00040
OCDF	0.4	0.001	0.0004
Total (ng I-TEQ m^{-3})			**0.1**

The emissions rates used in the IRAP model for each of the PCDD/Fs are shown in Table 4. These rates have been calculated based upon the percentage contribution of each congener to the total emission rates of all dioxin/furans at IED emissions limits.

Table 4: Emission Rates used in the IRAP Model for all of the PCDD/Fs

Congener	Emission rate per stack (g s^{-1})
2,3,7,8-TCDD	2.02 $\times10^{-10}$
1,2,3,7,8-PeCDD	8.16 $\times10^{-10}$
1,2,3,4,7,8-HxCDD	1.89 $\times10^{-10}$
1,2,3,6,7,8-HxCDD	1.70 $\times10^{-10}$
1,2,3,7,8,9-HxCDD	1.37 $\times10^{-10}$
1,2,3,4,6,7,8-HpCDD	1.11 $\times10^{-10}$
OCDD	2.61 $\times10^{-11}$
2,3,7,8-TCDF	1.83 $\times10^{-10}$
2,3,4,7,8-PeCDF	1.76 $\times10^{-09}$
1,2,3,7,8-PeCDF	9.14 $\times10^{-11}$
1,2,3,4,7,8-HxCDF	1.44 $\times10^{-09}$
1,2,3,6,7,8-HxCDF	5.29 $\times10^{-10}$
1,2,3,7,8,9-HxCDF	2.61 $\times10^{-11}$
2,3,4,6,7,8-HxCDF	5.68 $\times10^{-10}$
1,2,3,4,6,7,8-HpCDF	2.87 $\times10^{-10}$
1,2,3,4,7,8,9-HpCDF	2.61 $\times10^{-11}$
OCDF	2.61 $\times10^{-11}$

Properties of COPCs

The HHRAP includes a database that defines the physical and chemical properties of 206 COPCs, as well as toxicity factors for each COPC. This database is the source of the default values within the IRAP model. The physical and chemical properties determine how each of the COPCs would move within the environment and the extent to which they would bioconcentrate in different foodstuffs (e.g. meat, fish, vegetation, soil and water). An example of the range of different properties used within IRAP is presented in Table 5. Data for lead and 2,3,7,8-TCDD are included in Table 5 to provide an illustration of the marked differences in the properties associated with organic and inorganic substances.

Toxicity benchmarks (e.g. reference dose/concentrations, slope factors, unit risk factors) with regards to human health effects are shown in Table 6 for all of the COPCs considered in this assessment. These values are provided in the HHRAP and used to determine the carcinogenic and non-carcinogenic risks associated with inhalation or ingestion exposure to each of the COPCs.

The Carcinogenic Slope Factor (CSF) and Unit Risk Factors (URF) for each COPC are used to calculate the carcinogenic risk from ingestion and inhalation respectively. The ingestion Reference Dose (RfD) and Inhalation Reference Concentration (RfC) are used to calculate the non-carcinogenic risk associated with exposure to each COPC. The detailed methodology for calculating the non-carcinogenic and carcinogenic risks to human health are provided in section 2.6 and 2.7.

Table 5: Example IRAP Input Parameters for Lead and 2,3,7,8-TCDD

Parameter Description	Symbol	Units	Lead	2,3,7,8-TCDD
Chemical abstract service number	CAS No.	-	7439-92-1	1746-01-6
Molecular weight	MW	g mole^{-1}	209.21	322.0
Melting point of chemical	T_m	K	603.15	578.7
Vapour pressure	V_p	atm	3.97 x 10^{-12}	1.97 x 10^{-12}
Aqueous solubility	S	mg L^{-1}	9580	1.93 x 10^{-5}
Henry's Law constant	H	atm-m^{3} mol^{-1}	0.025	3.29 x 10^{-5}
Diffusivity of COPC in air	D_a	cm^{2} s^{-1}	0.0772	0.104
Diffusivity of COPC in water	Dw	cm^{2} s^{-1}	9.6 x 10^{-6}	5.6 x 10^{-6}
Octanol-water partition coefficient	K_ow	-	5.37	6,309,573
Organic carbon-water partition coefficient	K_oc	mL g^{-1}	0	3,890,451
Soil-water partition coefficient	Kd_s	mL g^{-1}	900	38,904
Suspended sediments/surface water partition coefficient	Kd_sw	L kg^{-1}	900	291,784
Bed sediment/sediment pore water partition coefficient	Kd_bs	mL g^{-1}	900	155,618
COPC loss constant due to biotic and abiotic degradation	K_s_g	a^{-1}	0	0.03
Fraction of COPC air concentration	f_v		0.007	0.664
Root concentration factor	RCF	mL g^{-1}	0	39,999
Plant-soil bioconcentration factor for below ground produce	br_root_veg	-	0.009	1.03
Plant-soil bioconcentration factor for lefy-vegetables	br_leafy_veg	-	0.0136	0.00455
Plant-soil bioconcentration factor for forage	br_forage	-	0.045	0.00455
COPC air-to-plant biotransfer factor for leafy vegetables	bv_leafy_veg	-	0	65,500
COPC air-to-plant biotransfer factor for forage	bv_forage	-	0	65,500
COPC biotransfer factor for milk	ba_milk	day kg^{-1}	0.00025	0.0055
COPC biotransfer factor for beef	ba_beef	day kg^{-1}	0.0003	0.026
COPC biotransfer factor for pork	ba_pork	day kg^{-1}	0	0.032
COPC biotransfer factor for chicken	ba_chicken	day kg^{-1}	0	0.019
Plant-soil bioconcentration factor for eggs	ba_egg	-	0	0.011
Fish bioconcentration factor	BCF_fish	L kg^{-1}	0.09	34,400
Fish bioaccumulation factor	BAF_fish	L kg^{-1}	0	0
Biota-sediment accumulation factor	BSAF_fish	-	0	0.09
Plant-soil bioconcentration factor for grain	br_grain	-	0.009	0.00455

Table 6: Toxicity Factors obtained from the HHRAP for the COPCS in this Assessment

COPC	Ingestion Reference Dose (RfD)	Inhalation Reference Concentration (RfC)	Ingestion Carcinogenic Slop Factor (Ing_csf)	Inhalation Unit Risk Factor (Inh_URF)
	(mg kg^{-1} d^{-1})	(mg m^{-3})	(mg kg^{-1} $d^{-1})^{-1}$	(µg $m^{-3})^{-1}$
Metals				
Antimony	0.0004	0.0014	0	0
Arsenic	0.0003	3.0×10^{-5}	1.5	0.0043
Cadmium	0.0004	0.0002	0.38	0.0018
Chromium (iii)	1.5	5.3	0	0
Chromium (vi)	0.0030	8.0×10^{-6}	0	0.012
Lead	0.000429	0.0015	0.0085	1.2×10^{-5}
Nickel	0.02	0.0002	0	0.00024
Thallium[(a)]	0.00008	0.00028	0	0
Elemental mercury	8.57×10^{-5}	0.0003	0	0
Mercuric chloride	0.0003	0.0011	0	0
Methyl mercury	0.0001	0.00035	0	0
PAHs				
Benzo(a)pyrene	0	0	7.3	0.0011
PCDD/Fs				
2,3,7,8-TCDD	1×10^{-9}	0	150,000	0
1,2,3,7,8-PeCDD	0	0	0	0
1,2,3,4,7,8-HxCDD	0	0	0	0
1,2,3,6,7,8-HxCDD	0	0	6,200	1.3
1,2,3,7,8,9-HxCDD	0	0	6,200	1.3
1,2,3,4,6,7,8-HpCDD	0	0	0	0
OCDD	0	0	0	0
2,3,7,8-TCDF	0	0	0	0
2,3,4,7,8-PeCDF	0	0	0	0
1,2,3,7,8-PeCDF	0	0	0	0
1,2,3,4,7,8-HxCDF	0	0	0	0
1,2,3,6,7,8-HxCDF	0	0	0	0
1,2,3,7,8,9-HxCDF	0	0	0	0
2,3,4,6,7,8-HxCDF	0	0	0	0
1,2,3,4,6,7,8-HpCDF	0	0	0	0
1,2,3,4,7,8,9-HpCDF	0	0	0	0
OCDF	0	0	0	0

(a) Reference dose for Thallium is sourced from the 1998 US EPA HHRA Proctocol6

Dispersion Modelling

The results of the air quality dispersion modelling report have been generated through the use of the air dispersion modelling software ADMS 5. Ground level concentrations and deposition rates have been generated using the model parameter values e.g. emission rates, building heights, terrain data, as detailed within the air quality dispersion modelling report.

IRAP imports the dispersion model output files generated by the US EPA ISC or ISC-AERMOD dispersion models. The output files generated by ADMS 5 therefore require reformatting, before the information can be imported into IRAP.

This assessment of the risks to human health has been carried out utilising the concentration predictions made in the air quality dispersion modelling report using ADMS. In addition to airborne concentrations of the COPCs, the human health risk assessment requires predictions of the following properties, which have been made in the air quality dispersion modelling report:

- airborne concentrations of vapour, particle and particle bound substances emitted;
- wet deposition rates of vapour, particle and particle bound substances; and
- dry deposition rates of particle and particle bound substances

The Facility will be equipped with fabric filters, which will mean the dominant size fraction of particles will be 1-2 µm in diameter and below. For particles of this size range a dry deposition velocity of 0.01 ms^{-1} has been used in the modelling. Whereas a dry deposition velocity of 0.005 ms^{-1} has been used to calculate dry deposition rates for gaseous phase substances. Wet deposition rates have been calculated for both particulate and gaseous substances in ADMS using values for the washout coefficients A and B of 0.0001 and 0.64 respectively.

The results from the air quality dispersion modelling report that are relevant to this assessment of the risks to human health are presented in Table 7 with all set up parameters used for the dispersion modelling presented in the air quality dispersion modelling report.

The points of maximum airborne concentration, dry deposition and wet deposition rates are represented by the relevant receptor locations as discussed in section 2.4 and shown on Figure 1 of Annex 1. Note that the point of maximum wet deposition is heavily influenced by the assumed washout mechanism, which is very localised, hence the location of the point of maximum wet deposition rate in close proximity to the source.

Table 7: Maximum Annual Average Concentrations and Deposition Rates associated with the Facility

Pollutant	Annual Average Concentrations [a]	Vapour Dry Deposition Rate[b]	Particle Dry Deposition Rate[b]	Wet Deposition Rate[b]
Metals	**($\mu g\ m^{-3}$)**	**($mg\ m^{-2}\ year^{-1}$)**	**($mg\ m^{-2}\ year^{-1}$)**	**($mg\ m^{-2}\ year^{-1}$)**
Antimony	0.0068	2.13	1.07	26.93
Arsenic	4.06×10^{-05}	0.013	0.006	0.162
Cadmium	0.0007	0.213	0.107	2.69
Chromium (iii)	0.0004	0.138	0.069	1.74
Chromium (vi)	9.34×10^{-06}	0.0029	0.0015	0.037
Lead	0.0068	2.13	1.07	26.93
Nickel	0.0018	0.58	0.29	7.32
Thallium	0.0007	0.213	0.107	2.69
Elemental mercury	1.35×10^{-06}	0.0004	0.0002	0.0054
Mercuric chloride	0.0003	0.103	0.051	1.30
PAHs				
Benzo(a)pyrene	1.35×10^{-5}	0.0004	0.0002	0.0054
PCDD/Fs	***($fg\ m^{-3}$)***	***($ng\ m^{-2}\ year^{-1}$)***	***($ng\ m^{-2}\ year^{-1}$)***	***($ng\ m^{-2}\ year^{-1}$)***
2,3,7,8-TCDD	0.042	0.013	0.007	0.167
1,2,3,7,8-PeCDD	0.169	0.053	0.027	0.673
1,2,3,4,7,8-HxCDD	0.039	0.012	0.006	0.156
1,2,3,6,7,8-HxCDD	0.035	0.011	0.006	0.140
1,2,3,7,8,9-HxCDD	0.028	0.009	0.004	0.113
1,2,3,4,6,7,8-HpCDD	0.023	0.007	0.004	0.092
OCDD	0.008	0.003	0.001	0.033
2,3,7,8-TCDF	0.038	0.012	0.006	0.151
2,3,4,7,8-PeCDF	0.365	0.115	0.058	1.454
1,2,3,7,8-PeCDF	0.019	0.006	0.003	0.075
1,2,3,4,7,8-HxCDF	0.298	0.094	0.047	1.185
1,2,3,6,7,8-HxCDF	0.110	0.035	0.017	0.436
1,2,3,7,8,9-HxCDF	0.005	0.002	0.001	0.022
2,3,4,6,7,8-HxCDF	0.118	0.037	0.019	0.469
1,2,3,4,6,7,8-HpCDF	0.060	0.019	0.009	0.237
1,2,3,4,7,8,9-HpCDF	0.005	0.002	0.001	0.022
OCDF	0.008	0.003	0.001	0.033

(a) Where 1 $ng m^{-3}$ is equal to 1×10^{-9} and 1 $fg\ m^{-3}$ is equal to 1×10^{-15}
(b) Where 1 $mg\ m^{-2}\ yr^{-1}$ is equal to $1 \times 10^{-3}\ g\ m^{-3}\ yr^{-1}$ and 1 $ng\ m^{-2}\ yr^{-1}$ is equal to $1 \times 10^{-9}\ g\ m^{-2}\ yr^{-1}$

2.3 Exposure Pathways

The local environment and site specific parameters within the study area will define the route that emissions could potentially take and lead to exposure at the relevant receptors. In order to calculate COPC specific exposure rates for each exposure pathway being considered some of the following information may be required:

- the COPC concentration in each media, as calculated in Section 2.2 above;
- consumption rates of receptors in each media;
- receptor body weight; and
- the frequency and duration of exposure.

In any given situation, regardless of site specific circumstances, two primary pathways exist where human receptors could be exposed to COPCs. These are defined as being either direct or indirect exposure pathways. The direct exposure pathway occurs via the inhalation of vapour and particulate matter emissions of COPCs from the source. Whereas, there are numerous potential indirect exposure pathways, as listed below:

- ingestion of vegetation and animal products contaminated with emissions from the Facility;
- ingestion of locally grown or locally caught food (including vegetables, animals and fish);
- ingestion of drinking water from surface water sources;
- incidental ingestion of soil;
- dermal (skin) contact with contaminated soil and water;
- ingestion of breast milk.

Exposure via the ingestion pathways can occur over a period of time and should also be expressed in terms of body weight of the receptor. The body weight of a receptor is defined by the US EPA as being 70 kg for an adult and 15 kg for a child with the exposure duration assumed to be 30 years for an adult and 6 years for a child. For each exposure pathway the daily intake is defined as the dose per body weight. This highlights the importance of considering the child scenario, as for the same dose at a lower body weight the daily intake can be significantly higher.

Plants and animals could be exposed to COPCs via deposition or direct uptake from the air. Subsequent consumption of these plants and animals via the food chain could lead to human receptors being exposed. Information on the diet of the particular receptors (type and quantity of food consumed) is used to predict the total daily intake of COPCs via the ingestion (food) pathway. Food not produced in the local vicinity will not be contaminated by COPCs and therefore only food produced and consumed at the receptor location is considered relevant in the calculation of exposure via this pathway.

The dermal contact exposure pathway can be disregarded from most assessments of the effects on the human health of the local population unless there are site specific requirements for its inclusion. Exposure via this pathway will occur infrequently and coupled with low dermal absorption factors will lead to a low total dose being experienced over the lifetime of an individual human receptor. Dermal contact via aquatic pathways e.g. swimming and fishing, is not a significant pathway for similar reasons.

The HHRAP considers the ingestion of drinking water from a groundwater source as an insignificant exposure pathway from facilities similar to the proposed facility. Surface water bodies used as a drinking water source and their associated watershed should be identified within the study area. If such water bodies exist then the exposure via drinking water from surface water sources should be included within the assessment.

The IRAP model requires certain site specific parameters relating to the local area with which to model the fate and transport of the COPCs via each exposure pathway. The default values within IRAP and contained within the HHRAP have been used to represent the following site specific parameters (as shown in Annex B):

- Silage and forage grown on contaminated soils and quantity of animal feed and soil consumed by the various animal species considered.
- The interception fraction for above ground vegetation, forage and silage and length of vegetation exposure to deposition. The yield/standing crop biomass is also required.
- Input data for assessing the risks associated with exposure to breast milk, including:
  - body weight of infant;
  - exposure duration;
  - proportion of ingested COPC stored in fat;
  - proportion of mother's weight that is fat;
  - fraction of fat in breast milk;
  - fraction of ingested contaminant that is absorbed; and
  - half-life of dioxins in adults and ingestion rate of breast milk.
- Other physical parameters (e.g. soil dry bulk density, density of air, soil mixing zone depth).

The following site specific parameters, relating to surface conditions, must be defined by the user as detailed in the IRAP and have been defined in this assessment as follows:

- annual average precipitation of 65.6 cma^{-1} (based on 1981-2010 meteorological data obtained at the Wisley meteorological station);
- annual average evapotranspiration rate of 45.96 cma^{-1} (assumed to be 70% precipitation);
- average annual irrigation of 0 cma^{-1};
- average annual runoff of 6.57 cma^{-1} (assumed to be 10% of total precipitation);
- an average annual wind velocity of 2.6 ms^{-1} (obtained from 1981-2010 meteorological data obtained at the Wisley meteorological station); and
- The time period over which emissions would be deposited is assumed to be 30 years, (the typical design period for a facility of this specification).

Study Specific Exposure Pathways

Based on the local environment surrounding the proposed facility Site the potential significance of all the exposure pathways, identified above, has been assessed. This has identified that the exposure pathways relevant to this assessment are as follows:

- inhalation;
- ingestion of locally grown food and locally reared animal products e.g. milk and eggs
- incidental ingestion of soil
- ingestion of breast milk

For exposure to occur via ingestion of drinking water there must be a source of drinking water on the surface in the local area that is affected by the emissions from the proposed facility. This exposure pathway is not considered relevant in this assessment of human health effects as the drinking water supply in the study area is dominated by water transferred into the study area and has therefore been excluded from any further assessment.

There are a number of water bodies within 10km that could represent a source of locally caught fish, for example managed trout fisheries. The local population can be considered to fit the urban resident type for whom any fish caught would not represent the main source of protein in their diet. For these reasons it has been considered appropriate to exclude the ingestion of locally caught fish as an exposure pathway in this assessment of health effects.

Based upon the local environment surrounding the proposed facility the following exposure pathways have been considered within this assessment with regards to ingestion:

- soil (incidental);
- home grown produce (fruits and vegetables);
- home grown beef;
- home grown pork;
- home grown chicken;
- milk from home reared cows;
- eggs from home reared chickens; and
- breast milk.

The inclusion of all food groups within this assessment has conservatively assumed that there is both arable and pastoral land in addition to locally grown produce and animals within the vicinity of the proposed facility. The ingestion of home reared meat is only considered for farmers and the families of farmers.

2.4 Receptors

The HHRAP defines three generic hypothetical receptor types for use within the human health risk assessment process. The receptor types are a hypothetical adult and/or child Resident, Farmer and Fisher.

The hypothetical farmer receptor is included where a member of the farming family could be exposed to COPCs. A proportion of the farmer's diet is assumed to come from home grown produce that are affected by emissions from the facility. The hypothetical resident receptor is included in the assessment where exposure could occur in an urban or non-farm rural setting. The hypothetical fisher receptor is included within the assessment where locally caught fish is the main source of protein in the receptors diet in an urban or non-farm, rural setting.

The impacts reported in the air quality dispersion modelling report are used within the IRAP model to predict the location of maximum concentration and deposition rates for each particular land use type. The land use of the local area is then identified and used to define the number and location of each of the relevant hypothetical receptor types e.g. a resident receptor within a residential area.

For each hypothetical type of receptor and within each particular land use, up to three locations are selected based on the maximum predicted airborne concentration (both long term and short term), maximum predicted dry deposition rate and maximum predicted wet deposition rate. It is not uncommon for some of these maxima points to be co-located, resulting in less than three receptor locations actually being selected.

The calculated total exposure to each COPC via each pathway requires the use of specific information for each receptor type. The default values within the HHRAP have been used to represent the following receptor specific parameters (as shown in Annex C):

- food (meat, dairy products, fish and vegetables), water and soil consumption rates for each receptor type. However, only Fishers are assumed to consume locally caught fish and only Farmers are assumed to consume locally reared animals and animal products.
- fraction of contaminated food, water and soil which is consumed by each receptor type.
- input data for the inhalation exposure including: inhalation exposure duration, inhalation exposure frequency, inhalation exposure time; and inhalation rate.
- input data for the ingestion exposure including: exposure duration, exposure frequency, exposure time; and body weight of receptor.

Study Specific Receptors

The Proposed Development Site is currently occupied by an existing power station, situated in the Slough Trading Estate. A short way to the south is the main railway line from London out to the west, the A4 road, and the M4 motorway. The M25 is located approximately 10km to the east, with Heathrow airport further beyond. The M40 is located to the north.

The area immediately around the Proposed Development Site is the Slough Trading Estate, a mix of industrial and commercial units in the centre of Slough. The main residential area of Slough surround the Trading Estate, and extend to the east. To the north are the communities of Stoke Poges, Beaconsfield, Gerrards Cross and Chalfont St Peters. To the south is Windsor, Old Windsor and Eton, and to the west, Burnham and Maidenhead.

Seven residential areas have been selected to represent the potential for residential receptor exposure to emissions from the proposed facility:

- Slough, Windsor, Beaconsfield, Burnham, Chalfont St Peter, Gerrards Cross and Maidenhead

The land surrounding these residential areas is generally characterised by agricultural activities, with some woodland and parkland between. Hypothetical farmer type receptors have been chosen to represent the rural areas to the north east, northwest, north, southeast and southwest of the proposed facility based on the predicted maximum concentration locations outside of urban areas.

The emissions from the proposed facility have been assessed for potential effects on human health at 20 hypothetical residential receptors and 37 hypothetical famer receptors in the local vicinity. Both adult and child receptor types have been considered for each location. The selected hypothetical receptors and their locations are identified in Table 8 and shown on Figure 1 in Annex A.

The hypothetical resident and farmer receptor locations shown on Figure 1 in Annex A represent the location of maximum predicted impact of either air concentration (long term or short term), wet deposition or dry deposition in that particular land use defined area. All other locations within that particular land use defined area would be at a lower risk of experiencing human health effects than the points of maximum impact, as they would have lower levels of exposure to COPCs. The receptor locations selected for use with this assessment of human health are hypothetical scenarios and are not necessarily representative of actual receptors within the local area.

Table 8: Receptor Type and Locations used for the Assessment of Human Health Effects

Identifier	Hypothetical Receptor Type	Location	Description of Maximum Impact	OS coordinates
BCF_1	Resident	Beaconsfield	Air concentration (hourly)	494871, 189646
BCF_2	Resident		Air concentration (long term), wet and dry deposition rate	495071, 189446
BNHM_1	Resident	Burnham	Air concentration (long term) and dry deposition rate	493071, 181496
BNHM_2	Resident		Air concentration (hourly)	493921, 182446
BNHM_3	Resident		Wet deposition rate	494021, 182596
CSP_1	Resident	Chalfont St Peter	Dry deposition rate	499471, 189246
CSP_2	Resident		Air concentration (long term), wet and dry deposition rate	499671, 189246
CSP_3	Resident		Air concentration (hourly)	499871, 189446
GC_1	Resident	Gerrards Cross	Wet deposition rate	498671, 187046
GC_2	Resident		Air concentration (long term) and dry deposition rate	498871, 186846
GC_3	Resident		Air concentration (hourly)	499671, 186446
MH_1	Resident	Maidenhead	Air concentration (long term), wet and dry deposition rate	491071, 179446
MH_2	Resident		Air concentration (hourly)	491071, 179646
RE1_1	Farmer	Rural area to the east of Slough	Air concentration (long term) and dry deposition rate	498871, 182646
RE1_2	Farmer		Wet deposition rate	499071, 182046
RE1_3	Farmer		Air concentration (hourly)	499471, 182446
RN1_1	Farmer	Rural area to the north of Stoke Poges	Wet deposition rate	498071, 186046
RN1_2	Farmer		Air concentration (long term) and dry deposition rate	498271, 185846
RN1_3	Farmer		Air concentration (hourly)	498871, 185846

Identifier	Hypothetical Receptor Type	Location	Description of Maximum Impact	OS coordinates
RN2_1	Farmer	Rural area to the north of Stoke Poges and west of Chalfont St Peter	Air concentration (hourly)	498071, 189046
RN2_2	Farmer		Air concentration (long term), dry deposition and wet deposition rate	498871, 188846
RNE1_1	Farmer	Rural area to the east of Gerrards Cross	Air concentration (long term) and dry deposition rate	500471, 186046
RNE1_2	Famer		Air concentration (hourly),	500671, 187246
RNE1_3	Farmer		Wet deposition rate	500671, 189646
RNW1_1	Farmer	Rural area to the north west of Slough	Air concentration (hourly)	494971, 183096
RNW1_2	Farmer		Air concentration (long term), wet and dry deposition	495721, 182996
RNW2_1	Farmer	Rural area north west of Slough and west of Beaconsfield	Wet deposition rate	491071, 185646
RNW2_2	Farmer		Air concentration (hourly and long term) and dry deposition rate	491271, 185646
RSE1_1	Farmer	Rural area to the south east of Windsor	Air concentration (hourly)	498071, 172246
RSE1_2	Farmer		Air concentration (long term), dry deposition and wet deposition rate	499471, 173246
RSW1_1	Farmer	Rural area to the south west of Slough	Air concentration (hourly)	493271, 180846
RSW1_2	Farmer		Wet deposition rate	493521, 179946
RSW1_3	Farmer		Air concentration (long term) and dry deposition rate	493521, 180396
RSW2_1	Farmer	Rural area to the south west of Windsor	Dry deposition rate	490671, 175046
RSW2_2	Farmer		Air concentration (long term), wet and dry deposition rate	491271, 174846
RSW2_3	Farmer		Air concentration (hourly)	493271, 174446
RW1_1	Farmer	Rural area to the west of Slough and north of Maidenhead	Air concentration (hourly)	490671, 184846
RW1_2	Farmer		Dry deposition rate	490671, 185246
RW1_3	Farmer		Air concentration (long term) and wet deposition rate	490671, 185446
SL_1	Resident	Slough	Air concentration (hourly)	495008.5, 181308.5
SL_3	Resident		Air concentration (long term) and dry deposition rate	495708.5, 181646
SP_1	Resident	Stoke Poges	Wet deposition rate	495921, 182646
SP_2	Resident		Air concentration (hourly)	495971, 182646
SP_3	Resident		Air concentration (long term) and dry deposition rate	496021, 182646
WBR_1	Farmer	Rural area around Wraysbury Reservoir	Air concentration (hourly)	502271, 175446
WBR_2	Farmer		Air concentration (long term), wet and dry deposition rate	502471, 175646
WR1_1	Farmer	Rural area to the west of Windsor and	Air concentration (hourly)	491471, 179046
WR1_2	Farmer		Air concentration (long term) and dry deposition rate	491671, 178446

Identifier	Hypothetical Receptor Type	Location	Description of Maximum Impact	OS coordinates
WR1_3	Farmer	south of Maidenhead	Wet deposition rate	492471, 177646
WR2_1	Famer	Rural area to the north, east and south of Windsor	Air concentration (long term) and dry deposition rate	494471, 178846
WR2_2	Farmer		Air concentration (hourly)	494871, 178646
WR2_3	Farmer		Wet deposition rate	495321, 179196
WSR_1	Famer	Rural area to the east of Windsor and Slough	Air concentration (hourly)	498271, 177846
WSR_2	Farmer		Wet deposition rate	498271, 178046
WSR_3	Farmer		Air concentration (long term) and dry deposition rate	500071, 178446
WU_1	Resident	Windsor	Air concentration (long term), wet and dry deposition rate	493271, 177246
WU_2	Resident		Air concentration (hourly)	494671, 177646

2.5 Exposure Assessment for Metals and Dioxin/Furans

Various world government bodies have set target levels and guideline values for exposure to a variety of inorganic metals and dioxins/furans in soil and air. The Department for Environment, Food and Rural Affairs (Defra) has developed soil guideline values (SGVs) using the Contaminated Land Exposure Assessment (CLEA) model[9]. This model takes into account a number of exposure pathways including; ingestion of soil and contaminated vegetables and inhalation of dust and vapours, in order to generate limit values in soil that are set at a level for the protection for human health. The predicted soil concentrations of inorganic metals and dioxins/furans can be compared to these values to assess the effect on human health from the emissions of the proposed facility.

The latest UK Total Dietary Study (TDS) in 2006[10] and 2001[11] conducted by the Food Standards Agency provided an estimate of the total dietary intake of metals and dioxins/furans for a range of receptors in a typical diet. The intake of metals and dioxins/furans attributed to the proposed facility can be compared to the intake experienced in a typical diet, as reported in the TDS, in order to assess the effect on human health.

A separate assessment of the contribution of Dioxins and Furans from the proposed facility to various food products has been made by comparison with the maximum levels specified by the European Commission[12]. The assessment within this report specifically reports results on dioxin and furan concentrations in milk and eggs, whereas food products are defined within the regulation as meat and meat products, fish, milk, eggs, oils and fats.

The World Health Organisation (WHO) and UK Committee on Toxicity (COT) have defined Tolerable Daily Intakes (TDI) for dioxins/furans of 1 to 4 pg I-TEQ kg-BW^{-1}d^{-1} and 2 pg I-TEQ kg-BW^{-1}d^{-1} respectively[13,14]. The units of the TDI are defined as picogrammes of the

[9] Environment Agency (2009) http://www.environment-agency.gov.uk/research/planning/33734.aspx - accessed on 25th August 2010
[10] FSA (2009) Measurement of the Concentrations of Metals and Other Elements from the 2006 UK Total Diet Study, Food Standards Agency January 2009
[11] FSA (2003) Dioxins and Dioxin-like PCBs in the UK Diet: 2001 Total Diet Study Samples, Food Standards Agency July 2003
[12] Commission Regulation 1881/2006, Setting of Maximum Levels for Certain Contaminants in Foodstuffs (19th December 2006)
[13] WHO (1998), Assessment of the Health Risk of Dioxins: Re-evaluation of the Tolerable Daily Intake (TDI), WHO Consultation, May 25-29 1998, Geneva, Switzerland
[14] COT (2001), Statement on the Tolerable Daily Intake for Dioxins and Dioxin like Polychlorinated Biphenyls, Committee on Toxicity, October 2001

International Toxic Equivalent per kilogram bodyweight per day. The predicted lifetime daily intake of dioxins/furans at each receptor associated with the proposed facility has been compared to the above TDIs in order to assess the health risks over the lifetime of a single receptor.

An additional exposure pathway considered in this assessment is the infant exposure to dioxins and furans via the ingestion of their mother's breast milk. This pathway is of particular importance as dioxin like compounds are extremely lipophilic (fat soluble) and could bioaccumulate in breast milk. In addition, the lower infant body weight means they will experience a disproportionately higher impact than in an adult from the same initial exposure. The HHRAP reports a national (U.S.) average background exposure level of 60 pg TEQ $kg^{-1}d^{-1}$ for all dioxins and furans in nursing infants. Predicted Average Daily Dose (ADD) associated with the proposed facility for each of the infant receptors is compared to this background exposure level in order to assess the impact on breast-fed infants from exposure to the sum of all dioxin/furans via ingestion of their mother's breast milk.

2.6 Method of Assessment for Non-Carcinogenic Effects

It is assumed that for most COPCs there is a threshold dose, below which no adverse effects will be observed. A reference dose is used to assess any potential health effects against exposure to COPCs exhibiting a threshold relationship. The reference dose (RfD) and reference concentration (RfC) represent a daily ingestion intake rate and a daily concentration in air respectively, at which there is no appreciable risk of adverse health effects. These reference values only identify the level below which effects are unlikely and they do not state anything about the risk for higher exposures. The reference dose and reference concentration for each COPC is provided in Table 6.

A Hazard Quotient (HQ) is used to assess the non-carcinogenic effects of emissions from the proposed facility on human health. This represents the potential to develop non-cancer health effects as a result of exposure to concentrations of COPCs. When assessing the level of exposure via the ingestion pathway the HQ is calculated as the Average Daily Dose (ADD) divided by the reference dose (RfD), as shown in equations (1) and (2) below.

$$HQ_{Ing,} = \frac{ADD_{Ing,}}{RfD_{Ing,}} \tag{1}$$

Where:

$$ADD_{Ing,} = \frac{I_{Ing,} \times ED \times EF}{AT \times 365} \tag{2}$$

Where: ADD_{Ing} = ingestion dose for COPC; ED is the exposure duration (dependent on the receptor type); EF is the exposure frequency (350 days per year); and AT is the averaging time (equal to ED for non-carcinogenic effects and 70 years for carcinogenic risks).

The HQ for the assessment of exposure via the inhalation pathway is calculated by dividing the exposure concentration by a reference concentration (RfC), as shown in equations (3) and (4) below.

$$HQ_{Inh} = \frac{EC}{RfC_{Inh}} \tag{3}$$

Where:

$$EC = \frac{C_a \times ED \times EF}{AT \times 365} \quad (4)$$

Where: EC is the exposure concentration of a COPC (µgm^{-3}), RfC_{Inh} is the reference concentration for a COPC (mgm^{-3}) and C_a is the concentration of the COPC in air.

If the daily intake is less than or equal to the reference dose, the hazard quotient would be less than or equal to 1 and this is considered to be a level that is protective of human health. A hazard quotient of greater than 1 would indicate the potential for non-carcinogenic human health effects.

A particular receptor has the potential to be exposed to multiple COPCs with non-carcinogenic effects. The total hazard quotient for all the COPCs exposed to a single receptor via one exposure pathway is defined by a Hazard Index (HI). The HI sums up all the individual hazard quotients from each COPC for a single pathway and assumes that the health effects from the emissions of the proposed facility are additive.

In addition, a receptor could be exposed to the health effects of COPCs via numerous exposure pathways. The total hazard index is the sum of the individual hazard indices for each exposure pathway relevant to that receptor. This generates a total non-carcinogenic life-time risk for each individual receptor encompassing the exposure experienced via all COPCs and all relevant pathways.

2.7 Method of Assessment for Carcinogenic Effects

Carcinogenic risks associated with exposure to the emissions from the proposed facility are calculated in terms of the excess lifetime risk of developing cancer. For each of the individual COPCs, the US EPA has calculated a Carcinogenic Slope Factor (CSF) for the ingestion exposure pathway and a Unit Risk Factor (URF) for the inhalation exposure pathway. The CSF represents an upper bound estimate of the carcinogenic risk for ingestion exposure to an individual COPC based on the dose-response relationship. The URF represents a similar linear dose-response relationship albeit for concentrations in the air.

The probability that an individual will develop cancer over a lifetime (excess life-time risk) as a result of a specific exposure to a certain carcinogenic COPC is calculated for the ingestion pathway using equation (5).

$$Risk_{Ing} = ADD_{Ing} \times CSF_{Ing} \quad (5)$$

Where ADD_{Ing} is the sum of the average daily dose from all ingestion exposure routes (mg/kg-day) and CSF is the cancer slope factor associated with ingestion exposure to a specific COPC (mg/kg-day)$^{-1}$.

The excess life-time risk of developing cancer associated with the inhalation of a specific COPC is calculated using equation (6).

$$Risk_{Inh} = EC \times URF_{Inh} \quad (6)$$

Where EC is the exposure concentration of a COPC (µgm^{-3}) and URF is the unit risk factor for inhalation exposure to a COPC (µgm^{-3}).

It is possible for a single receptor to be exposed to multiple COPCs within an individual pathway. Therefore the excess lifetime cancer risk for an exposure pathway is calculated as the sum of the cancer risks for individual COPCs for that pathway. Similarly a single receptor is at risk of being exposed to COPCs via multiple pathways. Therefore the total excess life time cancer risk for a single receptor is the sum of the total risk for all the individual exposure pathways relevant to that receptor.

2.8 Summary of Information

Inputs

The Chemicals of Potential Concern considered relevant to this assessment fall into the following three main classes: Dioxins/Furans; PAHs; and trace metals (including antimony, arsenic, cadmium, chromium (III) & (VI), mercury, lead and nickel).

Table 9 shows the exposure scenarios for the each of the generic receptor types recommended by the HHRAP. An exposure scenario is defined as the relevant exposure pathways for each receptor at a specific location.

The study specific pathways and receptors discussed in sections 2.3 and 2.4 have been selected and considered relevant based upon Table 9 below.

Table 9: Exposure Scenarios Recommended by the US EPA HHRAP for each Receptor Type

Exposure Pathway	Famer	Farmer Child	Resident	Resident Child
Inhalation of vapour and particulates	✓	✓	✓	✓
Incidental ingestion of soil	✓	✓	✓	✓
Ingestion of home grown produce	✓	✓	✓	✓
Ingestion of home grown beef	✓	✓	×	×
Ingestion of milk from home grown cows	✓	✓	×	×
Ingestion of home grown chicken	✓	✓	b	b
Ingestion of eggs from home grown chickens	✓	✓	b	b
Ingestion of home grown pork	✓	✓	×	×
Ingestion of breast milk	c	×	c	×

(a) acute receptor scenario evaluates short-term 1 hour maximum COPC air concentrations at any land use area that would support the other recommended exposure scenarios
(b) Site specific exposure setting characteristics (e.g. ponds on farm or presence of small livestock within residential areas) may warrant the consideration of this scenario
(c) Infant exposure to dioxins/furans via the ingestion of their mothers breast milk is evaluated as a separate exposure pathway

Outputs

This assessment considers the effects on the human health of the local population when exposed to emissions from the proposed facility by using a number of different methods. The

IRAP model calculates exposure concentrations and average daily doses experienced at each individual hypothetical receptor.

The exposure of receptors to metals and dioxin/furans from the proposed facility via concentrations in soil and in the diet of the local population is considered in this assessment by comparison to relevant standards and typical dietary values. The human health effects of the additional dioxin/furan concentrations associated with the emissions from the proposed facility are assessed by comparison with the TDI derived by the WHO and the UK COT. A separate exposure pathway is used to assess the infant exposure to dioxin/furans via the mother's breast milk by comparison to the US EPA background values.

In the assessment of the non-carcinogenic effects on human health a hazard quotient is calculated for each COPC for the ingestion and inhalation pathway by comparing the average dose received by a receptor to a reference dose, below which there is no appreciable risk of adverse human effects. A hazard index sums up the risk to human health experienced by a receptor to all the relevant COPCs via a single pathway and a total hazard index is calculated by combining the risks to all COPCs via all pathways.

Carcinogenic risk associated with exposure to the emissions from the proposed facility is calculated in terms of the excess lifetime risk of developing cancer at a single receptor for each COPC via the inhalation or ingestion pathway. This is done by multiplying the exposure concentration by a particular factor that takes into account the risk of developing cancer based on the dose response relationship for that COPC. The excess lifetime cancer risk for an exposure pathway at a single receptor sums up the risk associated with the exposure to all the relevant COPCs. The total excess lifetime risk of developing cancer at a single receptor takes into account the risks associated with all the relevant COPCs via all the relevant pathways.

3 RESULTS

3.1 Exposure Assessment

Metals

The maximum additional contribution to soil concentrations associated with the emissions of arsenic, cadmium, mercury, nickel and lead from the proposed facility, predicted at the resident and farmer receptors at the point of maximum impact in the study area are presented in Table 10 below. Values are also presented for the hypothetical resident SP_3 receptor as it is nearest resident type receptor in the Stoke Poges urban area to the maximally impacted farmer receptor in the study area.

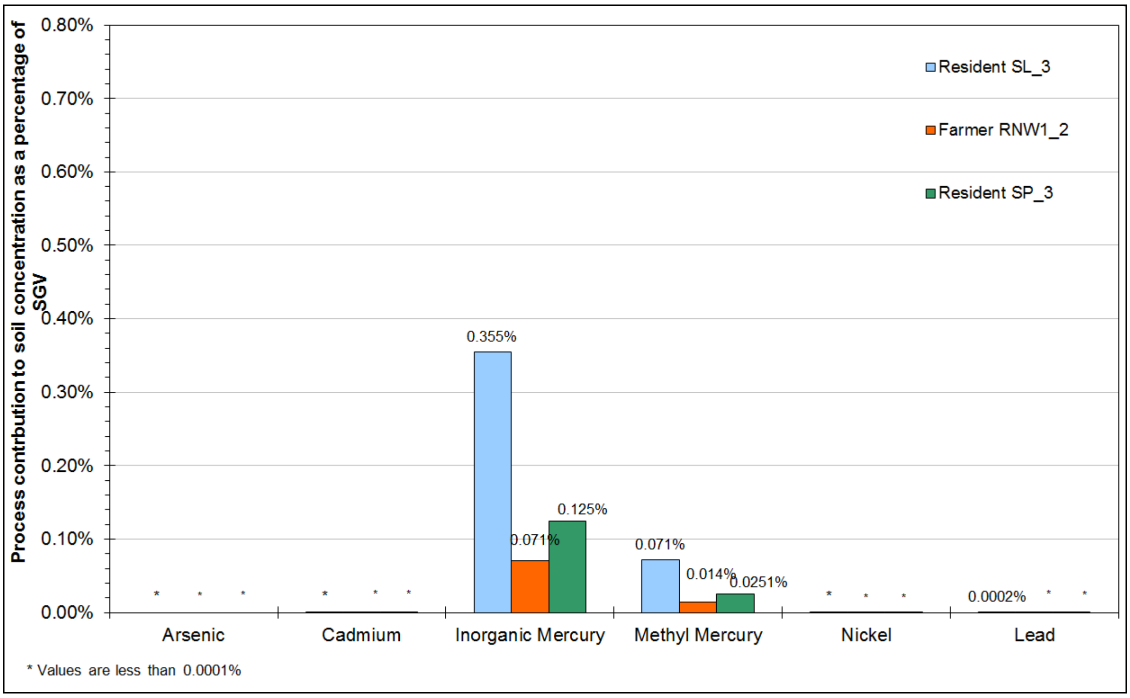
Table 10: Maximum Contribution to Trace Metal Concentrations in Soil associated with the Proposed Facility for the Resident and Farmer Receptor located at the point of Maximum Impact in the Study Area.

Metal	Resident SL_3 (mg kg^{-1})	Farmer RNW1_2 (mg kg^{-1})	Resident SP_3 (mg kg^{-1})	SGV (mg kg^{-1})[(a)]
Arsenic	4.80×10^{-09}	1.11×10^{-09}	1.83×10^{-09}	32
Cadmium	5.13×10^{-06}	1.19×10^{-06}	1.96×10^{-06}	1.8
Inorganic Mercury	2.84×10^{-01}	5.68×10^{-02}	9.99×10^{-02}	80
Methyl Mercury	5.71×10^{-03}	1.14×10^{-03}	2.01×10^{-03}	8
Nickel	1.5×10^{-05}	3.49×10^{-06}	5.72×10^{-06}	130
Lead	7.64×10^{-04}	1.78×10^{-04}	2.91×10^{-04}	450

A comparison of the predicted contribution to the soil concentrations associated with the proposed facility for each metal as a percentage of the most stringent SGV is presented in Figure 1.

The highest contribution to soil concentrations are predicted for inorganic mercury at the resident SL_3 location, as it is nearer the proposed facility and located in the downwind direction. The largest additional contribution to soil concentrations at the hypothetical farmer RNW1_2 receptor is also from inorganic mercury but are a factor of ten less than those predicted for the hypothetical resident SL_3 receptor. Contributions to the concentrations of inorganic mercury are predicted to be less than 0.4% of the SGV at the resident SL_3 location. All other predicted contributions to soil concentrations for arsenic, cadmium, methyl mercury, nickel and lead are less than 0.075% of the relevant SGV. These levels are significantly below the guideline values, and therefore represent a negligible contribution to soil concentrations of metals.

Figure 1: Predicted Maximum Contribution to Metal Concentrations in Soil as a Percentage of the Most Stringent SGV for Receptors Located at the Point of Maximum Impact



The predicted additional dietary intake of metals associated with the emissions from the proposed facility for the resident and farmer receptors types located at the point of maximum impact in the study area are shown in Table 11 below. The typical dietary intake of these substances obtained from the UK TDS in 2006[10] has been provided in Table 11 for comparison purposes.

Table 11: Dietary Intake of Metals Associated with the Proposed Facility for the Resident and Farmer Receptors located at the Points of Maximum Impact

Metal	Resident SL_3 (µg kg-BW^{-1} d^{-1})	Farmer RNW1_2 (µg kg-BW^{-1} d^{-1})	Resident SP_3 (µg kg-BW^{-1} d^{-1})	TDS Intake (µg kg-BW^{-1} d^{-1})$^{(a)}$
Arsenic	3.88 x 10^{-05}	1.97 x 10^{-05}	1.32 x 10^{-05}	1.65 - 1.68
Cadmium	6.45 x 10^{-04}	1.90 x 10^{-04}	2.20 x 10^{-04}	0.14 - 0.17
Chromium (b)	5.46 x 10^{-04}	1.24 x 10^{-03}	1.91 x 10^{-04}	0.28 - 0.37
Lead	6.47 x 10^{-03}	4.05 x 10^{-03}	2.21 x 10^{-03}	0.09 - 0.10
Mercury (c)	6.09 x 10^{-03}	2.62 x 10^{-03}	2.14 x 10^{-03}	0.02 - 0.05
Nickel	1.75 x 10^{-03}	3.58 x 10^{-03}	5.98 x 10^{-04}	1.49 - 1.63
Thallium	8.43 x 10^{-04}	4.69 x 10^{-03}	2.96 x 10^{-04}	0.011 - 0.012

(a) Mean exposure for an adult
(b) Total chromium (trivalent and hexavalent)
(c) Total mercury (organic and inorganic)

The hypothetical farmer receptor location (RNW1_2) would experience a greater impact on dietary intake of the metals (chromium, lead, nickel and thallium) emitted from the proposed facility, than would be experienced at any other location within the Borough of Slough or the wider study area. The greatest impact on the dietary intake of lead, mercury and cadmium would be experienced at the hypothetical resident receptor (SL_3). The impact on dietary intake varies in magnitude for each metal. The largest absolute change in dietary intake is predicted for the metal lead. The location SL_3 is representative of a hypothetical resident receptor whose main exposure pathway is via the ingestion of above ground vegetables and some incidental ingestion of soil. The dietary intake obtained from the TDS in 2006 is typical of intake rates of metals for adults in the UK population that obtain the majority of their food from retail stores. The maximum predicted intake at this location within the Borough of Slough (SL_3) can be considered conservative as it ignores the fact that most consumed food stuffs will be sourced from retail operations in the vicinity and as such represents a robust assessment of the impact of emissions from the proposed facility on daily intake rates.

The predicted maximum additional dietary intake for the hypothetical receptor scenarios can be compared to the typical dietary intake rates for each of the metals obtained from the UK TDS in 2006 listed in Table 11. For example the predicted additional dietary intake of lead in the maximum exposed hypothetical resident type receptor in Slough (SL_3) of 6.47 x 10^{-3}µg kg-BW^{-1}d^{-1} is markedly less than the equivalent typical dietary intake value of 9.0x10^{-2} – 1.0x10^{-1}µg kg-BW^{-1}d^{-1}. For mercury (both organic and inorganic) an additional dietary intake of 6.09 x 10^{-3}µg kg-BW^{-1}d^{-1} was predicted at the maximally impacted hypothetical resident type receptor in Slough (SL_3), while a typical dietary intake value of 2.0x10^{-2} - 5.0x10^{-2}µg kg-BW^{-1}d^{-1} was obtained from the UK TDS in 2006.

The maximum exposed hypothetical farmer type receptor (RNW1_2) would experience a greater impact on the dietary intake rate of each metal emitted from the proposed facility, than would be experienced at any other rural location within the study area. This receptor is a hypothetical receptor location and conservatively assumes that a significant proportion of the farmer's diet comes from home grown/reared food and animal produce. At this location the predicted maximum additional dietary intake of thallium for the hypothetical farmer RNW1_2 receptor scenario of 4.69x10^{-3}µg kg-BW^{-1}d^{-1} is less than the typical dietary value of 1.1x10^{-2} - 1.2x10^{-2}µg kg-BW^{-1}d^{-1} obtained from the UK TDS. The predicted additional dietary intake of mercury (both organic and inorganic) of 2.62x10^{-4}µg kg-BW^{-1}d^{-1} can be compared to the typical dietary values of 2.0x10^{-2} - 5.0x10^{-2}µg kg-BW^{-1}d^{-1} obtained from the UK TDS in 2006.

In practise the maximum impact on dietary intake of all metals at farmer type receptors would fall between the hypothetical scenario represented by RNW1_2 and the nearby hypothetical urban resident scenario for Slough (SL_3) and Stoke Poges (SP_3). The greater the proportion of shop bought food in the household diet of these receptors the closer the dietary intake values for these metals would be to the typical values presented in the UK TDS.

Dioxins/Furans

The maximum additional contribution to soil concentrations associated with the emissions of dioxins/furans from the proposed facility, predicted at the resident and farmer receptors located at the point of maximum impact in the study area, are presented in Table 12 below.

Table 12: Maximum Contributions to Soil Concentrations of Dioxins/Furnas associated with the Proposed Facility for the Resident and Farmer Receptors located at the point of Maximum Impact in the Study Area

COPC	Resident SL_3 (mg kg^{-1})	Farmer RNW1_2 (mg kg^{-1})	Resident SP_3(mg kg^{-1})	SGV (mg kg^{-1})[(a)]
Total PCDD/PCDF	3.22×10^{-7}	7.59×10^{-8}	1.27×10^{-7}	8

The largest additional contribution of dioxins and furans to soil concentrations associated with the proposed facility is predicted to occur at the hypothetical resident SL_3 scenario. This additional contribution to soil concentrations represents 0.0040% of the Soil Guideline Value for total dioxins and furans. All other additional contributions of dioxins and furans to the soil concentration at the other hypothetical farmer and resident receptor locations are predicted to be below 0.0015% of the Soil Guideline Value.

The additional contribution of the proposed facility to the concentrations of dioxins and furans in milk and eggs at the maximally impacted farmer receptors in each of the rural areas considered in this assessment are shown in Table 13.

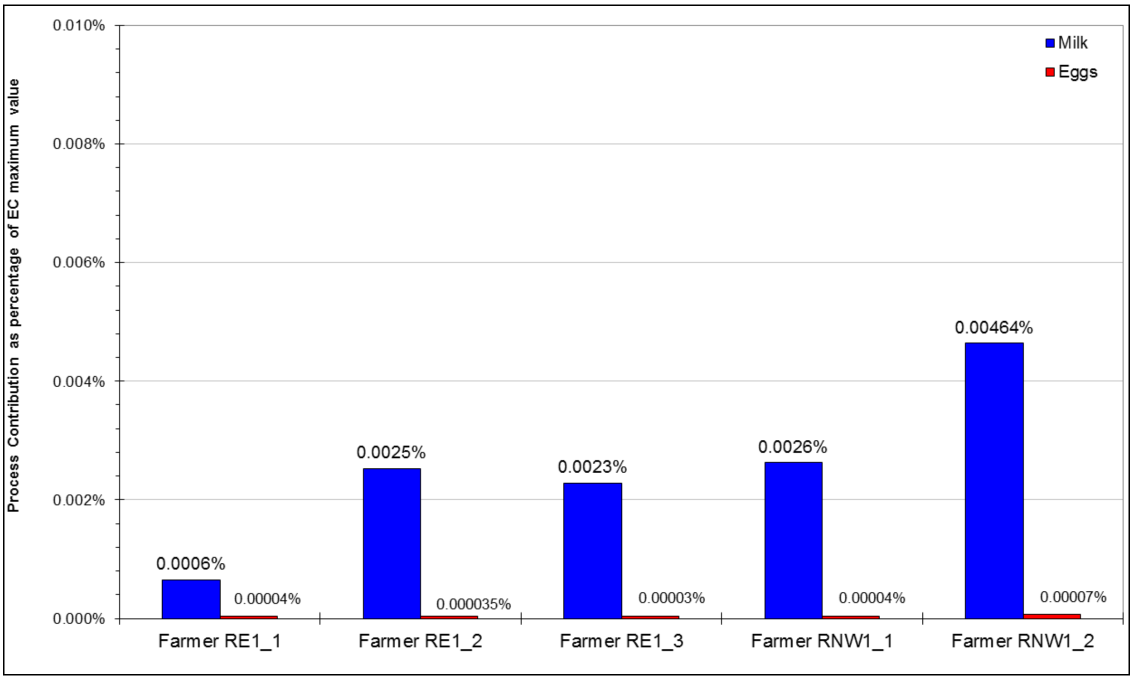
Table 13: Predicted Contributions to Dioxin/Furan Concentrations in Milk and Eggs associated with the Proposed Facility for the maximally predicted Farmer Receptors in each of the Rural Areas considered in this Assessment

Farmer Receptor	Concentration in Milk[(a)] (pg I-TEQ g^{-1} fat)	Concentration in Eggs[(b)] (pg I-TEQ g^{-1} fat)
Farmer RE1_1	1.94×10^{-05}	1.06×10^{-06}
Farmer RE1_2	7.58×10^{-05}	1.05×10^{-06}
Farmer RE1_3	6.86×10^{-05}	9.44×10^{-07}
Farmer RNW1_1	7.88×10^{-05}	1.25×10^{-06}
Farmer RNW1_2	1.39×10^{-04}	2.19×10^{-06}
Maximum Level[12]	3	3

(a) Assuming a fat content of milk of 3%
(b) Assuming a fat content of eggs of 12%

A comparison of the predicted additional dioxin/furan concentrations in milk and eggs associated with the proposed facility, as a percentage of the maximum European levels is presented in Figure 2.

Figure 2: Predicted Additional Dioxin/Furan Concentrations in Milk And Eggs as a Percentage of the Maximum European Permitted Levels at the Maximally Impacted Farmer Receptors



The largest additional contribution to the concentration of dioxins and furans in milk associated with the proposed facility is predicted to occur in the hypothetical farmer RNW1_2 scenario. This largest additional concentration represents less than 0.005% of the maximum European level. The largest additional contribution to the concentration of dioxin and furans in eggs is predicted to occur in the hypothetical farmer RNW1_2 scenario, which represents less than 0.00007% of the maximum permitted European level.

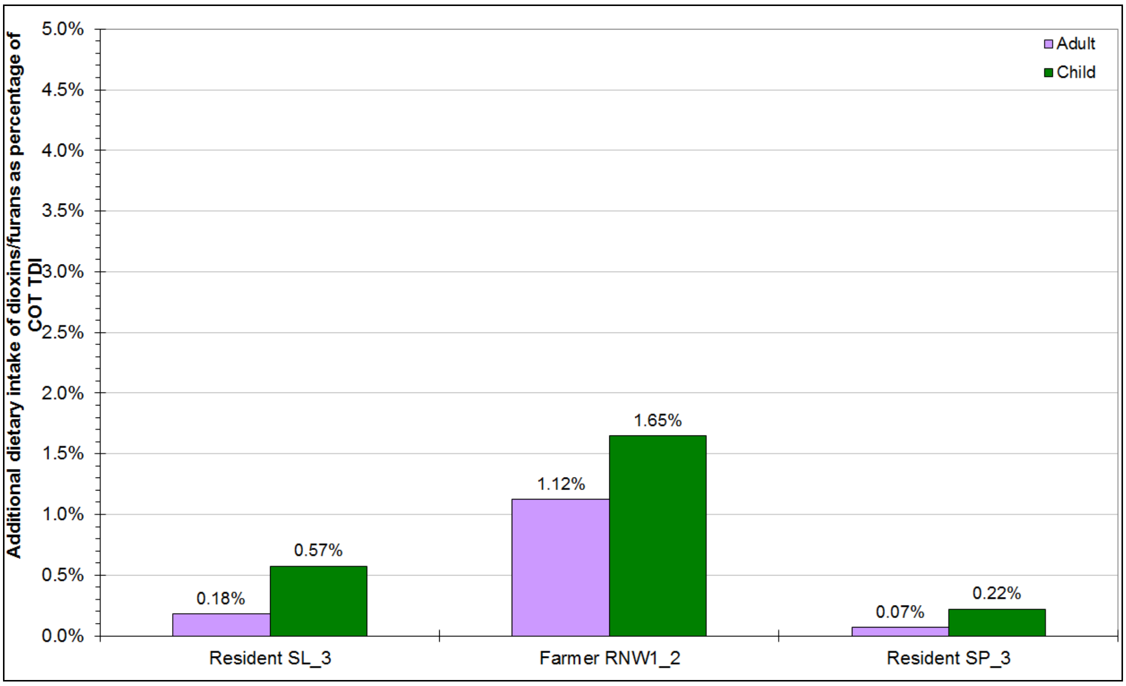
The additional average daily intake of dioxins and furans associated with the proposed facility over the lifetime of the resident and farmer receptors, located at the point of maximum impact in the study area, is shown in Table 14. These values are presented along with the WHO and COT tolerable daily intake values for comparison purposes.

Table 14: Average Daily Intake of dioxins/furans associated with the Proposed Facility for the Adult and Child of each Resident and Farmer Receptor, located at the point of Maximum Impact in the Study Area

Receptor	Adult (pg I-TEQ kg-BW^{-1} d^{-1})	Child (pg I-TEQ kg-BW^{-1} d^{-1})
Resident SL_3	0.0035	0.0114
Farmer RNW1_2	0.0225	0.0329
Resident SP_3	0.0013	0.0043
COT TDI[14]	2 pg I-TEQ kg-BW^{-1} d^{-1}	
WHO TDI[13]	1 to 4 pg I-TEQ kg-BW^{-1} d^{-1}	

The predicted additional average daily intake of dioxins and furans have been directed compared as a percentage of the COT TDI value, as shown in Figure 3.

Figure 3: Predicted Daily Intake of Dioxin/Furan for Receptors Located at the Point of Maximum Impact as a Percentage of the COT Tolerable Daily Intake

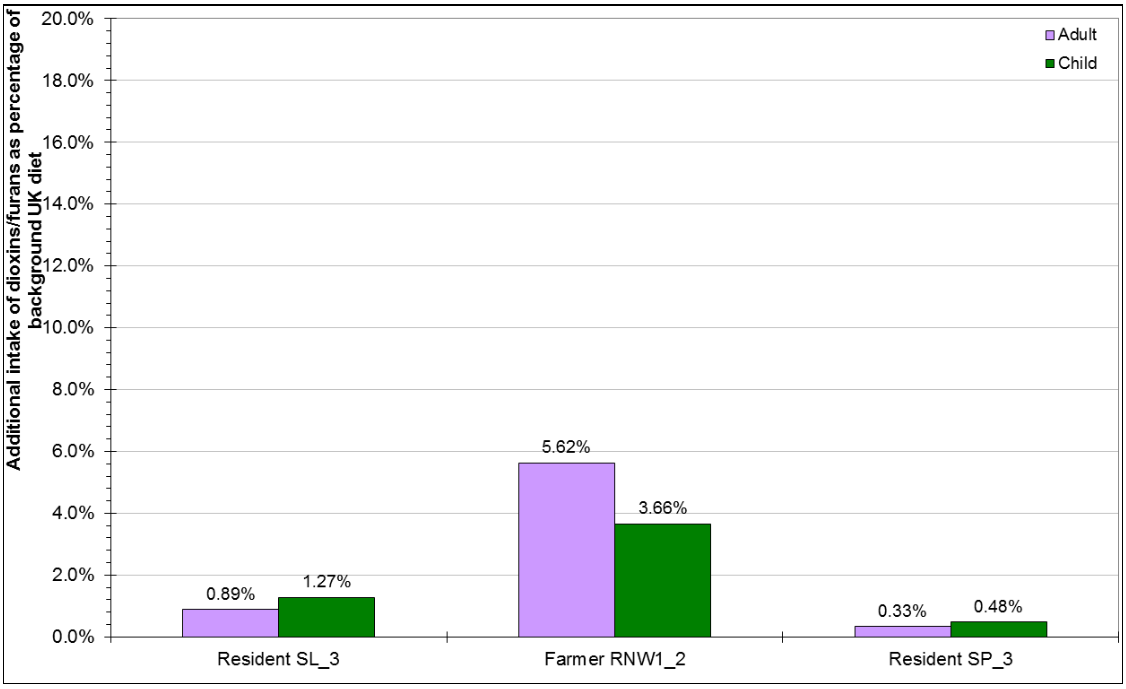


The total dioxins and furans associated with the proposed facility across all hypothetical receptor scenarios are predicted to contribute less than 2.0% of the COT TDI value. The hypothetical farmer's child receptor type (RNW1_2) is predicted to experience an impact that equates to 1.65% of the COT TDI value and the impact at all other child or adult receptors within the study area would be smaller in magnitude. The additional daily intake predicted at RNW1_2 for the Farmer's child receptor type is approximately 30 times smaller than the COT TDI value and the lower range value of the WHO TDI.

The additional daily intake of dioxins and furans in the hypothetical resident SL_3 scenario for the child receptor type is predicted to contribute a maximum of 0.57% of the COT TDI. The other hypothetical resident SP_3 scenario is predicted to contribute less than 0.22% to the COT TDI for both the adult and child receptor types. SL_3 and SP_1 are the nearest resident type receptors to the farmer RNW1_2 receptor and predicted impacts are approximately a factor of 3 less, for this receptor type that does not consume home grown meat.

The predicted additional average daily intake of dioxins and furans associated with the proposed facility over the lifetime of the same receptors identified above can also be compared to the typical dietary intake of these substances, as obtained from the UK TDS undertaken in 2001[11]. The predicted additional intake of dioxins and furans as a percentage of the typical UK dietary intake is presented in Figure 4.

Figure 4: Predicted Daily Intake of Dioxin/Furan for Receptors Located at the Point of Maximum Impact as a Percentage of UK Background Dietary Values



The most recently available data from the FSA have shown that dioxin and furan levels in the UK diet are declining. The analysis of the 2001 TDS samples for dioxin and furan concentrations have reported average daily intakes for adults and children (aged 4 – 6 years) of 0.4 and 0.9 pg kg-BW^{-1}day^{-1} respectively. This is a decrease from the 1997 values of 0.9 and 2.1 pg kg-BW^{-1}day^{-1} for an adult and child respectively.

The predicted additional dietary intake of dioxins and furans associated with the proposed facility represents less than 6% of the 2001 typical UK dietary values for all hypothetical receptor scenarios. The largest contributions to the typical dietary values are predicted to occur in the hypothetical farmer RNW1_2 scenario for the adult receptor type. The largest contribution to the typical dietary values of 1.27% and 0.89% are predicted to occur at the hypothetical SL_3 location for the child and adult receptor types respectively. At the nearest hypothetical resident receptor (SP_3) to Stoke Poges, the contribution from the operation of the proposed facility represents less than 0.5 % of the typical UK dietary intake values. These hypothetical resident receptors are the nearest to the farmer RNW1_2. This represents a significant reduction in values for a similar geographical location and reflects the conservative nature of the assessment for impacts on the rural community.

The predicted additional average daily dose of dioxins/furans associated with the proposed facility experienced by infants via their mother's breast milk for the resident and farmer receptor types, located at the point of maximum impact in the study area, is shown in Table 15.

Table 15: Additional Average Daily dose of Dioxins/Furans associated with the Proposed Facility for Infants via Exposure from their Mother's Breast Milk at the Resident and Farmer receptor types located at the Point of Maximum Impact in the Study Area.

Receptor	Average daily dose from breast feeding (pg I-TEQ kg^{-1} d^{-1})
Resident SL_3	0.0391
Farmer RNW1_2	0.2658
Resident SP_3	0.0147
US EPA Criteria	60
WHO Criteria	1 to 4
UK COT Criteria	2

The largest additional average daily dose (ADD) in an infant from breast feeding is predicted to occur in the hypothetical farmer RNW1_2 scenario, which represents less than 0.44% of the US EPA criteria value and less than 13.3% of the UK COT value. The corresponding additional ADD predicted in the hypothetical resident SL_3 and SP_3 scenario are approximately a factor of 10 and 20 respectively less than the ADD predicted in the farmer RNW1_2 scenario. The farmer receptor scenarios are assumed to consume locally grown and reared animal products, which are the most significant exposure route for dioxins and furans, whereas the resident scenario assumes a more varied and predominantly non local food source for its diet. The predicted additional ADDs for farmer receptor scenarios are therefore larger than those for resident scenarios as exposure to dioxins/furans mainly occurs through the food chain.

The predicted additional ADD for all the hypothetical receptor scenarios are below both the COT TDI value and the lower range of the WHO TDI value. The duration of exposure via the breast fed infant pathway to these additional ADD values is short, with the ADD over the lifetime of an individual significantly lower and similar to the values presented in Table 14.

3.2 Assessment of Non-Carcinogenic Effects

Non-Carcinogenic Effects by Receptor Type

The exposure concentrations experienced at the most sensitive receptors from emissions of each COPC associated with the proposed facility via inhalation and ingestion, represented by exposure concentrations and average daily doses respectively, are presented in Tables 16 to 18. The individual HQs, calculated for each COPC for each receptor using the method in section 2.6 by dividing the predicted exposure concentrations by reference concentrations, are also presented in the same tables below. In addition, the HI for each exposure pathway for all the COPCs along with the total HI for that receptor has been calculated.

Table 16: Summary of the Exposure Experienced by the Resident SL_3 Child Receptor for Each COPC Via Inhalation and Ingestion

COPC	Exposure Concentration ($\mu g\ m^{-3}$) Inhalation	Average Daily Dose ($mg\ kg^{-1}\ day^{-1}$) Ingestion	Hazard Quotient	
			Inhalation	Ingestion
Antimony	6.77×10^{-03}	2.09×10^{-09}	4.63×10^{-03}	5.00×10^{-06}
Arsenic	4.06×10^{-05}	9.33×10^{-08}	1.3×10^{-03}	2.98×10^{-04}
Cadmium	6.77×10^{-04}	1.55×10^{-06}	3.24×10^{-03}	3.72×10^{-03}
Chromium (III)	4.47×10^{-04}	1.44×10^{-06}	8.08×10^{-08}	9.24×10^{-07}
Chromium (VI)	9.33×10^{-06}	3.04×10^{-08}	1.12×10^{-03}	9.72×10^{-06}
Lead	6.77×10^{-03}	1.56×10^{-05}	4.33×10^{-03}	3.48×10^{-02}
Mercuric Chloride	3.25×10^{-04}	1.58×10^{-05}	2.84×10^{-04}	5.06×10^{-02}
Methyl mercury	-	6.84×10^{-07}	-	6.56×10^{-03}
Nickel	1.84×10^{-03}	4.22×10^{-06}	8.82×10^{-03}	2.02×10^{-04}
Thallium	6.76×10^{-04}	2.89×10^{-06}	2.41×10^{-03}-	3.61×10^{-02}-
2,3,7,8-TCDD	4.19×10^{-11}	2.35×10^{-13}	-	2.25×10^{-04}
HI for Exposure Pathway			6.77×10^{-03}	2.09×10^{-09}
Total Hazard Index			4.06×10^{-05}	

Table 17: Summary of the Exposure experienced by the Farmer RNW1_2 Child Receptor for each COPC via Inhalation and Ingestion

COPC	Exposure Concentration ($\mu g\ m^{-3}$) Inhalation	Average Daily Dose ($mg\ kg^{-1}\ day^{-1}$) Ingestion	Hazard Quotient	
			Inhalation	Ingestion
Antimony	1.19×10^{-03}	7.28×10^{-10}	8.14×10^{-04}	1.75×10^{-06}
Arsenic	7.13×10^{-06}	3.45×10^{-08}	2.28×10^{-04}	1.10×10^{-04}
Cadmium	1.19×10^{-04}	4.43×10^{-07}	5.70×10^{-04}	1.06×10^{-03}
Chromium (III)	7.84×10^{-05}	1.96×10^{-06}	1.42×10^{-08}	1.25×10^{-06}
Chromium (VI)	1.64×10^{-06}	4.13×10^{-08}	1.96×10^{-04}	1.32×10^{-05}
Lead	1.19×10^{-03}	7.89×10^{-06}	7.59×10^{-04}	1.76×10^{-02}
Mercuric Chloride	5.71×10^{-05}	5.31×10^{-06}	4.98×10^{-05}	1.70×10^{-02}
Methyl mercury	-	1.80×10^{-07}	-	1.73×10^{-03}
Nickel	3.23×10^{-04}	5.45×10^{-06}	1.55×10^{-03}	2.61×10^{-04}
Thallium	1.19×10^{-04}	5.52×10^{-06}	4.24×10^{-04}-	6.89×10^{-02}-
2,3,7,8-TCDD	7.35×10^{-12}	9.87×10^{-13}	-	9.46×10^{-04}
HI for Exposure Pathway			0.005	0.108
Total Hazard Index			0.112	

Table 18: Summary of the Exposure Experienced by the Resident SP_3 Child Receptor for Each COPC via Inhalation and Ingestion

COPC	Exposure Concentration ($\mu g\ m^{-3}$) Inhalation	Average Daily Dose ($mg\ kg^{-1}\ day^{-1}$) Ingestion	Hazard Quotient Inhalation	Hazard Quotient Ingestion
Antimony	2.23×10^{-03}	8.72×10^{-10}	1.53×10^{-03}	2.09×10^{-06}
Arsenic	1.34×10^{-05}	3.18×10^{-08}	4.27×10^{-04}	1.02×10^{-04}
Cadmium	2.23×10^{-04}	5.30×10^{-07}	1.07×10^{-03}	1.27×10^{-03}
Chromium (III)	1.47×10^{-04}	5.10×10^{-07}	2.66×10^{-08}	3.26×10^{-07}
Chromium (VI)	3.07×10^{-06}	1.07×10^{-08}	3.68×10^{-04}	3.43×10^{-06}
Lead	2.23×10^{-03}	5.32×10^{-06}	1.42×10^{-03}	1.19×10^{-02}
Mercuric Chloride	1.07×10^{-04}	5.56×10^{-06}	9.34×10^{-05}	1.78×10^{-02}
Methyl mercury	-	2.39×10^{-07}	-	2.30×10^{-03}
Nickel	6.06×10^{-04}	1.44×10^{-06}	2.91×10^{-03}	6.90×10^{-05}
Thallium	2.23×10^{-04}	1.04×10^{-06}	7.95×10^{-04}-	1.30×10^{-02}-
2,3,7,8-TCDD	1.38×10^{-11}	9.20×10^{-14}	-	8.83×10^{-05}
HI for Exposure Pathway			0.009	0.047
Total Hazard Index			0.055	

The HQs is a comparison of the predicted oral and inhalation exposure estimates to the reference dose and concentration values. US EPA guidance states that a total Hazard Index value of 1 or less represents a level of exposure below which no appreciable risk of adverse health effects, even to sensitive populations, over a 70 year time period would occur[5].

The largest HQs for the inhalation pathway are predicted for nickel in the resident and farmer hypothetical receptor scenarios, which represent approximately 25-30% of the total HI for that pathway. Larger HQs are predicted for the child type of receptor for both the farmer and resident receptor scenarios. The ingestion HQ for thallium is predicted to be the largest for the child farmer RNW1_2 receptor scenario out of all the hypothetical receptor scenarios and represents approximately 66% of the total HI for that exposure pathway. In the other resident hypothetical scenarios (SL_3 and SP_3) for the child receptor type, the largest HQ is predicted for inorganic mercury, which represents approximately 40% of the total HI for the ingestion exposure pathway at both locations. For the majority of COPCs the HQs predicted at the resident SP_3 receptor are approximately a factor of 10 less than those at the other receptor types.

Contributions to the hazard index for the ingestion exposure pathway are also predicted for cadmium and thallium. Antimony and lead are predicted to provide a contribution to the HI for the inhalation exposure pathway for each hypothetical receptor scenario.

Non-Carcinogenic Effects by Pathway

The HIs calculated for each exposure pathway, which takes into account the HQs for exposure to all COPCs via this pathway, for the most sensitive receptors are shown in Table 19.

Table 19: Summary of the Hazard Indices for each Exposure Pathway for the most Sensitive Receptors.

Pathway	HI for Resident SL_3 Child Receptor	HI for Farmer RNW1_2 Child Receptor	HI for Resident SP_3 Child Receptor
Inhalation	0.024	0.0040	0.0078
Ingestion of above ground vegetables	0.083	0.022	0.029
Ingestion of beef	-	0.0008	-
Ingestion of chicken	-	0.000047	-
Ingestion of drinking water	-	-	-
Ingestion of eggs	-	0.00006	-
Ingestion of fish	-	-	-
Ingestion of milk	-	0.138	-
Ingestion of pork	-	0.000013	-
Ingestion of soil	0.013	0.0026	0.0046
Total Hazard Index	0.120	0.043	0.041

The total HI for the hypothetical resident SL_3 child receptor scenario is approximately a factor of 3 larger than that of the farmer RNW1_2 child receptor scenario, located north of Slough and approximately 3 times larger than that of the resident SP_3 child, located in Stoke Poges. For both the hypothetical child resident receptor scenarios the largest non-carcinogenic risk occurs via the ingestion of above ground vegetables pathways, which represents approximately 60-70% of the total HI. The ingestion of food products and in particular the ingestion of above ground vegetables is predicted to be the largest non-carcinogenic pathway risk for the hypothetical child farmer receptor scenario, which represents more than 50% of the total HI.

The total HI for the resident SL_3 is approximately a factor of 3 larger than the nearest receptors (RNW1_2 and SP_3) indicating that the extra risk for the resident type of receptor occurs via the ingestion of locally grown vegetable products. The relative contribution of each pathway to the total hazard index value are consistent with experience in most studies. None of the total hazard index values determined in this study represents a significant effect.

Summary of Non-Carcinogenic Effects

The total Hazard Index for each receptor, which takes into account the cumulative risk for each COPC via each pathway, calculated by IRAP is presented in Table 20.

Table 20: Summary of the Total Hazard Index for Each Receptor

Receptor Name	Receptor Type	Total Hazard Index (HI)	Receptor Name	Receptor Type	Total Hazard Index (HI)
BCF_1	Resident Adult	0.0014	RSE1_2	Farmer Adult	0.0013
BCF_1	Resident Child	0.0027	RSE1_2	Farmer Child	0.0024
BCF_2	Resident Adult	0.0015	RSE1_1	Farmer Child	0.0020
BCF_2	Resident Child	0.0029	RSW1_1	Farmer Adult	0.0084
BNHM_1	Resident Adult	0.0039	RSW1_1	Farmer Child	0.0153
BNHM_1	Resident Child	0.0076	RSW1_2	Farmer Adult	0.0120
BNHM_2	Resident Adult	0.0030	RSW1_2	Farmer Child	0.0219
BNHM_2	Resident Child	0.0060	RSW1_3	Farmer Adult	0.0124
BNHM_3	Resident Adult	0.0033	RSW1_3	Farmer Child	0.0226
BNHM_3	Resident Child	0.0066	RSW2_1	Farmer Adult	0.0030
CSP_1	Resident Adult	0.0022	RSW2_1	Farmer Child	0.0056
CSP_1	Resident Child	0.0045	RSW2_2	Farmer Adult	0.0031
CSP_2	Resident Adult	0.0022	RSW2_2	Farmer Child	0.0056
CSP_2	Resident Child	0.0045	RSW2_3	Farmer Adult	0.0024
CSP_3	Resident Adult	0.0022	RSW2_3	Farmer Child	0.0043
CSP_3	Resident Child	0.0043	RW1_1	Farmer Adult	0.0017
GC_1	Resident Adult	0.0034	RW1_1	Farmer Child	0.0031
GC_1	Resident Child	0.0067	RW1_2	Farmer Adult	0.0018
GC_2	Resident Adult	0.0033	RW1_2	Farmer Child	0.0032
GC_2	Resident Child	0.0067	RW1_3	Farmer Adult	0.0018
GC_3	Resident Adult	0.0030	RW1_3	Farmer Child	0.0032
GC_3	Resident Child	0.0059	SL_1	Resident Adult	0.0118
MH_1	Resident Adult	0.0022	SL_1	Resident Child	0.0243
MH_1	Resident Child	0.0042	SL_3	Resident Adult	0.0613
MH_2	Resident Adult	0.0020	SL_3	Resident Child	**0.1202**
MH_2	Resident Child	0.0040	SP_1	Resident Adult	0.0207
RE1_1	Farmer Adult	0.0141	SP_1	Resident Child	0.0411
RE1_1	Farmer Child	0.0256	SP_2	Resident Adult	0.0208
RE1_2	Farmer Adult	0.0137	SP_2	Resident Child	0.0413
RE1_2	Farmer Child	0.0248	SP_3	Resident Adult	0.0209
RE1_3	Farmer Adult	0.0124	SP_3	Resident Child	**0.0413**
RE1_3	Farmer Child	0.0225	WBR_1	Farmer Adult	0.0017

Receptor Name	Receptor Type	Total Hazard Index (HI)	Receptor Name	Receptor Type	Total Hazard Index (HI)
RN1_1	Farmer Adult	0.0087	WBR_1	Farmer Child	0.0031
RN1_1	Farmer Child	0.0159	WBR_2	Farmer Adult	0.0018
RN1_2	Farmer Adult	0.0087	WBR_2	Farmer Child	0.0033
RN1_2	Farmer Child	0.0158	WR1_1	Farmer Adult	0.0056
RN1_3	Farmer Adult	0.0075	WR1_1	Farmer Child	0.0101
RN1_3	Farmer Child	0.0137	WR1_2	Farmer Adult	0.0059
RN2_1	Farmer Adult	0.0041	WR1_2	Farmer Child	0.0108
RN2_1	Farmer Child	0.0076	WR1_3	Farmer Adult	0.0053
RN2_2	Farmer Adult	0.0047	WR1_3	Farmer Child	0.0098
RN2_2	Farmer Child	0.0087	WR2_1	Farmer Adult	0.0058
RNE1_1	Farmer Adult	0.0057	WR2_1	Farmer Child	0.0106
RNE1_1	Farmer Child	0.0104	WR2_2	Farmer Adult	0.0051
RNE1_2	Farmer Adult	0.0048	WR2_2	Farmer Child	0.0093
RNE1_2	Farmer Child	0.0087	WR2_3	Farmer Adult	0.0052
RNE1_3	Farmer Adult	0.0040	WR2_3	Farmer Child	0.0095
RNE1_3	Farmer Child	0.0074	WSR_1	Farmer Adult	0.0030
RNW1_1	Farmer Adult	0.0132	WSR_1	Farmer Child	0.0055
RNW1_1	Farmer Child	0.0242	WSR_2	Farmer Adult	0.0032
RNW1_2	Farmer Adult	0.0234	WSR_2	Farmer Child	0.0058
RNW1_2	Farmer Child	**0.0429**	WSR_3	Farmer Adult	0.0034
RNW2_1	Farmer Adult	0.0019	WSR_3	Farmer Child	0.0062
RNW2_1	Farmer Child	0.0034	WU_1	Resident Adult	0.0022
RNW2_2	Farmer Adult	0.0019	WU_1	Resident Child	0.0044
RNW2_2	Farmer Child	0.0035	WU_2	Resident Adult	0.0020
RSE1_1	Farmer Adult	0.0011	WU_2	Resident Child	0.0039
Criterion		1.0			1.0

All of the Total Hazard Indices presented in Table 20 for each of the individual hypothetical receptor scenarios represent values that are approximately one order of magnitude lower than the reference dose at which there is an appreciable risk of non-carcinogenic health effects occurring over a 70 year lifetime.

The maximum predicted non-carcinogenic impact within an urban area would occur at the hypothetical receptor called SL_3 and the maximum predicted impact in a rural area would occur at the hypothetical receptor called RNW1_2. The hypothetical child resident type receptor (SL_3) and hypothetical child farmer type receptor (RNW1_2), which are located in the Slough urban area and the rural area north of Slough at the point of maximum deposition, have a total Hazard Index of 0.120 and 0.0429 respectively. These are approximately an order of magnitude lower than the reference dose (HI value of 1.0), at which there is an appreciable risk of non-carcinogenic health effects occurring over the lifetime of an individual. The risk of the operation of the proposed Facility resulting in non-carcinogenic health effects at locations within the Borough of Slough is low near the point of maximum impact and decreases to very low with increasing distance from the proposed facility.

Outside of the Borough of Slough, the total Hazard Index for the hypothetical resident's child type receptors in Stoke Poges (SP_3) of 0.0413 is a factor of approximately 25 less than the reference dose (HI value of 1.0) at which there is an appreciable risk of non-carcinogenic health effects occurring over the lifetime of an individual. This represents the impact on a maximum exposed hypothetical member of the nearby urban community in Stoke Poges. The total Hazard Index for the maximum exposed hypothetical farmer type receptor in the rural community to the east (RE1_1) is 0.0256 and a factor of approximately 40 less than the reference dose at which there is an appreciable risk of non-carcinogenic health effects occurring over the lifetime of an individual. The risk of the operation of the proposed facility resulting in non-carcinogenic health effects at any rural location or urban area outside the Borough of Slough and its nearby surrounding rural area is very low.

3.3 Assessment of Carcinogenic Effects

Carcinogenic Effects for each COPC

The exposure concentrations experienced at the most sensitive receptors from the emissions of each COPC associated with the proposed facility via inhalation and ingestion, represented by exposure concentrations and average daily doses respectively, are presented in Tables 21 to 23. The individual lifetime risk of developing cancer are also presented in the same tables below and are calculated for each COPC at each receptor using the method in section 2.7 by multiplying the predicted exposure concentrations by the relevant carcinogenic risk factor for inhalation and ingestion. In addition, the excess lifetime cancer risk for each exposure pathway encompassing all the COPCs and the total excess lifetime cancer risk for that receptor has been calculated.

Table 21: Summary of the Exposure Experienced by the Resident SL_3 Adult Receptor for each COPC via Inhalation and Ingestion

COPC	Exposure Concentration ($\mu g\ m^{-3}$) Inhalation	Average Daily Dose ($mg\ kg^{-1}\ day^{-1}$) Ingestion	Lifetime Cancer Risk	
			Inhalation	Ingestion
Arsenic	4.06×10^{-05}	3.88×10^{-08}	7.17×10^{-08}	2.39×10^{-08}
Benzo(a)pyrene	1.35×10^{-06}	1.53×10^{-09}	6.12×10^{-10}	4.59×10^{-09}
Cadmium	6.77×10^{-04}	6.45×10^{-07}	5.00×10^{-07}	1.01×10^{-07}
Chromium (VI)	9.33×10^{-06}	1.10×10^{-08}	4.60×10^{-08}	-
Lead	6.77×10^{-03}	6.47×10^{-06}	3.34×10^{-08}	2.26×10^{-08}
Nickel	1.84×10^{-03}	1.75×10^{-06}	1.82×10^{-07}	-
Total dioxins/furans	-	2.58×10^{-12}	-	5.61×10^{-08}
Total Lifetime Risk for Exposure Pathway			8.34×10^{-07}	2.08×10^{-07}
Total Lifetime Risk for Receptor			1.04×10^{-06}	

Table 22: Summary of the Exposure Experienced by the Farmer RNW1_2 Adult Receptor for each COPC via Inhalation and Ingestion

COPC	Exposure Concentration ($\mu g\ m^{-3}$) Inhalation	Average Daily Dose ($mg\ kg^{-1}\ day^{-1}$) Ingestion	Lifetime Cancer Risk	
			Inhalation	Ingestion
Arsenic	7.13×10^{-06}	1.97×10^{-08}	1.68×10^{-08}	1.62×10^{-08}
Benzo(a)pyrene	2.38×10^{-07}	3.13×10^{-08}	1.43×10^{-10}	1.25×10^{-07}
Cadmium	1.19×10^{-04}	1.90×10^{-07}	1.17×10^{-07}	3.96×10^{-08}
Chromium (VI)	1.64×10^{-06}	2.52×10^{-08}	1.08×10^{-08}	-
Lead	1.19×10^{-03}	4.04×10^{-06}	7.81×10^{-09}	1.88×10^{-08}
Nickel	3.23×10^{-04}	3.58×10^{-06}	4.25×10^{-08}	-
Total dioxins/furans	-	2.06×10^{-11}	-	6.87×10^{-07}
Total Lifetime Risk for Exposure Pathway			1.95×10^{-07}	8.87×10^{-07}
Total Lifetime Risk for Receptor			1.08×10^{-06}	

Table 23: Summary of the Exposure Experienced by the Resident SP_3 Adult Receptor for each COPC via Inhalation and Ingestion

COPC	Exposure Concentration ($\mu g\ m^{-3}$) Inhalation	Average Daily Dose ($mg\ kg^{-1}\ day^{-1}$) Ingestion	Lifetime Cancer Risk	
			Inhalation	Ingestion
Arsenic	1.34×10^{-05}	1.32×10^{-08}	2.36×10^{-08}	8.16×10^{-09}
Benzo(a)pyrene	4.46×10^{-07}	5.62×10^{-10}	2.02×10^{-10}	1.68×10^{-09}
Cadmium	2.23×10^{-04}	2.20×10^{-07}	1.65×10^{-07}	3.44×10^{-08}
Chromium (VI)	3.07×10^{-06}	3.85×10^{-09}	1.52×10^{-08}	-
Lead	2.23×10^{-03}	2.21×10^{-06}	1.10×10^{-08}	7.71×10^{-09}
Nickel	6.06×10^{-04}	5.98×10^{-07}	5.98×10^{-08}	-
Total dioxins/furans	-	9.65×10^{-13}	-	2.10×10^{-08}
Total Lifetime Risk for Exposure Pathway			2.75×10^{-07}	7.29×10^{-08}
Total Lifetime Risk for Receptor			3.48×10^{-07}	

The largest predicted lifetime cancer risk via the inhalation exposure pathway is for cadmium for the hypothetical resident and farmer receptor scenarios. Exposure via inhalation of cadmium represents approximately 60% of the total lifetime cancer risk for exposure to all COPCs via the inhalation pathway for each hypothetical receptor.

For the hypothetical farmer receptor scenarios the largest contribution to the lifetime cancer risk via the ingestion exposure pathway is predicted to occur for the total dioxins/furans and benzo[a]pyrene. Taken together the exposure via ingestion to total dioxins/furans and benzo[a]pyrene represents over 85% of the total lifetime cancer risk via the ingestion pathway for the hypothetical farmer receptor type. The largest contribution to the lifetime cancer risk via the ingestion exposure pathway for the hypothetical resident receptor types is predicted to occur for cadmium. Exposure to cadmium via the ingestion pathway at these locations represents approximately 45% of the total lifetime cancer risk for this receptor via this pathway with contributions also occurring for total dioxins/furans.

Carcinogenic Effects for each Pathway

The total lifetime cancer risks calculated for each exposure pathway, which takes into account the risk for exposure to all COPCs via this pathway, for the most sensitive receptors are shown in Table 24.

Table 24: Summary of the Total Lifetime Cancer Risk for Each Exposure Pathway for the Most Sensitive Receptors

Pathway	Lifetime Risk for Resident SL_3 Adult Receptor	Lifetime Risk for Farmer RNW1_2 Adult Receptor	Lifetime Risk for Resident SP_3 Adult Receptor
Inhalation	8.34×10^{-07}	1.95×10^{-07}	2.75×10^{-07}
Ingestion of above ground vegetables	2.02×10^{-07}	7.74×10^{-08}	7.08×10^{-08}
Ingestion of beef	-	1.84×10^{-07}	-
Ingestion of chicken	-	4.36×10^{-10}	-
Ingestion of drinking water	-	-	-
Ingestion of eggs	-	2.83×10^{-10}	-
Ingestion of fish	-	-	-
Ingestion of milk	-	6.08×10^{-07}	-
Ingestion of pork	-	1.47×10^{-08}	-
Ingestion of soil	5.44×10^{-09}	1.92×10^{-09}	2.10×10^{-09}
Total Lifetime Risk	1.04×10^{-06}	1.08×10^{-06}	3.48×10^{-07}

The total lifetime cancer risk for the hypothetical farmer RNW1_2 receptor scenario is approximately 10% times larger than that of the resident SL_3 receptor and approximately 3 times larger than that of the other nearest resident SP_3 receptor, located outside of Slough. For both the hypothetical resident receptors the largest risk to carcinogenic health effects occurs via the inhalation exposure pathway. The inhalation exposure pathway represents approximately 80% of the total carcinogenic risk via all pathways for these receptors.

The ingestion of food products and in particular the ingestion of milk is predicted to be the exposure pathway with the largest risk of carcinogenic effects for the hypothetical farmer receptor scenario. This exposure pathway represents approximately 60% of the total overall carcinogenic risk via all ingestion exposure pathways for the farmer RNW1_2receptor scenario.

Summary of Carcinogenic Effects

The total lifetime cancer risk for each receptor, which takes into account the cumulative risk for each COPC via each pathway, calculated by IRAP is presented in Table 25.

Table 25: Summary of the Total Hazard Index for each Receptor

Receptor Name	Receptor Type	Total Lifetime Cancer risk	Receptor Name	Receptor Type	Total Lifetime Cancer Risk
BCF_1	Resident Adult	2.19 $\times10^{-08}$	RSE1_2	Farmer Adult	6.06 $\times10^{-08}$
BCF_1	Resident Child	5.99 $\times10^{-09}$	RSE1_2	Farmer Child	1.27 $\times10^{-08}$
BCF_2	Resident Adult	2.35 $\times10^{-08}$	RSW1_1	Farmer Adult	3.84 $\times10^{-07}$
BCF_2	Resident Child	6.41 $\times10^{-09}$	RSE1_1	Farmer Child	1.07 $\times10^{-08}$
BNHM_1	Resident Adult	6.54 $\times10^{-08}$	RSW1_1	Farmer Child	8.04 $\times10^{-08}$
BNHM_1	Resident Child	1.73 $\times10^{-08}$	RSW1_2	Farmer Adult	5.50 $\times10^{-07}$
BNHM_2	Resident Adult	4.81 $\times10^{-08}$	RSW1_2	Farmer Child	1.15 $\times10^{-07}$
BNHM_2	Resident Child	1.31 $\times10^{-08}$	RSW1_3	Farmer Adult	5.64 $\times10^{-07}$
BNHM_3	Resident Adult	5.36 $\times10^{-08}$	RSW1_3	Farmer Child	1.18 $\times10^{-07}$
BNHM_3	Resident Child	1.46 $\times10^{-08}$	RSW2_1	Farmer Adult	1.40 $\times10^{-07}$
CSP_1	Resident Adult	3.67 $\times10^{-08}$	RSW2_1	Farmer Child	2.94 $\times10^{-08}$
CSP_1	Resident Child	9.91 $\times10^{-09}$	RSW2_2	Farmer Adult	1.41 $\times10^{-07}$
CSP_2	Resident Adult	3.68 $\times10^{-08}$	RSW2_2	Farmer Child	2.96 $\times10^{-08}$
CSP_2	Resident Child	9.93 $\times10^{-09}$	RSW2_3	Farmer Adult	1.09 $\times10^{-07}$
CSP_3	Resident Adult	3.56 $\times10^{-08}$	RSW2_3	Farmer Child	2.30 $\times10^{-08}$
CSP_3	Resident Child	9.61 $\times10^{-09}$	RW1_1	Farmer Adult	7.80 $\times10^{-08}$
GC_1	Resident Adult	5.52 $\times10^{-08}$	RW1_1	Farmer Child	1.64 $\times10^{-08}$
GC_1	Resident Child	1.49 $\times10^{-08}$	RW1_2	Farmer Adult	8.15 $\times10^{-08}$
GC_2	Resident Adult	5.52 $\times10^{-08}$	RW1_2	Farmer Child	1.71 $\times10^{-08}$
GC_2	Resident Child	1.48 $\times10^{-08}$	RW1_3	Farmer Adult	8.19 $\times10^{-08}$
GC_3	Resident Adult	5.00 $\times10^{-08}$	RW1_3	Farmer Child	1.72 $\times10^{-08}$
GC_3	Resident Child	1.33 $\times10^{-08}$	SL_1	Resident Adult	1.80 $\times10^{-07}$
MH_1	Resident Adult	3.62 $\times10^{-08}$	SL_1	Resident Child	5.13 $\times10^{-08}$
MH_1	Resident Child	9.58 $\times10^{-09}$	SL_3	Resident Adult	1.04 $\times10^{-06}$
MH_2	Resident Adult	3.42 $\times10^{-08}$	SL_3	Resident Child	2.74 $\times10^{-07}$
MH_2	Resident Child	9.05 $\times10^{-09}$	SP_1	Resident Adult	3.44 $\times10^{-07}$
RE1_1	Farmer Adult	6.37 $\times10^{-07}$	SP_1	Resident Child	9.20 $\times10^{-08}$
RE1_1	Farmer Child	1.33 $\times10^{-07}$	SP_2	Resident Adult	3.46 $\times10^{-07}$
RE1_2	Farmer Adult	6.18 $\times10^{-07}$	SP_2	Resident Child	9.24 $\times10^{-08}$
RE1_2	Farmer Child	1.29 $\times10^{-07}$	SP_3	Resident Adult	3.48 $\times10^{-07}$
RE1_3	Farmer Adult	5.61 $\times10^{-07}$	SP_3	Resident Child	9.26 $\times10^{-08}$
RE1_3	Farmer Child	1.17 $\times10^{-07}$	WBR_1	Farmer Adult	7.94 $\times10^{-08}$

Receptor Name	Receptor Type	Total Lifetime Cancer risk	Receptor Name	Receptor Type	Total Lifetime Cancer Risk
RN1_1	Farmer Adult	3.99×10^{-07}	WBR_1	Farmer Child	1.67×10^{-08}
RN1_1	Farmer Child	8.37×10^{-08}	WBR_2	Farmer Adult	8.25×10^{-08}
RN1_2	Farmer Adult	3.97×10^{-07}	WBR_2	Farmer Child	1.73×10^{-08}
RN1_2	Farmer Child	8.32×10^{-08}	WR1_1	Farmer Adult	2.53×10^{-07}
RN1_3	Farmer Adult	3.43×10^{-07}	WR1_1	Farmer Child	5.30×10^{-08}
RN1_3	Farmer Child	7.19×10^{-08}	WR1_2	Farmer Adult	2.70×10^{-07}
RN2_1	Farmer Adult	1.91×10^{-07}	WR1_2	Farmer Child	5.65×10^{-08}
RN2_1	Farmer Child	4.01×10^{-08}	WR1_3	Farmer Adult	2.46×10^{-07}
RN2_2	Farmer Adult	2.18×10^{-07}	WR1_3	Farmer Child	5.17×10^{-08}
RN2_2	Farmer Child	4.59×10^{-08}	WR2_1	Farmer Adult	2.69×10^{-07}
RNE1_1	Farmer Adult	2.60×10^{-07}	WR2_1	Farmer Child	5.65×10^{-08}
RNE1_1	Farmer Child	5.44×10^{-08}	WR2_2	Farmer Adult	2.36×10^{-07}
RNE1_2	Farmer Adult	2.18×10^{-07}	WR2_2	Farmer Child	4.96×10^{-08}
RNE1_2	Farmer Child	4.57×10^{-08}	WR2_3	Farmer Adult	2.42×10^{-07}
RNE1_3	Farmer Adult	1.86×10^{-07}	WR2_3	Farmer Child	5.10×10^{-08}
RNE1_3	Farmer Child	3.90×10^{-08}	WSR_1	Farmer Adult	1.38×10^{-07}
RNW1_1	Farmer Adult	6.10×10^{-07}	WSR_1	Farmer Child	2.90×10^{-08}
RNW1_1	Farmer Child	1.28×10^{-07}	WSR_2	Farmer Adult	1.46×10^{-07}
RNW1_2	Farmer Adult	1.08×10^{-06}	WSR_2	Farmer Child	3.06×10^{-08}
RNW1_2	Farmer Child	2.27×10^{-07}	WSR_3	Farmer Adult	1.57×10^{-07}
RNW2_1	Farmer Adult	8.66×10^{-08}	WSR_3	Farmer Child	3.30×10^{-08}
RNW2_1	Farmer Child	1.82×10^{-08}	WU_1	Resident Adult	3.55×10^{-08}
RNW2_2	Farmer Adult	8.90×10^{-08}	WU_1	Resident Child	9.63×10^{-09}
RNW2_2	Farmer Child	1.87×10^{-08}	WU_2	Resident Adult	3.17×10^{-08}
RSE1_1	Farmer Adult	5.07×10^{-08}	WU_2	Resident Child	8.62×10^{-09}
Criterion		1.0×10^{-05}			1.0×10^{-05}

The largest carcinogenic risk within an urban area is predicted to occur at the hypothetical receptor called SL_3 adult and the maximum predicted impact in a rural area would occur at the farmer RNW1_2 adult receptor scenario. The additional total lifetime (70 year period) carcinogenic risks to health at these hypothetical receptors associated with the proposed facility are 1.04×10^{-6} for the resident SL_3 and 1.08×10^{-6} for the farmer RNW1_2. The additional total lifetime carcinogenic risk at the resident receptor SP_3 in the Stoke Poges urban area is 3.48×10^{-7}. Expressing these values in terms of a probabilistic risk estimate of developing cancer over the lifetime of an individual, results in a 1 in 960,154, a 1 in 923,958 and a 1 in 2,877,615 probability of developing cancer for the resident SL_3, farmer RNW1_2 and resident SP_3 receptors respectively. The risks of developing cancer over the lifetime of an individual are significantly smaller than the $1x10^{-5}$ (1 in 100,000) lifetime risk of developing cancer considered acceptable by the US EPA.

If these lifetime risks over a 70 year period are converted into annual risks of carcinogenic effects then the risk of developing cancer over a year becomes 1 in 67,210,754 for the resident SL_3, 1 in 64,677,077 for the farmer RNW1_2 and 1 in 201,433,052 for the resident SP_3. These probabilistic estimates of risk are significantly smaller than the annual risk of $1x10^{-6}$ (1 in 1,000,000), considered acceptable for industry within the UK[15].

3.4 Summary of Results

The assessment of health effects from exposure to metals and organic substances associated with the operation of the proposed facility reported the following:

- The contribution of emissions from the proposed facility to soil concentrations of each metal and the total dioxins/furans are low. The impacts represent an additional contribution of less than 0.4% of the respective soil guideline concentration values for metals and less than 0.004% of the soil guideline concentration values for total dioxins/furans.

- A relatively low additional dietary intake of metals and dioxins/furans, when compared to the typical dietary intake values, is predicted to be associated with the operation of the proposed facility. The predicted additional dietary intake of lead in the hypothetical resident SL_3 receptor scenario of $6.47x10^{-3}$ µg kg-BW^{-1}d^{-1} is markedly less than the equivalent typical UK dietary value of $9.0x10^{-2}$ – $1.0x10^{-1}$ µg kg-BW^{-1}d^{-1}. The additional dietary intake of total dioxins/furans is predicted to be <6% of typical UK dietary values, with the daily intake predicted to be <2% of the COT TDI value;

- A low additional exposure to total dioxins/furans of infants via their mother's breast milk is predicted. Additional daily intake values are predicted to be <0.5% of the US EPA criteria and <14% of the UK COT TDI value;

- The maximum predicted non-carcinogenic impact within an urban area would occur at the hypothetical receptor called SL_3 and the maximum predicted impact in a rural area would occur at the hypothetical receptor called RNW1_2. The location of these two receptors and other receptors predicted to experience smaller impacts are illustrated on Figure 1 within Annex A. These receptors represent locations with larger risks of non-carcinogenic health effects predicted to be associated with the operation of the proposed facility than at any of the other resident and farmer receptor scenarios. A range of chemicals of potential concern have been assessed and of these nickel, inorganic mercury and thallium are predicted as having the largest contribution to non-carcinogenic health effects via the inhalation and ingestion pathway. The exposure pathways predicted to contain the largest risk to non-carcinogenic health effects are the ingestion of home grown above ground vegetables for the hypothetical resident receptor and the hypothetical farmer receptor. The total hazard indices for these hypothetical receptors locations are predicted to be approximately a factor of 10 below the reference dose at which there is an appreciable risk of health effects occurring over a 70 year lifetime.

- The maximum predicted carcinogenic impact within an urban area would occur at the hypothetical receptor called SL_3 and the maximum predicted impact in a rural area would occur at the hypothetical receptor called RNW1_2. The hypothetical resident SL_3 receptor and farmer RNW1_2 receptor represent locations with larger risks to carcinogenic health effects predicted to be associated with the proposed facility than at any other of the other resident and farmer receptor scenarios. A range of chemicals of potential concern have been assessed and of these cadmium and total dioxins/furans are predicted as having the largest contribution to

[15] CIWEM (2001) Risk Assessment for Environmental Professional, CIWEM Publication, December 2001

carcinogenic health effects via the ingestion pathway. The largest risk of carcinogenic health effects is predicted to occur for cadmium via the inhalation exposure pathway in the hypothetical resident receptor scenarios. The ingestion of milk and inhalation are predicted to be the exposure pathways with the largest risk of carcinogenic health effects in the hypothetical farmer receptor scenarios. The total lifetime risk at these locations is a 1 in 960,154 and 1 in 923,958 risk of developing cancer over the entire lifetime of an individual receptor, which translates into an annual risk of 1 in 67,210,754 and 1 in 64,677,077 respectively. This is well within the acceptable annual risk of 1 in 1,000,000 for UK industrial operations15.

4 CONCLUSION

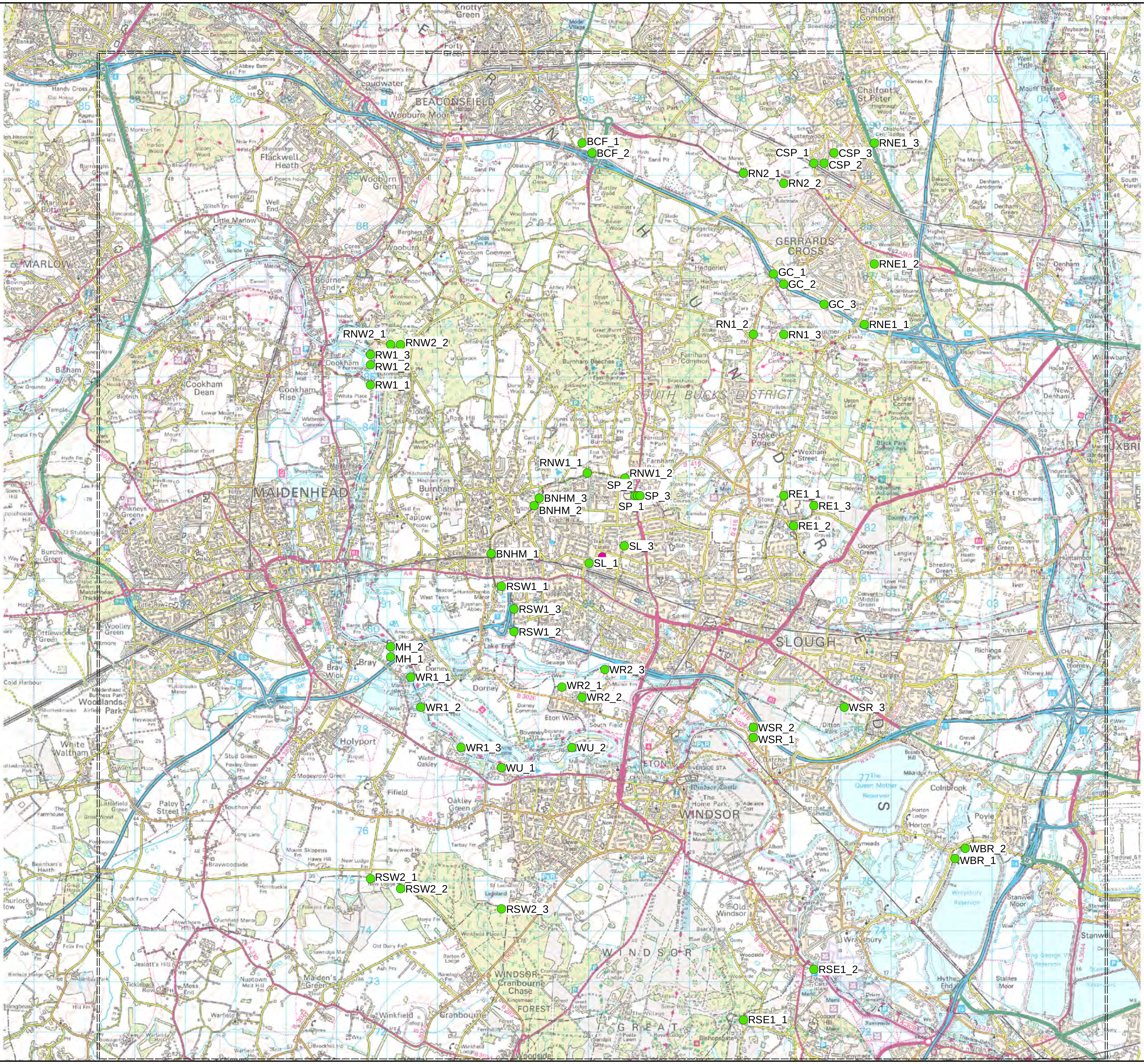
This assessment has quantified the risks to human health in the local population from exposure to various different chemicals of potential concern associated with the emissions of the proposed facility. The methodology used is consistent with the US EPA Human Health Risk Assessment Protocol5. The assessment has encompassed conservative assumptions regarding the exposure of a hypothetical individual receptor to the maximum concentrations of compounds of potential concern (COPCs) over the lifetime of an individual receptor and that a larger than average proportion of locally grown food is consumed. The COPCs emitted from the proposed facility have been identified, along with the exposure pathways of greatest concern and the potentially most sensitive hypothetical receptors within the vicinity. The commercially available human health risk assessment modelling tool IRAP and the results from the air dispersion modelling exercise have been used to calculate exposure concentrations and the risk of health effects at the most sensitive hypothetical receptors via the inhalation and ingestion pathways.

This assessment of the health effects from metals and organic substances has shown that there is not a significant risk to human health associated with emissions from the proposed facility via the inhalation and ingestion exposure pathway. The annual carcinogenic risks at the most sensitive receptor locations are predicted to achieve the UK industry acceptable annual risk of 1 in 1,000,000. The total non-carcinogenic risks for all COPCs via all exposure pathways predicted concentrations significantly below the reference dose and reference concentrations, at which there is an appreciable risk of health effects occurring. A relatively low dietary intake of metals and dioxins/furans is predicted to be associated with the proposed facility, when compared to the typical UK dietary intake values.

The assessment methodology has deliberately used assumptions to generate scenarios that will lead to robust estimations of the risk to human health. Such conservative assumptions include the duration and frequency of exposure to an individual i.e. they are assumed to live their entire lives in the area of maximum impact and that a significant portion of their diet is obtained from animal and vegetable products grown/reared in the local area where deposition occurs, whereas in reality it will originate from further afield. Taking into account the conservative nature of this assessment, it can be concluded with confidence that actual receptors within the Borough of Slough, or other communities would not be subject to a significant risk of carcinogenic and non-carcinogenic health effects from exposure to COPCs via the inhalation and ingestion pathways as a consequence of the proposed operation of the proposed facility.

ANNEX A

Figure 1 Receptor Locations



NOTES

- Receptor Locations
- Stack
- Model Domain

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Revision Details	By / Check	Check Date	Suffix

Purpose of Issue

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Project Title

Slough Multi-fuel

Drawing Title

Receptor Locations for Human Health Risk Assessment

Drawn	Checked	Approved	Date
MH	GG	GG	23/04/2014

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URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

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Figure 2.1	1

ANNEX B

Default values used within IRAP for selected site specific parameters

TABLE B1 DEFAULT VALUES WITHIN IRAP FOR SELECTED SITE SPECIFIC PARAMETERS USED AS PART OF THE HUMAN HEALTH RISK ASSESSMENT

Parameter	Parameter Value	IRAP Symbol	Units
Soil dry bulk density	1.5	bd	g cm^{-3}
Forage fraction grown on contam. soil eaten by CATTLE	1.0	beef_fi_forage	-
Grain fraction grown on contam. soil eaten by CATTLE	1.0	beef_fi_grain	-
Silage fraction grown on contam. eaten by CATTLE	1.0	beef_fi_silage	-
Qty of forage eaten by CATTLE each day	8.8	beef_qp_forage	kg DW day^{-1}
Qty of grain eaten by CATTLE each day	0.47	beef_qp_grain	kg DW day^{-1}
Qty of silage eaten by CATTLE each day	2.5	beef_qp_silage	kg DW day^{-1}
Grain fraction grown on contam. soil eaten by CHICKEN	1.0	chicken_fi_grain	-
Qty of grain eaten by CHICKEN each day	0.2	chick_qp_grain	kg DW day^{-1}
Average annual evapotranspiration	45.96	e_v	cm yr^{-1}
Fish lipid content	0.07	f_lipid	-
Fraction of CHICKEN's diet that is soil	0.1	fd_chicken	-
Universal gas constant	8.205×10^{-5}	gas_r	atm-m^3 mol^{-1} K^{-1}
Average annual irrigation	0	i	cm yr^{-1}
Plant surface loss coefficient	18	kp	yr^{-1}
Fraction of mercury emissions NOT lost to the global cycle	0.48	merc_q_corr	-
Fraction of mercury speciated into methyl mercury in produce	0.22	mercmethyl_ag	-
Fraction of mercury speciated into methyl mercury in soil	0.02	mercmethyl_sc	-
Forage fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_forage	-
Grain fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_grain	-
Silage fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_silage	-
Qty of forage eaten by MILK CATTLE each day	13.2	milk_qp_forage	kg DW d^{-1}
Qty of grain eaten by MILK CATTLE each day	3.0	milk_qp_grain	kg DW d^{-1}
Qty of silage eaten by MILK CATTLE each day	4.1	milk_qp_silage	kg DW d^{-1}
Averaging time	1	milkfat_at	yr
Body weight of infant	9.4	milfat_bw_infant	kg
Exposure duration of infant to breast milk	1	milkfat_ed	a
Proportion of ingested dioxin that is stored in fat	0.9	milkfat_f1	-
Proportion of mothers weight that is fat	0.3	milkfat_f2	-
Fraction of fat in breast milk	0.04	milkfat_f3	-
Fraction of ingested contaminant that is absorbed	0.9	milkfat_f4	-

TABLE B1 DEFAULT VALUES WITHIN IRAP FOR SELECTED SITE SPECIFIC PARAMETERS USED AS PART OF THE HUMAN HEALTH RISK ASSESSMENT

Parameter	Parameter Value	IRAP Symbol	Units
Half-life of dioxin in adults	2555	milkfat_h	day
Ingestion rate of breast milk	0.688	milkfat_ir_milk	kg day^{-1}
Viscosity of air corresponding to air temp.	1.81×10^{-04}	mu_a	g cm^{-1} s^{-1}
Average annual precipitation	65.6	p	cm yr^{-1}
Fraction of grain grown on contam. soil eaten by PIGS	1.0	pork_fi_grain	-
Fraction of silage grown on contam. soil and eaten by PIGS	1.0	pork_fi_silage	-
Qty of grain eaten by PIGS each day	3.3	pork_qp_grain	kg DW day^{-1}
Qty of silage eaten by PIGS each day	1.4	pork_qp_silage	kg DW day^{-1}
Qty of soil eaten by CATTLE	0.5	qs_beef	kg day^{-1}
Qty of soil eaten by CHICKEN	0.022	qs_chick	kg day^{-1}
Qty of soil eaten by DAIRY CATTLE	0.4	qs_milk	kg day^{-1}
Qty of soil eaten by PIGS	0.37	qs_pork	kg day^{-1}
Average annual runoff	6.57	r	cm yr^{-1}
Density of air	1.2×10^{-3}	rho_a	g cm^{-3}
Solids particle density	2.7	rho_s	g cm^{-3}
Interception fraction - edible portion ABOVEGROUND	0.39	rp	-
Interception fraction - edible portion FORAGE	0.5	rp_forage	-
Interception fraction - edible portion SILAGE	0.46	rp_silage	-
Ambient air temperature	298	t	K
Temperature correction factor	1.026	theta	-
Soil volumetric water content	0.2	theta_s	mL cm^{-3}
Length of plant expos. to depos. - ABOVEGROUND	0.16	tp	year
Length of plant expos. to depos. - FORAGE	0.12	tp_forage	year
Length of plant expos. to depos. - SILAGE	0.16	tp_silage	year
Dry deposition velocity	0.5	vdv	cm s^{-1}
Dry deposition velocity for mercury	2.9	vdv_hg	cm s^{-1}
Wind velocity	5.3	w	m s^{-1}
Yield/standing crop biomass - edible portion ABOVEGROUND	2.24	yp	kg DW m^{-2}
Yield/standing crop biomass - edible portion FORAGE	0.24	yp_forage	kg DW m^{-2}
Yield/standing crop biomass - edible portion SILAGE	0.8	yp_silage	kg DW m^{-2}
Soil mixing zone depth	2.0	z	cm
Soil mixing depth for produce	2.0	z_p	cm

ANNEX C

Default values used within IRAP for Receptor Specific Parameters

TABLE C1 DEFAULT VALUES WITHIN IRAP FOR RECEPTOR SPECIFIC PARAMETERS USED AS PART OF THE HUMAN HEALTH RISK ASSESSMENT

Parameter Description	Adult Resident	Child Resident	Adult Farmer	Child Farmer	Adult Fisher	Child Fisher	Units
Averaging time for carcinogens	70	70	70	70	70	70	year
Averaging time for noncarcinogens	30	6	40	6	30	6	year
Consumption rate of BEEF	0.0	0.0	0.00122	0.00075	0.0	0.0	Kg/kg-day FW
Body weight	70	15	70	15	70	15	kg
Consumption rate of POULTRY	0.0	0.0	0.00066	0.00045	0.0	0.0	Kg/kg-day FW
Consumption rate of ABOVEGROUND PRODUCE	0.00032	0.00077	0.00047	0.00113	0.00032	0.00077	Kg/kg-day FW
Consumption rate of BELOWGROUND PRODUCE	0.00014	0.00023	0.00017	0.00028	0.00014	0.00023	Kg/kg-day FW
Consumption rate of DRINKING WATER	1.4	0.67	1.4	0.67	1.4	0.67	L day^{-1}
Consumption rate of PROTECTED ABOVEGROUND PRODUCE	0.00061	0.0015	0.00064	0.00157	0.00061	0.0015	Kg/kg-day FW
Consumption rate of SOIL	0.0001	0.0002	0.0001	0.0002	0.0001	0.0002	kg day^{-1}
Exposure duration	30	6	40	6	30	6	year
Exposure frequency	350	350	350	350	350	350	day/year
Consumption rate of EGGS	0.0	0.0	0.00075	0.00054	0.0	0.0	Kg/kg-day FW
Fraction of contaminated ABOVEGROUND PRODUCE	1.0	1.0	1.0	1.0	1.0	1.0	-
Fraction of contaminated DRINKING WATER	1.0	1.0	1.0	1.0	1.0	1.0	-
Fraction contaminated SOIL	1.0	1.0	1.0	1.0	1.0	1.0	-
Consumption rate of FISH	0.0	0.0	0.0	0.0	0.00125	0.00088	Kg/kg-day FW
Fraction of contaminated FISH	1.0	1.0	1.0	1.0	1.0	1.0	-
Inhalation exposure duration	30	6	40	6	30	6	year
Inhalation exposure frequency	350	350	350	350	350	350	day/year
Inhalation exposure time	24	24	24	24	24	24	hrs/day
Fraction of contaminated BEEF	1	1	1	1	1	1	-
Fraction of contaminated POULTRY	1	1	1	1	1	1	-
Fraction of contaminated EGGS	1	1	1	1	1	1	-
Fraction of contaminated MILK	1	1	1	1	1	1	-
Fraction of contaminated PORK	1	1	1	1	1	1	-
Inhalation rate	0.83	0.30	0.83	0.30	0.83	0.30	m^3 hr^{-1}
Consumption rate of MILK	0.0	0.0	0.01367	0.02268	0.0	0.0	Kg/kg-day FW
Consumption rate of PORK	0.0	0.0	0.00055	0.00042	0.0	0.0	Kg/kg-day

TABLE C1 DEFAULT VALUES WITHIN IRAP FOR RECEPTOR SPECIFIC PARAMETERS USED AS PART OF THE HUMAN HEALTH RISK ASSESSMENT

Parameter Description	Adult Resident	Child Resident	Adult Farmer	Child Farmer	Adult Fisher	Child Fisher	Units
							FW
Time period at the beginning of combustion	0	0	0	0	0	0	year
Length of exposure duration	30	6	40	6	30	6	year

Appendix C-1

Transport Assessment

URS

Slough Multifuel CHP Facility

Transport Assessment

47066339

Prepared for:
SSE Generation Ltd

UNITED KINGDOM & IRELAND

REVISION SCHEDULE

Rev	Date	Details	Prepared by	Reviewed by	Approved by
1	September 2013	Draft	James McInnerny Graduate Transport Planner	Sean O'Connell Senior Transport Planner	Neil Titley Associate
2	May 2014	Update	James McInnerny Graduate Transport Planner	Sean O'Connell Senior Transport Planner	Neil Titley Associate

URS Infrastructure & Environment UK Limited
URS House, Horne Lane
Bedford
MK40 1TS
United Kingdom
Tel: +44 (0)1234 349 641
Fax: +44 (0)1234 216 268
[redacted]

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The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken between [insert date] and [insert date] and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

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Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

Where field investigations are carried out, these have been restricted to a level of detail required to meet the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in issuing this Report.

Costs may vary outside the ranges quoted. Whilst cost estimates are provided for individual issues in this Report these are based upon information at the time which can be incomplete. Cost estimates for such issues may therefore vary from those provided. Where costs are supplied, these estimates should be considered in aggregate only. No reliance should be made in relation to any division of aggregate costs, including in relation to any issue, site or other subdivision.

No allowance has been made for changes in prices or exchange rates or changes in any other conditions which may result in price fluctuations in the future. Where assessments of works or costs necessary to achieve compliance have been made, these are based upon measures which, in URS' experience, could normally be negotiated with the relevant authorities under present legislation and enforcement practice, assuming a pro-active and reasonable approach by site management.

Forecast cost estimates do not include such costs associated with any negotiations, appeals or other non-technical actions associated with the agreement on measures to meet the requirements of the authorities, nor are potential business loss and interruption costs considered that may be incurred as part of any technical measures.

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1 INTRODUCTION

1.1 Background

1.1.1 This Transport Assessment has been prepared in support of a planning application by SSE Generation Ltd to Slough Borough Council (SBC) for the demolition and removal of redundant generating plant and buildings and the development of a multifuel combined heat and power (CHP) facility providing up to 50 megawatt (MW) gross electrical capacity and up to 20 MW of heat.

1.1.2 The Proposed Development Site is located on the existing Slough Heat and Power (SHP) site within the Slough Trading Estate, 342 Edinburgh Avenue, Slough, SL1 4TU. A site location plan is included as **Annex A** at the end of this report. The Proposed Development Site will occupy an area of approximately 1.9 hectare (ha) and is illustrated within **Annex B**.

1.1.3 Demolition and Construction at its peak will employ up to 500 workers on site, of which around 100 would be employed during initial enabling works. On average, there will be around 300 workers on site throughout the construction and commissioning periods. The operation of the Proposed Development is expected to generate an additional 20 staff onsite, which would bring the staffing levels part way back up to early 2013 levels (prior to the closure of the CFB boilers in March 2013).

1.2 Report Format

1.2.1 Following this introduction, Section 2 sets out details of the existing site conditions, access arrangements details of the surrounding highway networks and information on any recent pattern of accidents within the existing road network, based on publicly available accident data.

1.2.2 Section 3 includes details on facilities for public transport users, cyclists and pedestrians, while Section 4 provides a review of relevant transport policy at the national and local levels. Section 5 presents the performance of the existing road network.

1.2.3 Section 6 presents the detailed development proposal.

1.2.4 An assessment of the committed developments in the vicinity of the site is outlined in Section 7, while Section 8 provides details of the impact of the demolition and construction phase of the Proposed Development.

1.2.5 Section 9 provides details of the impact of the Proposed Development once operational on traffic flows. It sets out the predicted trip generation and distribution, with an assessment of the impact of the Proposed Development on the surrounding highway network.

1.2.6 The Transport Assessment is concluded in Section 10.

2 EXISTING CONDITIONS

2.1 Site Description

2.1.1 The Proposed Development Site lies in the Thames Valley, approximately 4 kilometres (km) north of the River Thames within the SHP site in Slough Trading Estate in Slough, Berkshire. Windsor is approximately 5km south of the Proposed Development Site and Maidenhead is approximately 7km west of the Site.

2.1.2 The area surrounding the Site is occupied by various industrial, warehouse and retail businesses, both large and small, which is typical of much of the Trading Estate that covers an area of approximately 158ha.

2.1.3 The nearest residential properties are located approximately 200m north of the Proposed Development Site on Bodmin Avenue, with the nearest park and green space area, Kennedy Park, situated approximately 400m northwest of the Site.

2.2 Site Access

2.2.1 Existing vehicular access to the SHP site is via 8 principal points of access/egress. The vehicular access points include:

- An access point in the northwest of the Site adjacent to the Fibre Fuel building (Building 27 in Figure 4-1, *Chapter 4: Site Description, Project Alternatives and Evolution* of this ES) which has lockable gates and a barrier operated by security;
- Car access off Greenock Road, to the south of the Site;
- Car access off Harwich Road located immediately to the south of the package boiler in the southeast corner of the SHP site;
- HGV access from Harwich Road via a sliding gate activated by security. There is no exit from this route currently;
- Car access via 342 Edinburgh Avenue to the staff car park next to Building 20 in Figure 4-1;
- HGV exit for CFB deliveries to Edinburgh Avenue in the northeast of the Site, adjacent to the CFB boilerhouse (Building 17 on Figure 4-1, *Chapter 4: Site Description, Project Alternatives and Evolution* of this ES). This has an auto-activated sliding door;
- A manually activated roller shutter door used to enter the enclosure beneath the existing north stack from Edinburgh Avenue (next to Building 11 on Figure 4-1); and
- A manually operated gate to access the Cooling Tower compound for either small lorries or pedestrians located mid-point between the two towers along Edinburgh Avenue.

2.2.2 There are further access/egress points, including pedestrian access, on the SHP site, however these are not relevant to the Proposed Development and hence are not discussed further.

2.3 Local Road Network

2.3.1 The local roads mentioned in this section are illustrated in the Site Location Plan in **Annex A** at the rear of this report.

2.3.2 Greenock Road and Harwich Road are two access roads located south of the SHP site and leading to the SHP site in a north to south direction. These roads have sufficient width for HGVs. Cambridge Avenue runs from east to west through the industrial estate to the south of the Site and serves other units.

2.3.3 The northern boundary of the Site is formed by Edinburgh Avenue, which runs from west to east between Fairlie Road and A355 Farnham Road.

2.3.4 To the east of the Site is another industrial unit, which is bounded by Liverpool Road. Liverpool Road runs from Edinburgh Avenue in the north to the crossroads with Buckingham Avenue/Leigh Road in the south. Leigh Road continues south to the A4 Bath Road, but narrows to a single lane subject to traffic signals over the railway line.

2.3.5 To the south of the Site is Buckingham Avenue and this runs between Burnham Lane in the west and A355 Farnham Way in the east.

2.3.6 Fairlie Road is the western boundary of the SHP site and runs from Buckingham Avenue in the south, to the roundabout junction with Pevensey Road, where it becomes Chaffield, in the north. Chaffield then continues north, where a right turn can be taken on to Northborough Road, which also leads to the A355.

2.3.7 Edinburgh Avenue, Buckingham Avenue, Fairlie Road and Liverpool Road are all local distributor roads within the Slough Trading Estate and are wide enough to accommodate HGVs. They are all subject to a 30mph speed limit.

2.3.8 The A355 runs from north to south, approximately 700m east of the Proposed Development Site. In the vicinity of the Site it is called Farnham Road. This road terminates at Junction 6 of the M4, approximately 3km southeast of the Site. The A355 continues north to Junction 2 of the M40 (located 9.3km northwest of the Site) and then on to Amersham. There is a stretch of bus lane on the Farnham Road located to the south of the junction with Buckingham Avenue and there are plans to extend this.

2.3.9 The A4 runs from east to west approximately 500m south of the Site. The road starts in Avonmouth, to the west of Bristol, and continues past Bristol, Bath, Marlborough, Reading, Maidenhead and Slough, before terminating in Central London. The A4 provides a link road onto the M4 at Junction 7, 3.5km southwest of the Proposed Development.

2.3.10 The M4 starts in London and travels west past Slough, Reading, Swindon, Bristol, Newport Cardiff and Swansea. Additionally, the M40 links London to High Wycombe, Oxford, Banbury, Royal Leamington Spa and finally Birmingham. The close proximity of these key roads to the Site means that the Proposed Development is well placed in a location near to the capital. It should also be noted that London Heathrow Airport is only approximately an 18km drive to the east of the Site via the M4.

2.4 Accident Data Analysis

2.4.1 In order to examine the existing accident record, Personal Injury Accident (PIA) data was requested from Slough Borough Council for the highway network surrounding the Proposed Development Site.

2.4.2 The data covers the most recent available five year period at the time of writing, displaying accidents occurring between 1st January 2008 and 31st December 2013. In total there were 84 accidents recorded during this time, of which eight were classified as serious and the remaining seventy six were classified as slight in severity. There were no fatalities recorded during this time.

2.4.3 In order to examine the accident pattern, accident data has been analysed at the following locations:

- Buckingham Avenue;
- Cambridge Road/Fairlie Road junction;
- Edinburgh Avenue;

- Farnham Road/Buckingham Avenue junction;
- Farnham Road/Service Road junction;
- Farnham Road/Sheffield Road/Edinburgh Avenue junction;
- Leigh Road; and
- Leigh Road/ A4 Bath Road junction.

Buckingham Avenue

2.4.4 There were ten accidents that were classified as slight and two that were classified as serious along Buckingham Avenue. A summary of the accidents is provided in the table below.

Table 2-6: Summary of Accidents Occurring on Buckingham Avenue

Severity and Number	Light	Dark	Wet	Dry	Single Veh	Veh to Veh	Veh to Ped	Veh to Ped Cycle	Veh to M/cycle
Slight (10)	7	3	0	10	1	8	0	1	0
Serious (2)	1	1	0	2	0	1	0	0	1
Total (12)	**8**	**4**	**0**	**12**	**1**	**9**	**0**	**1**	**1**

2.4.5 There was one slight accident at the junction with Fairlie Road and Buckingham Avenue and this was a rear shunt in queuing traffic involving two cars.

2.4.6 There was one accident categorised as slight at the junction with Buckingham Avenue and Bradford Road that happened when a car hit another car in a turning movement, in dark conditions and fled the scene. A further serious accident happened when a minibus was driving at night with drunken youths on board. A window was smashed and a passenger fell out of the vehicle.

2.4.7 There were two accidents categorised as slight at the junction with Buckingham Avenue and Bestobell Road. The first of the accidents happened when a car misread another's manoeuvre in dark conditions and they collided. The second happened when a car turned left into the junction and hit a cyclist.

2.4.8 There was one slight accident at the junction with Falmouth Road and Buckingham Avenue when a car ran a red light and collided with another vehicle.

2.4.9 There was one serious accident at the junction with Hamilton Road and Buckingham Avenue that occurred when a car turned right into the path of a motorcycle. A further slight accident happened at this location when a speeding car on the main carriageway collided with a right turning vehicle at night.

2.4.10 There were three accidents categorised as slight at the Buckingham Avenue/Liverpool Road junction and all of these were in light and dry conditions. All three accidents involved two vehicles colliding during a turning movement.

2.4.11 The final slight accident on Buckingham Avenue happened at the junction with Yarmouth Road, when an HGV turned right and collided with a car.

Cambridge Avenue/Fairlie Road Junction

2.4.12 There were three slight accidents recorded at the Cambridge Road/Fairlie Road junction. A summary of the accidents is provided in the table below.

Table 2-7: Summary of Accidents Occurring at the Cambridge Road/Fairlie Road Junction									
Severity and Number	**Light**	**Dark**	**Wet**	**Dry**	**Single Veh**	**Veh to Veh**	**Veh to Ped**	**Veh to Ped Cycle**	**Veh to M/cycle**
Slight (3)	2	1	2	1	0	1	1	1	0
Total (3)	**2**	**1**	**2**	**1**	**0**	**1**	**1**	**1**	**0**

2.4.13 The first accident at this junction happened when a car failed to give way at the crossroads and collided with an HGV in dark and wet conditions. The second was when a car hit a pedestrian on a crossing while it was raining and the third was when a cycle turned right across the path of a car and collided.

Edinburgh Avenue

2.4.14 There were twenty-four accidents that were classified as slight and three that were classified as serious along Edinburgh Avenue. A summary of the accidents is provided in the table below.

Table 2-8: Summary of Accidents Occurring on Edinburgh Avenue									
Severity and Number	**Light**	**Dark**	**Wet**	**Dry**	**Single Veh**	**Veh to Veh**	**Veh to Ped**	**Veh to Ped Cycle**	**Veh to M/cycle**
Slight (24)	16	8	7	17	0	16	2	0	6
Serious (3)	2	1	0	3	0	0	0	2	1
Total (27)	**18**	**9**	**7**	**20**	**0**	**16**	**2**	**2**	**7**

2.4.15 There were two accidents at the junction with Fairlie Road and Edinburgh Avenue and the first of these was a serious incident when a pedal cyclist was cycling on the footway and collided with the give way sign at night. The second accident at this junction happened when a car hit another car, fled the scene, but was contacted as the number plate fell off. Another slight accident was recorded south of this junction on Fairlie Road when the driver of a stolen car performed a handbrake turn to avoid police and overturned.

2.4.16 There was one slight accident on Edinburgh Avenue 170m east of the junction with Montrose Avenue when a car skidded in wet weather and hit the rear of the car in front, before fleeing the scene. On Edinburgh Avenue, 280m west of Farnham Road, there was a slight accident when a drunk driver rear shunted another vehicle in dark and wet conditions. A slight accident occurred at a private driveway, 70m west of Bestobell Road, when a car failed to signal and collided with an HGV, which also hit a parked car. On Edinburgh Avenue, to the immediate west of the junction with Perth Avenue, a motorcycle doing a wheelie failed to see a car pull out of a driveway and hit it, resulting in a slight accident. At the junction with Montrose Avenue, a pedestrian stepped into the road and was hit by a wing mirror and at the junction with Stirling Road a car turned across the path of a taxi and they collided in dark and wet conditions. Both of these were recorded as slight accidents.

2.4.17 There were two serious accidents during the period under investigation at the junction with Edinburgh Avenue and Liverpool Road. The first was when a car travelling through signals at a temporary road works hit a cyclist at the side of the road and the second was when a motorcyclist hit the rear of a car and was thrown from his vehicle. There were also two slight accidents at this junction and one happened when a car failed to give way and hit a motorcycle that was overtaking another vehicle. Another was when a car failed to give way on a wet day and hit another car.

2.4.18 There were two slight accidents at the junction with Sykes Road when a car failed to give way, one hitting a motorcycle and the other a car and both of these happened on wet nights. Another slight accident at this junction involved a two-car collision in a turning movement.

2.4.19 There were four slight accidents at the junction with Edinburgh Avenue and Perth Avenue and the first of these was at night when a car pulled into the path of a speeding vehicle and, in avoiding this vehicle, has hit a third car. The speeding car fled the scene. There was another slight accident at night when a car failed to give way and hit an oncoming car while turning right. Of the final two accidents at this junction, the first was when a car turning left failed to see motorcycle and collided and the second when a van failed to give way and hit a car. The taillight fell off the van and hit a stationary motorcyclist.

2.4.20 Seven accidents were recorded as slight in nature at the Edinburgh Road/Bestobell Road junction. The first of these involved a drunk driver drifting across the road at night into an oncoming car and another happened on a wet night when a car overtook a vehicle, failed to give way and collided with a car on the junction. Two accidents happened when cars collided during a turning movement, one when a car failed to give way and hit a motorcycle and another when a car hit a five-year-old child and fled the scene. The final slight accident at this junction occurred when a car failed to give way and hit another car, lost control and hit a third car, before overturning.

Farnham Road/Buckingham Avenue Junction

2.4.21 There were five accidents classified by SBC as slight and two as serious at the junction with A355 Farnham Road and Buckingham Avenue. A summary of the accidents is provided in the table below.

Table 2-9: Summary of Accidents Occurring at the Farnham Road/Buckingham Avenue Junction

Severity and Number	Light	Dark	Wet	Dry	Single Veh	Veh to Veh	Veh to Ped	Veh to Ped Cycle	Veh to M/cycle
Slight (5)	2	3	2	3	0	4	0	0	1
Serious (2)	0	2	0	2	0	2	0	0	0
Total (7)	**2**	**5**	**2**	**5**	**0**	**6**	**0**	**0**	**1**

2.4.22 Both serious accidents in the table above happened in dark conditions and the first was when a car overtaking another car moved to the wrong side of the road and hit an oncoming vehicle. The second happened when a drunk driver overtook a car, moved to the wrong side of the road and hit an oncoming vehicle.

2.4.23 Two slight accidents happened when a car hit the rear of another and fled the scene. One of these was in dark conditions. There was one three-car rear shunt at the traffic lights in dark and wet conditions and another two-car rear shunt when on a light and dry day.

2.4.24 The final slight accident at this junction was when a motorcycle ran a red light and hit a car on a wet night.

Farnham Road/Service Road Junction

2.4.25 There were three accidents recorded as slight by Slough Borough Council at the junction with Farnham Road and the Service Road. A summary of the accidents is provided in the table below.

Table 2-10: Summary of Accidents Occurring at the Farnham Road/Service Road Junction

Severity and Number	Light	Dark	Wet	Dry	Single Veh	Veh to Veh	Veh to Ped	Veh to Ped Cycle	Veh to M/cycle
Slight (3)	3	0	0	3	0	0	1	1	1
Total (3)	**3**	**0**	**0**	**3**	**0**	**0**	**1**	**1**	**1**

2.4.26 The first of these accidents happened when a car driver opened their door into a cyclist, who fell. The second happened when a car travelling south in the service road hit a pedestrian crossing the road. Both accidents were in light and dry conditions. The final accident happened when a motorcycle overtook a car and the car gave a misleading signal and hit the motorbike.

Farnham Road/Sheffield Road/Edinburgh Avenue Junction

2.4.27 There were fourteen accidents recorded at the junction with A355 Farnham Road/Edinburgh Avenue/Sheffield Road. All of these accidents were classified as slight and a summary of the accidents is provided in the table below.

Table 2-11: Summary of Accidents Occurring at the Farnham Road/Sheffield Road/Edinburgh Avenue Junction

Severity and Number	Light	Dark	Wet	Dry	Single Veh	Veh to Veh	Veh to Ped	Veh to Ped Cycle	Veh to M/cycle
Slight (14)	8	6	5	9	0	10	0	1	3
Total (14)	**8**	**6**	**5**	**9**	**0**	**10**	**0**	**1**	**3**

2.4.28 Three of the accidents in the table above involved motorcycles and the first of these occurred in wet conditions when a car hit a motorcycle during in a turning movement. A second happened when a car ran a red light and hit a motorcycle and a third was when a passenger fell from a motorbike as it pulled away from the junction.

2.4.29 There was one slight accident at this junction involving a pedal cycle, when a cyclist entered the carriageway from the pavement and was struck by a car.

2.4.30 Three accidents happened when cars ran a red light and hit another car. One of these was in dark conditions and another was during rain. There were a further three incidents when a vehicle failed to give way and hit a car during a turning movement, with the first of these in wet weather, the second in dark conditions and the third on a wet night.

2.4.31 There was a further accident when a taxi rear shunted a car in queuing traffic and another when a car hit a vehicle in the next lane and fled the scene during dark and wet conditions. The final two accidents at this junction both happened at night and the first was when a speeding car lost control and hit a taxi. The second happened when a police minibus on an emergency call ran a red light and was hit by a car travelling across the junction.

Leigh Road

2.4.32 There were six accidents categorised as slight at along Leigh Road during the study period. A summary of the accidents is provided in the table below.

Table 2-12: Summary of Accidents Occurring on Leigh Road

Severity and Number	Light	Dark	Wet	Dry	Single Veh	Veh to Veh	Veh to Ped	Veh to Ped Cycle	Veh to M/cycle
Slight (6)	5	1	3	3	1	3	0	2	0
Total (6)	5	1	3	3	1	3	0	2	0

2.4.33 There was one single vehicle accident 130m north of Argyll Avenue and this was when a car was travelling over the railway bridge and the driver got their foot caught under a mat and crashed. A second accident happened 50m north of the same junction when a car hit a cyclist and then fled the scene. There was one accident at the Argyll Avenue junction where a car turned across the path of an HGV and collided during dark and wet conditions.

2.4.34 There were three accidents at the junction with Leigh Road and Bedford Road. Two of these occurred when a car failed to give way and hit another car in wet conditions. On one of these occasions, the give way markings may have been worn away. The third slight accident at this junction was when a car failed to give way, hit another car and pushed that car into a cyclist.

Leigh Road/A4 Bath Road Junction

2.4.35 There were nine accidents classified as slight and one as serious at the junction with Leigh Road and the A4 Bath Road during the five-year study period. A summary of the accidents is provided in the table below.

Table 2-13: Summary of Accidents Occurring at the Leigh Road/A4 Bath Road Junction

Severity and Number	Light	Dark	Wet	Dry	Single Veh	Veh to Veh	Veh to Ped	Veh to Ped Cycle	Veh to M/cycle
Slight (9)	5	4	1	8	0	8	1	0	0
Serious (1)	1	0	0	1	0	0	0	0	1
Total (10)	**6**	**4**	**1**	**9**	**0**	**8**	**1**	**0**	**1**

2.4.36 The serious accident occurred when a taxi turned across the path of a motorcycle and they collided.

2.4.37 There was one slight accident involving a pedestrian and this happened when they crossed from behind a stationary vehicle on a dark night and were hit by a car.

2.4.38 All of the other eight slight accidents involved two-car collisions and the first was when two cars collided when the traffic signals were not working, the second when two cars collided in an overtaking manoeuvre and the third when a car failed to stop at a red light and hit another car. All three of these accidents happened at night.

2.4.39 There was one accident when a car went through the junction on amber signals and hit a car coming the other way on green and another when a car ran a red light and hit another vehicle. Of the final three accidents, one car pulled across the front of a stationary vehicle and collided, then fled the scene; another happened when two cars collided in a turning movement and a third was a two-car rear shunt due to sudden braking.

Accidents Involving HGVs and Vulnerable Road Users

2.4.40 As the focus of the transport study at the proposed development is on the HGVs accessing the site, HGV accidents have also been assessed separately. There were just four slight accidents involving HGVs across the entire network within the five years under investigation and a summary of the accidents is provided in the table below.

Table 2-14: Summary of Accidents Involving HGVs

Severity and Number	Light	Dark	Wet	Dry	Single HGV	HGV to Car	HGV to Ped	HGV to Ped Cycle	HGV to M/cycle
Slight (4)	2	2	2	2	0	4	0	0	0
Total (4)	**2**	**2**	**2**	**2**	**0**	**4**	**0**	**0**	**0**

2.4.41 In just one of the accidents in the table above was the HGV responsible for the accident. This happened at the Buckingham Avenue/Yarmouth Road junction when an HGV turned right and collided with a car. The other three accidents all involved a car crashing into an HGV and none of them were located outside of the site access.

2.4.42 It should also be noted that no HGV accidents involved vulnerable road users. This would suggest that there is little conflict between these modes of travel and HGVs, hence the potential effect of the additional HGVs on the road network on accidents has not been considered further in this Transport Assessment.

3 LOCAL SUSTAINABLE TRANSPORT FACILITIES

3.1 National Rail Services

3.1.1 Slough Rail Station is located approximately a 3.2km walk to the east of the Proposed Development Site and is operated by First Great Western. The station provides a direct link to destinations including London, Windsor, Reading and Oxford.

3.1.2 Ticket machines are available and a manned ticket office has opening times as follows:

- Monday - Friday 06:00 - 21:30
- Saturday 06:30 - 21:30
- Sunday 07:00 - 21:30

3.1.3 There is level access from the highway to both sides of the station, giving step free access to London Paddington (slow), Reading (fast) and Windsor services. Inter-platform access is restricted by use of a staff assisted barrow crossing and only across slow lines. A stepped footbridge is in use at the station.

3.1.4 Slough Rail Station Car Park has 615 spaces and is operated by APCOA Parking (UK) Limited. It is open 24 hours per day and disabled parking is free of charge (though wheelchair users may require assistance using car park equipment at this station).

3.1.5 Table 3-1 below shows the peak hour frequencies of services operating at Slough Rail Station.

Table 3-1: Peak Hour Frequency of Rail Services

Route	Frequency Per Hour					
	Mon–Fri		Sat		Sun	
	AM	PM	AM	PM	AM	PM
Reading – London Paddington – Slough – Windsor and Eton Central	3	4	2	3	-	-
Windsor and Eton Central- Slough – London Paddington- Reading	3	3	2	3	-	-
Windsor and Eton Central – Slough	-	-	-	-	1	3
Slough - Windsor and Eton Central	-	-	-	-	2	3
London Paddington – Slough – Reading – Oxford (Fast Services)	2	1	2	2	1	1
Oxford – Reading – Slough – London Paddington (Fast Services)	0	2	2	2	0	1

3.1.6 As can be seen from the table above, there are three trains per hour from Slough to London Paddington on a weekday morning peak, while in the evening peak hour there are 5 return services (one of which is a fast service). There are also regular services to Reading, Oxford and Windsor and Eton Central in both the AM and PM peak weekday hours and at weekends. This offers an attractive opportunity for Slough Rail Station to be utilised as a mode of travel for part of the journey to and from the Proposed Development Site.

3.1.7 Burnham rail station is a popular alternative for staff and visitors to the trading estate, as it avoids local traffic, is close to Site and connects to Slough. This station is located 1.9km to the west of the Site and is on the same line as Slough station. Services operate to Slough, Reading and Paddington from this station.

3.2 Bus Services

3.2.1 The nearest bus stops to the Site are located on Buckingham Avenue, south of the Proposed Development. These bus stops are located approximately 250m from the centre of the Site via Liverpool Road and approximately 550m away from the Site if utilising the access point nearest to Fairlie Road on Edinburgh Avenue. Both are sheltered and have seating.

3.2.2 There are four different services operating at these bus stops and the frequencies are displayed in the table below.

Table 3-2: Peak Hour Frequency of Bus Services

Bus Number	Route	Frequency Per Hour					
		Mon–Fri		Sat		Sun	
		AM	PM	AM	PM	AM	PM
1b	Slough - Britwell (Hoppas), via Slough Trading Estate	2	1	2	1	0	0
1b	Britwell - Slough (Hoppas), via Slough Trading Estate	2	2	2	2	0	0
2	Slough - Priory Estate - Burnham (Hoppas), via Slough Trading Estate & Whittaker Road	2	2	2	2	1	1
2	Burnham - Slough (Hoppas), via Whittaker Road & Slough Trading Estate	2	2	2	2	1	1
3	Slough-Cippenham-Trading Estate-Manor Park	2	2	2	1	0	1
4	Slough-Manor Park-Trading Estate-Cippenham	2	2	1	2	1	1

3.2.3 The above table clearly displays that there is an attractive frequency of bus services in the vicinity of the Site. These services provide interchanges with other sustainable transport modes and could thus form either part of or the entire journey to work.

3.3 Pedestrian Facilities

3.3.1 Cambridge Avenue has some designated pedestrian footways on both the north and south sides of the road, but these are heavily interspersed by loading bays, parking and access points for the industrial units on this road. Greenock Road has good, wide and even footways on both sides of the road between Cambridge Avenue and the gated entry. Harwich Road does not have any pedestrian facilities.

3.3.2 There are good, wide and evenly surfaced footways on both sides of Edinburgh Road, Fairlie Road and Liverpool Road for their entire length. Dropped kerbs are provided at all access roads and crossing points. A four way signalised crossing point is provided at the junction with Liverpool Road, Leigh Road and Buckingham Avenue, with dropped kerbs, tactile paving and central pedestrian refuge islands. Buckingham Avenue has footways the full length of the road on both sides, with dropped kerbs at crossing and access points.

3.3.3 Leigh Road provides the quickest pedestrian route to the A4 Bath Road. There are good, wide and even footways on both sides of Leigh Road between Buckingham Avenue and the junction with Malton Avenue/Bedford Avenue. South of this point there is only a footway on the western side and this is wide until the road provides a bridge over the railway line. At this point the road becomes single lane and the footway is extremely narrow. From approximately 50m north of the junction of Leigh Road/Argyll Avenue heading south to the A4 Bath Road, there are good wide and even footways on both sides of Leigh Road.

3.3.4 The A355 Farnham Road has good, wide and even footways on both sides of the road within the vicinity of the Site. Dropped kerbs and tactile paving are provided at pedestrian crossing points.

3.3.5 There is a continuous network of footways all the way to the rail station located 3.3km to the east of the Site via several possible routes. The bus stops on Buckingham Avenue can be easily reached on foot. The nearest crossing point to access the bus stop on the south side of Buckingham Avenue for westbound services is located at the junction with Buckingham Avenue/Fairlie Road/Falmouth Road. This is a signalised crossing located approximately 120m west of the bus stops.

3.3.6 An average walking speed of approximately 1.4 m/s is generally assumed for pedestrians at new developments. This equates to approximately 400m in five minutes or three miles per hour. With this in mind the rail station could be reached in less than 40 minutes and the bus stops on Buckingham Avenue could be reached in between 3 and 6.5 minutes from the centre of the Site, depending on the exit used. It is generally considered that journeys of 2km or less provide the best opportunity to encourage employees to travel to work on foot. Within this distance there are a number of residential areas.

3.4 Cycle Facilities

3.4.1 Slough's cycling strategy aims to:

- Improve facilities for cyclists
- Improve safety for cyclists
- Provide people with an alternative to the car for some journeys.

3.4.2 In turn this will help to:

- Reduce traffic congestion
- Improve the urban environment
- Promote good health and leisure opportunities.

3.4.3 Buckingham Avenue, Fairlie Road, Chaffield, Northborough Road and Dover Road all have cycle lanes or bus/cycle lanes on them. The A355 Farnham Road has a shared pedestrian/cycle path adjacent to the carriageway between the junction with Buckingham Avenue and the A4 Bath Road. The A4 Bath Road also has a shared pedestrian/cycle path adjacent to the carriageway between Dover Road to the west and the town centre in the east. A continuous cycle route is available to the rail station from the Site (this is with the exception of Edinburgh Avenue).

3.4.4 Cycle facilities within the vicinity of the Site link into the surrounding network to provide an attractive opportunity to promote cycling as a viable mode of transport to the Site. The map shows that the site is a little over 10 minutes cycle from the town centre and the rail station would be within a 10 minute cycle. Cycling could therefore form part of a wider journey utilising multiple modes.

3.4.5 It is generally considered that distances of less than 5km provide the best opportunities to replace single occupancy car journeys with cycle trips. With this in mind, the majority of Slough, Windsor, Burnham and some smaller villages are within 5km of the Site.

4 POLICY CONTEXT

4.1 National Planning Policy Framework

4.1.1 The Government introduced the National Planning Policy Framework (NPPF) in March 2012. The Framework brings the Government's planning policies for England into a single document and describes how it expects these to be applied. The purpose of the planning system is to contribute to the achievement of sustainable development.

4.1.2 The National Planning Policy Framework replaces previous planning policy statements and planning policy guidance notes. With respect to transport the most relevant document that has been replaced is Planning Policy Guidance 13 (Transport).

4.1.3 There are three dimensions to sustainable development: economic, social and environmental. These dimensions give rise to the need for the planning system to perform a number of roles:

- **An economic role** – contributing to building a strong, responsive and competitive economy, by ensuring that sufficient land of the right type is available in the right places and at the right time to support growth and innovation; and by identifying and coordinating development requirements, including the provision of infrastructure;
- **A social role** – supporting strong, vibrant and healthy communities, by providing the supply of housing required to meet the needs of present and future generations; and by creating a high quality built environment, with accessible local services that reflect the community's needs and support its health, social and cultural well-being; and
- **An environmental role** – contributing to protecting and enhancing our natural, built and historic environment; and, as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy.

4.1.4 At the heart of the NPPF is a presumption in favour of sustainable development, which the Government states should be seen as a golden thread running through both plan-making and decision-taking. The Framework identifies a set of core land-use planning principles that should underpin both plan-making and decision-taking. The most relevant to transport is that planning should, *"actively manage patterns of growth to make the fullest possible use of public transport, walking and cycling, and focus significant development in locations which are or can be made sustainable*".

4.1.5 In paragraph 29 of the NPPF the Government states that transport policies have an important role to play in facilitating sustainable development. It also states that the transport system needs to be balanced in favour of sustainable transport modes. In the following paragraph the document says that encouragement should be given to solutions which support reductions in greenhouse gas emissions and reduce congestion. Local Authorities are advised that in preparing Local Plans they should support a pattern of development which, where reasonable to do so, facilitates the use of sustainable modes of transport.

4.1.6 All developments that generate significant amounts of movement should be supported by a Transport Statement or Transport Assessment. Plans and decisions should take account of whether:

- The opportunities for sustainable transport modes have been taken up depending on the nature and location of the site, to reduce the need for major transport infrastructure;
- Safe and suitable access to the site can be achieved for all people; and
- Improvements can be undertaken within the transport network that cost effectively limit the significant impacts of the development. Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe.

4.1.7 In paragraph 35 of the NPPF guidance is given that plans should protect and exploit opportunities for the use of sustainable transport modes for the movement of goods or people. It then goes on to provide the following series of bullet points where developments should be located and designed where practical to:

- Accommodate the efficient delivery of goods and supplies;
- Give priority to pedestrian and cycle movements, and have access to high quality public transport facilities;
- Create safe and secure layouts which minimise conflicts between traffic and cyclists or pedestrians, avoiding street clutter and where appropriate establishing home zones;
- Incorporate facilities for charging plug-in and other ultra-low emission vehicles; and
- Consider the needs of people with disabilities by all modes of transport.

4.2 Local Policy

Local Development Documents

4.2.1 Local Development Documents collectively make up Slough Borough Council's (SBC) Local Development Framework (LDF). In addition to the Local Development Scheme, Statement of Community Involvement and the Annual Monitoring Report, the following Development Plan Documents (DPD) and Supplementary Planning Documents (SPD) have already been adopted by the council and form the current LDF. Supplementary Planning Documents are used to provide further detail to policies and proposals in a DPD.

Slough Local Development Framework, Core Strategy Development Plan Document (December 2008)

4.2.2 The Core Strategy is the overarching strategic policy document in the Local Development Framework. It sets out the key issues to be addressed, and how this will be achieved through the spatial vision, strategic objectives, spatial strategy and supporting policies for addressing the social, economic and environmental issues for development across the Borough. It will cover the period from April 2006 to March 2026. The Core Strategy also includes a framework for implementing and monitoring its policies.

4.2.3 As a major employment and retail centre Slough experiences significant in and out-commuting which leads to congestion, particularly in peak hours. If unconstrained, the level of traffic in Slough could increase by 20% over the plan period. This is, however, unlikely to happen because of the limited capacity of the road network which has meant that the amount of traffic in Slough has actually fallen slightly in the period from 2000 to 2005.

4.2.4 Core Policy 7 (Transport) states that all new development should reinforce the principles of the transport strategy as set out in the council's Local Transport Plan and Spatial Strategy, which seek to ensure that new development is sustainable and is located in the most accessible locations, thereby reducing the need to travel.

4.2.5 Development proposals will, either individually or collectively, have to make appropriate provisions for:

- Reducing the need to travel;
- Widening travel choices and making travel by sustainable means of transport more attractive than the private car;
- Improving road safety; and
- Improving air quality and reducing the impact of travel upon the environment, in particular climate change.

4.2.6 The Spatial Strategy recognises that not all development could or should take place in the town centre and that some other areas within the Borough need to change. An important part of the "spreading the benefits" part of the strategy is that selected areas outside of the town centre should also be regenerated. Parts of Britwell and the Slough Trading Estate are examples of such areas which would benefit from being redeveloped in a comprehensive, properly planned and coordinated manner. The scale of development in these areas will depend upon the existing and proposed accessibility of sites and the extent of any environmental constraints.

4.2.7 Developers will be encouraged to prepare master plans for the comprehensive redevelopment of areas such as the Heart of Slough, Queensmere/Observatory shopping centres and Slough Trading Estate.

4.2.8 As part of the "spreading the benefits" part of the Spatial Strategy, there will also be other selected regeneration projects, which will include Britwell, Slough Trading Estate and parts of Chalvey. These will be comprehensively planned to meet the diverse needs of the local community.

4.2.9 Slough Trading Estate, owned by SEGRO, is the largest Existing Business Area and provides around a quarter of all of the jobs in the Borough. As a result its continued success as an employment centre is of great importance to the local economy and the prosperity of the town as a whole. There has been a rolling program of refurbishment and redevelopment in the Trading Estate in recent years in order to ensure that it is able to accommodate modern business needs and continues to attract inward investment. This has been aided by the designation of the Trading Estate as a Simplified Planning Zone with its integrated transport strategy.

4.2.10 It is recognised that the Trading Estate will need to continue to evolve to serve the needs of knowledge-based industries. SEGRO is in the process of producing a master plan for the area which is intended to achieve this. The success of the Trading Estate is important to the Borough's sustainable development as it has the potential to retain and attract businesses, create jobs and offer opportunities for improving skills and training to local people. As a result it is proposed that Slough Trading Estate should be treated as a special case within the Core Strategy.

4.2.11 The council will also support the establishment of a transport hub within Slough Trading Estate as part of the Master Plan for the comprehensive regeneration of the Estate. It will also support improvements to Burnham railway station in order to increase its use for people commuting to the Trading Estate.

4.2.12 Any proposals for the regeneration of Slough Trading Estate will have to include an integrated transport package which will reduce reliance upon the private car and improve public transport. This could include the creation of a new local transport hub.

Slough Local Transport Plan

4.2.13 SBC has produced its second five year Local Transport Plan 2006 - 2011 (Doc.14). The vision for Slough's transport system aims to tackle problems such as congestion, air quality and make the transport structure more sustainable in the future. The three key themes for the vision are:

- A more balanced local transport system;
- An effective public transport hub serving both local and regional journeys and interchange; and
- Better public transport connectivity to and from Heathrow Airport and west London.

Local Plan

4.2.14 The Local Plan for Slough sets out policies to control development and to provide a framework for coordinating and directing development and several of the policies have been 'saved' in order to extend the life of selected Local Plan policies beyond September 2007. The Local Plan for Slough does not provide any notable additional advice relevant to transport.

Simplified Planning Zone

4.2.15 There has been a Simplified Planning Zone (SPZ) covering the majority of the Slough Trading Estate since 1995. The current scheme, adopted on 12 November 2004, provides the framework for regeneration and development on the Trading Estate until 2014.

4.2.16 The SPZ is implemented in partnership with SEGRO. A key addition in the current scheme is an integrated transport strategy, which helps ensure more sustainable travel to, from and within the estate. The power station, located on Edinburgh Avenue, constitutes a special type of use, which requires careful consideration. Existing planning control is therefore retained over the power station and all developments within its curtilage as defined by the sub-zone, where the provisions of the SPZ will not apply.

4.2.17 The current SPZ expires in November 2014, although SBC (with SEGRO) has produced a new draft SPZ for the Trading Estate (under consultation), which would run for a further 10 year period to 2024.

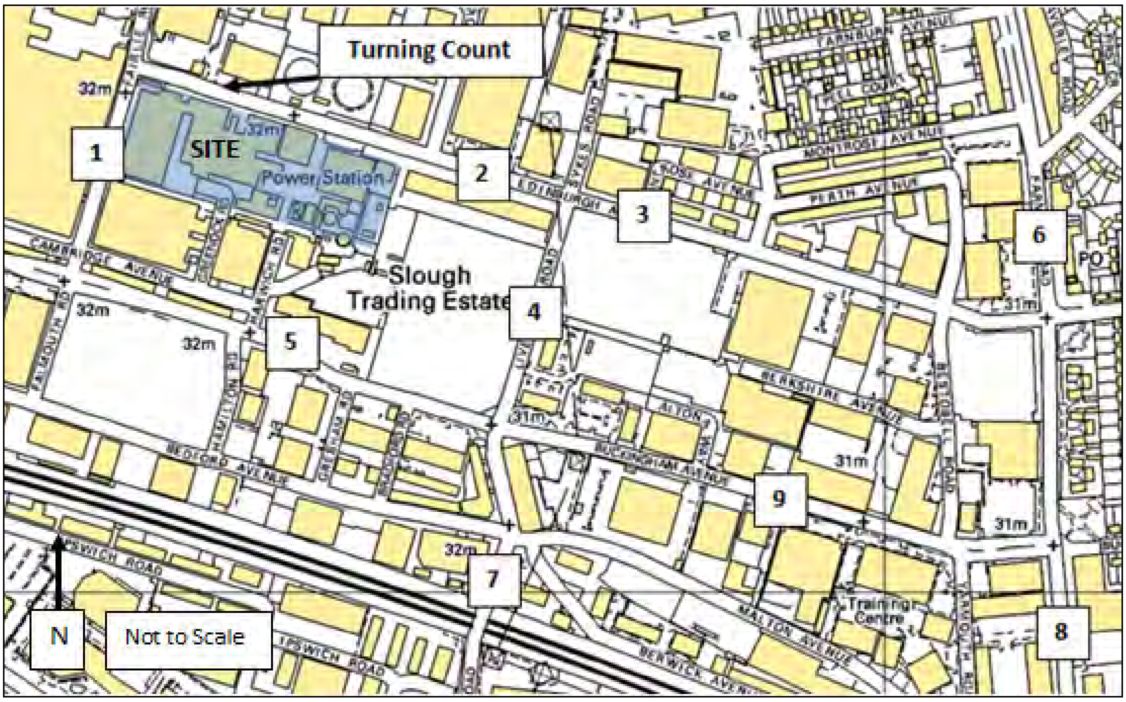
5 EXISTING TRAFFIC VOLUMES

5.1.1 In order to establish existing traffic volumes on the local network, a series of two-way Automatic Traffic Counts (ATCs) were carried out for a period of one week commencing on 8th June 2013 at the following nine locations:

1. Fairlie Road;
2. Edinburgh Avenue (west of Liverpool Road junction);
3. Edinburgh Avenue (east of Liverpool Road junction);
4. Liverpool Road;
5. Buckingham Avenue (west of Liverpool Road junction);
6. A355 Farnham Road (north of Edinburgh Avenue junction);
7. Leigh Road;
8. A355 Farnham Road (south of Buckingham Avenue junction); and
9. Buckingham Avenue (east of Liverpool Road junction).

5.1.2 The locations of the counts are shown in Figure 5-1 below.

Figure 5-1: Traffic Count Location Plan



5.1.3 From the results of the surveys the AM and PM peak hours were identified as 08:00-09:00 and 17:00-18:00 respectively. Daily average and peak hour traffic flow diagrams for the network are presented in **Annex C** as Figures 5-1, 5-2 and 5-3.

5.1.4 Peak hour and daily two-way traffic flows are presented in Table 5-1 below, for all ATC locations.

Table 5-1: 2013 ATC PEAK HOUR AND DAILY TWO-WAY TRAFFIC FLOWS						
	AM Peak		PM Peak		Daily	
ATC Location	Total Vehicles	HGV	Total Vehicles	HGV	Total Vehicles	HGV
Fairlie Rd	1068	13	1268	12	17542	253
Edinburgh Ave (west of Liverpool Road jctn.)	317	2	398	0	5533	57
Edinburgh Ave (east of Liverpool Road jctn.)	758	5	827	1	11792	90
Liverpool Rd	363	2	435	2	5236	44
Buckingham Ave (west of Liverpool Road jctn.)	739	12	665	7	10921	234
Farnham Rd (north of Edinburgh Ave jctn.)	1110	22	1263	19	21679	391
Leigh Rd	705	4	801	4	9393	86
Farnham Rd (south of Buckingham Ave jctn.)	1429	27	1378	22	25111	449
Buckingham Ave (east of Liverpool Road jctn.)	567	12	494	7	8625	182

5.1.5 In order to establish the current contribution to local traffic flows from the existing SHP site, a manual turning count was also undertaken at the main site access on Edinburgh Avenue (the exact location of this count can be seen in Figure 5-1 above). This survey was conducted over three 24-hour periods, on Monday 10th, Wednesday 12th and Friday 14th June 2013. Table 5-2 below shows the average number of HGVs entering and exiting the site on these days.

5.1.6 To provide a comparison, historic data from 2007 has also been presented as this provides the highest level of trips to the SHP site in recent years. The SHP site was fully operational at this time and traffic to/from the site was at a much higher volume. The data has been presented as daily traffic for arrivals and departures. It should be noted that the access operated well during this period of higher level of activity. This suggests that there is significant scope for additional capacity at the site as a result of the Proposed Development.

Table 5-2: COMPARISON OF CURRENT DEVELOPMENT TRAFFIC WITH HISTORICAL DEVELOPMENT TRAFFIC				
	2013		Maximum 2007	
Location	Daily HGV Arrivals	Daily HGV Departures	Daily HGV Arrivals	Daily HGV Departures
Edinburgh Avenue- Main Site Access	14	14	86	86

5.1.7 The above suggests that there is significant scope for additional capacity at the Site beyond current levels, since the closure of plant has resulted in a substantial decrease in HGV traffic to the wider SHP site since 2007.

5.1.8 The current traffic planning condition at SHP allows lorry deliveries to the SHP site 24/7 and an overall total of 126 deliveries per day (using Routes 1, 2 or 3). Night-time deliveries (23:00 to 07:00) are currently restricted by SBC to a maximum of 3 HGV deliveries per hour at the SHP site, using either Route 1 (between the M40 and Edinburgh Avenue) and/or Route 2 (between M4 Junction 6 and Dover Road), and with no deliveries allowed via Junction 7 of the M4 (i.e. Route 3 and part of Route 2, west of Dover Road) (see Figure 6-1).

5.1.9 The traffic modelling currently presents a worst-case assessment on the basis of deliveries occurring during peak hour traffic; the assessment is therefore likely to overestimate the actual effect on local traffic.

6 PROPOSED DEVELOPMENT

6.1 Development Proposal

6.1.1 The Proposed Development will require the demolition and removal of buildings housing redundant plant and ancillary infrastructure to enable the development of a multifuel combined heat and power facility, generating up to 50 MW of gross electrical output with up to 20 MW of heat to supply the existing heat network.

6.1.2 The Proposed Development will comprise of an enclosed tipping hall and fuel bunker, up to two furnaces where the fuel will be combusted and boiler unit(s) to raise steam, a turbine hall with a steam turbine to generate electricity, up to two Flue Gas Treatment (FGT) plants to clean the flue gas, and a new stack for discharge of cleaned flue gas (which would replace the existing south stack on the SHP site) or an extension to the existing south stack.

6.1.3 The plant will produce two types of by-product; a flue gas treatment residue (approximately 15,000 tonnes per annum (tpa)), which is likely to be collected in sealed HGVs from the secondary access on Edinburgh Avenue, and a wet bottom ash (approximately 80,000 tpa). Bottom ash generated in the boiler will be conveyed to an on-site storage system prior to being taken off-site in sheeted HGV's. This ash will be recycled where possible, or otherwise disposed of to an appropriately licensed landfill offsite.

6.1.4 The Proposed Development will have an estimated maximum capacity of 480,000 tpa of Waste Derived Fuel (WDF) including up to 4 days on site fuel storage capacity in a dedicated bunker. All WDF will be processed offsite and delivered to site by road using HGVs.

6.1.5 During the demolition and construction period, there is expected to be 24 abnormal load deliveries, some of which may occur during the peak month, and on average approximately 300 additional staff on site (500 during the peak month). Access/egress for staff will be using the south access/exit onto Buckingham Avenue during demolition/construction. Access/egress for HGV's will be mainly using the south access from Harwich Road or Greenock Road.

6.1.6 Once operational, staff levels will increase by 20 full-time equivalent staff, increasing the number of staff onsite to 51.5 full-time equivalent employees. This will increase numbers but is still below the levels in early 2013, prior to the closure of the CFB plant in March 2013.

6.1.7 During operation there will be a one-way system entering the site from Edinburgh Avenue in the northwest of the Site and exiting in the northeast corner of the Site back onto this road. Flue Gas Treatment residue may also be collected using a third exit/egress point, which is under the north stack, between the two mentioned other access points. This would enable the occasional HGV to back in and collect, then drive onto Edinburgh Avenue and into the site for weighing and then out again in the northeast of the Site.

6.1.8 At the main access point on Edinburgh Avenue, the entrance barrier will be relocated further into the Site to avoid queuing on the road due to HGVs protruding, and the access and the exit on Edinburgh Avenue will become yellow box junctions as part of the Proposed Development. This is in recognition of the fact that queuing sometimes occurs on Edinburgh Avenue. Using this box junction approach would prevent HGVs from being blocked while accessing/egressing the site and would therefore prevent further queuing at these junctions. **Annex D** of this report displays the HGV tracking exercise at these junctions which shows that both the access and egress are suitable for the proposed development use. Visibility at the exit junction has also been assessed so as to check the safety of vehicles leaving the site. This was checked as outlined in DfT's Design Manual for Roads and Bridges (DMRB), at a position of 2.4m back from the stop line. The assessment shows clear visibility to at least 90m in either direction from the exit junction.

6.1.9 Access to the two offices at 6 and 342 Edinburgh Avenue will also be retained, as well as the residue offloading enclosure under the north chimney which is also accessed from Edinburgh Avenue. The car access in the south east of the SHP site for workers accessing and leaving the site will also be retained. No upgrade works are anticipated along these access roads, and hence it is not considered necessary to include these roads within the Proposed Development site boundary, although the impact of all vehicular movements on these roads will be assessed as part of this report. No lorry access is anticipated from the south once the Proposed Development is operational, although emergency access will be retained.

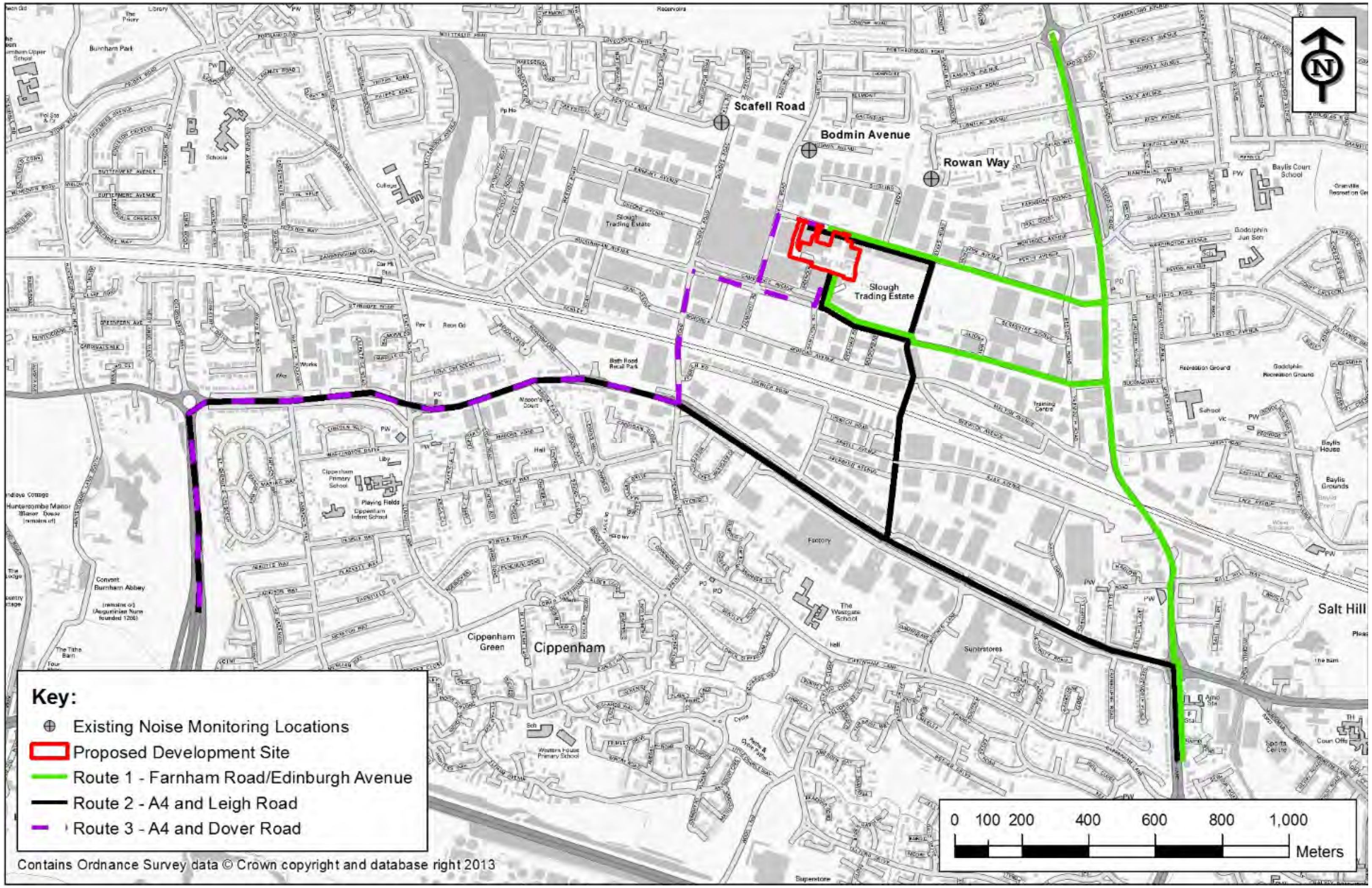
6.1.10 The following planning conditions are currently in place on the existing SHP site and have been taken into consideration in this Transport Assessment:

- A maximum combined total of 126 two-way deliveries per day (for the SHP site as a whole);
- Night-time deliveries shall be restricted to no more than 3 deliveries per hour at the SHP site in the hours between 23:00 and 07:00, with no night-time deliveries allowed via M4 Junction 7 and Dover Road; and
- All commercial vehicles shall use Farnham Road/Edinburgh Avenue, A4 and Dover Road or A4 and Leigh Road to access the SHP site. HGV's have historically accessed the site from Buckingham Avenue then into the site via Harwich Road

6.1.11 A site masterplan for the Proposed Development is included as **Annex B** to this report. All HGV generated at the site will have to use one of three routes to access/egress the site. The SHP site will use a three-strike system to control HGV drivers. Any trucks seen to not be following the designated routes will be warned. On the third warning the driver will be banned from site. This would be implemented for the Proposed Development. Contractual obligations will also be made between SSE and the waste supplier to control the HGV routes. These routes are shown in Figure 6-1 below.

6.1.12 In order to increase the safety of vulnerable road users, HGV operators will be encouraged to use safety equipment such as sidebars, blind spot cameras, audible 'turning left' warnings and reversing beeps on all HGVs accessing the site.

Figure 6-1: Permitted Routes at Development Site



7 CUMULATIVE IMPACT ASSESSMENT

7.1 Committed Developments

7.1.1 The committed developments that have been included in this cumulative impact assessment are as follows

- Leigh Road/Bath Road Central Core Planning Application, Slough Trading Estate, 0.5km south east of SHP (P/14515/000). SBC granted outline planning permission for the redevelopment of 21.9 ha of land at Leigh Road/Bath Road on the 30th Sept 2009 to include commercial offices, hotel and leisure facilities (LRCC1). Leigh Road/Bath Road Central Core 2 Planning Application, Slough Trading Estate, 0.5km south east of SHP (P14515/3). An alternate planning application for redevelopment of 21.9 ha of land at Leigh Road/Bath Road to include retail, commercial offices was submitted in May 2011. This development allows for more environmentally sensitive land uses, such as nursery provision.
- Britwell Regeneration - mixed residential, community and retail use, 0.7km north west of SHP (application ref: P/15513/000). Full planning application for demolition and redevelopment of two linked development sites (site 2a Kennedy Park and 2b Wentworth Avenue shops/ Marunden Green). Site 2a comprises 171 residential units, 980 m^2 of retail use (use classes a1, a2, a3 and a5) and 411 m^2 retail space, health centre or nursery (use classes a1, a2, a3, a5 and d1). Site 2b comprises 87 residential units and 195 m^2 of retail use (use classes a1). Surface car parking and cycle parking provision; amenity space; access and associated and ancillary development across both sites also form part of the proposals.

7.1.2 The Leigh Road/Bath Road Central Core development is located to the south east of the development site under study in this report. Flows for this site have been taken from the Transport Assessment prepared by Peter Bretts Associates LLP. The Britwell Regeneration site is located to the northwest and traffic flows have been taken from the 2013 Transport Assessment prepared by Amey.

7.1.3 The combined traffic flows that are generated by these committed developments are presented in **Annex C** to this report as Figures 7-1, 7-2 and 7-3. These flows have been added to all demolition/construction and opening year flows (2017 and 2019) within this Transport Assessment, so as to provide a robust assessment of the local network.

7.1.4 The combined two-way committed development traffic flows are presented in Table 7-1 below for the peak hours and the daily scenarios. The Transport Assessments for the committed developments in question displayed AM and PM peak hour flows only. As such, a factor has been applied to the combined peak hour traffic so as to give the daily number of vehicles expected. This factor was calculated using TRICS data for Land Use 02- Employment/D-Industrial Estate.

7.1.5 It should also be noted that the Applicant is to submit a separate simultaneous planning application to SBC for some ancillary buildings/car parking, including a central site services building, a water treatment plant and parking on the SHP site (hereafter referred to as the "*Further Development*"). It is anticipated that this will be the subject of a separate composite planning application to be submitted in parallel with the application for the Proposed Development. The application is expected to slightly reduce the number of car parking spaces onsite and is expected to generate small levels of traffic and has therefore not been considered in the cumulative impact assessment.

Table 7-1: COMBINED TWO-WAY COMMITTED DEVELOPMENT TRAFFIC FLOWS			
	Total Vehicles		
ATC Location	**AM**	**PM**	**Daily Average**
Fairlie Rd	6	0	35
Edinburgh Ave (west of Liverpool Road jctn.)	6	5	65
Edinburgh Ave (east of Liverpool Road jctn.)	106	86	1,128
Liverpool Rd	172	154	1,916
Buckingham Ave (west of Liverpool Road jctn.)	145	117	1,540
Farnham Rd (north of Edinburgh Ave jctn.)	194	182	2,209
Leigh Rd	720	584	7,662
Farnham Rd (south of Buckingham Ave jctn.)	223	188	2,415
Buckingham Ave (east of Liverpool Road jctn.)	245	198	2,603

7.1.6 An additional one third of the trips associated with the Proposed Development were routed south down Liverpool Road and Leigh Road for operational flows to account for the Leigh Road Bridge improvements (which is currently under construction and to be completed in 2015).

7.1.7 Traffic generated by schemes considered in the cumulative effect assessment will result in an increase in total daily traffic on the surrounding highway network. The table below displays the percentage increase as a result of the cumulative schemes at each ATC location.

Table 7-2: PERCENTAGE INCREASE AT EACH ATC LOCATION DUE TO COMMITTED DEVELOPMENTS			
ATC Location	**2019 Total Daily Vehicle Flows Plus Proposed Development**	**2019 Total Daily Vehicle Flows Plus Proposed Development and Cumulative Schemes**	**Percentage Increase due to Cumulative Schemes**
Fairlie Rd	19009	19044	0.2%
Edinburgh Ave (west of Liverpool Road jctn.)	6107	6172	1.1%
Edinburgh Ave (east of Liverpool Road jctn.)	12879	14007	8.1%
Liverpool Rd	5704	7620	25.1%
Buckingham Ave (west of Liverpool Road jctn.)	11814	13354	11.5%
Farnham Rd (north of Edinburgh Ave jctn.)	23510	25719	8.6%
Leigh Rd	10201	17863	42.9%
Farnham Rd (south of Buckingham Ave jctn.)	27230	29645	8.1%
Buckingham Ave (east of Liverpool Road jctn.)	9330	11933	21.8%

7.1.8 In addition to traffic flows included in the table above, there are plans in progress to create a bus Lane between Buckingham Avenue and A4 Bath Road on Farnham Road. The main features of the scheme are:

- Construction of a bus lane from the junction of Buckingham Avenue East to No 102 Farnham Road and then No 82 Farnham Road to its junction with Bath Road;
- Completion of cycle facilities from No 90 Farnham Road to Bath Road;
- New all-round pedestrian crossing at junction of Farnham Road and Buckingham Avenue;
- Redesigning of the junction layout of Farnham Road and its junction with Whitby Road including pedestrian crossings;
- Removal of islands outside 42 to 62 Farnham Road;
- Relocation of controlled pedestrian crossing at 59 Farnham Road to the junction of Farnham Road and Pitts Road;
- Replacement of barriers outside 64 to 82 Farnham Road with high kerbing;
- Alterations to access/ exit at the junction of Farnham Road and Salt Hill Drive;
- Improvement works at the junction of Farnham Road and Bath Road; and

- Improvement works to the Farnham Road/ Bath Road Junction (Tun's Junction).

7.1.9 This bus lane development may result in a slight displacement of traffic arriving/departing the site to/from Farnham Road to the south, as the bus lane may reduce the capacity of the A355. At the time of writing, there was no information available regarding the impact of this bus lane. This traffic is considered most likely to re-distribute to utilise the Leigh Road/Liverpool Road route once the improvements to the railway bridge are complete. The additional one third of eastern traffic added to Liverpool Road and Leigh Road in the proposed development traffic flows provides a robust assessment of the potential effect on this route.

7.1.10 The Simplified Planning Zone has been taken into account in this cumulative impact assessment. Additionally, it has been noted that there are plans for the Trading Estate to add new jobs to those currently available. To help local people access these employment opportunities, SEGRO has created Slough Aspire, a dedicated skills and training centre which will deliver a range of training programmes and career advice services. The continued growth of the Trading Estate, including the redevelopment of industrial units immediately to the south of the Proposed Development, is taken into account in this report through the growth factors that have been applied to the baseline flows.

8 DEMOLITION AND CONSTRUCTION TRAFFIC

8.1 Trip Generation

8.1.1 The trip generation for peak demolition and construction has been based on staff and HGV numbers supplied by SSE and Fichtner (the project engineers). Demolition/Construction during its peak month will employ up to 500 workers on site (with an expected average of 300), split over three shifts. This means a total of 167 staff will be on site at any one time during the peak month. There will be around 100 workers on site throughout the enabling works.

8.1.2 During peak demolition/construction, there will be approximately 500 two way light vehicle movements per day and approximately 30 HGV movements.

8.1.3 The peak hours have been identified as 08:00 to 09:00 and 17:00 to 18:00 from the ATC surveys. It has been assumed that one third of staff (167) will arrive/depart during the peak hours to represent a shift changeover. This would represent a worst case scenario and the effects presented in this assessment are therefore likely to be an overestimate of the actual effects on local road traffic. This approach is considered to provide the most robust assessment possible. However demolition and construction shift changeovers will be scheduled to avoid the weekday peak hours (07:30 to 09:30 and 16:30 to 18:30) to avoid the worst affected hours and this will be enforced through the Construction and Environmental Management Plan (CEMP).

8.1.4 The core demolition and construction hours will typically be 08:00-18:00 on weekdays, although some 24 hour activity may be carried out onsite. The number of HGVs arriving has been split evenly between these working hours, which is a more conservative estimate than assuming a 24 hour spread of traffic. Therefore, 10% of the HGV traffic for the site has been assumed to arrive/depart in each of the peak hours. In reality, HGV deliveries will be scheduled to avoid the weekday peak hours (07:30 to 09:30 and 16:30 to 18:30) but this approach offers a worst case scenario for the Proposed Development.

8.1.5 It should also be noted that there are expected to be around 24 abnormal loads during the entire three year demolition/construction period. These will be routed along Farnham Road and Edinburgh Avenue to the access point. These vehicles arrive so infrequently that they have not been included in the traffic flows. It is considered that there will be sufficient capacity on the road network to deal with these loads.

8.1.6 A breakdown of the traffic expected at the site is provided in the table below.

Table 8-1: BREAKDOWN OF DEMOLITION/CONSTRUCTION TRAFFIC AT PROPOSED DEVELOPMENT

Vehicle Type	Arrivals and Departures Per Day	Arrivals and Departures Per Peak Hour
HGV	30	3
Car	500	167

8.2 Trip Distribution

8.2.1 The exact location of the site laydown/accommodation area has not yet been determined, although it is likely to be within close proximity to the SHP site. For the purpose of this assessment it has been assumed that all construction/demolition vehicles will use the access on Harwich Road to the south of the site for trips to and from the Proposed Development. The likely trip distribution at this access has been taken from the manual turning count at the site access on Edinburgh Avenue. This data shows that around 21% of vehicles will arrive/depart to and from the west and 79% to and from the east.

8.2.2 If the site laydown/accommodation area is located elsewhere there would be some additional trips on the network as materials are moved between the laydown area and the site. However, these movements would be minimised in order to avoid double-handling where possible, and would be timed to avoid peak hours. As noted above, a robust approach has been used for the assessment of effects and it is considered that the additional vehicle movements associated with alternative site laydown/accommodation locations would not be significant

8.2.3 All HGV trips to and from the west have been routed from Harwich Road along Buckingham Avenue to the junction with Fairlie Road, where all HGVs head south. This route not only seems the most plausible for vehicles using the Site, but due to one of the ATC locations under study being located to the south of this junction, it also provides the most robust assessment possible.

8.2.4 The HGV trips to/from the east have all been routed along Buckingham Avenue to the junction with A355 Farnham Road, where they have been distributed either north or south in accordance with the ATC data collected in the traffic survey.

8.2.5 All light vehicle movements have been routed from the access at Harwich Road onto Buckingham Avenue. It has been assumed that 21% will arrive/depart to and from the west and 79% to and from the east. All trips from/to the west head along Buckingham Avenue and head off the network under study. All trips to from the east head along Buckingham Avenue to the junction with Farnham Road.

8.2.6 The trip distribution for both HGVs and cars at Farnham Road is as follows:

- 57% arriving from the north;
- 43% Arriving from the south;
- 36% Heading to the north; and
- 64% heading to the south.

8.3 Network Assessment

8.3.1 The impact of the demolition and construction traffic on the local highway network has been assessed for 2017 as this is predicted to be the year of peak activity at the site.

8.3.2 In order to provide an estimate of 2017 base traffic flows, traffic growth factors have been calculated using TEMPRO, adjusted for local growth using NTEM traffic growth calculations. The traffic growth factors are:

- AM Peak – 1.0418
- PM Peak – 1.0466
- Five Day – 1.0459

8.3.3 These traffic growth factors have been applied to the 2013 base Daily Average, and the AM and PM peak traffic flows to provide an estimate of the 2017 traffic flows without the demolition and construction traffic. These are provided in **Annex C** as Figures 8-1, 8-2 and 8-3.

8.3.4 The 2017 Daily Average, AM and PM peak traffic flows plus traffic generated by the demolition and construction phase are presented in **Annex C** as Figures 8-4, 8-5 and 8-6 respectively.

8.3.5 Table 8-3 below shows the difference in flows between the 2017 baseline flows and the scenario with demolition and construction traffic. Table 8-4 displays the percentage increase in flows at all ATC locations as a result of the proposed demolition/construction traffic.

Table 8-3: 2017 PEAK DEMOLITION / CONSTRUCTION- TWO-WAY TRAFFIC FLOWS

ATC Location	2017 Without Demolition/Construction						2017 with Demolition/Construction					
	Total Vehicles			HGV			Total Vehicles			HGV		
	AM	PM	Daily	AM	PM	Daily	AM	PM	Daily	AM	PM	Daily
Fairlie Rd	1118	1327	18382	13	12	265	1118	1327	18382	13	12	265
Edinburgh Ave (west of Liverpool Road jctn.)	337	421	5852	2	0	60	337	421	5852	2	0	60
Edinburgh Ave (east of Liverpool Road jctn.)	896	951	13461	5	1	94	896	951	13461	5	1	94
Liverpool Rd	550	609	7392	2	2	46	550	609	7392	2	2	46
Buckingham Ave (west of Liverpool Road jctn.)	915	813	12962	12	7	244	1183	1081	13800	16	11	292
Farnham Rd (north of Edinburgh Ave jctn.)	1350	1503	24884	23	19	409	1475	1628	25274	25	21	432
Leigh Rd	1454	1422	17486	4	4	90	1454	1422	17486	4	4	90
Farnham Rd (south of Buckingham Ave jctn.)	1712	1630	28678	28	23	469	1855	1773	29126	30	25	494
Buckingham Ave (east of Liverpool Road jctn.)	836	715	11624	12	7	191	1104	983	12462	16	11	239

Table 8-4: 2017 PEAK DEMOLITION/CONSTRUCTION TWO-WAY TRAFFIC FLOWS- PERCENTAGE INCREASE COMPARED WITH BASELINE						
ATC Location	**Percentage Increase**					
	Total Vehicles			**HGV**		
	AM	**PM**	**Daily**	**AM**	**PM**	**Daily**
Fairlie Rd	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Edinburgh Ave (west of Liverpool Road jctn.)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Edinburgh Ave (east of Liverpool Road jctn.)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Liverpool Rd	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Buckingham Ave (west of Liverpool Road jctn.)	29.3%	33.0%	6.5%	33.3%	57.1%	19.7%
Farnham Rd (north of Edinburgh Ave jctn.)	9.3%	8.3%	1.6%	8.7%	10.5%	5.6%
Leigh Rd	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Farnham Rd (south of Buckingham Ave jctn.)	8.4%	8.8%	1.6%	7.1%	8.7%	5.3%
Buckingham Ave (east of Liverpool Road jctn.)	32.1%	37.5%	7.2%	33.3%	57.1%	25.1%

8.3.6 The results in the table above display that Buckingham Avenue will be most heavily impacted by total vehicles associated with the Site.

8.3.7 ATC locations witness a 0% impact at all times of day for all locations other than Buckingham Avenue and Farnham Road. Buckingham Avenue (east of Liverpool Road junction) will see a total increase of 37.5% in total vehicles during the PM peak. The overall impact on Farnham Road is far lower than on Buckingham Avenue, with the largest increase of 9.3% in total vehicles at Farnham Road (north of Edinburgh Avenue junction) in the AM peak hour.

8.3.8 The rise in the percentage of HGVs at some locations (the largest increase being of 57.1% on Buckingham Avenue in the PM peak hour) is attributable to the fact that at these locations there was a small number of baseline HGVs meaning that a single vehicle can make a large impact in the percentage difference. The existing low level of HGV's can be attributed to a reduction in traffic related to the closure of the CFB boilerhouse at the SHP site, with HGV's having previously used the same traffic route as for the Proposed Development. Until 2011, HGV traffic on these routes was comparable/higher than these predicted levels.

8.3.9 There is a similar pattern of impact during both peaks. The impact on the daily traffic is generally less than in the peak hours at all locations. The AM and PM peak are discussed because these are considered the worst-affected peak hours.

8.3.10 There is no impact at all on Liverpool Road or Leigh Road. This is because no construction traffic has been routed this way.

8.3.11 There are expected to be an additional 24 abnormal loads during the entire period of construction. These have not been modelled within the assessment due to the infrequency of arrivals/departures. Based on the results in the table above, these additional deliveries are not expected to cause any capacity issues on the network. The existing access arrangements are considered sufficient to accommodate these deliveries.

8.4 Construction Traffic Mitigation

8.4.1 A Construction Environmental Management Plan (CEMP) will be prepared by the contractor and submitted to SBC for approval prior to the commencement of any demolition or construction work on site. All travel to site by staff will be managed through the CEMP, including management of parking, provision of minibuses and a car share scheme. The CEMP will include designated construction traffic routes and other measures to minimise the impact of traffic, including proposed restrictions on start/finish times. A framework CEMP is presented in *Appendix B-1, Volume II* of this ES, which demonstrates the likely structure and content of the CEMP.

8.4.2 The access and egress of demolition/construction traffic will be carefully planned to minimise effects on the surrounding highway and local road users, including any employees still occupying parts of the Site that will be developed during later stages of the works. The increase in demolition/construction traffic flows will be managed to minimise the effect on the surrounding highways and all local road users, and no HGVs will be scheduled to arrive at the Site during the morning and evening commuter weekday peak periods (between 07:30 to 09:30 and 16:30 to 18:30). Discussions will be held with SBC to agree a safe site access strategy in advance of site works commencing, and prior to each phase of the works. Deliveries will also be phased on a ‘just in time’ basis where possible. This will minimise travel time and potential congestion around the Site.

8.4.3 Demolition and construction staff will be encouraged to travel to and from the Site by sustainable means. In particular, emphasis will be given to car sharing and the use of minivans. Parking within the Site and for local laydown areas for demolition/construction staff will be managed in order to prevent overspill parking on the surrounding side roads. A draft Workplace Travel Plan has been produced for the current operation on site. This will be revised to cover both the demolition/ construction and operational phases. This document will be written in consultation with SBC and will promote measures at the Site that increase the use of sustainable modes by staff. The Workplace Travel Plan will include measures such as promoting use of public transport, incentives to cycle to work, car sharing, meet-points and utilisation of minibus services to site.

8.4.4 Pedestrian access to the Site will be segregated from vehicular traffic at all times, with clear signage to maintain the safety of the site and the general public. This will be enhanced through the Further Development planning application for the SHP site, as discussed later in this chapter.

8.4.5 In order to further increase the safety of vulnerable road users, HGV operators will be encouraged to fit safety equipment such as sidebars, blind spot cameras, audible ‘turning left’ warnings and reversing beeps to all HGVs accessing the site.

8.4.6 Table 8-5 below displays a traffic profile for the existing traffic flows, which is to be used in the CEMP as a guide as to the times to be avoided by construction vehicles. This displays at which times in the day the demolition and construction traffic flows would have the most impact on the existing conditions. The following table shows the existing traffic profile for Buckingham Avenue and Farnham Road (at both ATC locations on each road).

Table 8-5: 2017 EXISTING TRAFFIC PROFILE: BUCKINGHAM AVENUE AND FARNHAM ROAD				
Hour	**Total Existing Flows for Buckingham Avenue (West)**	**Total Base Existing Flows for Buckingham Avenue (East)**	**Total Base Existing Flows for Farnham Road (North)**	**Total Base Existing Flows for Farnham Road (South)**
00:00	53	53	348	325
01:00	38	37	229	209
02:00	36	34	164	167
03:00	27	25	131	136
04:00	42	34	161	206
05:00	76	85	320	395
06:00	223	175	582	769
07:00	490	382	939	1262
08:00	739	567	1110	1429
09:00	646	517	1135	1414
10:00	627	511	1212	1415
11:00	657	499	1236	1445
12:00	750	593	1306	1543
13:00	743	597	1324	1567
14:00	723	565	1340	1590
15:00	704	554	1367	1535
16:00	692	521	1314	1448
17:00	665	495	1263	1377
18:00	552	438	1355	1455
19:00	391	326	1281	1335
20:00	266	218	1108	1076
21:00	187	168	943	908
22:00	134	120	770	738
23:00	87	85	570	546

8.4.7

8.4.8 Looking at Table 8-5 above, the traffic levels are generally lower before 07:30 and after 18:30 on Farnham Road and Buckingham Avenue, which are the two roads most affected by demolition and construction traffic. Any increase in traffic levels that are predicted to occur as a result of the demolition and construction phase will be managed through the CEMP to minimise the effect on the surrounding highways and all local road users.

8.4.9 The CEMP will set out measures whereby the most heavily affected hours will be avoided. To minimise this effect it has been agreed that the demolition and construction shift changeover will be scheduled to avoid the weekday peak hours (07:30 to 09:30 and 16:30 to 18:30) to avoid the worst affected hours. Similarly, no demolition and construction HGVs will be scheduled to arrive at site between the weekday peak hours (07:30 to 09:30 and 16:30 to 18:30). The effects presented in the Transport Assessment are therefore likely to be an overestimate of the actual effects on local road traffic. The mitigation measures to be enforced through the CEMP will reduce any impacts.

9 PROPOSED DEVELOPMENT OPERATIONAL TRAFFIC

9.1 Trip Generation

9.1.1 Employee numbers at the Site will rise by an estimated 20 staff from current levels as the site becomes operational. Staffing levels have dropped in 2013 due to the closure of the CFB plant onsite. Taking the relatively low numbers into account, worker car trips have not been considered further in the assessment.

9.1.2 SSE has provided information on the proposed numbers of HGVs at the site, based on the tonnage of materials being delivered to site annually. Once operational, there will be an average of 100 HGV deliveries expected each day at the SHP site, as shown in Table 9-1. A breakdown of the daily average deliveries expected during operation of the Proposed Development is presented in Table 9-2. The Proposed Development is expected to contribute an average 80 deliveries per day (based on the maximum fuel throughput), whilst the existing Boiler 17 will contribute an additional 20 per day. The figure for Boiler 17 was calculated from an average 14 deliveries per day measured in early 2013 whilst the boiler was running at 65% load, therefore approximately 20 deliveries per day is envisaged at full load.

9.1.3 The trip generation has been estimated based on the maximum fuel capacity of the Proposed Development, which is 20% higher than the design capacity, which is likely to lead to an overestimate of the number of arrivals/departures.

Table 9-1: DAILY AVERAGE HGV DELIVERIES FOR THE OPERATIONAL PHASE OF THE PROPOSED DEVELOPMENT

Material	Description	Approximate Annual Quantities (tonnes per annum)	Approximate Average Daily Deliveries
Fuel	WDF	480,000 (maximum)	65
		400,000 (design)	54
	Gas	-	Pipeline
Reagents	Hydrated Lime	6,500	1
	Activated Carbon	1,500	<1
	Ammonia	200	<1
Residues	Bottom Ash	80,000 (maximum)	11
		67,000 (design)	9
	Flue Gas Treatment	15,000	2
Water	Raw Water	1,600,000	Pipeline
Total Approximate Average Road Deliveries			**80 (Maximum)**
			67 (Design)

9.1.4 The planning conditions for the existing SHP site allow a maximum permitted consent of 126 HGV deliveries per day. The site may well operate at this level at its peak, so this has also been assessed. A summary of the existing and proposed trip generations is presented in Table 9-3 below.

Table 9-2: 2019 DAILY AVERAGE- ARRIVALS AND DEPARTURES

Location	2013 Base		2019 Proposed Development Traffic		2019 Maximum Permitted Development Traffic	
	HGV Arr	HGV Dep	HGV Arr	HGV Dep	HGV Arr	HGV Dep
Edinburgh Avenue-Main Site Access	14	14	100	100	126	126

9.1.5 To provide a peak hour assessment, daily trip generation has been divided by 24 hours. Table 9-4 below outlines the predicted peak hour arrivals and departures.

Table 9-3: 2019 PEAK HOUR ARRIVALS AND DEPARTURES

Location	2019 AM Proposed Development Traffic		2019 PM Proposed Development Traffic		2019 AM Maximum Permitted Development Traffic		2019 PM Maximum Permitted Development Traffic	
	HGV Arr	HGV Dep	HGV Arr	HGV Dep	HGV Arr	HGV Dep	HGV Arr	HGV Dep
Edinburgh Avenue- Main Site Access	4	4	4	4	5	5	5	5

9.2 Trip Distribution

9.2.1 The data from the manual turning count at the Site access on Edinburgh Avenue has been used to ascertain the trip distribution for HGVs at the site. It has been assumed that 21% will arrive/depart to and from the west and 79% to and from the east.

9.2.2 All trips to and from the west have been routed along Edinburgh Avenue to the junction with Fairlie Road, where all HGVs head south. This route not only seems the most plausible for vehicles using the site, but due to one of the ATC locations under study being located to the south of this junction it also provides the most robust assessment possible.

9.2.3 The trips to/from the east have all been routed along Edinburgh Avenue to the junction with A355 Farnham Road, where they have been distributed either north or south in accordance with the ATC data collected in the traffic survey. The trip distribution at the Farnham Road junction is as follows:

- 57% arriving from the north;
- 43% arriving from the south;
- 36% heading to the north; and
- 64% heading to the south.

9.2.4 An additional one third of the traffic heading east from the site access has been routed south via Liverpool Road and Leigh Road. This is in recognition of the fact that this is also a viable route for vehicles at the site due to the development at the Leigh Road Bridge (due for completion in 2015). It is considered that this approach offers a robust assessment of the Proposed Development's effect on the surrounding network to avoid underestimating the effects along either Route 1 or 2.

9.3 Network Assessment

9.3.1 The effect of the Proposed Development on the local highway network has been assessed for 2019 as this is the year that the Proposed Development is expected to become operational.

9.3.2 In order to provide an estimate of 2019 base traffic flows, traffic growth factors have been calculated using TEMPRO, adjusted for local growth using NTEM traffic growth calculations. The traffic growth factors are:

- AM Peak – 1.0834
- PM Peak – 1.0819
- Five Day – 1.0818

9.3.3 These traffic growth factors have been applied to the 2013 base Daily Average, AM and PM peak traffic flows to provide an estimate of the 2019 base traffic flows and these are provided in **Annex C** as Figures 9-1, 9-2 and 9-3.

9.3.4 The 2019 Daily Average, AM and PM peak traffic flows plus traffic generated by the Proposed Development are presented in **Annex C** as Figures 9-4, 9-5 and 9-6 respectively.

9.3.5 The 2019 Daily Average, AM and PM peak traffic flows plus maximum permitted traffic flows are presented in **Annex C** as Figures 9-7, 9-8 and 9-9 respectively.

9.3.6 Tables 9-5, 9-6 and 9-7 present the 2019 Base, 2019 With Proposed Development Traffic and 2019 with Maximum Consented Development Traffic two-way flows at each ATC location. They show flows for both Total Vehicles and HGVs in the AM Peak, PM Peak and Daily Average scenarios respectively. The percentage increase from 2019 Base traffic is also displayed.

Table 9-4: 2019 AM PEAK- TWO-WAY TRAFFIC FLOWS INCREASE

ATC Location	2019 Base Traffic		2019 Base + Proposed Development Traffic				2019 Base + Maximum Permitted Development Traffic			
	Total Vehicle Flows	HGV Flows	Total Vehicle Flows	Total Vehicle % Increase	HGV Flows	HGV % increase	Total Vehicle Flows	Total Vehicle % Increase	HGV Flows	HGV % increase
Fairlie Rd	1164	14	1166	0.2%	16	14.3%	1166	0.2%	16	14.3%
Edinburgh Ave (west of Liverpool Road jctn.)	349	2	355	1.7%	8	300%	357	2.3%	10	400%
Edinburgh Ave (east of Liverpool Road jctn.)	927	5	933	0.7%	11	120%	935	0.9%	13	160%
Liverpool Rd	566	2	568	0.4%	4	100%	568	0.4%	4	100%
Buckingham Ave (west of Liverpool Road jctn.)	946	13	946	0.0%	13	0.0%	946	0.0%	13	0.0%
Farnham Rd (north of Edinburgh Ave jctn.)	1397	24	1400	0.2%	27	12.5%	1400	0.2%	27	12.5%
Leigh Rd	1484	4	1486	0.1%	6	50.0%	1486	0.1%	6	50.0%
Farnham Rd (south of Buckingham Ave jctn.)	1771	30	1774	0.2%	33	10.0%	1776	0.3%	35	16.7%
Buckingham Ave (east of Liverpool Road jctn.)	859	13	859	0.0%	13	0.0%	859	0.0%	13	0.0%

9.3.7 The table above shows that with the Proposed Development, the local roads will be affected by an increase of less than 1% during the AM peak, with the exception of Edinburgh Avenue (west of Liverpool Road junction), the ATC closest to the site access. This will see an increase of 1.7% in total vehicles. This increases to just 2.3% with the Maximum Permitted Development. The other locations remain below a 1% effect with the Maximum Permitted operational flows.

9.3.8 There appears to be a significant rise in the percentage of HGVs at some locations, with the largest increase being 300% at Edinburgh Avenue (west of Liverpool Road junction) with the Proposed Development traffic and 400% with the Maximum Permitted traffic. It should be noted however that this only represents an increase of six and eight HGVs respectively in the morning peak hour at this location.

9.3.9 It should be noted that no HGV deliveries will be scheduled between the peak hours (07:30 to 09:30 and 16:30 to 18:30). These HGVs have been assessed against the peak hours, however, in order to form a worst-case scenario. The results therefore overestimate the traffic flows during the peak hours.

9.3.10 In terms of trip distribution, Table 7-12 shows that 37.5% of trips are expected to use Route 1, via Farnham Road to/from the M4, 37.5% are expected to go via Farnham Road to/from the M40 (also Route 1), and the final 25% will go via Fairlie Road, onto Dover Road and thereafter to Junction 7 of the M4, which is Route 3. As discussed above, a further 33% of eastbound trips have been added to the road network along Route 2, via Liverpool Road, Leigh Road and then to either Junction 6 or 7 of the M4.

Table 9-5: 2019 PM PEAK- TWO-WAY TRAFFIC FLOWS INCREASE

ATC Location	2019 Base Traffic		2019 Base + Proposed Development Traffic				2019 Base + Maximum Permitted Development Traffic			
	Total Vehicle Flows	HGV Flows	Total Vehicle Flows	Total Vehicle % Increase	HGV Flows	HGV % increase	Total Vehicle Flows	Total Vehicle % Increase	HGV Flows	HGV % increase
Fairlie Rd	1372	12	1374	0.2%	14	16.7%	1374	0.2%	14	16.7%
Edinburgh Ave (west of Liverpool Road jctn.)	436	0	442	1.4%	6	100%	444	1.8%	8	100%
Edinburgh Ave (east of Liverpool Road jctn.)	980	1	986	0.6%	7	600%	988	0.8%	9	800%
Liverpool Rd	625	2	627	0.3%	4	100%	627	0.3%	4	100%
Buckingham Ave (west of Liverpool Road jctn.)	836	7	836	0.0%	7	0.0%	836	0.0%	7	0.0%
Farnham Rd (north of Edinburgh Ave jctn.)	1549	21	1552	0.2%	24	14.3%	1552	0.2%	24	14.3%
Leigh Rd	1450	4	1452	0.1%	6	50.0%	1452	0.1%	6	50.0%
Farnham Rd (south of Buckingham Ave jctn.)	1679	24	1682	0.2%	27	12.5%	1684	0.3%	29	20.8%
Buckingham Ave (east of Liverpool Road jctn.)	733	7	733	0.0%	7	0.0%	733	0.0%	7	0.0%

9.3.11 The table above shows that with the Proposed Development, all local roads will be impacted by an increase of less than 1% in the PM peak hour, with the exception of Edinburgh Avenue (west of Liverpool Road junction). This will see an increase of 1.4% in total vehicles.

9.3.12 The Maximum Permitted flows also show only one of the nine locations increasing by more than 1% for total vehicles. Edinburgh Avenue (west of Liverpool Road junction) remains the largest increase with a 1.8% rise. This represents an increase of just eight vehicles per hour from the 2019 base flows.

9.3.13 Once again, the rise in the percentage of HGVs at some locations (the largest increase being 800% on Edinburgh Avenue east for the Maximum Permitted development flows) is attributable to the fact that at these locations there was a very small number of HGVs in the baseline, meaning that a single vehicle can make a large impact in the percentage difference.

Table 9-6: 2019 DAILY AVERAGE- TWO-WAY TRAFFIC FLOWS INCREASE

ATC Location	2019 Base Traffic		2019 Base + Proposed Development Traffic				2019 Base + Maximum Permitted Development Traffic			
	Total Vehicle Flows	HGV Flows	Total Vehicle Flows	Total Vehicle % Increase	HGV Flows	HGV % increase	Total Vehicle Flows	Total Vehicle % Increase	HGV Flows	HGV % increase
Fairlie Rd	19012	274	19054	0.2%	316	15.3%	19064	0.3%	326	19.0%
Edinburgh Ave (west of Liverpool Road jctn.)	6050	62	6208	2.6%	220	255%	6250	3.3%	262	323%
Edinburgh Ave (east of Liverpool Road jctn.)	13885	97	14043	1.1%	255	163%	14085	1.4%	297	206%
Liverpool Rd	7580	47	7632	0.7%	99	111%	7646	0.9%	113	140%
Buckingham Ave (west of Liverpool Road jctn.)	13354	253	13354	0.0%	253	0.0%	13354	0.0%	253	0.0%
Farnham Rd (north of Edinburgh Ave jctn.)	25662	423	25735	0.3%	496	17.3%	25756	0.4%	517	22.2%
Leigh Rd	17823	93	17875	0.3%	145	55.9%	17890	0.4%	159	71.0%
Farnham Rd (south of Buckingham Ave jctn.)	29580	485	29665	0.3%	570	17.5%	29686	0.4%	591	21.9%
Buckingham Ave (east of Liverpool Road jctn.)	11933	197	11933	0.0%	197	0.0%	11933	0.0%	197	0.0%

9.3.14 The table above shows that with the Proposed Development, for the daily average all roads will be affected by an increase of less than 1%, with the exceptions of Edinburgh Avenue (west of Liverpool Road junction) and Edinburgh Avenue (east of Liverpool Road junction). These will see a daily increase of 2.6% and 1.1% respectively in total vehicles. Even with the Maximum Permitted development flows for the existing SHP site, only these same two locations will increase by more than 1% for total vehicles throughout the day. Edinburgh Avenue (west of Liverpool Road junction) remains the largest increase of 3.3%, but this is still only 200 additional vehicles daily.

9.3.15 The increase in the number of HGVs throughout the day is within that permitted by the existing consent for the SHP site.

9.3.16 In summary, the Proposed Development flows are lower than the Permitted Maximum flows at the SHP site for the AM, PM and full day average periods. Even with the maximum flows, none of these locations is expected to be heavily affected as a result of the site traffic.

9.4 Impact on A355 Farnham Road/A4 Bath Road Junction

9.4.1 The A355 Farnham Road/A4 Bath Road signalised junction is located to the south east of the Site and has been identified by SBC as being sensitive to increases in traffic flows.

9.4.2 With the maximum operational traffic flows, the Site will generate a daily total of 106 two way movements at the northern arm of this junction, representing an increase of just 0.4%.

9.4.3 These flows would be distributed across the other three arms at this junction, and therefore the impact on other arms will be even lower. It is therefore considered that the Proposed Development would have a negligible effect on the operation of this junction.

9.4.4 In terms of trip distribution, the traffic model predicts that for the daily average, 42.5% of trips will use Route 1 travelling along Farnham Road to/from the M4, with 36.5% of trips heading along Farnham Road to/from the M40 on Route 1. A further 21% of the trips are expected to travel along Fairlie Road, continuing onto Dover Road and thereafter to Junction 7 of the M4, which is Route 3.

9.4.5 As discussed above, an additional one third of trips have been added to the road network and are shown to utilise Route 2, via Liverpool Road, Leigh Road and then to either junction 6 or 7 of the M4. This results in more trips on the road network than expected, but it avoids underestimating the potential effect on either route.

9.4.6 The distribution differs slightly to the AM and PM peak hours because of the change in suitability of these roads during different times of day, with some roads predicted to be a quicker route to Site during peak hours than others for example.

9.5 Sensitivity Test

9.5.1 The Operational east/west trip distribution is currently predicted to be 79%:21%. A sensitivity test has been undertaken that assumes up to 100% of traffic could arrive and depart to/from the east and 50% to/from the west. This accounts for the likelihood that more traffic will come from the east (Greater London and the M25). The additional one third of traffic routed to/from the east has again been routed down Liverpool Road and Leigh Road.

9.5.2 The 2019 AM peak, PM peak and Daily traffic flows plus the sensitivity test traffic flows are presented in **Annex C** as Figures 9-10, 9-11 and 9-12 respectively. The table below shows the results of the test for the AM peak hour.

Table 9-7: 2019 AM PEAK SENSITIVITY TEST- TWO-WAY TRAFFIC FLOWS INCREASE						
ATC Location	**2019 Base Traffic**		**2019 Proposed Development Sensitivity Test**			
	Total Vehicle Flows	**HGV Flows**	**Total Vehicle Flows**	**Total Vehicle % Increase**	**HGV Flows**	**HGV % increase**
Fairlie Rd	1164	14	1170	0.5%	20	42.9%
Edinburgh Ave (west of Liverpool Road jctn.)	349	2	359	2.9%	12	500.0%
Edinburgh Ave (east of Liverpool Road jctn.)	927	5	937	1.1%	15	200.0%
Liverpool Rd	566	2	572	1.1%	8	300.0%
Buckingham Ave (west of Liverpool Road jctn.)	946	13	946	0.0%	13	0.0%
Farnham Rd (north of Edinburgh Ave jctn.)	1397	24	1402	0.4%	29	20.8%
Leigh Rd	1484	4	1490	0.4%	10	150.0%
Farnham Rd (south of Buckingham Ave jctn.)	1771	30	1776	0.3%	35	16.7%
Buckingham Ave (east of Liverpool Road jctn.)	859	13	859	0.0%	13	0.0%

9.5.3 The table above shows that with the Sensitivity Test traffic flows for the AM Peak, all roads will be affected by an increase of less than 2%, with the exceptions of Edinburgh Avenue (west of Liverpool Road junction). This will see an increase of 2.9% in total vehicles. The increase in the percentage effect on HGV flows can once again be explained by the low number of vehicles involved. No location has more than ten additional HGVs in the peak hour.

9.5.4 The table below shows the results of the test for the PM peak hour.

Table 9-8: 2019 PM PEAK SENSITIVITY TEST- TWO-WAY TRAFFIC FLOWS INCREASE						
ATC Location	**2019 Base Traffic**		**2019 Proposed Development Sensitivity Test**			
	Total Vehicle Flows	**HGV Flows**	**Total Vehicle Flows**	**Total Vehicle % Increase**	**HGV Flows**	**HGV % increase**
Fairlie Rd	1372	12	1378	0.4%	18	50.0%
Edinburgh Ave (west of Liverpool Road jctn.)	436	0	446	2.3%	10	100.0%
Edinburgh Ave (east of Liverpool Road jctn.)	980	1	990	1.0%	11	1000.0%
Liverpool Rd	625	2	631	1.0%	8	300.0%
Buckingham Ave (west of Liverpool Road jctn.)	836	7	836	0.0%	7	0.0%
Farnham Rd (north of Edinburgh Ave jctn.)	1549	21	1554	0.3%	26	23.8%
Leigh Rd	1450	4	1457	0.5%	10	150.0%
Farnham Rd (south of Buckingham Ave jctn.)	1679	24	1684	0.3%	29	20.8%
Buckingham Ave (east of Liverpool Road jctn.)	733	7	733	0.0%	7	0.0%

9.5.5 Table 9-8 shows that during the PM Peak for the Sensitivity Test traffic flows, all roads will be affected by an increase of 1% or less, with the exceptions of Edinburgh Avenue (west of Liverpool Road junction). This will see an increase of 2.3% in total vehicles. The increase in the percentage effect for HGV flows can be explained by the low number of vehicles involved. As in the AM peak, no location has more than ten additional HGVs in the peak hour.

9.5.6 The table below shows the results of the test for the daily traffic.

Table 9-9: 2019 DAILY SENSITIVITY TEST - TWO-WAY TRAFFIC FLOWS INCREASE						
ATC Location	**2019 Base Traffic**		**2019 Proposed Development Sensitivity Test**			
	Total Vehicle Flows	**HGV Flows**	**Total Vehicle Flows**	**Total Vehicle % Increase**	**HGV Flows**	**HGV % increase**
Fairlie Rd	19012	274	19138	0.7%	400	46.0%
Edinburgh Ave (west of Liverpool Road jctn.)	6050	62	6302	4.2%	314	406.5%
Edinburgh Ave (east of Liverpool Road jctn.)	13885	97	14137	1.8%	349	259.8%
Liverpool Rd	7580	47	7664	1.1%	131	178.7%
Buckingham Ave (west of Liverpool Road jctn.)	13354	253	13354	0.0%	253	0.0%
Farnham Rd (north of Edinburgh Ave jctn.)	25662	423	25779	0.5%	540	27.7%
Leigh Rd	17823	93	17907	0.5%	177	90.3%
Farnham Rd (south of Buckingham Ave jctn.)	29580	485	29715	0.5%	620	27.8%
Buckingham Ave (east of Liverpool Road jctn.)	11933	197	11933	0.0%	197	0.0%

9.5.7 For the daily Sensitivity Test traffic flows, all roads will be affected by an increase of less than 2%, with the exceptions of Edinburgh Avenue (west of the Liverpool Road junction). This will see an increase of 4.2% in total vehicles. The increase in the percentage effect on HGV flows can once again be explained by the low number of vehicles involved. No location has more than 252 additional HGVs throughout the day.

9.5.8 Based on the findings in *Chapter 9: Noise and Vibration* of this ES, and with the overall aim of reducing congestion during daytime peak periods, it is proposed that the current 8 hour period night-time restrictions (outlined in paragraph 5.1.8 of this report) are replaced with the following:

- A maximum of 126 deliveries per day, with an expected total of 100 deliveries per day;
- A maximum 64 total deliveries at night, with a maximum of 3 per hour from M40 Junction 2, and a maximum 8 per hour in total;
- HGVs arriving from the west or Midlands will only access the site via M4 Junction 7;
- HGVs arriving from elsewhere (excluding nights) will arrive via M4 Junctions 6 or 7; and
- No HGVs will be scheduled to arrive at site between 07:30 to 09:30 and 16:30 and 18:30 from Monday to Friday.

9.5.9 These restrictions would apply to both the demolition/construction phase and operational phase of the Proposed Development.

9.5.10 This revised condition would allow an additional 40 night-time deliveries (an increase from 24 currently to 64), and therefore provides the Applicant with greater scope to avoid deliveries during the peak hour, day time period. No HGV deliveries will be scheduled to arrive at site between 07:30 to 09:30 and 16:30 and 18:30. Given that the traffic flows have again been tested against the peak hours in the previous sections, and baseline flows are less outside these hours, this Transport Assessment will have overestimated the effect of the Proposed Development. Despite this, no significant effects have been identified.

9.5.11 The new restrictions also state that HGVs will not be allowed to arrive via the A355 Farnham Road (north of Edinburgh Avenue) during daytime, and only 3 per hour in night-time (23:00 to 07:00), which has been taken into account in the Sensitivity Test. Due to the fact that most of these vehicles will be arriving at the site from the M40 west of the Proposed Development, the most likely alternative route that these vehicles would take is via Fairlie Road and south to the A4. Even if they distribute across other routes, the sensitivity test adds a far higher proportion of trips to each road than is expected to occur. The trips have also been left on the A355 Farnham Road (north) so as to show what would happen at this location should the restrictions not be implemented. It is therefore considered that this test provides a very robust assessment of the potential impact of the proposed development on the surrounding highway network.

9.5.12 The proposed restriction on HGVs heading north on Farnham Road is not anticipated to have an adverse impact on the Three Tuns junction (A355 Farnham Road/A4 Bath Road junction). As discussed above, the most likely alternative route for these vehicles is west and then south to the A4, using Junction 7 of the M4 to access the site rather than the Three Tuns junction from Junction 6. Even in the unlikely event that 100% of the HGVs travelled through the Three Tuns junction, an additional five HGVs per hour in each direction would be added to the junction (increasing the hourly total two-way trips through this junction from 1771 to 1781 and the hourly total two-way HGV trips through the junction from 30 to 40). As discussed above, these vehicles would need to avoid the peak hours (07:30 to 09:30 and 16:30 and 18:30) and would therefore be utilising the junction at less busy times of the day, resulting in a negligible impact on the operation of the junction.

9.5.13 In summary, this Sensitivity Test demonstrates that throughout the day the maximum permitted traffic flows would still have a relatively low impact on the surrounding network, even if on certain days the trip distribution was markedly different from that predicted to occur. The sensitivity test also assesses the impact of the development with the proposed restrictions in place. The effect of the Proposed Development on the surrounding highway network continues to be low even with the Sensitivity Test distribution and proposed restrictions.

10 CONCLUSIONS

10.1.1 This Transport Assessment has been prepared in support of a planning application by SSE Generation Ltd to SBC for the demolition and removal of redundant generating plant and buildings and the development of a multifuel combined heat and power (CHP) facility providing up to 50MW gross electrical capacity and up to 20MW of heat.

10.1.2 The Site is positioned favourably for road access to the M4, M25 and M40 motorways as well as the A4. The A355 provides access to shops and other local amenities, as well as the wider transport network.

10.1.3 The report demonstrates that the Site is accessible by public transport, with four bus services operating within an easy walking distance of the development.

10.1.4 Slough Rail Station is located approximately a 3.2km (40 minutes) walk to the east of the Site and is operated by First Great Western. The station provides a direct link to destinations including London, Windsor, Reading and Oxford. The station could be easily reached by pedal cycle and so could still be used as part of a wider journey. Burnham station is also located within an easy walking distance and so could also be used as part of a sustainable journey to/from the Site.

10.1.5 There is a good network of footways within the vicinity of the Site. It is generally considered that journeys of 2km or less provide the best opportunity to encourage employees to travel to work on foot. Within this distance there are a number of residential areas. Walking therefore has potential to be promoted as a mode of travel to access the Site.

10.1.6 There does not appear to be a specific pattern of accidents in the vicinity of the SHP site, with accidents spread across the network. During the six years considered there were only four accidents involving HGVs on the network.

10.1.7 The entrance and exit junctions on Edinburgh Avenue are considered to be suitable in design for the proposed development. Each junction will become a yellow box junction so as to prevent any potential queuing. Additionally, the barrier at the entrance will be relocated further into the Site for the same reason.

10.1.8 To establish the potential effect of the Proposed Development, ATC surveys were carried out at nine locations on the surrounding highway network. TEMPRO growth rates were applied to the 2013 survey data and local committed development flows were added to form a baseline scenario for demolition/construction and opening year flows. The demolition and construction flows, Proposed Development flows and the Maximum Consented flows (which include deliveries for B17) were then added to the respective baseline data and the results were analysed.

10.1.9 At its peak, construction of the Proposed Development will employ up to 500 workers on site split into three shifts of 167, and around 100 would be employed during initial enabling works. On average, there will be around 300 workers over 3 shifts on site throughout the construction period.

10.1.10 Once operational, the Proposed Development is expected to provide an additional 20 permanent staff.

10.1.11 It was found that during the demolition/construction phase the largest effect will be on Buckingham Avenue. This is due to the number of staff accessing the Site from this road. HGVs will also most heavily affect Buckingham Avenue. Vehicle movements during this period will be enforced through the CEMP.

10.1.12 The main effect during operation will be the increased numbers of HGV deliveries and collections at the Site however HGV deliveries will be scheduled to avoid the weekday peak hours (07:30 to 09:30 and 16:30 to 18:30).

10.1.13 No effect is expected on local roads other than Buckingham Avenue and Farnham Road. Buckingham Avenue (east) will see a total increase of 37.5% in total vehicles during the PM peak. The overall effect on Farnham Road is far lower than on Buckingham Avenue, with the largest increase of 9.3% in total vehicles at Farnham Road (north) in the AM peak hour.

10.1.14 The rise in the percentage of HGVs at some locations (the largest increase being of 57.1% on Buckingham Avenue in the PM peak hour) is attributable to the fact that at these locations there was a small number of HGVs, meaning that a single vehicle can make a large impact in the percentage difference.

10.1.15 There is a similar pattern of effect during both peaks. The effect on the daily traffic is generally less than in the peak hours at all locations. There is no effect at all on Liverpool Road or Leigh Road. This is because no demolition/construction traffic will be routed this way.

10.1.16 A demolition and construction traffic flow profile was undertaken and the results of this showed that demolition and construction traffic will raise traffic levels above the levels of the current morning peak throughout the day at the four locations affected by the trip distribution. There are however significant variations in the level of this effect and as a result, demolition and construction shift changeovers will be scheduled to avoid the weekday peak hours (07:30 to 09:30 and 16:30 to 18:30) to avoid the worst affected hours and this will be enforced through the CEMP. The effects presented in this assessment are therefore likely to be an overestimate of the actual effects on local road traffic. Overnight the effect results in lower flows than the existing peak hour.

10.1.17 Demolition and construction traffic will be mitigated through a CEMP and which will impose designated routes and timings for all trips generated by the site and will look to limit the effect of this phase of development.

10.1.18 The 2019 data showed that with the current restrictions in place, there will be a very low impact on the highway network as a whole for the AM peak, PM peak and daily flows as a result of the Proposed Development. The most heavily impacted road will be Edinburgh Avenue, near to the site access, with a predicted 3.3% increase in total daily vehicles with the maximum operational flows. The low baseline levels of traffic on this road mean that the impact is still expected to be insignificant.

10.1.19 The effect of the Proposed Development on the A355 Farnham Road/A4 Bath Road signalised junction is also expected to be negligible.

10.1.20 A sensitivity test was conducted to show an absolute worst-case scenario for the surrounding highway network. This took the maximum permitted traffic and routed 50% of this from/to the west, 100% from/to the east and 33.3% to/from the south. This result showed that even if on one day there was a huge shift from the expected trip distribution onto different routes, the effect of the Proposed Development would still be expected to be low. This sensitivity test also displays that with the proposed restrictions at the site, the development would still have little effect on the surrounding highway network.

10.1.21 In summary, it is considered that the Proposed Development is well positioned in terms of sustainable travel. The effect of the Proposed Development on the surrounding transport infrastructure is predicted to be low. The Proposed Development is expected to generate significantly less traffic than the maximum permitted by the existing consent for the SHP site.

Annex A - Site Location Plan

N
Key:
Proposed Development Site
0
1
2
4
6
Kilometers
A4
A355
M4
M40
M25
Slough
Slough Trading Estate
Kennedy Park
Maidenhead
Bath Road
Burnham
Taplow
Farnham Royal
Stoke Poges
Hedgerley
Fulmer
Iver Heath
George Green
Richings Park
Langley
Iver
Colnbrook
Datchet
Eton
Eton Wick
Dorney
Windsor
Bray
Cookham
Bisham
Marlow
Little Marlow
Bourne End
Wooburn Green
Beaconsfield
Loudwater
Seer Green
Chalfont St. Peter
West Hyde
South Harefield
Denham Green
Denham
Ickenham
Uxbridge
Cowley
Hurley
Burchetts Green
Littlewick Green
Oakley Green
Fifield
Legoland
Stanwell
Horton
Queen Mother Reservoir
BUCKINGHAMSHIRE
BERKSHIRE
Handy Cross
Cock Marsh
Globeside Business Park
Eton Dorney Rowing Centre
Lakeside Industrial Estate
Horton Industrial Estate
The Home Park
London Road
Oxford Road
Stoke Poges Lane
Stoke Road
Wood Lane
Iver Lane
Bray Road
Dean Lane
Eton Road
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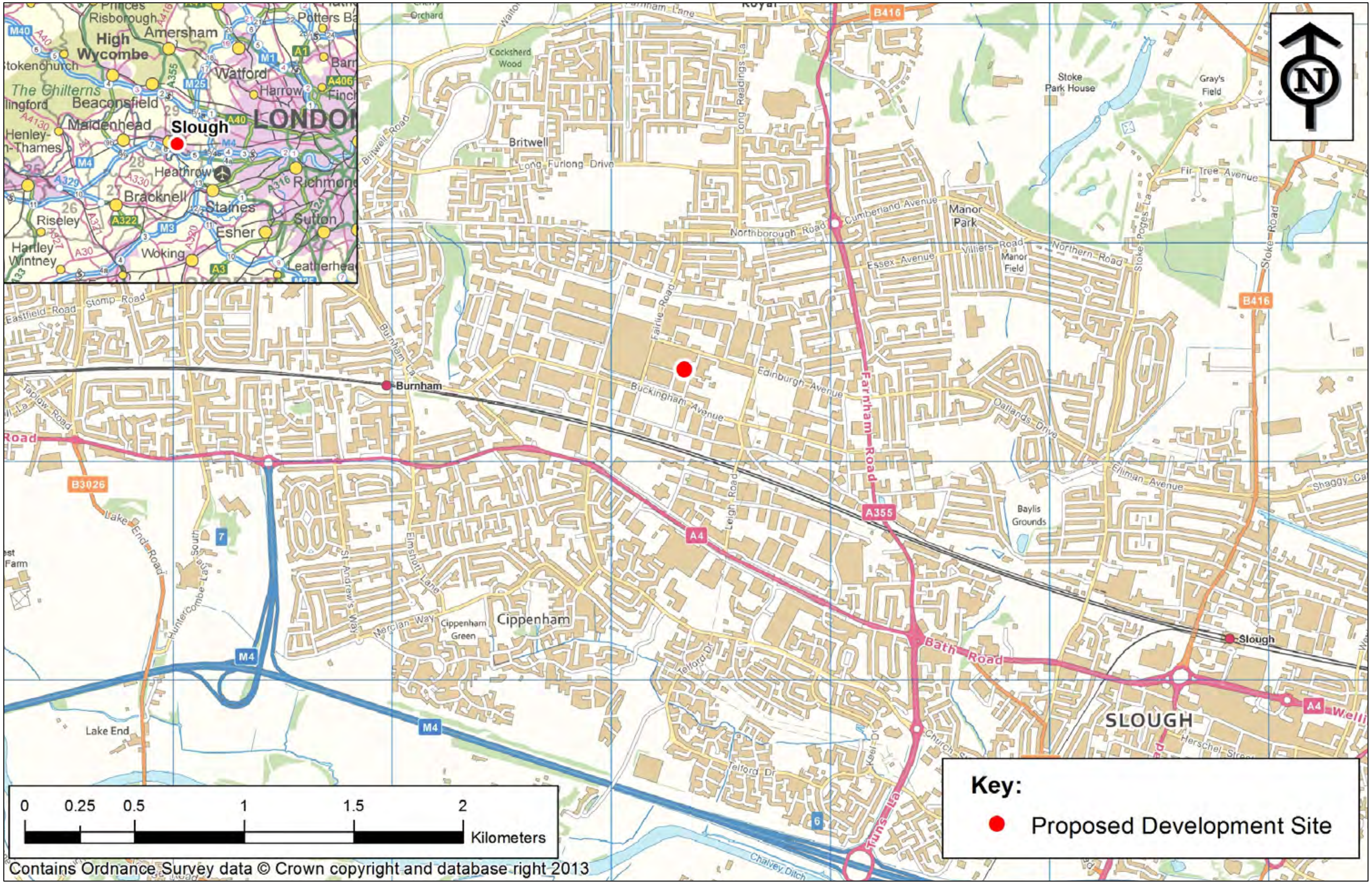
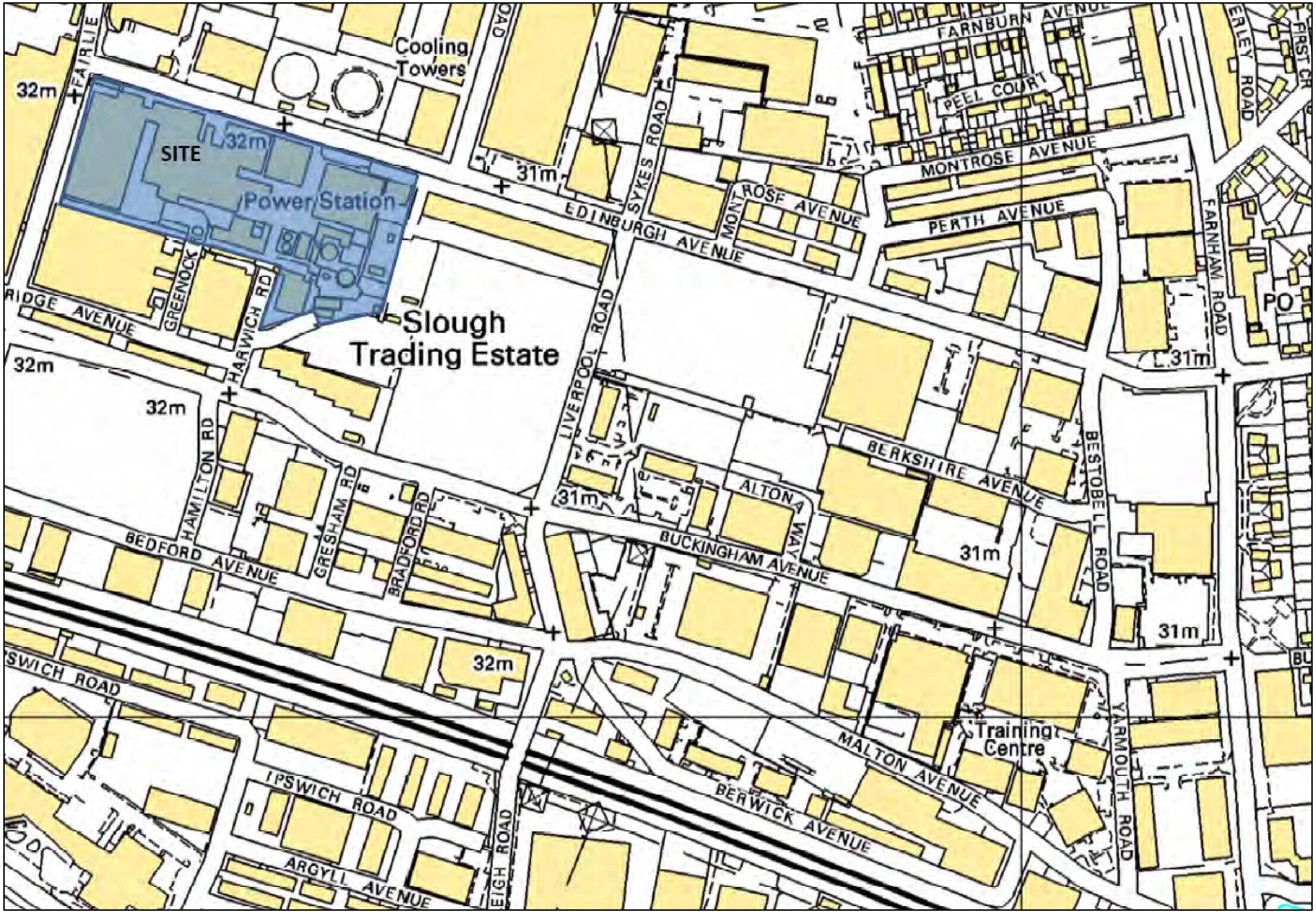
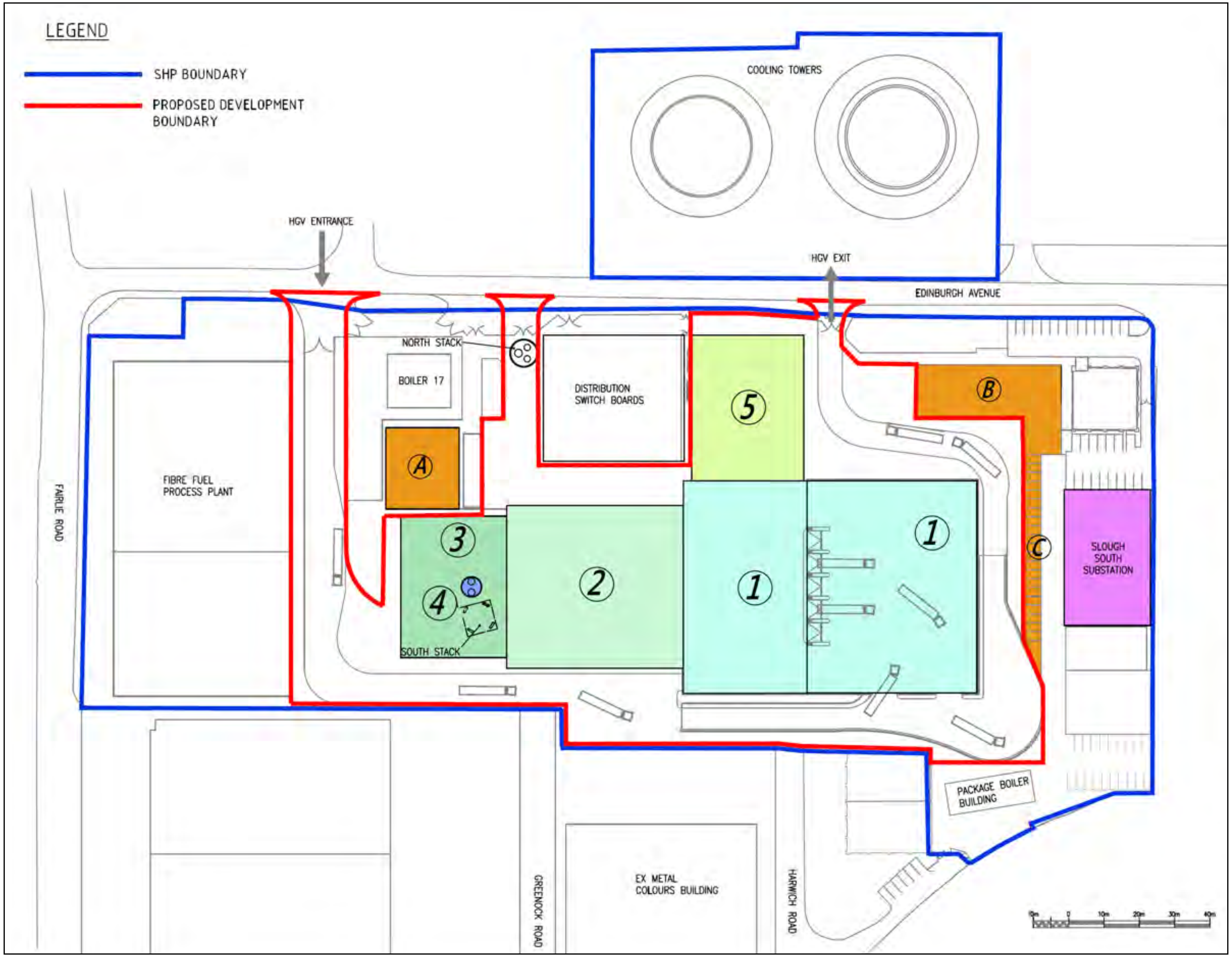

Key:
Proposed Development Site
Kilometers
0
0.25
0.5
1
1.5
2
Contains Ordnance Survey data © Crown copyright and database right 2013
Slough
LONDON
SLOUGH
Burnham
Britwell
Cippenham
Manor Park
Farnham Road
Bath Road
Edinburgh Avenue
Buckingham Avenue
M4
A4
A355
B416
B3026


SITE
Power Station
Slough
Trading Estate
Cooling
Towers
FAIRLIE
EDINBURGH AVENUE
SYKES ROAD
MONTROSE AVENUE
PERTH AVENUE
FARNBURN AVENUE
PEEL COURT
FARNHAM ROAD
PO
RIDGE AVENUE
GREENOCK
HARWICH RD
LIVERPOOL ROAD
BERKSHIRE AVENUE
BESTOBELL ROAD
ALTONA WAY
BUCKINGHAM AVENUE
HAMILTON RD
GRESHAM RD
BRADFORD RD
BEDFORD AVENUE
IPSWICH ROAD
ARGYLL AVENUE
BERWICK AVENUE
MALTON AVENUE
YARMOUTH ROAD
Training
Centre
32m
31m

Annex B – Site Masterplan

Annex B



Main Layout Features of the Proposed Development:

1 – Enclosed tipping hall and fuel bunker
2 – Boiler house
3 – Flue Gas Treatment (FGT) plant
4 – Possible new stack to replace the existing south stack
5 – Turbine Hall

Main Layout Features of the Further Development:

A – Water Treatment Plant
B – Central Site Service Building
C – Car Parking

Annex C – Traffic Flow Diagrams

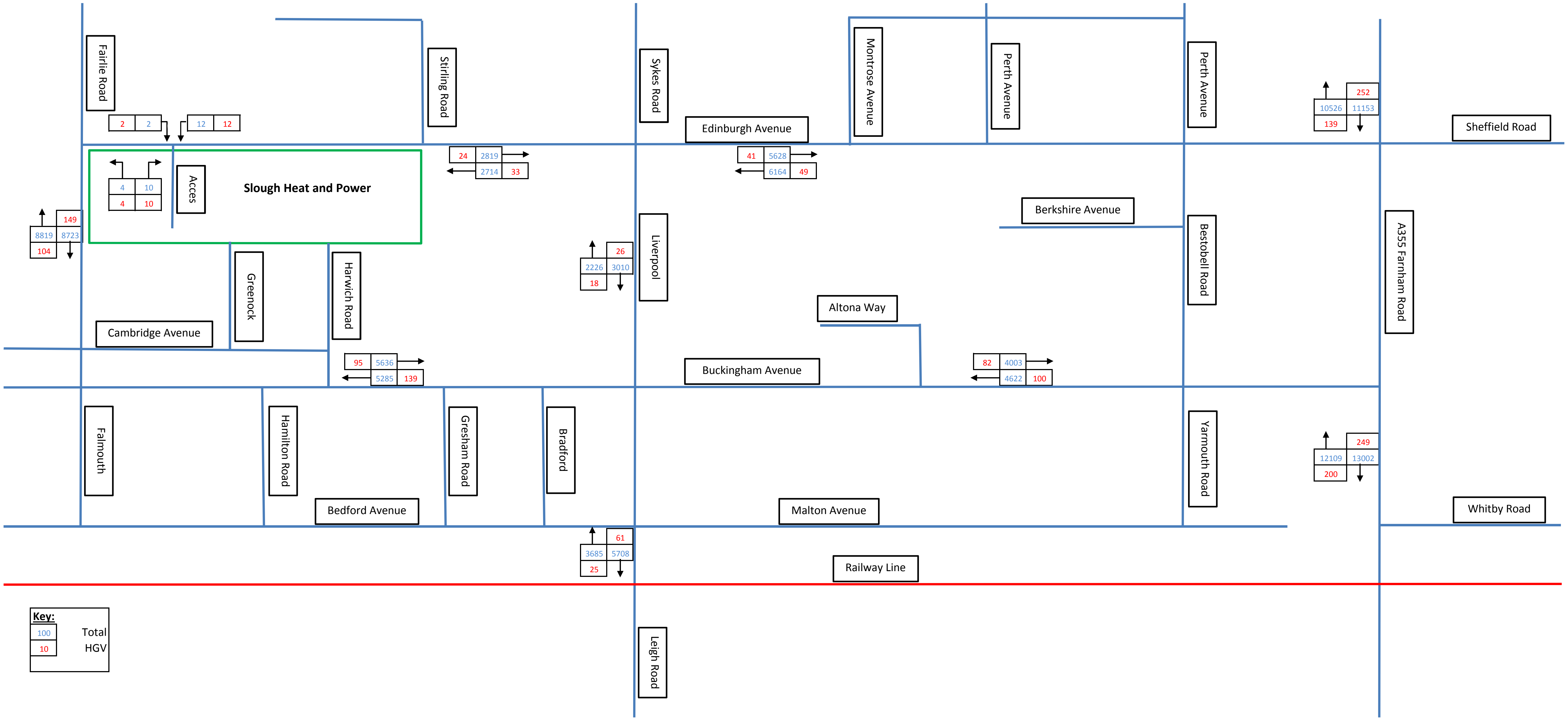


Figure 5-1: 2013 Base- Daily Average

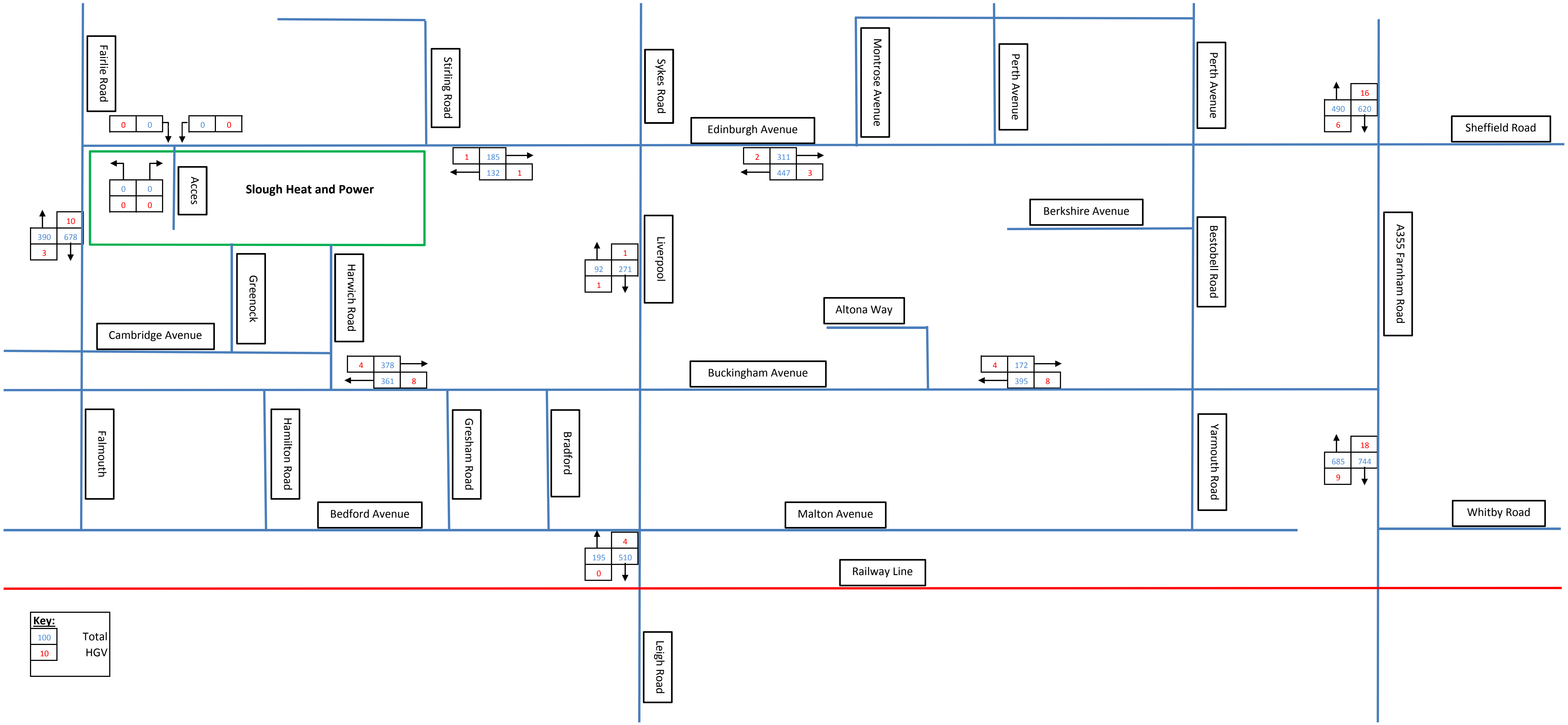


Figure 5-2: 2013 Base- AM Peak Hour

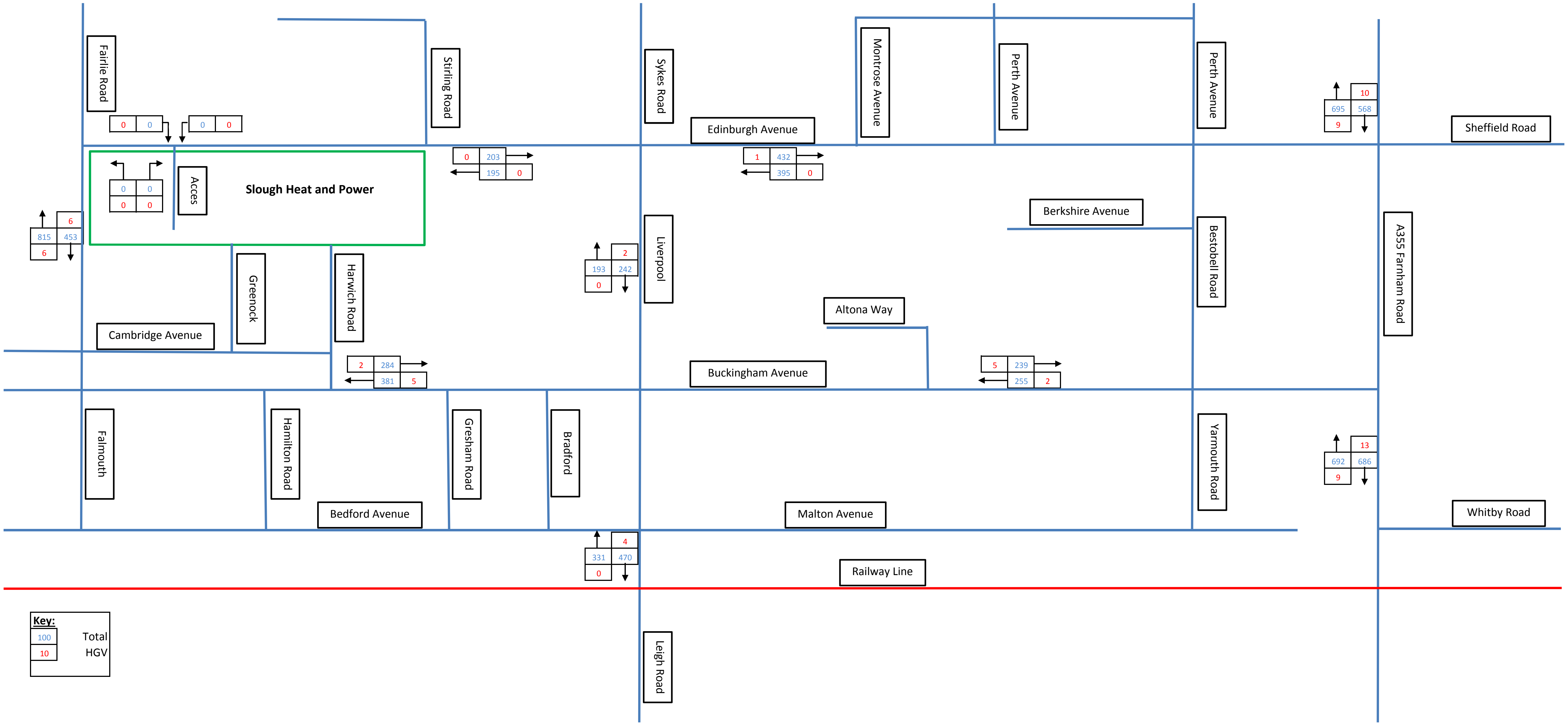


Figure 5-3: 2013 Base- PM Peak Hour

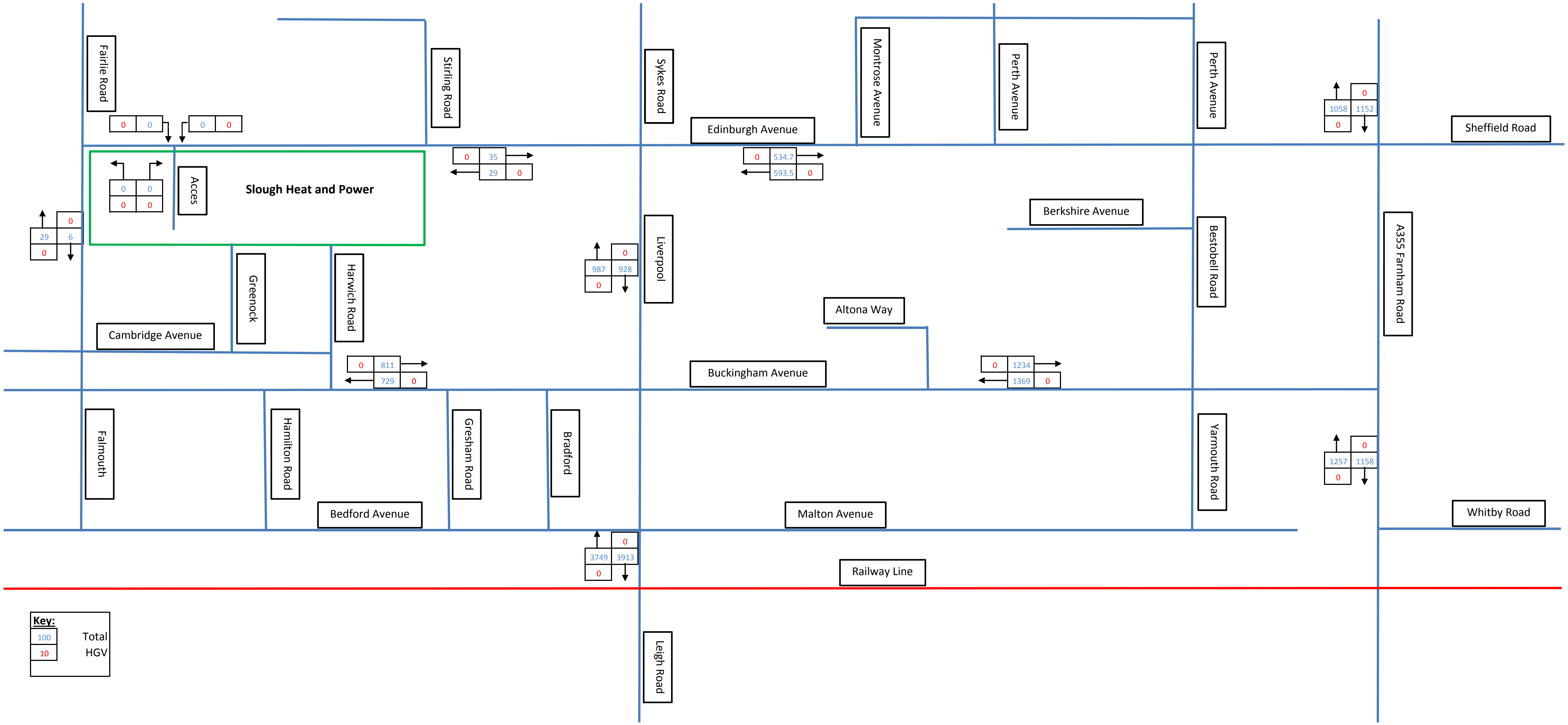


Figure 7-1: Weekday Traffic Generated by Cumulative Developments

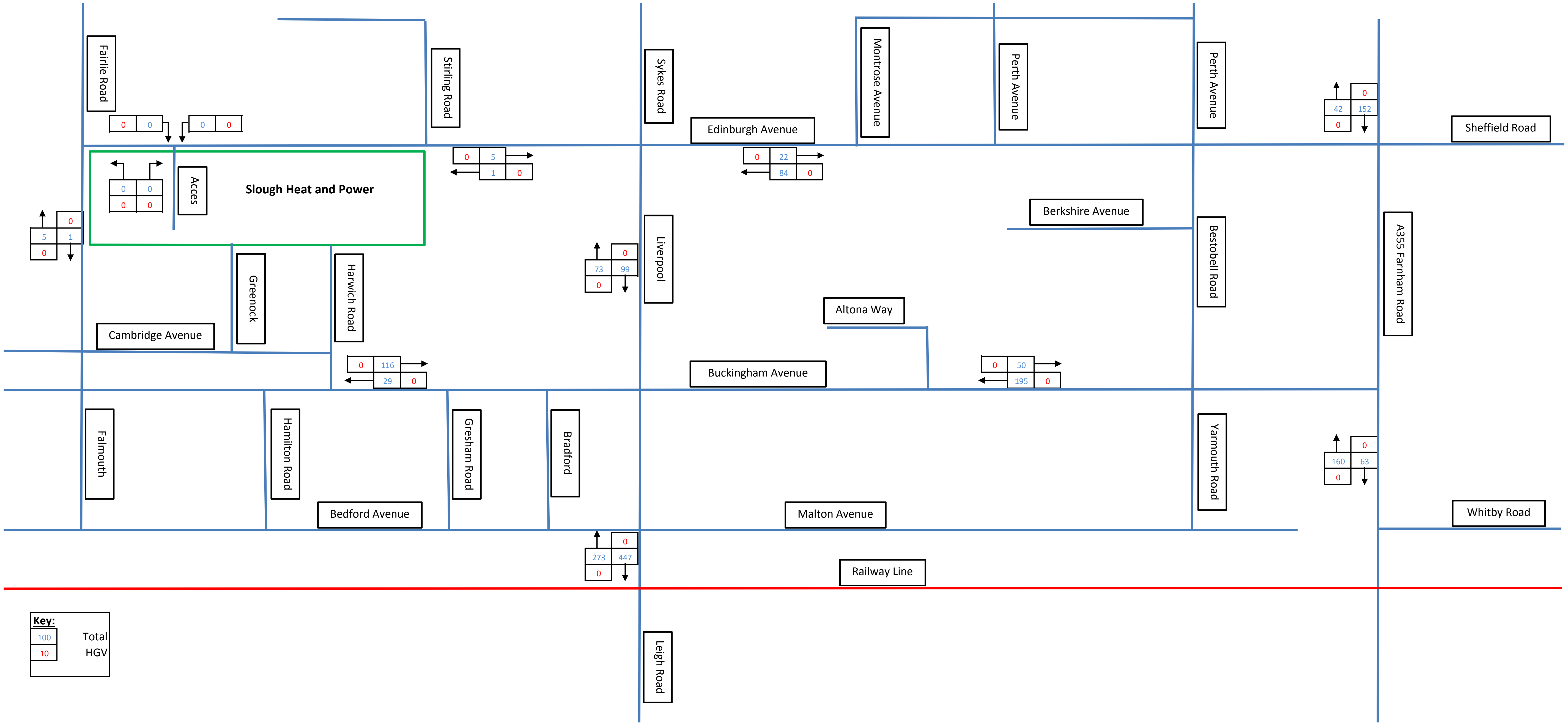


Figure 7-2: AM Peak Traffic Generated by Cumulative Developments

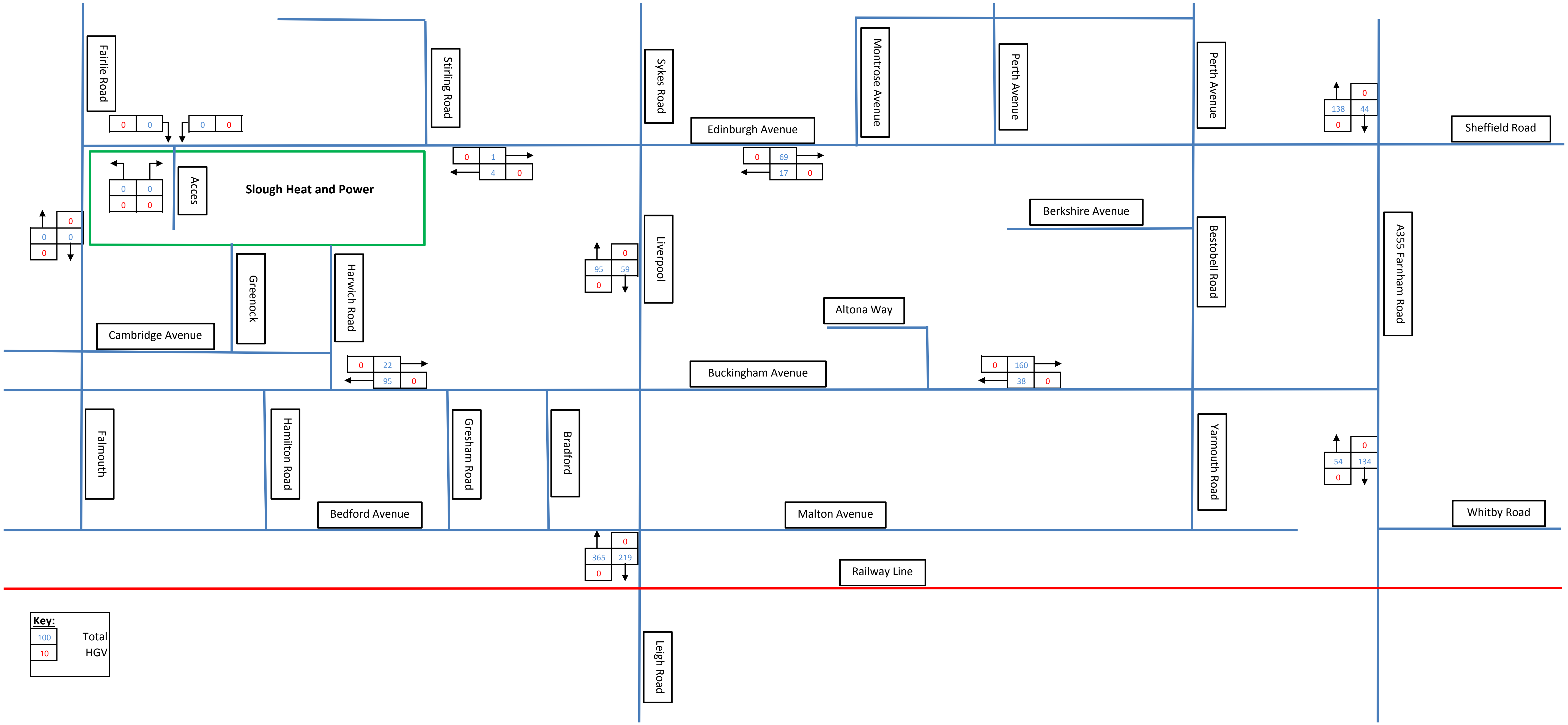


Figure 7-3: PM Peak Traffic Generated by Cumulative Developments

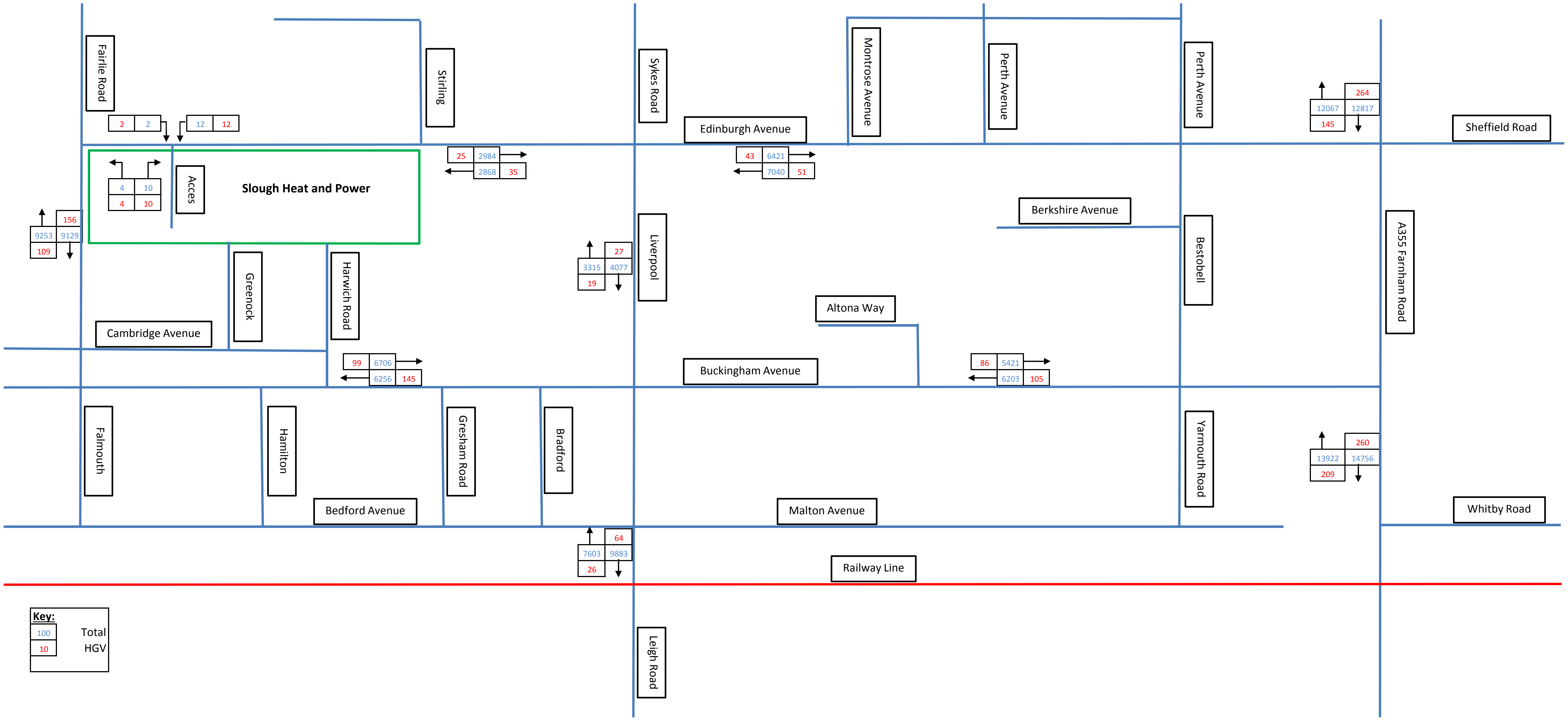


Figure 8-1: 2017 Base- Daily Traffic

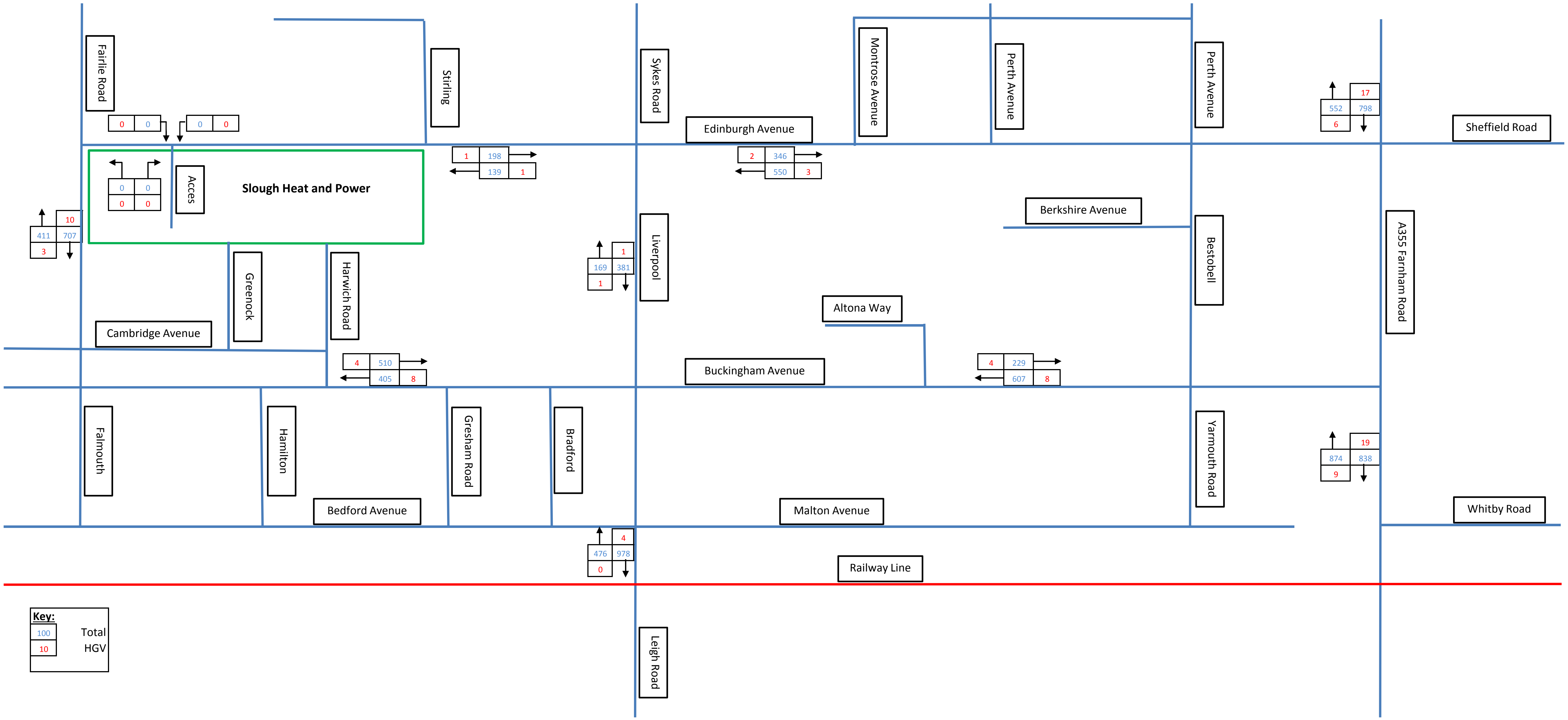


Figure 8-2: 2017 Base- AM Peak Traffic

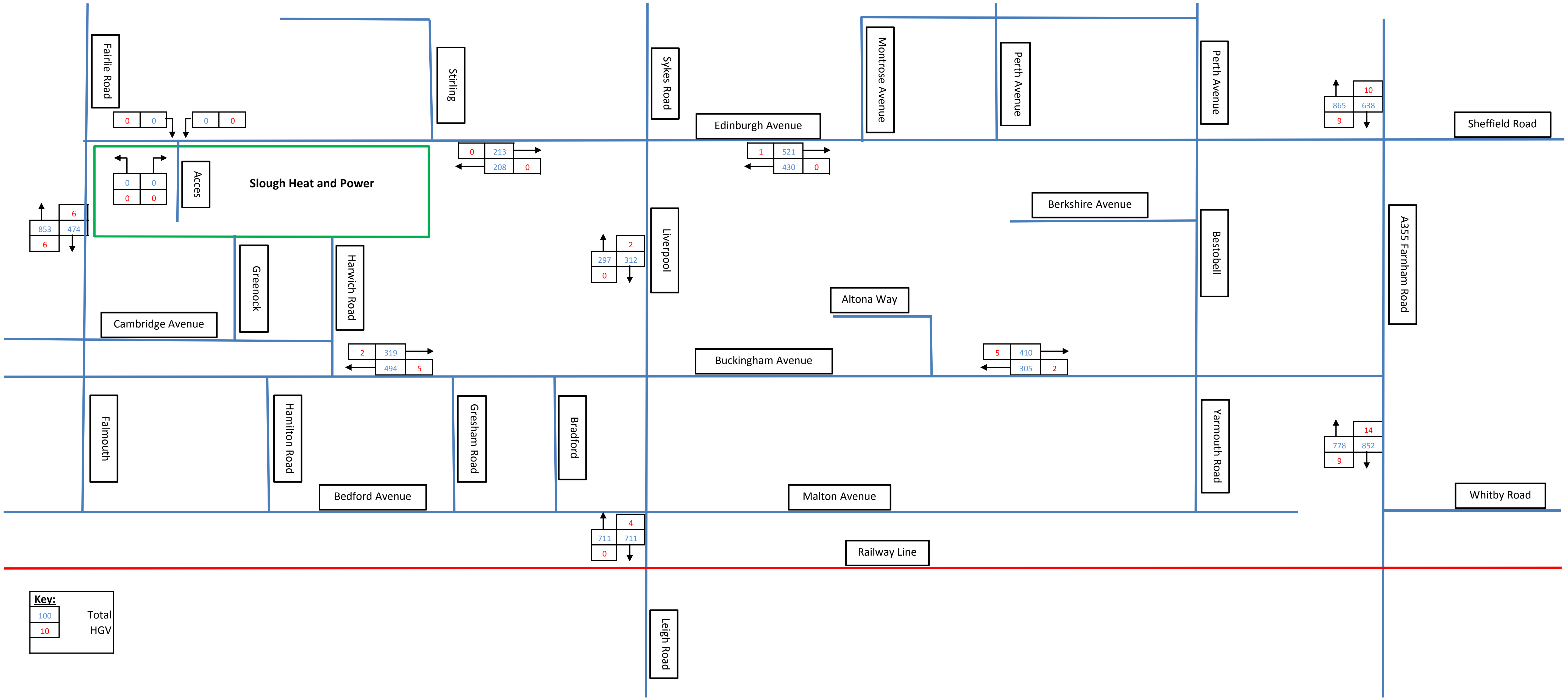


Figure 8-3: 2017 Base- PM Peak Hour

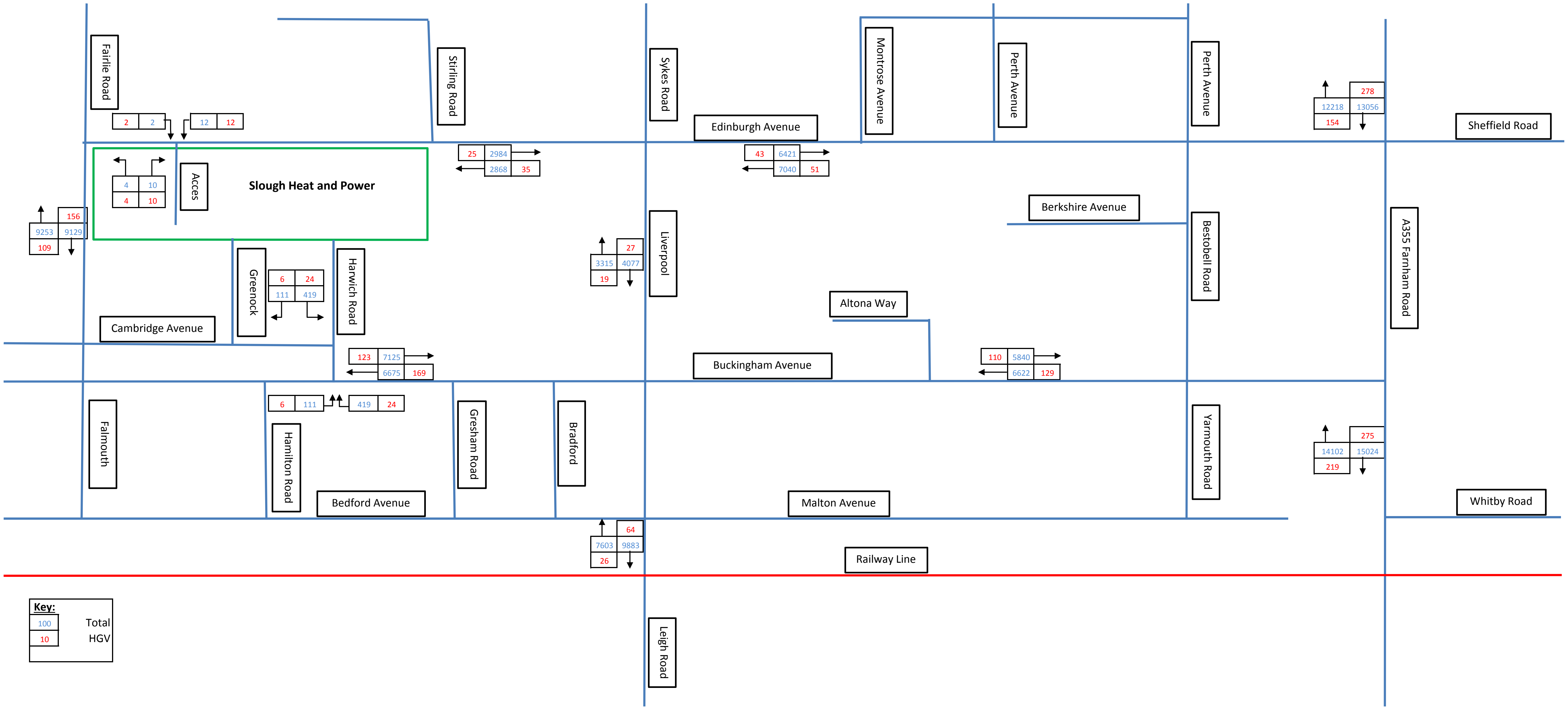


Figure 8-4: 2017 Daily Traffic With Construction

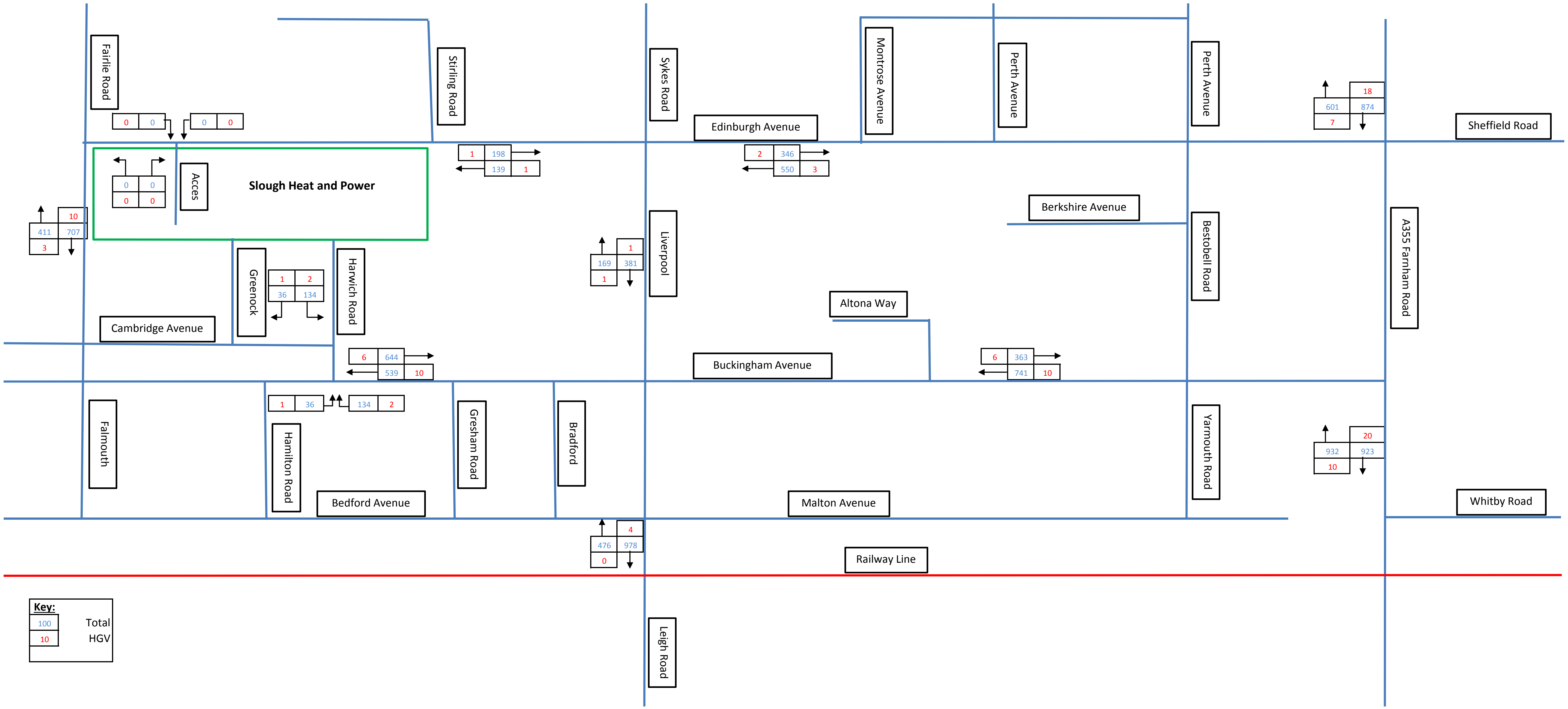


Figure 8-5: 2017 AM Traffic With Construction

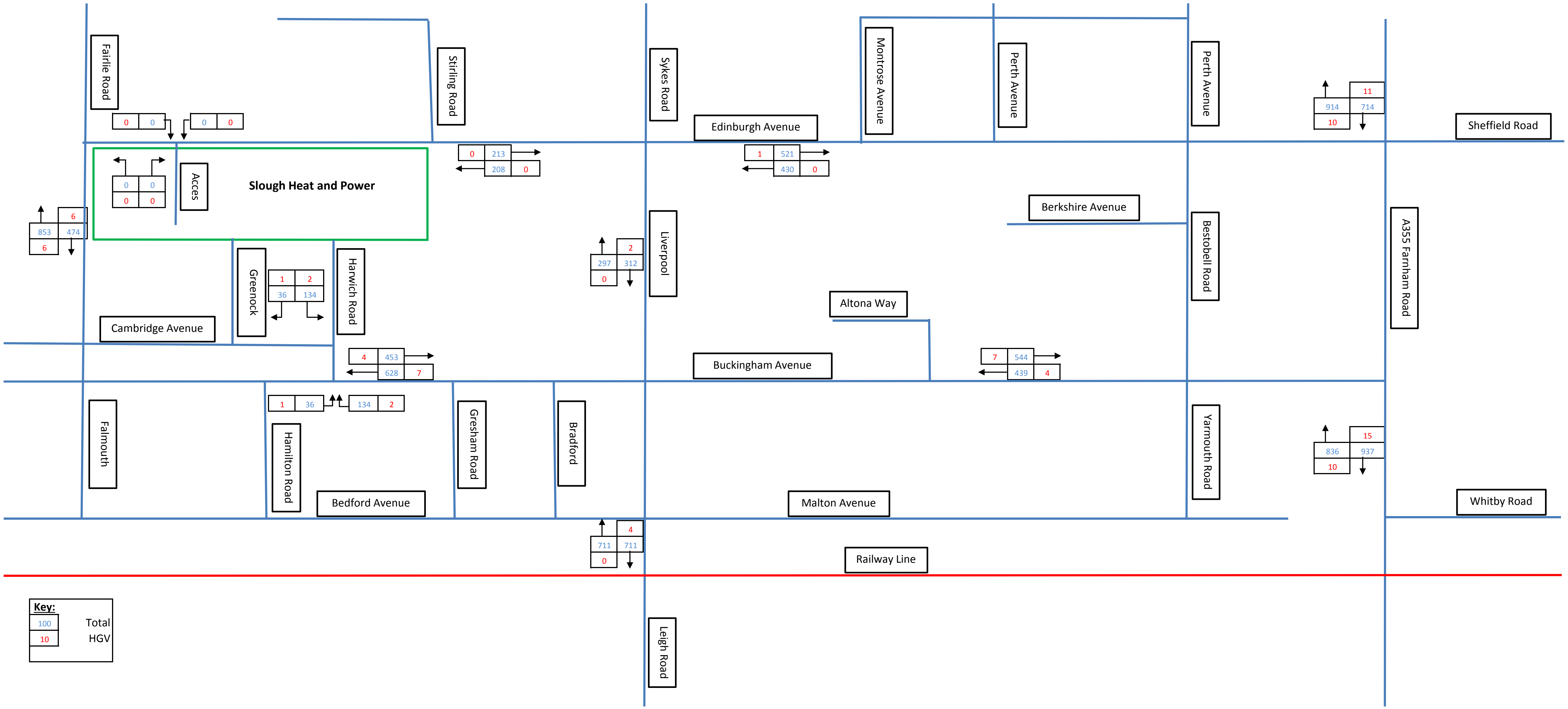


Figure 8-6: 2017 PM Traffic With Construction

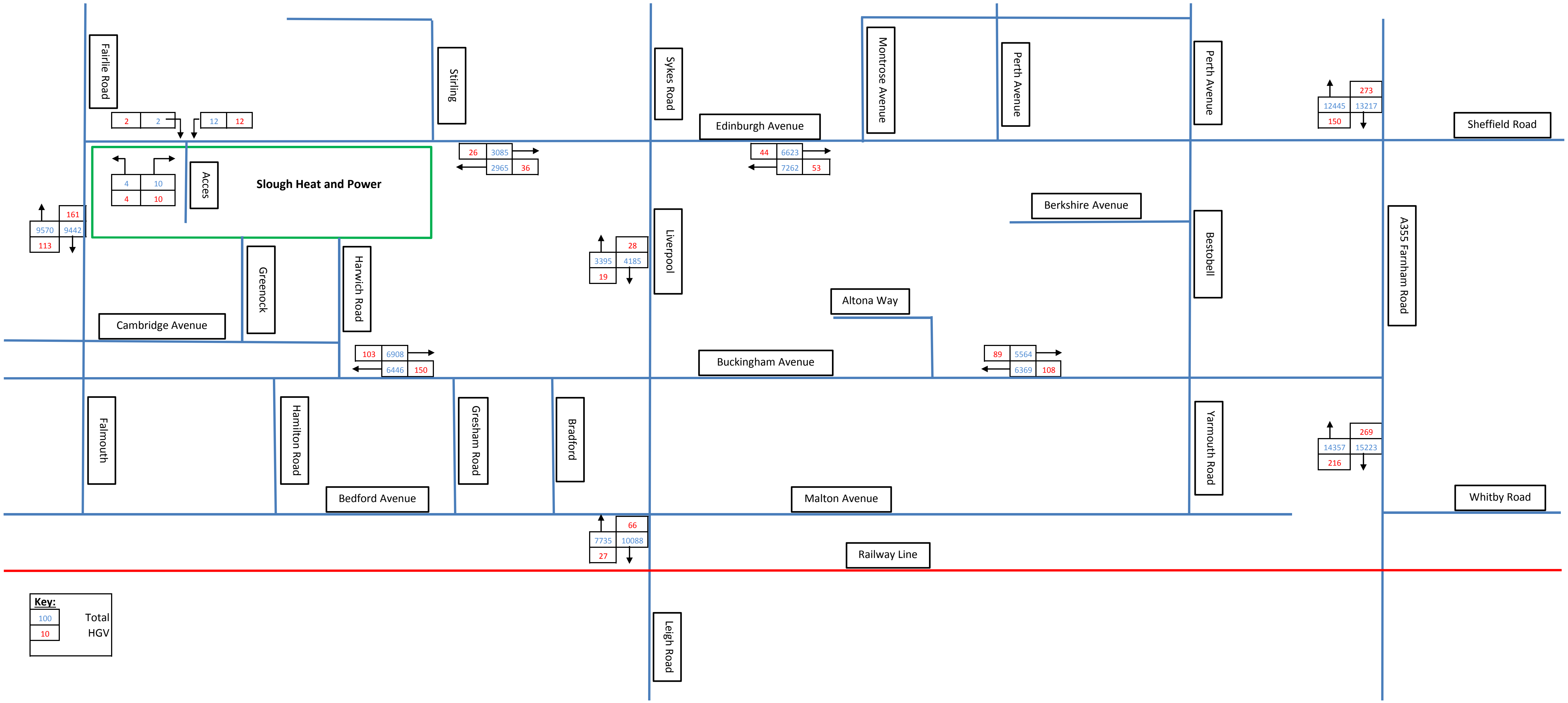


Figure 9-1: 2019 Base- Daily Average

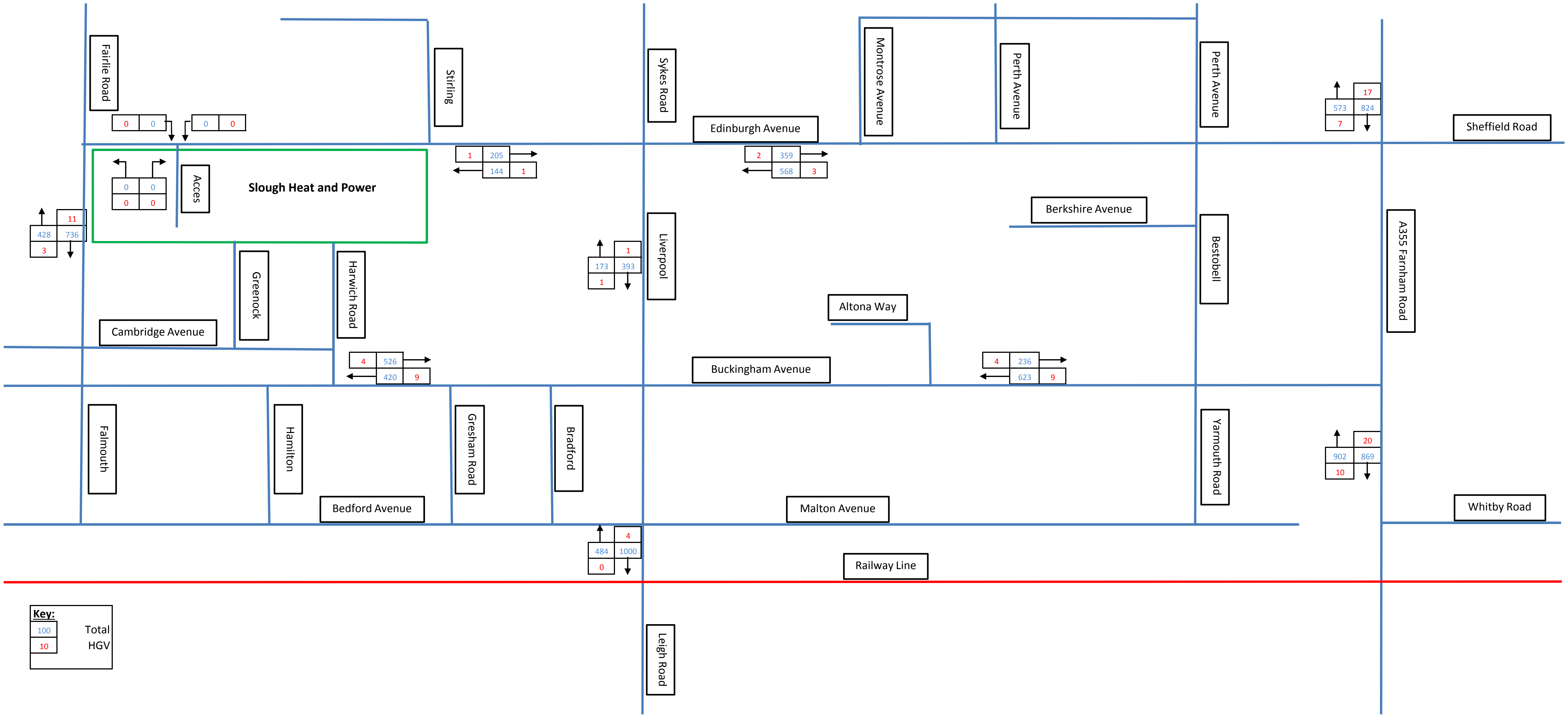


Figure 9-2: 2019 Base- AM Peak Hour

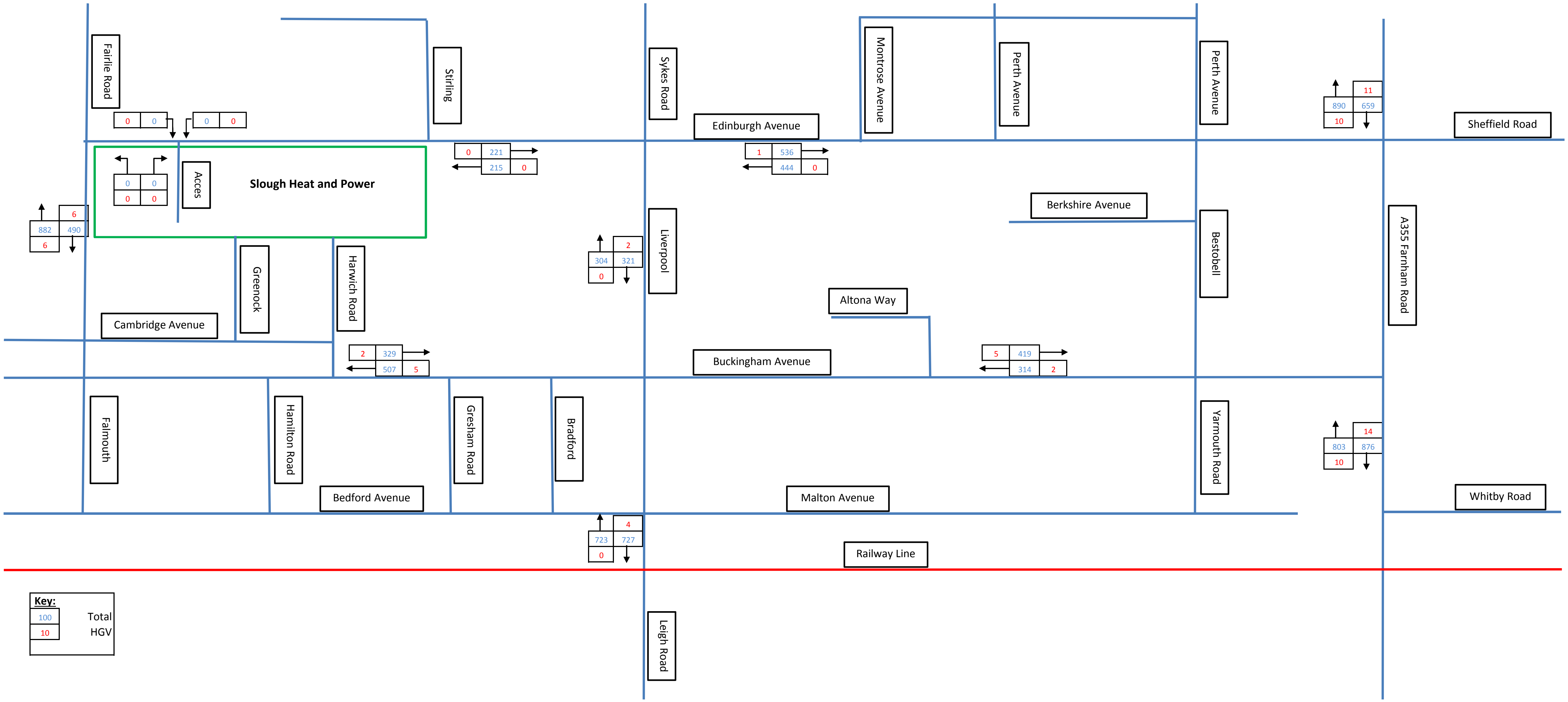


Figure 9-3: 2019 Base- PM Peak Hour

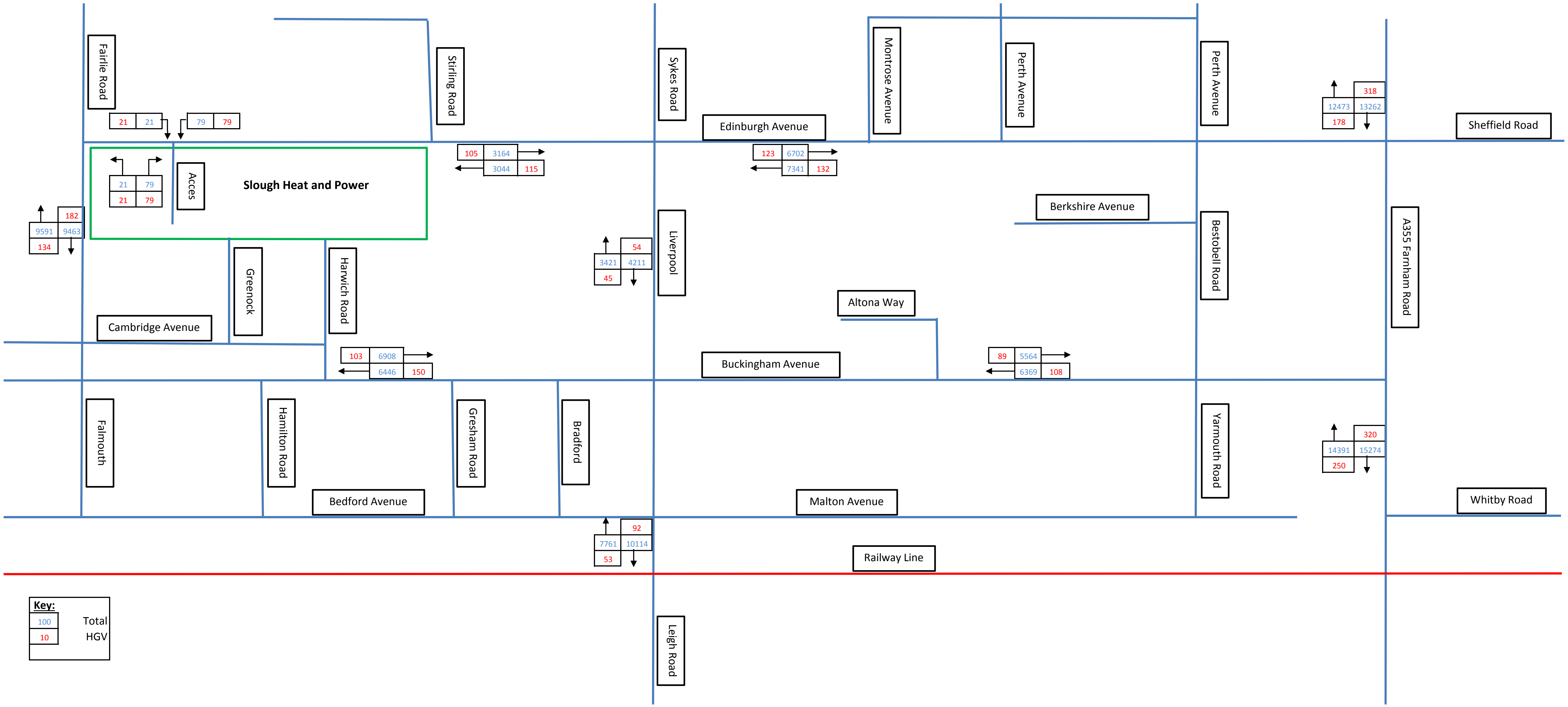


Figure 9-4: 2019- Daily Traffic Flows With Proposed Development

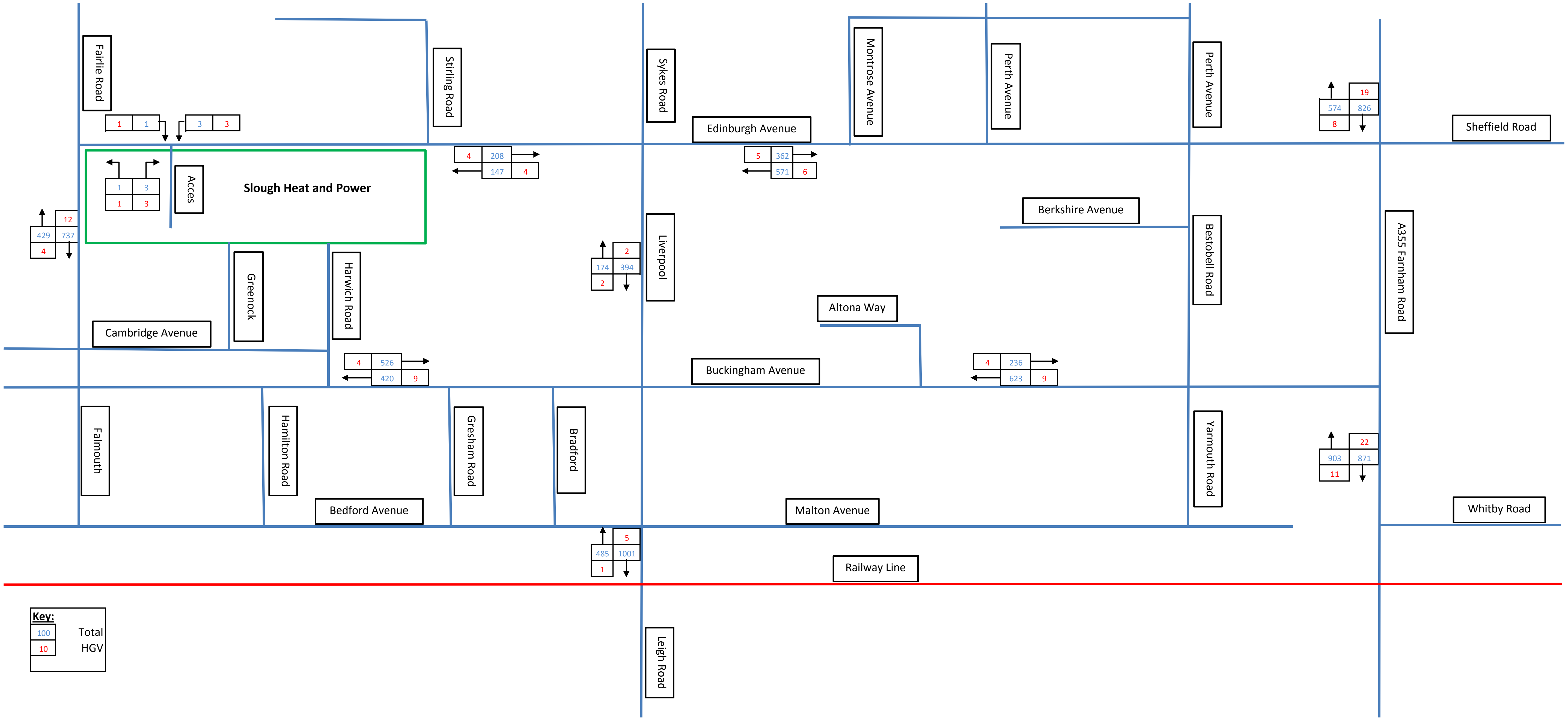


Figure 9-5: 2019- AM Peak With Proposed Development

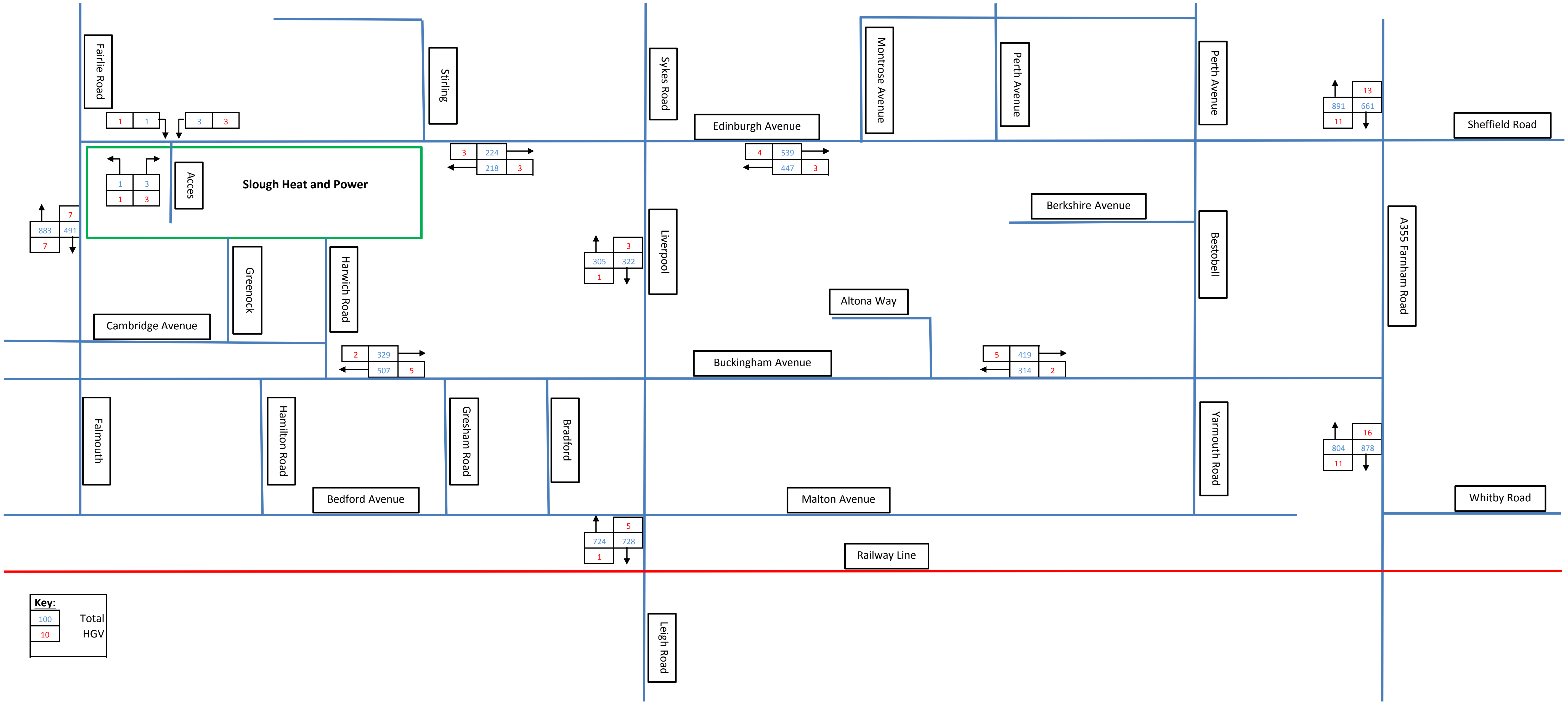


Figure 9-6: 2019- PM Peak With Proposed Development

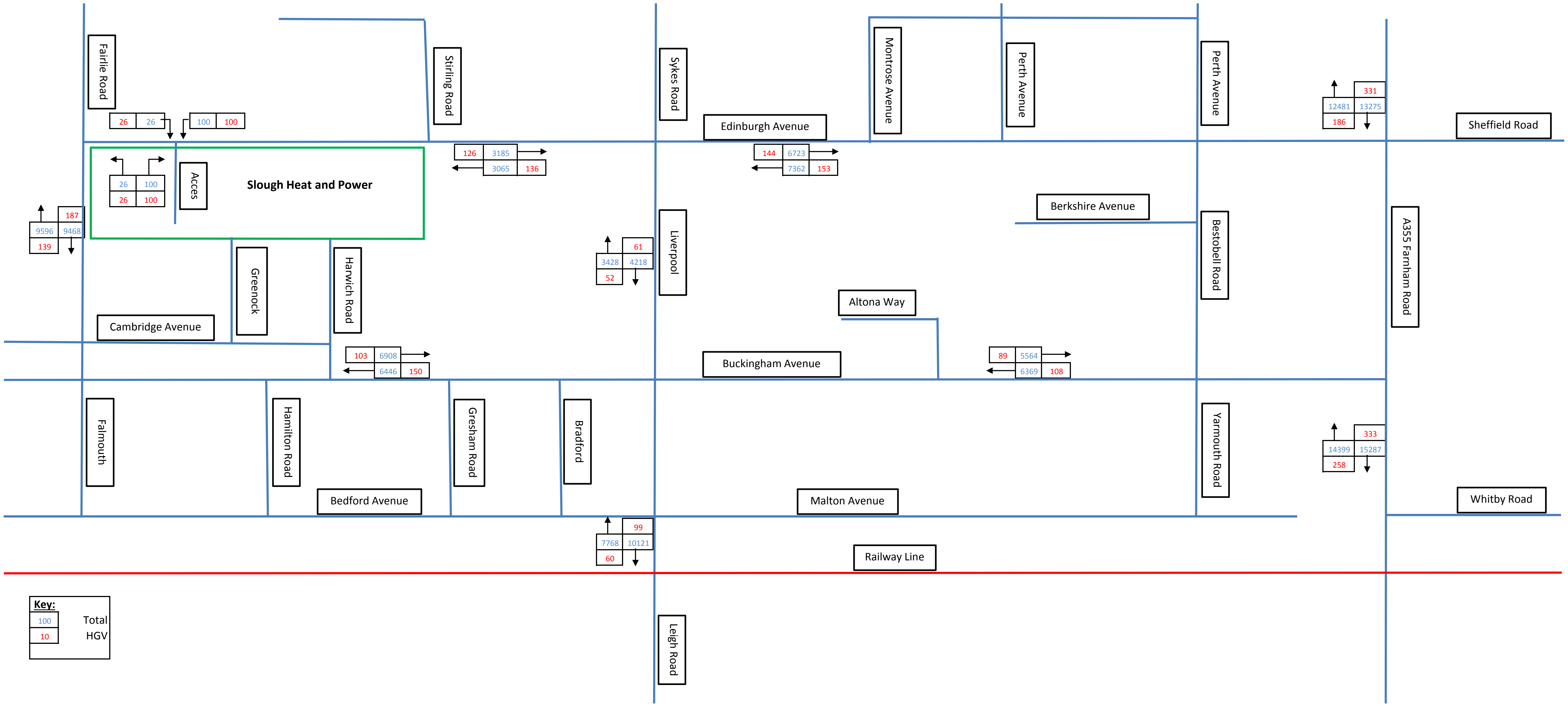


Figure 9-7: 2019- Daily Flows With Maximum Consented Development Traffic

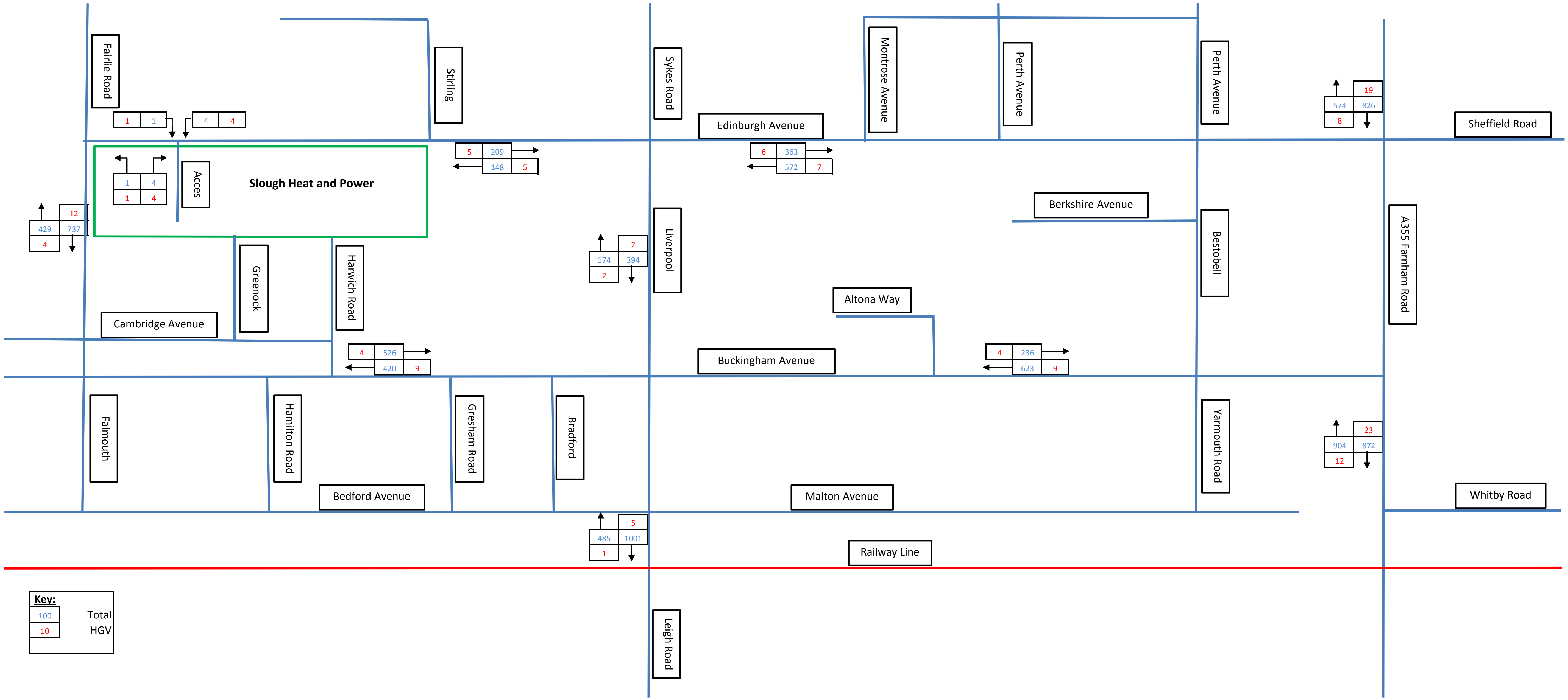


Figure 9-8: 2019- AM Peak With Maximum Consented Development Traffic

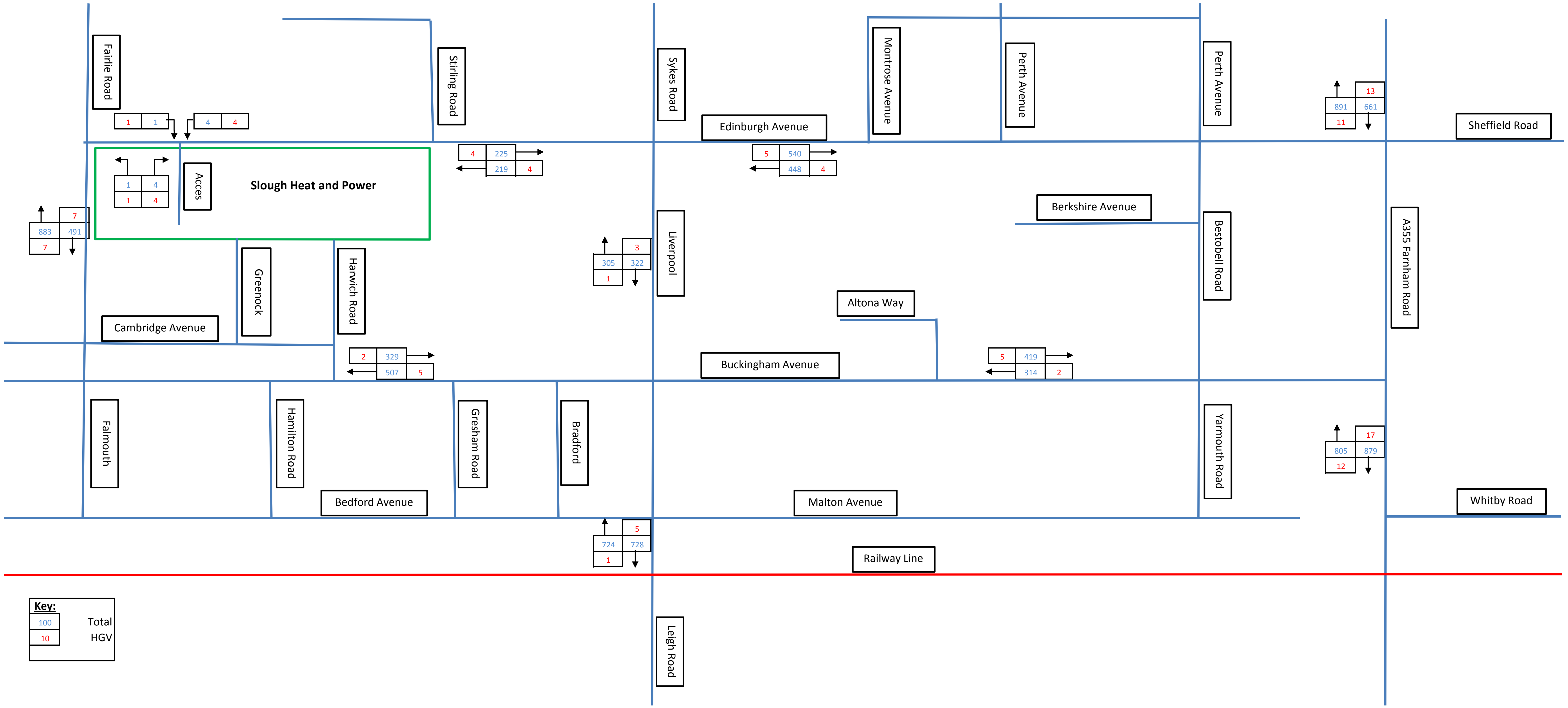


Figure 9-9: 2019- PM Peak With Maximum Consented Development Traffic

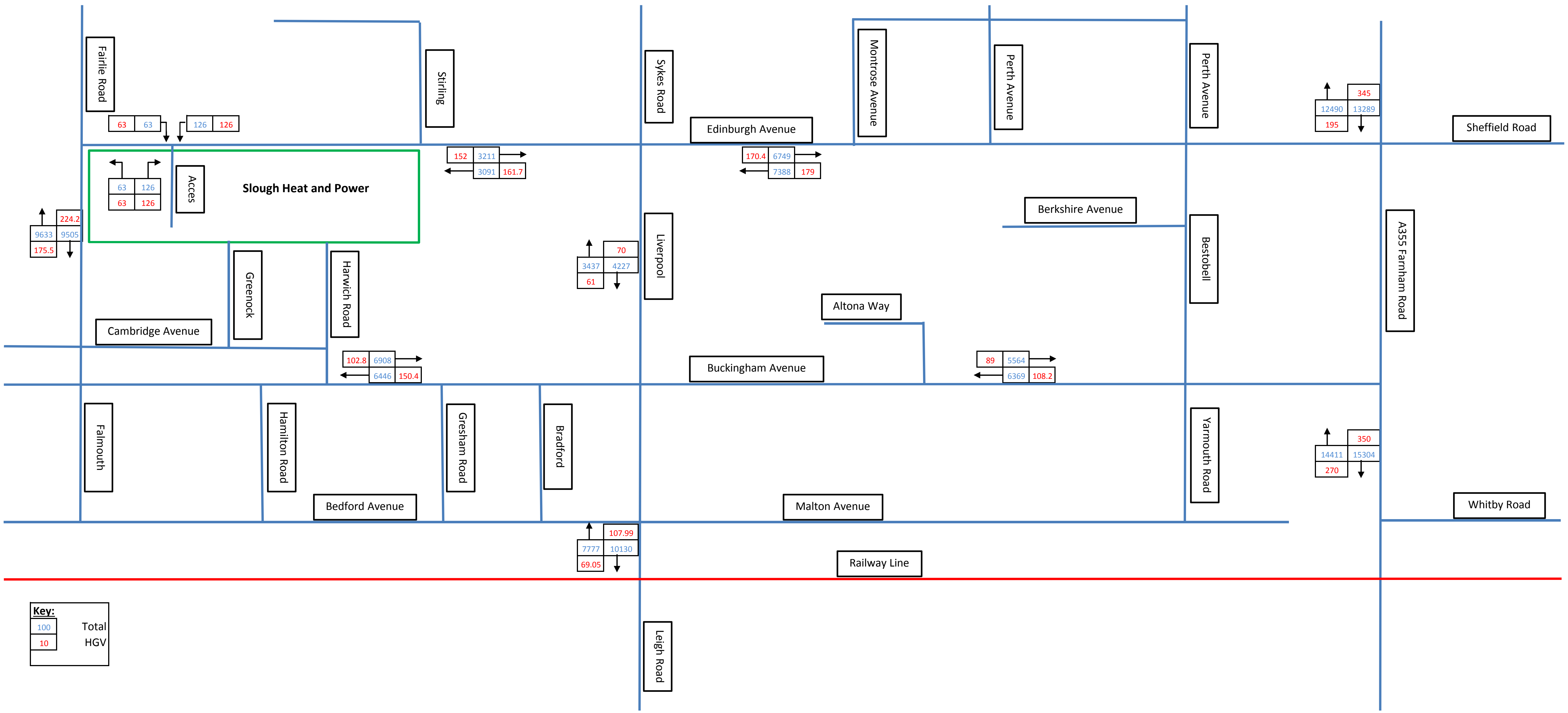


Figure 9-10: 2019- Daily Sensitivity Test

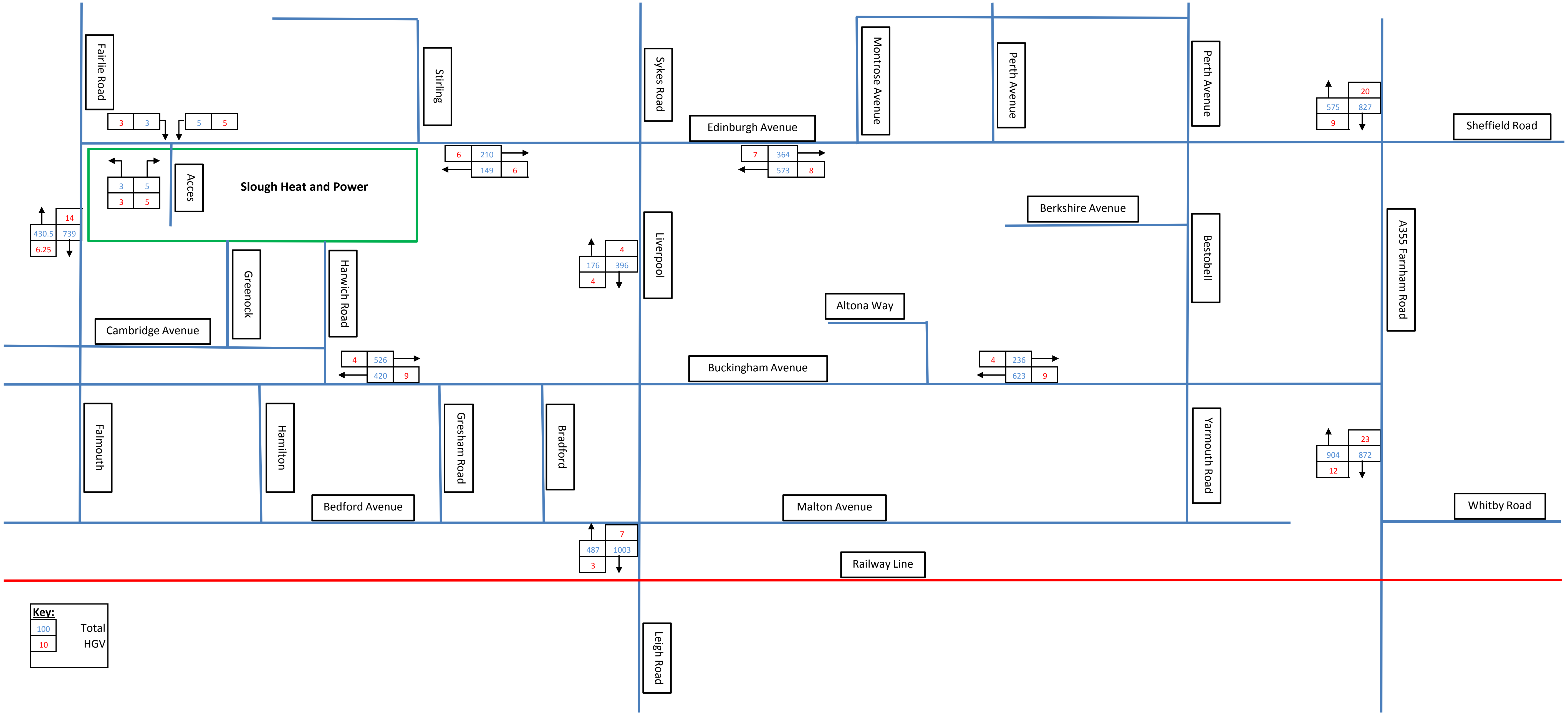


Figure 9-11: 2019- AM Peak Sensitivity Test

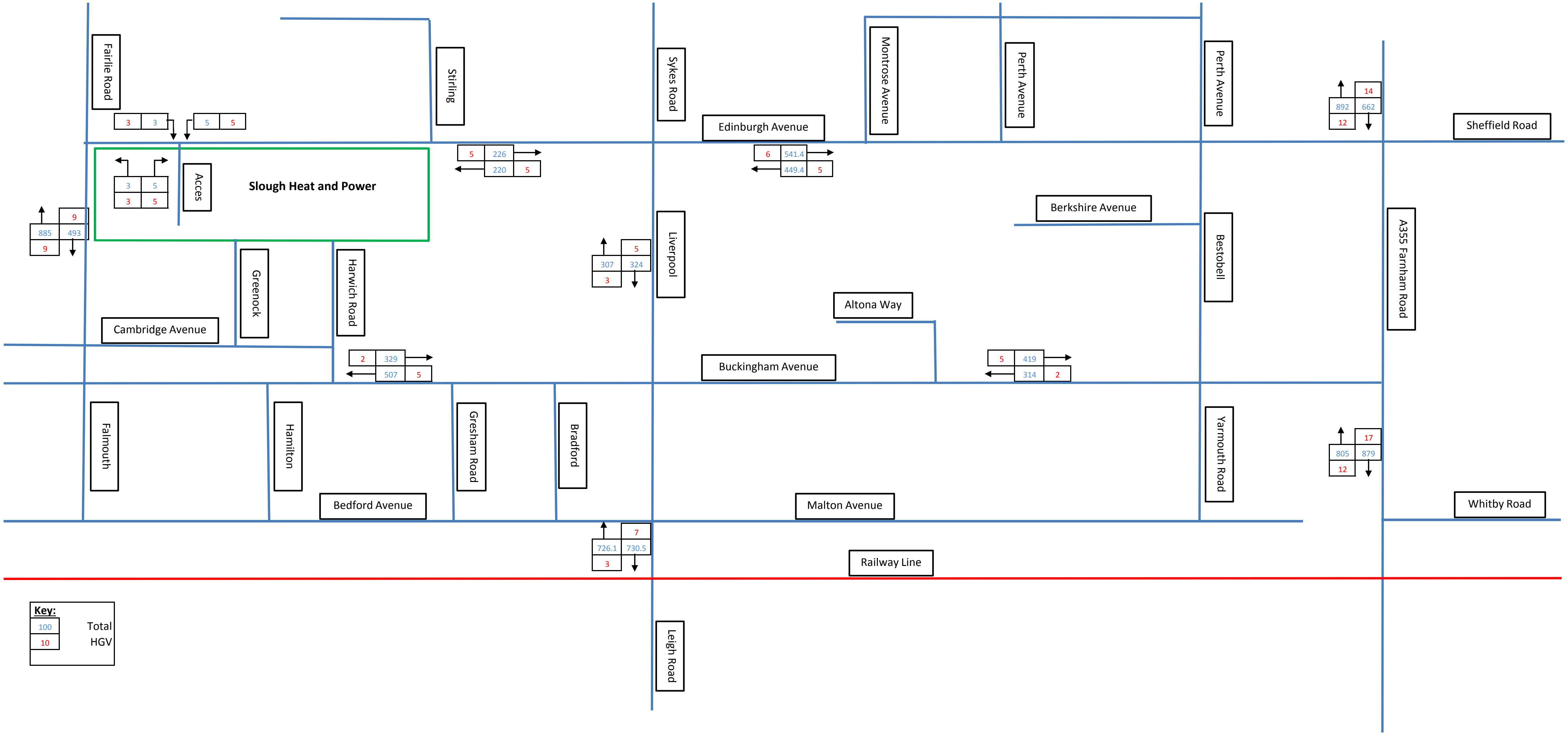


Figure 9-12: 2019- PM Peak Sensitivity Test

Annex D – Tracking Excercise

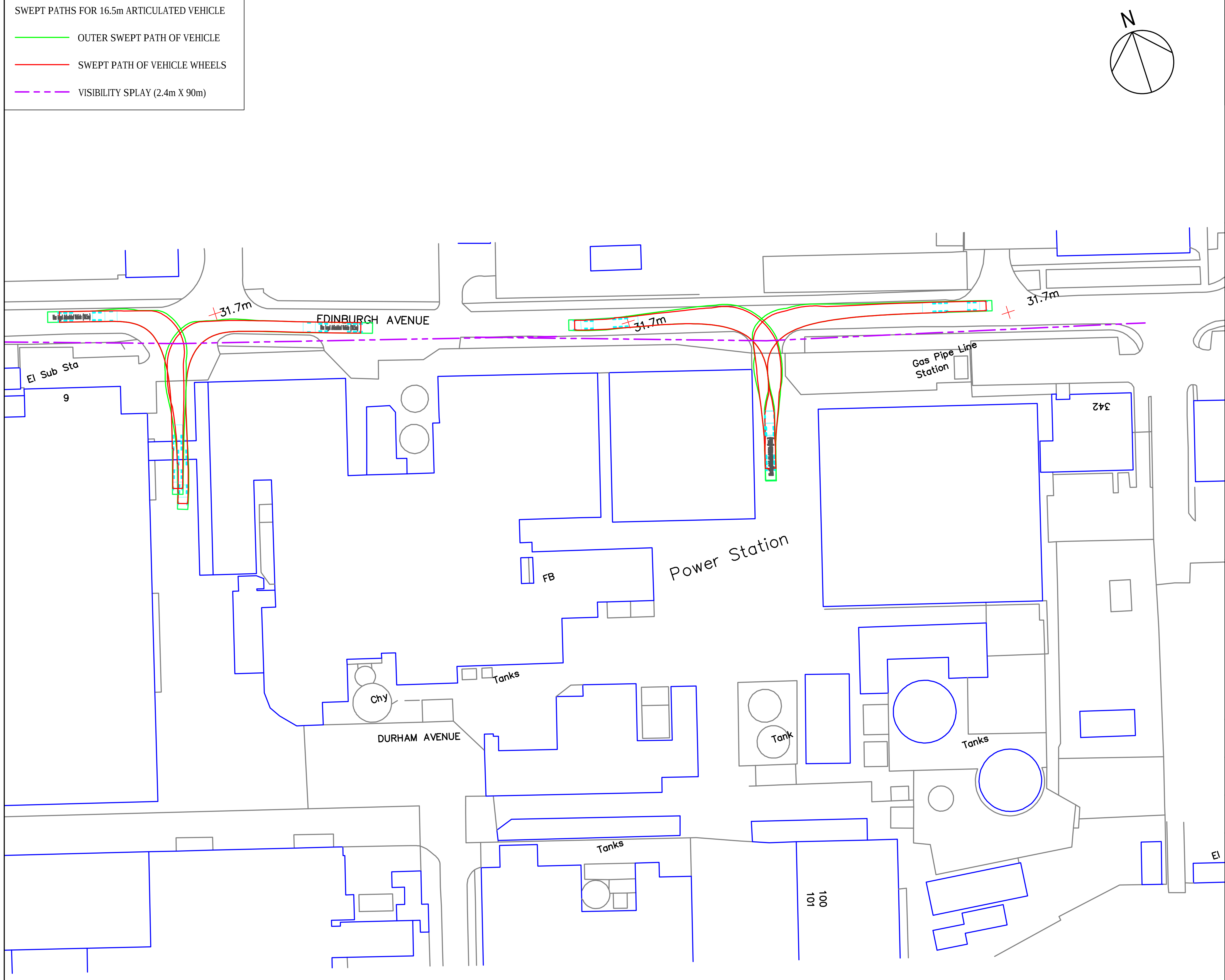
KEY

SWEPT PATHS FOR 16.5m ARTICULATED VEHICLE

OUTER SWEPT PATH OF VEHICLE

SWEPT PATH OF VEHICLE WHEELS

VISIBILITY SPLAY (2.4m X 90m)



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

IT IS ASSUMED THAT ALL WORKS ON THIS DRAWING WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROPRIATE METHOD STATEMENT.

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.

Purpose of issue

INFORMATION

Client

SSE - SLOUGH HEAT & POWER

Project Title

SLOUGH MULTIFUEL CHP FACILITY

Drawing Title

TRACKING MOVEMENTS & VISIBILITY SPLAY

Designed	Drawn	Checked	Approved	Date
JM	ASR			

URS Internal Project No.	Suitability
47066339	

Scale @ A3	Zone
1:1000	

URS Infrastructure & Environment UK Limited
URS House
Horne Lane
Bedfordshire, MK40 1TS
Tel:+44 (0)1234 349641
Fax:+44 (0)1234 216268
www.ursglobal.com

Drawing Number

47066339/SK01

Rev

Plot Date : 8/14/2014 3:25 PM
File Name : 47066339-SK01

Appendix C-2

Framework Workplace Travel Plan

SLOUGH HEAT AND POWER

TRAVEL PLAN

MAY 2014

342 Edinburgh Avenue

SLOUGH

SL1 4TU

CONTENTS

11. Forward and Introduction

SSE is committed to being a sustainable organisation and this rolls out in the form of the Site Environmental Management System which is accredited to ISO 140001.

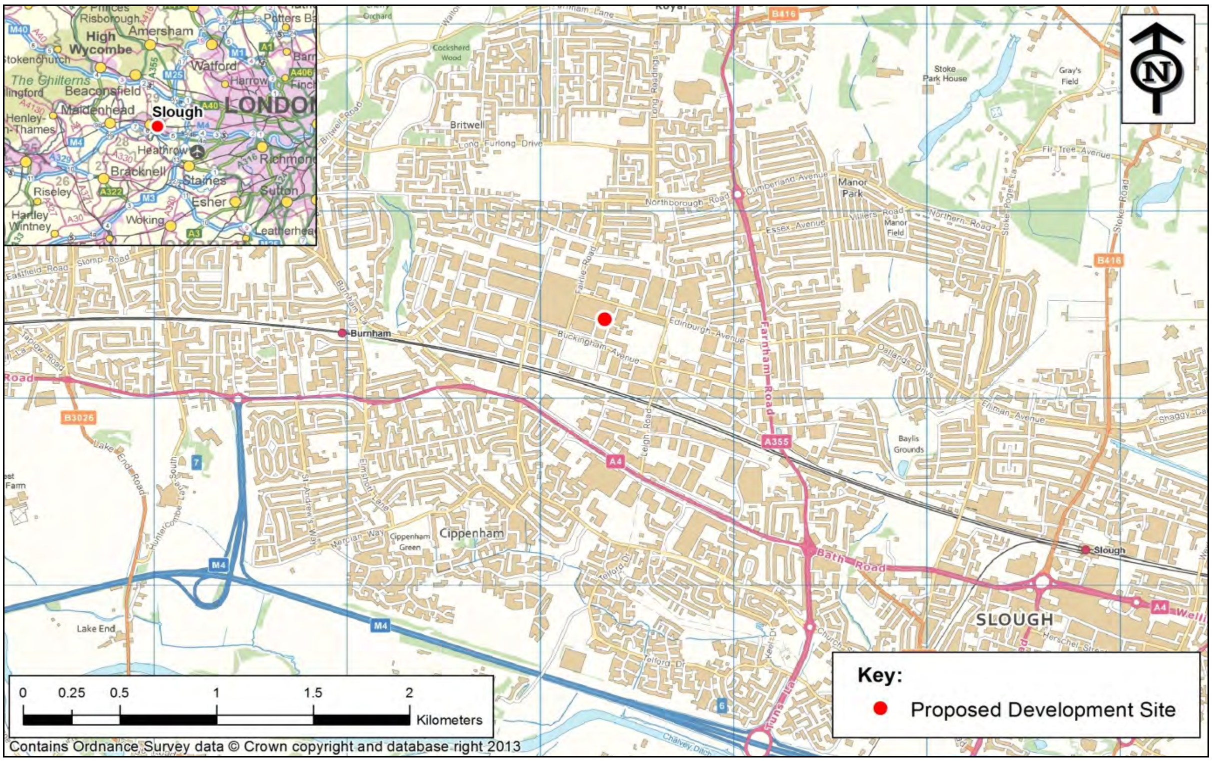
The SHP site is currently being considered for a major redevelopment with a multifuel plant of up to 50MWe in capacity. This development will also consolidate the site parking spaces and in the process reduce the total spaces by around 10%. Ahead of this project starting a Travel Plan is being developed which will incorporate any new objectives and targets relating to site travel that are agreed in connection with the site redevelopment.

This Travel Plan has been written by SSE.

12. Site Characteristics

SHP generates low carbon electricity and also provides utility services to the Slough Trading Estate including distribution of electricity, steam and potable water. The SHP Power Station Site occupies some 4Ha in total and is located within the Slough Trading Estate, a 475acre business park owned and managed by SEGRO. The site which lies on both sides of Edinburgh Avenue is leased from Segro on a 40 year lease agreement following the sale of SHP by Segro to SSE in 2008. The figure below shows the general location of the Power Station.

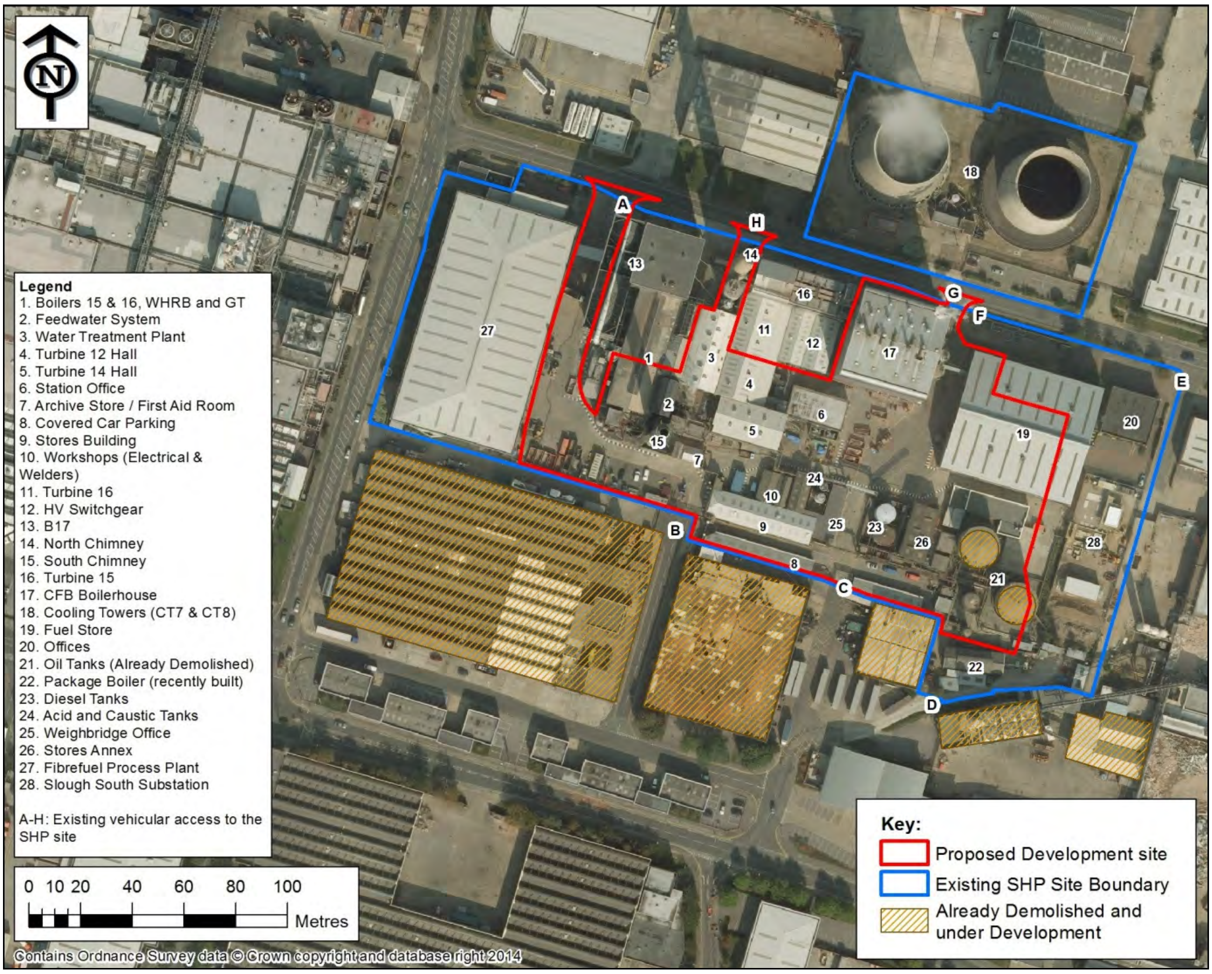
Figure 1: SHP Site Location which includes a Proposed Development Site for SHP Multifuel



Over the next 5 years the site is expected to undergo a major transformation with time expired and redundant plant and equipment expected to be replaced with a modern multifuel CHP plant. This will create changes to the site access arrangements and staff numbers and a travel plan provides a useful means of documenting the necessary actions and site design to minimise travel from the site.

The current and proposed site layouts are shown below:

Figure 2: Aerial Shot of SHP Site showing the 8 main site access points



NOTE: Existing vehicular access to the SHP site is via 8 principal points of access/egress; these are shown in Figure 2 and can be described as follows:

a) an access point in the northwest of the Site adjacent to the Fibre Fuel building (Building 27 in Figure 2) which has lockable gates and a barrier operated by security;

b) car access off Greenock Road, to the south of the Site and immediately to the west of Building 9;

c) HGV access from Harwich Road (for biomass, wood waste and coal for the CFB boilers) via a sliding gate activated by security; there is no exit from this route currently;

d) car access off Harwich Road located immediately to the south of the package boiler (Building 22) in the southeast corner of the SHP site;

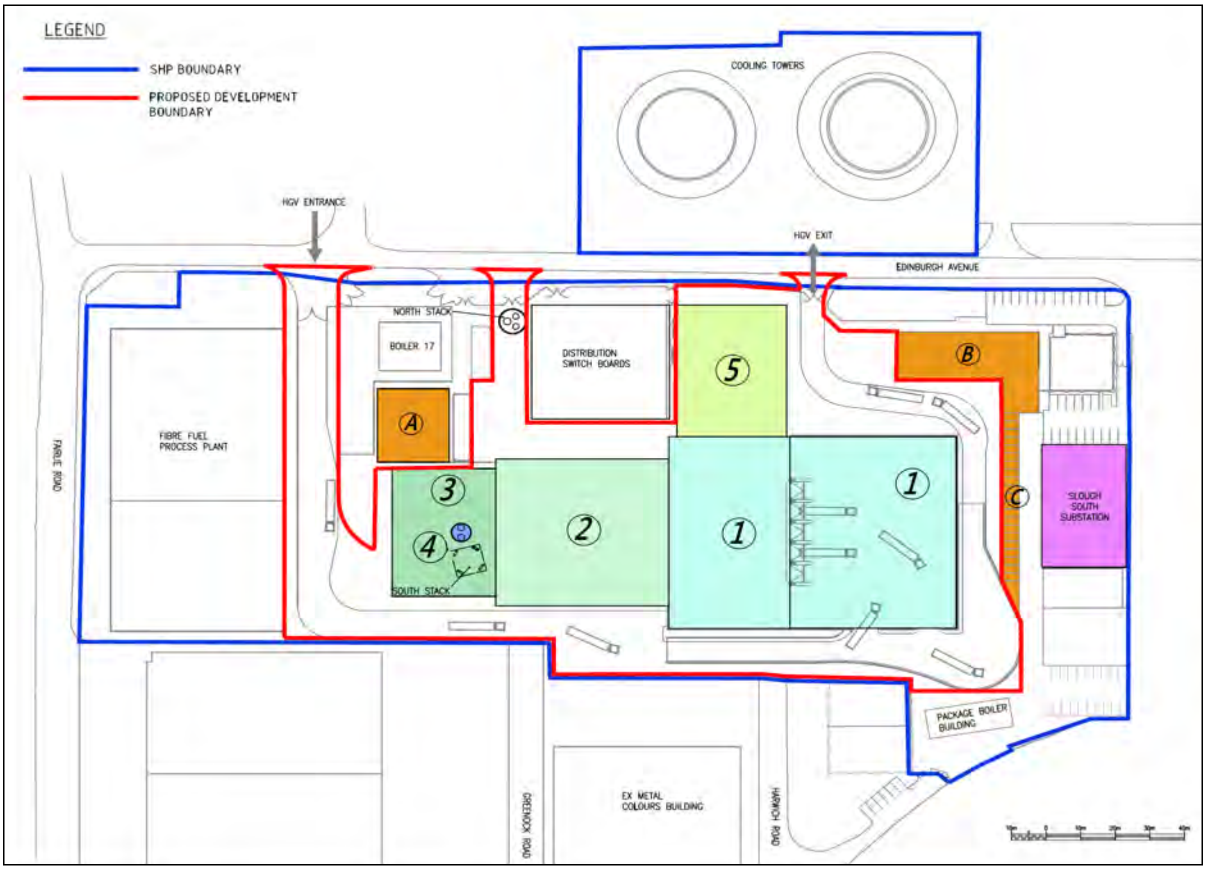
e) car access via 342 Edinburgh Avenue to the staff car park next to Building 20 in Figure 4-1;

f) HGV exit for CFB deliveries to Edinburgh Avenue in the northeast of the Site, adjacent to the CFB boilers (Building 17 on Figure 2). This has an auto-activated sliding door;

g) a manually operated gate to access the Cooling Tower compound for either small lorries or pedestrians located mid-point between the two towers along Edinburgh Avenue; and

h) a manually activated roller shutter door used to enter the enclosure beneath the existing north stack from Edinburgh Avenue (Building 14 on Figure 2).

Figure 3: SHP Site after redevelopment with reduced site access and egress



NOTE: Car access will be retained at points D and E as shown in Figure 2.

The site currently employs 40 full time staff of which 20 work a 5 shift system with12 hour shifts. The remainder of the staff are management, maintenance and admin roles. In addition, a further 6 SSE staff members are based on the site along with a number of support services including external maintenance, security, cleaning and catering. During plant outages staff numbers can double for a period of 3 to 4 weeks at a time.

13. Site Accessibility

SHP is located within the Slough Trading Estate.

Pedestrian and cycle access to the site is from Edinburgh Avenue (access points E and also A on Fig 2) which runs along the north side of the main power station site. A covered cycle rack for up to 10 bikes (typically 5/6 are parked here) is located within the secure CCTV covered site boundary. Shower and changing facilities already exist on site in 3 separate locations.

The nearest bus stop is a covered shelter with limited seating and is about half a mile away in Buckingham Avenue (close to Liverpool Road) near the shopping complex. The services available close to SHP can be summarised as follows:

Table 1 - Peak Hour Frequency of Bus Services

Bus Number	Route	Frequency Per Hour					
		Mon–Fri		Sat		Sun	
		AM	PM	AM	PM	AM	PM
1b	Slough - Britwell (Hoppas), via Slough Trading Estate	2	1	2	1	0	0
1b	Britwell - Slough (Hoppas), via Slough Trading Estate	2	2	2	2	0	0
2	Slough - Priory Estate - Burnham (Hoppas), via Slough Trading Estate & Whittaker Road	2	2	2	2	1	1
2	Burnham - Slough (Hoppas), via Whittaker Road & Slough Trading Estate	2	2	2	2	1	1
3	Slough-Cippenham-Trading Estate-Manor Park	2	2	2	1	0	1
4	Slough-Manor Park-Trading Estate-Cippenham	2	2	1	2	1	1

The nearest railway station is Burnham which is around 20 minutes walk from the site and has stopping services approximately every 30 minutes during the day to London. Burnham railway station, together with the main Slough railway station, are accessible from the local hoppa bus that stops in Buckingham Avenue. Frequent fast trains as well as stopping trains run from Slough into London, see below for a summary of peak hour services:

Table 2 – Summary of Peak Hour Frequency of Rail Services

Route	Frequency Per Hour					
	Mon–Fri		Sat		Sun	
	AM	PM	AM	PM	AM	PM
Reading – London Paddington – Slough – Windsor and Eton Central	3	4	2	3	-	-
Windsor and Eton Central- Slough – London Paddington- Reading	3	3	2	3	-	-
Windsor and Eton Central – Slough	-	-	-	-	1	3
Slough - Windsor and Eton Central	-	-	-	-	2	3
London Paddington – Slough – Reading – Oxford (Fast Services)	2	1	2	2	1	1
Oxford – Reading – Slough – London Paddington (Fast Services)	0	2	2	2	0	1

Cars can access site parking at a number of points:

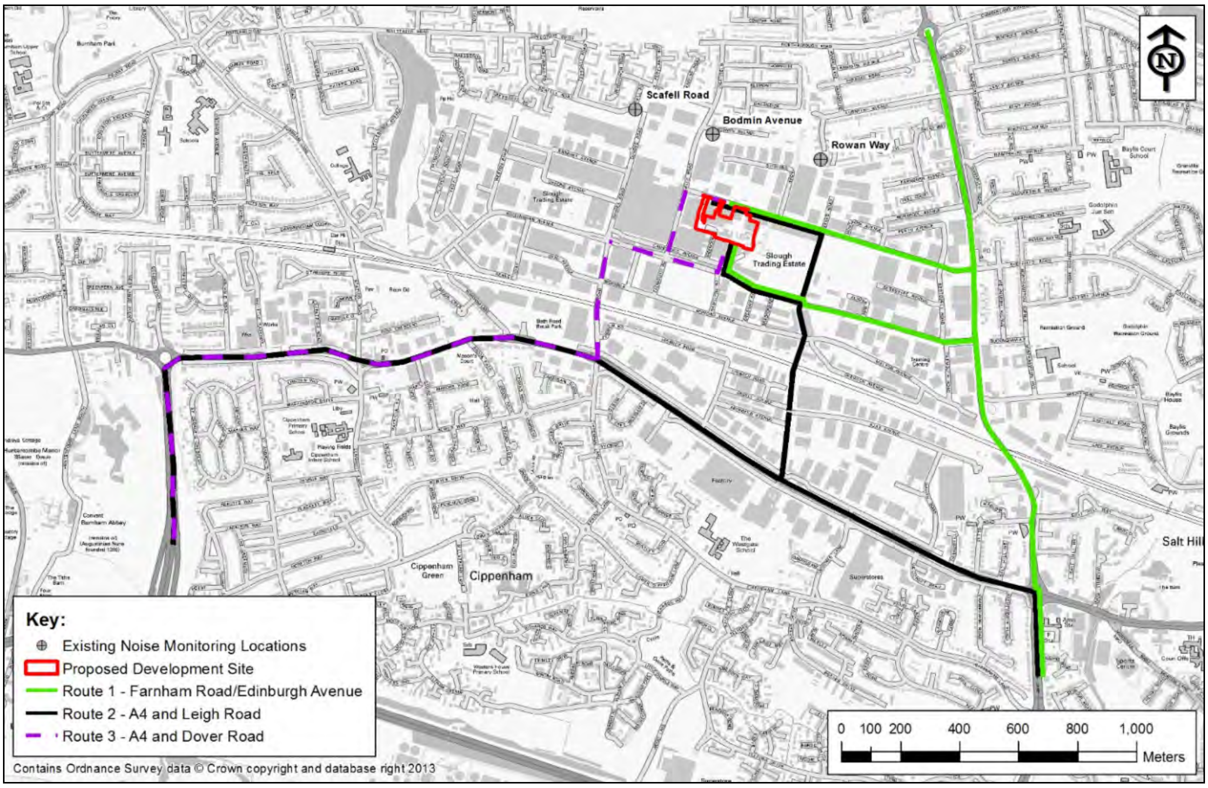
1. 342 Edinburgh Avenue (parking at front and rear) [access point E in Fig 2]
2. 6 Edinburgh Avenue (parking at front) [access point A in Fig 2]
3. Power Station site covered parking (access from Harwich Road and exit to Greenock Road) [access point B in Fig 2]
4. Contractor Parking in front of the Cooling Towers.

SHP currently has a total of 107 car parking spaces (with 3 allocated disabled spaces) with access controlled by swipe card entrances within the power station and behind 342 Edinburgh Avenue and for authorised visitors or contractors in the other car parks.

Motorcycles park in the normal car parking spaces.

HGVs delivering fuel and FGT reagents access/exit the site for Boiler 17 from the Fibrefuel entrance in the northwest corner of the site. Powder tankers taking away FGT residues currently enter and exit the site under the North Stack. Routing is restricted as set out in the figure below:

Figure 4: HGV route restrictions currently in Operation



Stores deliveries will arrive at site via Greenock Road through a dedicated entrance with an intercom.

5. Baseline Travel Information

A travel survey will be conducted and collated within 6 months of this Travel Plan being approved by SSE and Slough BC.

It will completed in the pro-forma attached.

6. Objectives

1. The overriding principle is that staff, and in particular shift workers, should find a means of travelling to site that is safe for the hours of work that apply to them.
2. The Travel Plan will provide continuous improvement in practices and performance over the previous 3 year period that will:
    1. Help reduce local congestion;
    2. Help reduce CO2 emissions; and
    3. Promote the use of sustainable transport (cycling, walking, buses, trains).
3. The Travel Plan will comply with the SSE Travel Policy and Sustainability Objectives
4. SSE will seek to reduce the number of lorry movements to and from site by improved payload as well as reducing their impact by incorporating engine rating standards over and above the minimum.
5. Any Objectives will be tested against Local Transport Plan Objectives as may be revised by Slough BC from time to time.

7. Targets

SMART targets will be included in the Travel Plan and reviewed and updated in subsequent 3 yearly reviews. The overall aim of the Targets will be to contribute to the wider Slough Local Transport Plan targets of reducing congestion and pollution.

Key Targets will include:

Staff and Visitors

1. Through a staff survey every 3 years monitor rates for single occupancy vehicles and set a reduction target (for site staff
2. Assess the practicality of implementing a system to compile travel information for site visitors and contractors

3. Promote the use of Electric Vehicle charging points by making sufficient points available on site.

4. Promote the use of public transport to get to site (for site staff, visitors and contractors)

5. Record bicycle use and promote the use of bicycles including making cycle route planning tools available and communicating any SSE cycling promotions.

6. Assess the need for bicycle use training

7. Promote walking to work where applicable.

8. Change/staggering in working hours to avoid congestion.

HGVs

1. Promote the requirement to stick to the designated site access routes and document information provided

2. Monitor and record average payload (tonnes per delivery) by material category with an overall average.

3. Monitor and record nightime deliveries (% of deliveries, numbers)

4. Promote the use of higher EURO Engine status amongst suppliers (to get to EURO VI by 2020)

8. Measures

All staff will be made aware of opportunities to support the Travel Plan. This will include:

1. Adopting any SSE based promotions for sustainable transport

2. Promotion of car sharing including through SBC's web portal www.sloughjourneyshare.com

3. Promotion of the use of Public transport for business travel in accordance with SSE Sustainability criteria

4. Promotion of avoiding travel where possible by the use of conference calls, linking meetings in a similar location, videoconferencing (if available)

5. Encouraging alternative working practices where practicable to avoid journeys

9. Travel Plan Co-ordinator and Management Support

The Process Support Manager will ensure that:

1. the Targets and KPIs are managed ;
2. the Travel Survey is completed and compiled every three years; and
3. the Travel Plan is consistent with the Site EMS and SSE SHE and sustainability principles.

The SHP Site Manager will ensure that the Travel Plan is reviewed at least on a 3 yearly basis and the findings communicated to all site based staff.

The Slough MF Development Manager will be responsible for ensuring that any targets that relate to the site redevelopment are incorporated into the Travel Plan at a timely stage during the Project evolution.

10. Monitoring and Reporting

The Travel Plan will be in operation for the lifespan of the site and will be reviewed as a minimum every 3 years. This will be incorporated into the site Environmental Management System. The review will comprise:

1. A staff travel survey;

2. A review of the staff travel plan;

3. A review of the travel plan targets;

4. A review of single occupancy statistics;

5. A review of HGV deliveries against an agreed set of annual KPIs; and

6. A summary of the 3 yearly review in an agreed pro-forma sent to Slough BC.

11. Action Plan

To be developed following the first staff survey**.**

Annex 1

SSE Staff Travel Survey

SHP based SSE staff travel survey

Introduction

Slough Borough Council (SBC) successfully secured over £4m from the Department for Transport (DfT) through the Local Sustainable Transport Fund (LSTF). This fund has enabled SBC to develop and deliver sustainable transport policies and initiatives with local businesses and organisations in Slough.

As part of preparing for our site redevelopment and the submission of a planning application for SHP Multifuel SSE is looking to develop an SHP Site Travel Plan for all staff currently based on the site which can then be updated when the redevelopment starts.

The aim of the LSTF programme is to support economic growth by reducing traffic congestion in and around Slough. This will be achieved largely through reduced car use in favour of increased walking, cycling, public transport use and more flexible car use including sharing or travelling outside busy periods.

Please complete this survey to help us understand your travel needs, the survey will help inform the site's travel plan. The survey should take no longer than 2 minutes to complete.

Thank you for your time.

About you

What distance do you travel to work at this site?

Under 1km	☐
Between 1km and 2km	☐
Between 2km and 5km	☐
Between 5km and 10km	☐
Further than 10km	☐

What are your typical working hours, e.g. 8.00 to 16:00?

Current travel arrangements

What is your MAIN MODE of travelling to work? *(mode that covers the longest distance) (please select ONE only)*

Walk	☐	Drive a car alone	☐
Cycle	☐	Car share (driver)	☐
Train and cycle	☐	Car share (passenger)	☐
Train	☐	Scooter / motorcycle	☐
London Underground	☐	Taxi	☐
Public bus	☐	Not applicable – work from home	☐
Employer bus	☐	Other	☐

What other modes of travel do you use to travel to work *(please select all that apply)*

Walk	☐	Drive a car alone	☐
Cycle	☐	Car share (driver)	☐
Train and cycle	☐	Car share (passenger)	☐
Train	☐	Scooter / motorcycle	☐
London Underground	☐	Taxi	☐
Public bus	☐	Not applicable – work from home	☐
Employer bus	☐	Other	☐

Do you currently experience travel or transport problems?

Yes ☐

No ☐

If yes, please describe:

Are there any travel alternatives to or from work which you could consider? (Please tick all that apply)

Car share	☐
Public transport	☐
Walk	☐
Cycle	☐
I would not travel by any other means	☐

Travel and Transport Initiatives

Slough Borough Council will be delivering a number of sustainable travel initiatives as part of the LSTF. Please could you tick which of the below would be of interest to you.

Please tick any of these other initiatives that would be of interest (Please tick all that apply):

New / Improved cycle routes to work	☐
Additional Cycle storage at my workplace	☐
Pool bikes	☐
Cycle route maps	☐
Cyclist training	☐
Bicycle User Groups	☐
Car share network	☐
New / improved walking routes to the workplace	☐
New / improved pedestrian signage	☐
Walking route maps	☐
Online walking challenges	☐
Walking promotional activities for staff	☐
Eco-driving training / simulator events	☐
Freight safety promotion	☐
HGV / cyclist safety training	☐
Sustainable travel events / promotional days at your workplace	☐
Pedometer to measure walking steps	☐

Would you find it useful to have real time information about the following?

	Yes	No	Not sure
Bus services	☐	☐	☐
Rail services	☐	☐	☐
Traffic network	☐	☐	☐

Would any of these channels be useful for you to receive real time travel information?

	Yes	No	Not sure
Website	☐	☐	☐
Phone applicatons	☐	☐	☐
Display boards	☐	☐	☐
Social media	☐	☐	☐

Additional Comments

Please use this space to write any additional transport / travel related comments

Appendix D-1

Air Quality Technical Appendix

URS

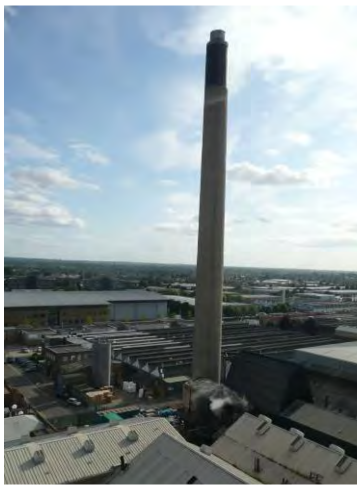
Slough Multifuel CHP Facility

Air Quality Dispersion Modelling

47066339

Prepared for:
SSE Generation Ltd

UNITED KINGDOM & IRELAND



REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Reviewed by**	**Approved by**
1	September 2014	Final	Helen Watson and Natalie Williams	Neil Titley	Richard Lowe

URS Infrastructure & Environment UK Limited
Scott House, Alencon Link
Basingstoke
RG21 7PP
United Kingdom
Tel: +44 (0)1234 349 641
Fax: +44 (0)1234 216 268
[redacted]

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CONTENTS

1. INTRODUCTION

This Technical Appendix supplements *Chapter 8: Air Quality* of the Environmental Statement (ES) for the Slough Multifuel Combined Heat and Power (CHP) facility (the 'Proposed Development') and describes the details for the dispersion modelling of road traffic and point source emissions from the operational development.

2. ROAD TRAFFIC AIR DISPERSION MODELLING

2.1. Methodology

The assessment of road traffic emissions from the Proposed Development primarily focuses on the worst affected residential receptor. This receptor is located 12 metre (m) from the kerbside of Farnham Road, approximately 800m east of the Proposed Development Site. There are no known residential dwellings closer to the Proposed Development Site located on the roads affected by road traffic associated with the Proposed Development.

In order to take into account the effect of the traffic emissions and determine the baseline air quality conditions on Farnham Road the ADMS-Roads model (version 3.1) has been used. This model calculates concentrations of pollutants using the following parameters:

- Traffic Volume: The number of vehicles travelling a length of road in a given time will affect the subsequent ground level concentrations of pollutants;
- Fleet Composition: The proportion of HGVs to light vehicles (e.g. cars) will affect the mass flux of pollutants;
- Fleet Velocity: The speed of the fleet affects the mass flux of study species (vehicle engines emit the least pollution at speeds between 60-80 kilometres per hour (km/hr)); and,
- Receptor Location: The location of the receptor, in relation to the source, affects the extent of dispersion that can occur.

The following baseline scenarios have been taken into account within this assessment:

- 2017 Baseline (using 2017 traffic flows based on 2017 background concentrations and 2017 emission factors). This is the year when the most traffic is expected to be generated by the construction activities associated with the Proposed Development;
- 2019 Baseline (using 2019 traffic flows, and 2019 background concentrations and 2019 emission factors). This is the first year when the Proposed Development is expected to begin operation.

The modelling of road traffic emissions has also included the consideration of the following alternative scenarios, in order to ensure that worst case increases in pollutant concentration is considered, assuming background concentrations and vehicle fleet emissions do not improve as has previously been assumed:

- 2017 Baseline (using 2017 traffic flows based on 2013 background concentrations and 2013 emission factors). This is the year when the most traffic is expected to be generated by the construction activities associated with the Proposed Development;

- 2019 Baseline (using 2019 traffic flows, and 2013 background concentrations and 2013 emission factors). This is the first year when the Proposed Development is expected to begin operation.

All modelled road traffic emissions scenarios have used a model setup that includes diurnal traffic profiles based on traffic counts undertaken in support of the Transport Assessment.

Baseline and predicted annual average daily traffic (AADT) flows for the demolition and construction phase of the Proposed Development for Farnham Road are presented in Table A-1. These flows are reproduced from Table 8-16 in *Chapter 8: Air Quality* of this ES.

Table A-1: 2-way 2017 AADT Flows during Construction Phase

Road	AADT in 2017		Increase
	Baseline Without Proposed Development	With Construction Flows	
Farnham Road (north of the Edinburgh Avenue junction)	24,884 (409)	25,274 (432)	1.5% (5.3%)
Farnham Road (south of the Edinburgh Avenue junction)	28,678 (469)	29,126 (494)	1.5% (5.1%)

Note: Figures in brackets indicate the number of HGVs.

Baseline and predicted AADT flows for the operational phase of the Proposed Development for the opening year of 2019 are presented in Table A-2, and have been reproduced from the traffic data provided in Table 8-18 in Chapter 8: *Air Quality* of this ES.

Table A-2: 2-way 2019 AADT Traffic Flows during Operation

Road	AADT in 2019		Increase
	Baseline Without Proposed Development	With Proposed Development	
Farnham Road (north of the Edinburgh Avenue junction)	25,662 (423)	25,735 (496)	0.4% (22.2%)
Farnham Road (south of the Edinburgh Avenue junction)	29,580 (485)	29,665 (570)	0.4% (21.9%)

Note: Figures in brackets indicate the number of HGVs.

The modelling of road emissions has taken into consideration the sensitivity of the predicted results to the model input variables, and to ultimately identify the realistic worst-case results for inclusion in the assessment. These variables include:

- Meteorological data for 2013 from a representative meteorological station (Heathrow Airport). The year 2013 was selected to match the year of the baseline traffic data provided and local NO_2 measurement data used for model verification, as per current guidance. The meteorological data was allocated a surface roughness of 0.2m in the ADMS-Roads model, and the study area was given a surface roughness of 1m, which is considered representative of large urban areas typical of the traffic study area.

- A canyon height of 15m was included along Farnham Road, south of Edinburgh Avenue, which could affect dispersion from the road.

- Road speeds of 30km/hr and 15km/hr at junctions were assumed, derived from the Great British Transport Statistics (Ref. A-1).

- The NO_x results from the ADMS Roads model have been converted into NO_2 using the Defra NO_x to NO_2 calculator as detailed in Chapter 8: *Air Quality* of this ES.

The trips in Table A-1 and Table A-2 demonstrate the effect on Farnham Road prior to the revised commitments presented in Section 7.5, *Chapter 7: Traffic and Transport* of this ES. This study therefore presents an unrealistic worst-case situation for flows along the section of Farnham Road north of Edinburgh Avenue. Should the revised conditions be accepted, the change in flows along this part of Farnham Road would be less than shown, which would reduce the predicted effect on air quality from that described below. Flows would be predicted to increase slightly along Fairlie Road and Dover Road, as shown by the Sensitivity Testing in Section 7.5, Chapter 7: Traffic and Transport, however there are not currently any sensitive residential receptors along these roads that would require further consideration. Flows would also increase along Bath Road, however as discussed above, the effect on Bath Road would be less than on Farnham Road, where properties are located further from the kerb, and the change in flows is less.

2.2. Background Monitoring Data and Model Verification

There are a number of automatic monitoring stations and diffusion tube monitors located within a reasonable distance of the Proposed Development site. The diffusion tube locations identified within 2km of the Proposed Development Site and the data collated is presented and discussed in Table 8-12, *Chapter 8: Air Quality* of the ES. However, the automatic monitoring stations and diffusion tubes are generally situated at locations where they are influenced by NO_2 emissions from nearby road sources. As such, the background concentrations used in this assessment have been sourced from Defra's background pollutant maps.

Table A-3 below outlines the chosen background concentrations used within the ADMS-Roads model from the Defra background maps.

Table A-3: Background Concentrations Used within the Model

Pollutant	2013 (µg/m^3)	2017 (µg/m^3)	2019 (µg/m^3)
NO_2	28.3	25.9	24.2
PM_{10}	21.0	20.0	19.6

Table A-3 shows that the Defra background maps project a drop-off in annual mean background NO_2 and PM_{10} concentrations from 2013 (model verification year) to 2017 (year of peak construction) and 2019 (first year of operation). This assessment reports predicted NO_2 concentrations based on this projected improvement in background NO_2 concentrations. However, there is currently some uncertainty in the rate at which background pollutant concentrations are falling. In light of this uncertainty, this assessment also reports predicted pollutant values that assume no drop-off in background pollutant concentrations from 2013 onwards.

2.3. Vehicle Emissions

This assessment has used the current version of ADMS-Roads, which makes use of DfT's current Emission Factor Toolkit (v6). The traffic mix within the ADMS-Roads model has been set to 'England (urban)'. Within Defra's NO_x to NO_2 spreadsheet, the traffic mix was set to 'all other urban traffic'.

The current DfT Emission Factor Toolkit (v6) assumes a gradual improvement in road traffic emission rates over time, due to improving vehicle technology and the evolution of the UK vehicle fleet. This assessment reports predicted pollutant concentrations based on this projected improvement in emission rates. However, there is currently some uncertainty in the rate at which vehicle emissions are improving, due to the slower than anticipated evolution of the vehicle fleet. To account for this uncertainty, this assessment also reports predicted pollutant values that assume no improvement in vehicle emission rates from 2013 onwards.

2.4. Model Verification

A model verification exercise has been undertaken to account for model bias within the ADMS-Roads dispersion modelling undertaken for this assessment. The verification exercise has been undertaken in accordance with the methodology described in LAQM TG(09).

The measured annual mean NO_2 concentration in 2013 at the Farnham Road diffusion tube (NGR: 496397, 180341), in 2013, was compared against the modelled annual mean NO_2 concentration value at the same location. The location of the measurement site was included within an ADMS Roads model with emission factors set for 2013. The measured road NO_x contribution and the modelled total NO_2 concentration were then calculated using Defra's NO_x to NO_2 convertor spreadsheet, using background pollutant concentration data for 2013.

Table A-4 shows how the model performed in comparison with the measured concentrations at the Farnham Road location. The model has been shown to under predict annual mean NO_2 concentrations by about 24%. Ideally, modelled predictions of annual mean NO_2 should be within 10% of monitored or measured values. As such, the measured and modelled road NO_x contributions from the diffusion tube location on Farnham Road were compared, and the factor of that difference applied to the road NO_x contribution predicted at the sensitive receptor in the Tuns Lane AQMA for the assessment below.

Table A-4: Model Verification using Local Monitoring Data

Site	Measured Total NO_2 (µg/m^3)	Modelled Total NO_2 (µg/m^3)	Model Total NO_2 Factor	Measured Road NO_X (µg/m^3)	Modelled Road NO_X (µg/m^3)	Model Road NO_X Factor
Farnham Rd	41.7	33.5	1.245	30.7	11.2	2.737

A sensitivity analysis of an alternative verification and dispersion modelling exercise involving the dispersion model setup with diurnal traffic flow profiles is provided later on in this Technical Appendix. Profiles were calculated using 24 hour categorised traffic count data from Edinburgh Avenue and Farnham Road. The traffic counts were undertaken as part of the Transport Assessment for the Proposed Scheme.

2.5. Modelled Concentrations

Table A-5 presents the modelled 2017 baseline concentrations at the worse cast residential receptor (taken to be 12m from Farnham Road), as well as the incremental increases in pollutant concentrations from peak demolition and construction traffic. Values in brackets denote predictions based on the assumption of no improvement in background pollutant concentrations or vehicle emission rates from 2013.

Table A-5: Predicted Change in Pollutant Concentrations from Construction Traffic

Road	Baseline Without Proposed Development 2017 ($\mu g/m^3$)		With Construction Traffic 2017 ($\mu g/m^3$)		Increase ($\mu g/m^3$)	
	NO_2	PM_{10}	NO_2	PM_{10}	NO_2	PM_{10}
Residential Receptor Farnham Road	42.7 (48.5)	23.2 (24.6)	42.9 (48.9)	23.2 (24.7)	0.3 (<0.4)	0.1 (0.1)

Table A-5 shows that baseline concentrations at the worst case residential receptor are predicted to just exceed with the annual average AQS objectives for NO_2. Baseline annual mean concentrations of PM_{10} are well below the AQS objective for that pollutant.

The additional traffic attributed to the peak demolition and construction phase show an increase of less than 0.3µg/m^3 in predicted mean annual NO_2 and an increase of 0.1µg/m^3 in predicted annual mean PM_{10} concentrations. This represents less than 1% magnitude of change and the effect is therefore considered of **negligible** significance.

The table also shows that assuming no improvement in background pollutant concentrations and vehicle emission rates from 2013, the magnitude of change is still less than 1% of the AQS objective and the effect is still considered to be of **negligible** significance.

Table A-6 presents the modelled concentrations, incorporating both background concentrations and local emissions sources from traffic flows for 2019, during operation of the Proposed Development. The incremental increase in pollutant concentrations from the operational phase is also presented. Values in brackets denote predictions based on the assumption of no improvement in background pollutant concentrations or vehicle emission rates from 2013.

Table A-6: Predicted Change in Pollutant Concentrations from Operational Traffic

Road	Baseline Without Proposed Development 2019 ($\mu g/m^3$)		With Operational Traffic 2019 ($\mu g/m^3$)		Increase ($\mu g/m^3$)	
	NO_2	PM_{10}	NO_2	PM_{10}	NO_2	PM_{10}
Residential Receptor along Farnham Road	38.9 (49.0)	22.8 (24.7)	39.1 (49.6)	24.1 (24.8)	0.2 (0.5)	<0.1 (<0.1)

The predicted increase in mean annual NO_2 and PM_{10} concentrations attributable to operational traffic on Farnham Road are both less than 1% and the effect can therefore be considered to be **negligible**. In absolute terms this is a 0.2µg/m^3 increase to mean annual NO_2 and less than a 0.1µg/m^3 increase to mean annual PM_{10}. Furthermore, the predicted concentration at this receptor in 2019 is expected to be lower than in 2017, due to predicted improvements in vehicle emissions as the older, more polluting vehicles are gradually replaced by newer, cleaner models.

Table A-6 also shows that the assumption of holding background pollutant concentrations and vehicle emission rates at 2013 levels would lead to an increase in annual mean NO_2 concentrations of over 1% (0.5µg/m^3), constituting a small magnitude of change. Such an impact in an area where air quality is in excess of the AQS objective for that pollutant is considered to represent a **minor adverse** effect. Such an effect is not considered to be significant.

It should be noted that SHP records show HGVs delivering to the SHP are generally 2-3 years old (72% of the HGVs delivered to the SHP site between April-Sept 2013 were registered in 2010 or later) and will therefore have lower emission concentrations than the average fleet composition assumed within the ADMS-Roads model (typically 6-7 years old). It has also being confirmed by the operator that by the year of operation (2019) they will commit to all HGVs delivering WDF to the site being EURO VI compliant, offering over a 75% reduction (in g/kWh) on Euro V standard HGVs and about a 90% reduction (in g/kWh) on Euro IV standard HGVs. This commitment has not been taken into account within the modelling, and hence the ADMS model is therefore likely to be overestimating the actual impact on this receptor by an order of magnitude, despite already showing that there is expected to be an imperceptible change within the AQMA.

Finally, as the annual mean NO_2 concentration is below 60µg/m^3, LAQM,TG(09) states that it can be considered unlikely that the construction and operational traffic associated with the Proposed Development would lead to an exceedance of the hourly NO_2 objective.

2.6. Road Traffic Emissions Model Sensitivity Analysis

The road traffic emissions assessment has also been undertaken with an alternative model that included diurnal profiles of vehicle flow based on traffic counts undertaken within the study area for the Transport Survey.

A summary of the verification exercise based on this alternative model is provided in Table A-7. The use of the diurnal profiles on the links included within the model makes little difference to the performance of the model included within the main assessment, with annual mean NO_2 concentrations being under predicted by 27%.

Table A-7: Model Verification using Local Monitoring Data (With Diurnal Profile)

Site	Measured Total NO_2 (µg/m^3)	Modelled Total NO_2 (µg/m^3)	Model Total NO_2 Factor	Measured Road NO_X (µg/m^3)	Modelled Road NO_X (µg/m^3)	Model Road NO_X Factor
Farnham Rd	41.7	32.8	1.271	30.7	9.7	3.173

Table A-8 presents the modelled 2017 baseline concentrations at the worse cast residential receptor (taken to be 12m from Farnham Road), as well as the incremental increases in pollutant concentrations from peak demolition and construction traffic.

Table A-8: Predicted Change in Pollutant Concentrations from Construction Traffic

Road	Baseline Without Development 2017 (µg/m^3)		With Construction Traffic 2017 (µg/m^3)		Increase (µg/m^3)	
	NO_2	PM_{10}	NO_2	PM_{10}	NO_2	PM_{10}
Residential Receptor Farnham Road	43.1 (49.0)	24.2 (24.7)	43.3 (49.3)	24.3 (24.8)	0.3 (<0.4)	0.1 (0.1)

Note: Values in parenthesis denote predictions based on the assumption of no improvement in background pollutant concentrations or vehicle emission rates from 2013.

Table A-8 shows that baseline concentrations at the worst case residential receptor are predicted to marginally comply with the annual average AQS objective for NO_2. Baseline annual mean concentrations of PM_{10} are well below the AQS objective for that pollutant.

The additional traffic attributed to the peak demolition and construction phase show an increase of 0.3µg/m^3 in predicted annual mean NO_2 and less than 0.1µg/m^3 in predicted annual mean PM_{10} concentrations. This represents a magnitude of change that is less than 1% of the AQS objective and the effect is therefore considered to be of **negligible** significance.

The table also shows that assuming no improvement in background pollutant concentrations and vehicle emission rates from 2013, the magnitude of change is still less than 1% of the AQS objective and the effect is still considered to be of **negligible** significance.

Table A-9 presents the modelled concentrations, incorporating both background concentrations and local emissions sources from traffic flows for 2019, during operation of the Proposed Development. The incremental increase in pollutant concentrations from the operational phase is also presented.

Table A-9: Predicted Change in Pollutant Concentrations from Operational Traffic

Road	Baseline Without Development 2019 (µg/m^3)		With Operational Traffic 2019 (µg/m^3)		Increase (µg/m^3)	
	NO_2	PM_{10}	NO_2	PM_{10}	NO_2	PM_{10}
Residential Receptor along Farnham Road	39.3 (49.5)	24.2 (24.9)	39.5 (50.0)	24.2 (24.9)	0.2 (0.5)	<0.1 (0.1)

Note: Values in parenthesis denote predictions based on the assumption of no improvement in background pollutant concentrations or vehicle emission rates from 2013.

The predicted increase in mean annual NO_2 and PM_{10} concentrations attributable to operational traffic on Farnham Road are both less than 1% and the effect can therefore be considered to be **negligible**. In absolute terms this is a 0.2µg/m^3 increase to mean annual NO_2 and less than a 0.1µg/m^3 increase to mean annual PM_{10}. Furthermore, the predicted concentration at this receptor in 2019 is expected to be lower than in 2017, due to predicted improvements in vehicle emissions as the older, more polluting vehicles are gradually replaced by newer, cleaner models.

Table A-9 also shows that the assumption of holding background pollutant concentrations and vehicle emission rates at 2013 levels would lead to an increase in annual mean NO_2 concentrations of over 1% (0.5µg/m^3), constituting a small magnitude of change. Such an impact in an area where air quality is in excess of the AQS objective for that pollutant is considered to represent a **minor adverse** effect. Such an effect is not considered to be significant.

Finally, as the annual mean NO_2 concentration is below 60µg/m^3, LAQM,TG(09) states that it can be considered unlikely that the construction and operational traffic associated with the Proposed Development would lead to an exceedance of the hourly NO_2 objective.

Whilst the inclusion of diurnal profiles within the dispersion model setup has slightly increased the predicted annual mean pollutant concentrations, the magnitude of change and the significance of effects remain consistent to those reported within the main assessment.

3. POINT SOURCE AIR DISPERSION MODELLING

Dispersion modelling calculates the predicted ground level concentrations arising from the emissions to atmosphere, based on Gaussian approximation techniques. The model employed has been developed for UK regulatory use and its use in such assessments is approved by the Environment Agency and Local Authorities.

ADMS5 uses a continuous calculation method to determine the conditions of the receiving atmosphere based on the Monin-Obukhov length, which represents the height of the boundary layer and the degree of turbulence within the atmosphere. This is generally regarded as a more comprehensive modelling approach than that employed by older models such as ISC, which use discrete approximations to the atmospheric conditions known as Pasquill stability classes. The degree of turbulence in the atmosphere affects the rate at which pollutants from point sources are dispersed in the environment. The more unstable the atmosphere, for example due to high solar insolation, the greater the degree of mixing. While this is in principle the desired effect for the release of pollutants through stacks at elevated heights, this can also lead to localised peak concentrations if the plume is rapidly brought to ground level.ADMS5 utilises site-specific hourly sequential meteorological data to enable a realistic assessment of dispersion from point sources to be conducted for meteorological conditions that are directly applicable to the site.

Stack parameter modelling was undertaken with ADMS5, in order to determine the influence on the dispersion of emissions from the Proposed Development. The parameters assessed included the effects of differing stack heights, efflux velocities, NO_x concentrations and NH_3 concentrations. This work subsequently led to the determination of appropriate stack parameters for the Proposed Development, as presented in the ES. Further details are provided in *Section 6: Stack Parameter Modelling* of this appendix.

Both single and twin line configurations were considered as part of the stack parameter modelling, and predicted results were assessed against the Air Quality Standards (AQSs), EALs, CLPVEs and Critical Loads at key receptor locations. The assessment also focussed on the maximum off-site process contributions (PCs), NO_2 process contribution at Tuns Lane AQMA and nitrogen deposition at Burnham Beeches SAC.

Various parameters can affect the degree of dispersion from a source, and these are accounted for in the modelling scenario, where appropriate. The presence of elevated or complex terrain in the vicinity of the source can affect the flow pattern of the wind field, which can in turn bring a plume to ground more rapidly. Buildings of sufficient height located close to the emissions sources can affect dispersion – inducing downwash in the emitted plume and entraining pollutants towards ground level.

Sensitivity of the predicted concentrations to variations in these model representations has been undertaken to ensure that the reported results provide a realistic worst-case assessment.

3.1. Modelled Parameters

Emissions Inventory

The assessment of the process emissions has been based on anticipated worst-case emission flow rate and temperatures at this design stage for both potential future operating scenarios, as shown in Table A-10, together with emissions at IED ELVs. The ELVs used in the assessment are presented in Table A-11, together with the mass release rates from the operational Proposed Development.

Table A-10: Stack Release Parameters

Parameter	Single Line	Twin Line
Number of Stacks	1	1
Approximate Stack Location	495271, 181446	495262, 181460
Stack Height (m)	85	90
Efflux Velocity (m/s)	17.9	18.0
Emission Temperature (°C)	140	140
Actual Volumetric Flow (Am3/hr)	309,550	445,948
Moisture content (%)[1]	18.09	19.24
Oxygen content (%)	7.0	7.0
Normalised Volumetric Flow (Nm^3/hr) [2]	234,982	333,784
Effective Combined Flue Diameter at Release	2.47	2.96

[1] The different moisture content reflects the different plant efficiency expected between the single line and twin line

[2] Normalised to 0ºC, 101kPa, Dry at 11% oxygen

Table A-11: Industrial Emissions Directive Emission Limit Values and Release Rates

Pollutant	Daily Average ELV (mg/Nm^3)	Half Hourly Average ELV (mg/Nm^3)	Single Line Release Rates (g/s)		Twin Line Release Rates (g/s)	
			Annual Average[4]	Peak[5]	Annual Average[4]	Peak[5]
NO_x	200	400	13.05	26.11	18.54	37.09
SO_2	50	200	3.26	13.05	4.64	18.54
TPM	10	30	0.65	1.96	0.93	2.78
CO	50	100	3.26	6.53	4.64	9.27
HCl	10	60	0.65	3.92	0.93	5.56
HF	1	4	0.065	0.26	0.093	0.37
VOC[1]	10	20	0.65	1.31	0.93	1.85
Cd, Tl	0.05	-	0.0033	-	0.0046	-
Hg	0.05	-	0.0033	-	0.0046	-
Other metals[2]	0.5	-	0.033	-	0.046	-
NH_3[3]	5	-	0.33	-	0.46	-

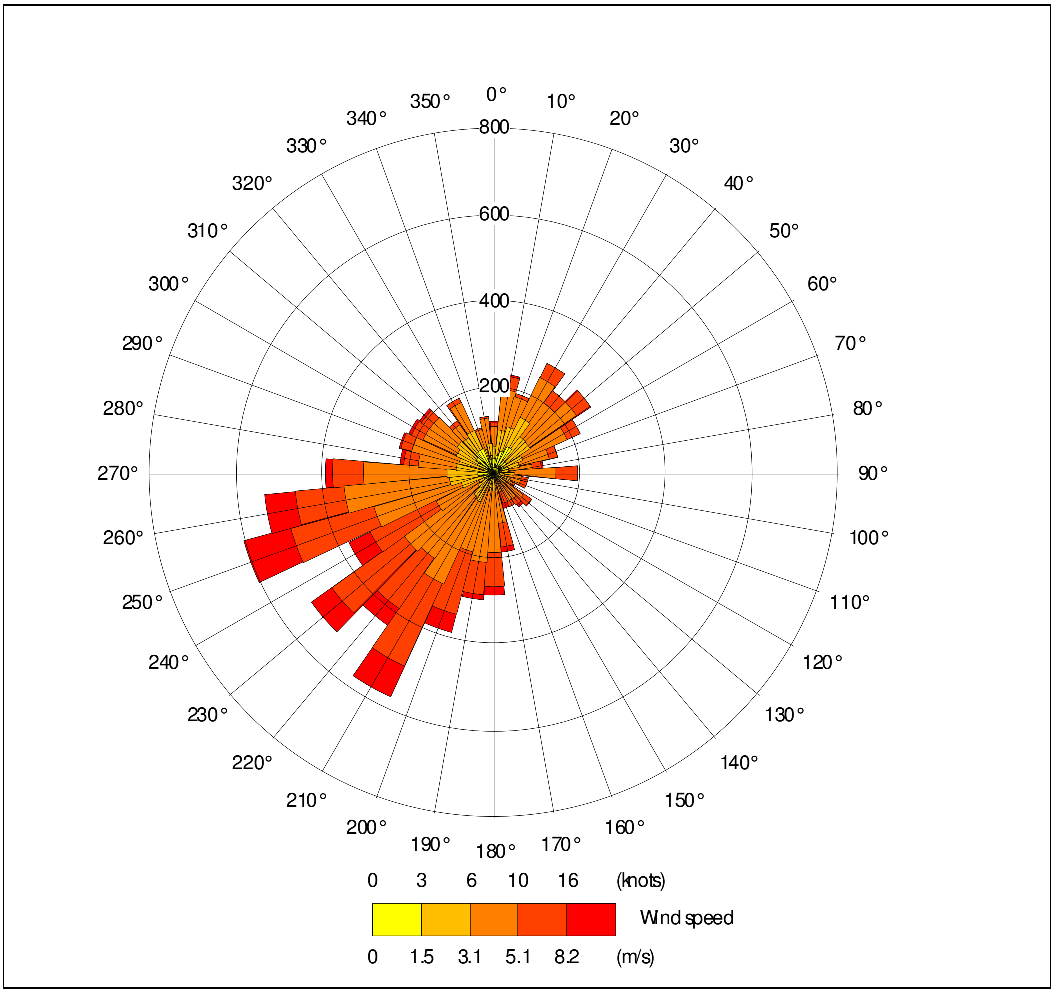
1. VOCs conservatively assumed to be 100% benzene
2. Includes Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V
3. ELV for ammonia is a proposed ELV, and isn't stipulated in the IED.
4. Used for the assessment of annual average impacts
5. Used for the assessment of short term impacts.

Meteorological Data

Actual measured hourly-sequential meteorological data is available for input into dispersion models, and it is important to select data as representative as possible for the site that is modelled. This is usually achieved by selecting a meteorological station as close to the site as possible, although other stations may be used if the local terrain and conditions vary considerably, or if the station does not provide sufficient data.

The meteorological site that was selected for the assessment was Heathrow Airport, located approximately 9km southeast of the Site, in flat terrain. The modelling for this assessment has utilised meteorological data for the period 2008-2013, with 2008 providing the worst-case results for long term impacts, and different years providing worst case results for short term impacts. The model outputs from the meteorological year resulting in the worst case results for short term impacts has been used in the main assessment, with all long term impacts reported being generated with the 2008 meteorological data. An example wind rose for Heathrow Airport in 2008 is provided in Figure A-1.

Figure A-1 Heathrow Airport Wind Rose (2008)



Buildings and Terrain

The presence of buildings or structures near to the emission points can have a significant effect on the dispersion of emissions. The wind field can become entrained into the wake of buildings, which causes the wind to be directed to ground level more rapidly than in the absence of a building. If an emission is entrained into this deviated wind field, this can give rise to elevated ground-level concentrations. Building effects are typically considered where a structure of height greater than 40% of the stack height is situated within 8-10 stack heights of the emissions source.

Buildings associated with the Proposed Development considered to be of sufficient height and size to potentially impact on the dispersal of emissions from the stack include the new Boiler House and the existing Cooling Towers. It has not been considered necessary to include the Bunker, as model sensitivity has shown its inclusion did not affect model results.

At this stage, while the final dimensions of the buildings for the process are determined, the air quality assessment is conservatively based on the proposed worst case envelope building dimensions from the different technology providers. In reality, the building dimensions may be smaller than the ones used in the assessment, however, this would be expected to reduce the significance of building impacts on the dispersion of emissions from the main stack; the results presented in this report are therefore considered to be conservative with respect to building effects.

It is recognised that when in use, the hot cooling tower plumes will generate a thermal up-draught, which could potentially increase the buoyancy and hence dispersion from the Proposed Development stack, and consequently reduce the ground level concentrations. In this way, it could be argued that any impacts arising from the building effects from the cooling tower structures would be offset by the increased buoyancy of the gases, which is a modelling approach frequently used in the assessment of emissions from thermal power stations. However, any up-draught effect from the cooling towers cannot be adequately represented in the dispersion model, due to the model limitations; consequently the cooling towers have been included as buildings within the modelling assessment in order to present a worst-case assessment. Parameters representing the buildings and cooling towers included in the model are shown in Table A-12 (see also Table 5-4, *Chapter 5: The Proposed Development* of this ES), whilst a plan showing the buildings used in the ADMS simulations is shown in Figure A-2 below. The stack is shown in the figure as a red dot.

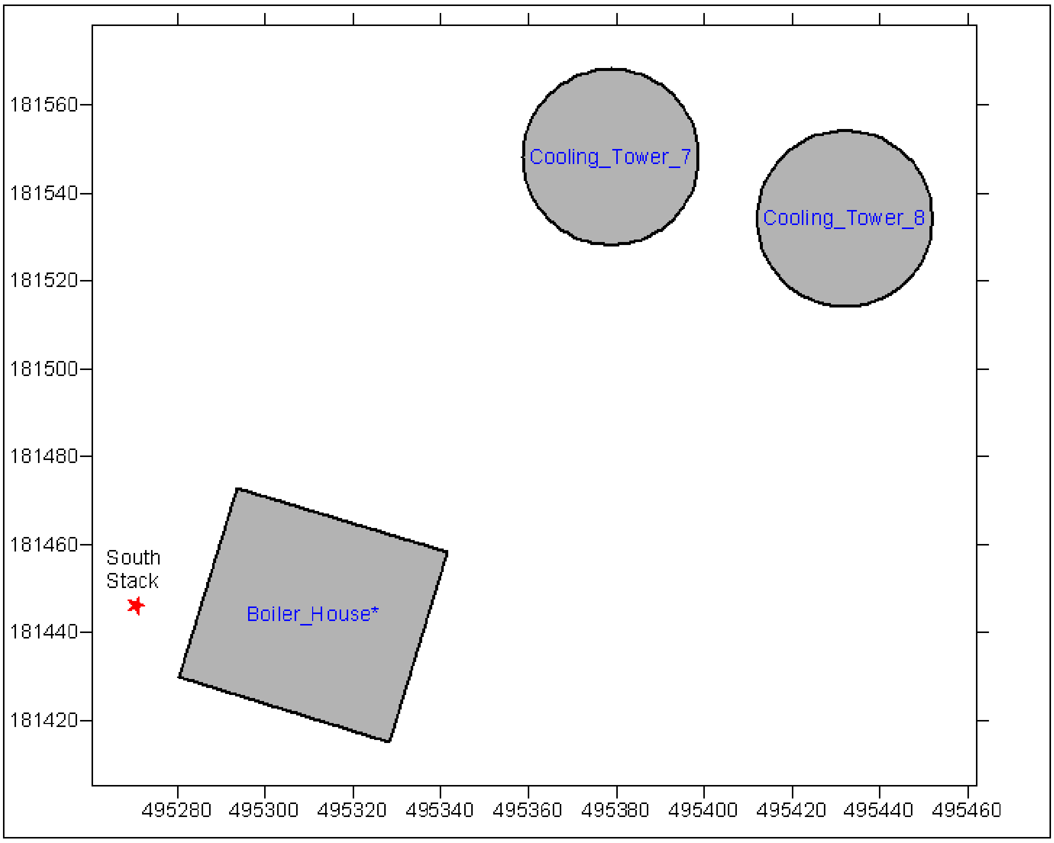
Table A-12: Buildings Incorporated into the Modelling Assessment

Building	Grid Reference (x,y)		Height (m)	Length (m)	Width (m)	Angle [1]
Boiler House	495311	181444	48	50	45	107
Cooling Tower 7	495379	181548	48.8	40	-	-
Cooling Tower 8	495432	181534	48.9	40	-	-

1. The angle between the building length and grid north.

2. The existing cooling towers have been modelled as circular structures of 40m diameter and therefore have no designated 'width' or 'angle'.

Figure A-2 Visualisation of Buildings in Modelling Assessment ADMS



The Site is situated on relatively flat ground, therefore site-specific terrain data has not been used in the model, as typically terrain data will only have a marked effect on predicted concentrations where hills with gradient of more than 1 in 10 are present in the vicinity of the source, which is not the case at this site.

The site is located to the west of Slough centre in an industrial trading estate with residential developments approximately 200m to the north, 500m to the northeast and 1km to the east of the site. A surface roughness of 0.5m, corresponding to parkland and open suburbia, has been selected to represent the local terrain, which is consistent with previous dispersion modelling assessments that have been carried out for the site.

Modelled Domain and Receptors

The model has been based on a grid (81 x 81) extending 2km from the point source. The grid resolution therefore provides output at 50m intervals from the source. The nearest sensitive receptor to the source is located approximately 200m from the source, therefore this resolution is considered appropriate. A lower resolution grid extending 5km from the point source has also been used to assess the sensitivity of the model results to grid resolution.

In addition, the nearest sensitive human and ecological receptors have been identified and represented as specified points for the model output, as detailed in *Chapter 8: Air Quality* of this ES.

Odour Model Parameters

Some of the model parameters used in the odour assessment varied from those detailed above for the modelling of the proposed power plant emissions, and variations from those parameters are discussed here.

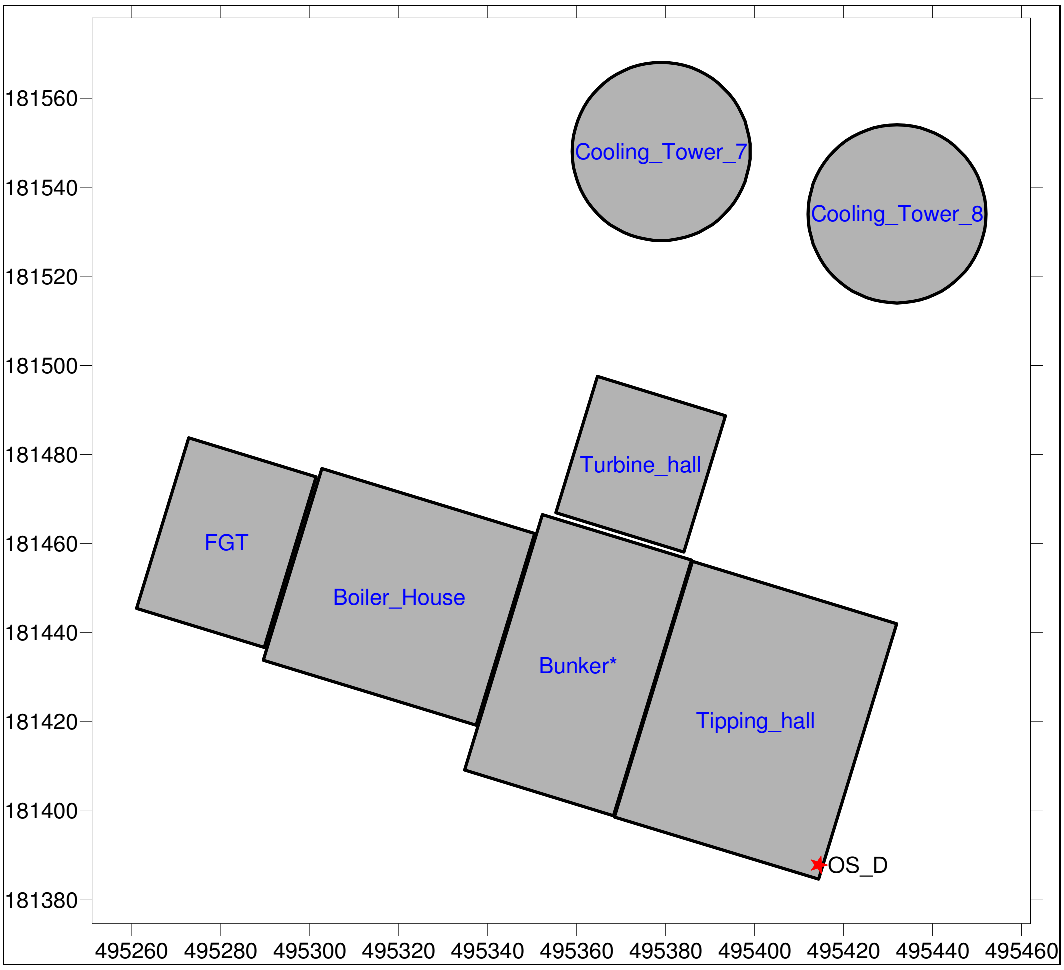
The odour modelling carried out for the ES was based on best estimate emission parameters, stack location and odour release data; however it is only an indicative study at this stage. Only one year of meteorological data (2008) was therefore used in the model runs.

Due to the lower stack height of the assumed carbon plant release point, additional buildings were included in the model, as shown in Table A-13 and Figure A-3. The assumed carbon plant stack is shown in the figure as a red dot.

Table A-13: Buildings Incorporated into the Odour Modelling Assessment

Building	Grid Reference (x,y)		Height (m)	Length (m)	Width (m)	Angle [1]
Boiler House	495311	181444	48	50	45	107
Cooling Tower 7	495379	181548	48.8	40	-	-
Cooling Tower 8	495432	181534	48.9	40	-	-
Bunker	495360	181433	40	60	35	107
Tipping Hall	495400	181420	15	60	48	107
Turbine Hall	495374	181478	30	40	32	107
Flue Gas Treatment	495281	181460	35	40	30	107

Figure A-3 Visualisation of Buildings used in Odour Assessment in ADMS



The model was also run using a smaller grid, extending 1km from the Proposed Development in all directions. The grid spacing used was 51 x 51, which results in a grid spacing of 40m.

3.2. Results and Discussion

It is considered that the modelled parameters used will result in a conservative estimation of the Proposed Development process contribution. These include:

- Use of the worst-case meteorological year for all reported results;
- Assessment of emission concentrations at the IED limits, when average concentrations are likely to be below these values;
- Assumption that 70% of NO_x emissions are converted to NO_2 in the stack vicinity in the long term, and 35% in the short term;
- Assumption that 100% of particulate emissions are PM_{10} or below;
- 100% plant availability and operation per year;
- Inclusion of buildings within the model, especially the inclusion of the existing cooling towers and excluding potential up-draught effects from the cooling tower thermal plumes in the assessment; and,

- Reporting maximum off-site Process Contributions (PCs) from the model, rather than results at specific receptors.

The results for the operating scenario resulting in the most worst case off site impacts (single line with 85m stack), were presented in *Chapter 8: Air Quality* of this ES. The results for the twin line assessment are presented in this Technical Appendix, for comparison. The impacts from the two scenarios are within 0.3μg/m^3 of each other for the NO_2 annual average, which equates to a difference of less than 1% of the AQS, and does not affect the overall outcome of the impacts described in this chapter. An overall summary of both sets of results are presented in Table A-14.

Table A-14: Predicted Concentrations from Dispersion Modelling at Worst Case Sensitive Receptors

Pollutant	Measured as	NAQS/ EAL (µg/m^3)	Single Line Results			Twin Line Results		
			PC[1] (µg/m^3)	PC / AQS[2] %	Magnitude of Change	PC[1] (µg/m^3)	PC / AQS[2] %	Magnitude of Change
NO_x (as NO_2)	Annual Mean	40	1.6	4.1%	Small	1.3	3.2%	Small
	Annual Mean at AQMA	40	0.2	0.5%	Imperceptible	0.3	0.7%	Imperceptible
	Annual Mean at Habitat site	30	0.3	0.9%	Imperceptible	0.32	1.1%	Small
	24-hour 100th percentile Habitat site	75	5.6	7.4%	Small	7.0	9.4%	Small
	Hourly Mean (99.8th %ile)$^{)}$	200	18.3	9.2%	Small	17.6	8.8%	Small
Sulphur Dioxide	24-Hour Mean (99.2nd %ile)	125	16.5	13.2%	Medium	14.2	11.4%	Medium
	Hourly Mean (99.7th %ile)	350	25.8	7.4%	Small	24.0	6.9%	Small
	15-Minute Mean (99.9th %%ile)	266	28.9	10.9%	Medium	29.3	11.0%	Medium
	Annual Mean at Habitat site	20	0.07	0.3%	Imperceptible	0.08	0.4%	Imperceptible
PM_{10}	Annual Mean	40	0.1	0.3%	Imperceptible	0.09	0.3%	Imperceptible
	24-Hour Mean (90.4th %ile)	50	1.2	2.4%	Imperceptible	0.9	1.9%	Imperceptible
$PM_{2.5}$	Annual Mean	20	0.1	0.6%	Imperceptible	0.09	0.6%	Imperceptible
CO	8-Hour Rolling Annual Mean	10,000	15.6	0.2%	Imperceptible	14.7	0.1%	Imperceptible
NH_3	Annual Mean	180	0.07	0.0%	Imperceptible	0.05	0.0%	Imperceptible
	Annual Mean at Habitat site	3	0.007	0.2%	Imperceptible	0.008	0.3%	Imperceptible

Pollutant	Measured as	NAQS/ EAL ($\mu g/m^3$)	Single Line Results			Twin Line Results		
			PC[1] ($\mu g/m^3$)	PC / AQS[2] %	Magnitude of Change	PC[1] ($\mu g/m^3$)	PC / AQS[2] %	Magnitude of Change
	Maximum Hourly Mean	2,500	0.9	0.0%	Imperceptible	0.9	0.0%	Imperceptible
VOC	Hourly mean- 100th percentile	5	0.13	2.7%	Imperceptible	0.12	2.3%	Imperceptible
HCl	Hourly mean- 100th percentile	750	10.3	1.4%	Imperceptible	11.1	1.5%	Imperceptible
HF	Annual Mean	16	0.01	0.1%	Imperceptible	0.009	0.1%	Imperceptible
	Annual Mean at Habitat site	5	0.001	0.0%	Imperceptible	0.002	0.0%	Imperceptible
	Hourly mean- 100th percentile	160	0.7	0.4%	Imperceptible	0.7	0.5%	Imperceptible
Mercury	Annual Mean	0.25	0.0006	0.2%	Imperceptible	0.0005	0.2%	Imperceptible
	Hourly mean- 100th percentile	7.5	0.009	0.1%	Imperceptible	0.009	0.1%	Imperceptible
Cd and Tl	Annual Mean	0.005	0.0006	11.7%	Large	0.0005	9.1%	Medium
Heavy Metals	Annual Mean	5	0.006	3.9%	Small	0.005	3.0%	Small
	Hourly mean- 100th percentile	150	0.09	8.7%	Small	0.09	9.2%	Small

[1] PC = Process Contribution

[2] AQS = Taken to be Air Quality Standard, CLPVE or Environmental Assessment Level, as appropriate

3.3. Visible Plumes from the Power Plant

Plume visibility results for the twin line assessment are presented in Table A-15, with a range shown for the five years of meteorological data used in the assessment.

Table A-15 Plume Visibility Results

Parameter	Units	2008	2009	2010	2011	2012	2013
No. of visible plume groundings	Hours	1	0	0	0	2	2
Percentage of visible plumes (all hours)	%	64	59	62	57	67	63
Percentage of visible plumes (daylight hours*)	%	57	51	51	49	59	64
Maximum visible plume length (daylight hours)	m	2,259	2,795	2,504	2,659	2,738	2,647
No. of visible plumes over 1000m (each plume event is 1 hour duration)	Hours	41	51	34	56	54	25
No. of visible plumes over 500m (each plume event is 1 hour duration)	Hours	92	110	71	99	102	58
Average visible plume length (daylight hours)	m	182	213	180	195	185	148
% Plumes Exceeding an average 50m Site Boundary (daylight hours only)	%	37	32	35	32	37	43

*Daylight hours have been assumed to occur between 07.00 – 19.00 throughout the whole year, i.e. for 12 hours per day.

Based on the model results presented in Table A-15, it is considered that the predicted visible plume effects from the power plant stack is 'medium', as per the results for the single line assessment (see Table 8-28 of *Chapter 8: Air Quality* of this ES).

3.4. Point source Model Sensitivity Analysis

Sensitivity analysis has been conducted on the model input variables to determine the effects on predicted results, and to ultimately identify the realistic worst-case results for inclusion in the assessment. These variables include:

- Meteorological data;
- Inclusion of buildings and structures;
- Surface roughness; and
- Grid resolution.

The sensitivities are presented in Table A-16 as the maximum deviations for the main pollutants from the process contribution results as presented in *Chapter 8: Air Quality* of this ES. The results presented in Chapter 8 and Table A-14 above are the worst-case with respect to meteorological data, building representation and grid size, but best estimates with regards to the surface roughness.

Table A-16: Sensitivity Analysis Results (as percentage deviation from PC Results)

Pollutant	Met Data		Grid Size		Surface Roughness		Buildings	
	ST	LT	ST	LT	ST	LT	ST	LT
NO_2	-4.3%	-47.0%	-5.9%	-1.5%	-4.7%	18.6%	-37.4%	-63.0%
SO_2	-8.9%	-47.0%	-2.5%	1.5%	1.8%	18.6%	-29.4%	-63.0%
PM_{10}	-41.8%	-46.3%	-19.3%	-1.5%	-28.5%	18.7%	-67.0%	-63.0%

Notes: ST = Short term (typically hourly averages), LT = Long-term (annual averages)

Meteorological Data

Six years of meteorological data from Heathrow Airport have been assessed (2008-2013), with 2008 data providing the worst-case long term results and different years providing worst case short term predicted results. The highest predicted results from all five years met data have been reported in the main assessment to provide a worst-case assessment, in accordance with H1 guidance. The sensitivity results above are therefore negative as the other met years predict lower ground level concentrations than those reported in the main chapter. Changing the met year affected the predicted results by a maximum of -47.0% for annual average impacts, resulting in a NO_2 PC of 0.86µg/m^3 compared to the reported 1.6µg/m^3.

Modelled Domain and Grid Spacing

The model has been run to simulate a Cartesian domain extending 2km and 5km either side of the Proposed Development. As each simulation was based on a grid of 81 by 81 points, this led to grid spacings of 50m and 125m, respectively. The larger grid spacing would be expected to lead to lower predicted peak concentrations as they are averaged out over the grid square, and this was predominantly found to be the case. Using a coarser grid decreased the predicted short term results by a maximum of -19.3%.

In general the worst-case results were those for the smaller grid, and therefore this was used to determine worst-case off-site impacts for the main assessment.

Surface Roughness

The main model was run with a surface roughness of 0.5m, deemed appropriate to represent open suburbia. For the sensitivity analysis, the model was also run with a surface roughness of 0.3m (representative of the maximum value appropriate for agricultural areas) and 1m (representative of cities). Due to the location of the site, within an urban area, the surface roughness used in the main model (0.5m) was deemed appropriate, as the higher the surface roughness, the greater the degree of friction introduced into the modelling. This would result in a higher probability of elevated concentrations being predicted close to the source and therefore may lead to an overestimation of impacts. The use of the 0.5m surface roughness also corresponded to previous modelling assessments that have been carried out for the SSE Slough site.

On the whole, worst case results long term results were received when using the 1.0m surface roughness, and the 0.3m surface roughness resulted in reductions of a similar magnitude to the increases associated with the higher surface roughness. The short term impacts were less affected by surface roughness.

The greatest variations from the main model results for both surface roughness values are presented in Table A-16.

Buildings

The model has been run without the inclusion of buildings, in order to determine the effect of the building represented in the model. The wind field can become entrained into the wake of buildings, which causes the wind to be directed to ground level more rapidly than in the absence of a building, resulting in higher predicted ground level concentration. Therefore, when buildings are not included, the predicted ground level concentrations are reduced, as can be seen from Table A-16, with impacts being up to 67.0% lower than reported in the main assessment.

4. STACK PARAMETERS MODELLING

A series of different stack parameters were assessed through detailed dispersion modelling with ADMS5, in order to determine the influence on the dispersion of emissions from the Proposed Development. The parameters assessed included the effects of differing stack heights, efflux velocities, NO_x concentrations and NH_3 concentrations.

This work subsequently led to the determination of appropriate stack parameters for the Proposed Development, as presented in the ES.

Both single and twin line configurations were considered as part of the stack height assessment, and predicted results were assessed against the Air Quality Standards (AQSs), EALs, CLPVEs and Critical Loads at key receptor locations. The assessment also focussed on the maximum off-site process contributions (PCs), NO_2 process contribution at Tuns Lane AQMA and nitrogen deposition at Burnham Beeches SAC.

Single Line Assessment

For the single line configuration the initial design parameters were assessed, including the existing 82m South Stack, a 15m/s efflux velocity and all pollutant releases at IED limits, including ammonia at 10mg/Nm3. The assessment indicated that:

- Maximum off-site process contribution of NO_2 was 5% of the long term AQS, which is considered a minor adverse effect;
- Maximum off-site process contribution of NO_2 at the Tuns Lane AQMA was under 1% of the long term AQS, which is considered a negligible effect; and
- Nutrient nitrogen deposition from process contributions at Burnham Beeches SAC was 1.1% of the minimum Critical Level and <1% of the maximum Critical Level.

Following this initial model, further modelling was undertaken in an attempt to reduce the maximum off-site process contribution and impacts at the Burnham Beeches SAC. A series of scenarios were modelled, which included:

- Increasing the stack velocity from 15m/s to 18m/s (by keeping the volumetric flow the same but reducing the diameter of the stack at the point of release i.e. through an accelerator cone);
- Increasing the stack height from between 82m to 100m;
- Reducing the NO_x concentration limit from 200mg/Nm^3 to 150mg/Nm^3; and,
- Reducing the NH_3 concentration from 10mg/Nm^3 to 5mg/Nm^3.

Following analysis of the results, a combination of the above parameter changes was then modelled including an 85m release height, an 18m/s efflux velocity, 200mg/Nm^3 NO_x, 5mg/m^3 ammonia and a 48m building height.

This scenario resulted in effects that were 4.3% of the annual average NO_2 AQS (minor) on the worst affected residential receptors; <1% of the annual average NO_2 AQS (negligible) at the Tuns Lane AQMA; and <1% of the annual average NO_x CLPVE and N-deposition Critical Level (negligible) at Burnham Beeches SAC.

It was determined that the single line assessment should therefore be based on the following parameters:

- Single Line: 85m release height, 18m/s efflux velocity, 200mg/Nm^3 NO_x, 5mg/Nm^3 ammonia and a 48m building height.

Twin Line Assessment

For the twin line configuration the initial design parameters were assessed, including a new 85m stack, a 15m/s efflux velocity and all pollutant releases at IED limits, including ammonia at 10mg/Nm^3. The assessment indicated that:

- Maximum off-site process contribution of NO_2 was 5% of the long term AQS, which is considered a minor adverse effect;
- Maximum off-site process contribution of NO_2 was <1% of long term AQS at Tuns Lane, which is considered a negligible effect; and
- Nutrient nitrogen deposition from process at Burnham Beeches SAC was 1.4% of minimum Critical Level and <1% of maximum Critical Level.

Similarly to the single line assessment, the dispersion modelling assessment was refined by changing a series of parameters in isolation and then a combination of these were then used to model effects further. It was thus determined that the twin line assessment should therefore be based on the following parameters:

- Twin Line: a 90m release height, an 18m/s efflux velocity, 200mg/Nm^3 NO_X, 5mg/Nm^3 ammonia and a 48m building height.

This scenario resulted in effects that were 3.6% of the annual average NO2 AQS (minor) on the worst affected residential receptors; <1% of the annual average NO_2 AQS at the Tuns Lane AQMA (negligible), and <1% of the annual average NOx CLPVE and N-deposition critical load (negligible) on Burnham Beeches SAC.

EIA Application Scenario

Based on the results of the stack dispersion modelling it was decided that the following parameters would be modelled for the EIA:

- Single Line: 85m release height, 18m/s, 200mg/m^3 NO_x, 5mg/Nm^3 ammonia, 48m high building; and
- Twin Line: 90m release height, 18m/s, 200 mg/m^3 NO_x, 5mg/Nm^3 ammonia, 48m high building.

When determining suitable stack heights for such developments, it is also important to consider the visual effects of the stack. It is therefore a balance between ensuring predicted effects are at a level that is not going to result in unacceptable environmental effects, and a height that is not going to cause unacceptable visual effects. It was therefore considered that an increase in the stack height above 90m would have led to an increase in the significance of visual effect, considering that the existing stack is 82m high.

REFERENCES

Ref. 1 Department for Transport (2007): National Transport Statistics 2007 Edition: Section 7 Roads and Traffic. Accessed: www.dft.gov.uk/pgr/statistics/datatablespublications/tsgb/2007edition/

Appendix E-1

Noise Modelling Methodology

1 NOISE MODELLING SOFTWARE

CadnaA®[1] is a sophisticated noise modelling software package that predicts noise levels based on the appropriate input data e.g. location and orientation of equipment and sound power data. The software package can take into account a variety of information about the site including topography, buildings, and operational, demolition and construction noise sources.

Noise Modelling Assumptions

The following assumptions have been made, which are typical when calculating the propagation of noise, when producing the noise model:

- The ground conditions around the site are mainly roads and buildings therefore the ground has been modelled as semisoft;
- Air temperature was assumed to be 10 degrees and humidity 70%;
- It is assumed that all building façades are smooth facades therefore they have been given an absorption coefficient of 0.21; and
- One order of reflection was modelled.

2 CONSTRUCTION NOISE PREDICTIONS

CadnaA noise mapping software was used to predict construction noise levels at the selected receptors. The construction noise model followed the procedures for prediction of construction noise set out in BS 5228-1:2009.

Sound power levels for each of the following construction activities have been calculated:

- Demolition
- Piling and foundation works
- Building and general site activity

A full list of typical items of plant associated with each construction phase and associated sound power data from BS 5228 is presented in Table A1. The total sound power level applied to area sources within the construction noise model for these activities have been summarised in Table A2. These calculations are based on the assumption of a work site area of 100m x 100m and that plant will be, on average, operational for approximately 60% of the time.

[1] CadnaA®, registered trademark of Datakustik GmbH (Munich, Germany). (www.datakustik.com).

Table A1: Plant & Equipment Associated with the Demolition and Construction Stages of Work

Plant / Equipment	Sound Power Level (dB) Referenced from BS 5228	Stage of Work		
		Demolition	Piling and Foundation Works	Building and General Site Activities
Compressors	108	3	6	6
Hand Held Pneumatic Breaker	111	3	0	0
Dump Truck (tipping fill)	107	2	2	0
Dump Truck (pass-by)	115	3	3	0
Wheeled Loader	108	0	0	2
Lorry (delivery and collection)	108	4	10	10
Water Pump (20 kW)	93	0	0	1
Pre-Cast Concrete Piling Hydraulic Hammer Rig	117	0	4	0
Hand-Held Welder (welding piles)	101	0	1	0
Generator for Welding	101	0	1	0
Dumper (idling)	91	0	0	1
Wheeled Backhoe Loader	95	0	0	2
Tracked Excavator	99	5	5	5
Concrete Mixer Truck	108	6	25	25
Truck Mounted Concrete Pump and Boom Arm	108	0	3	3
Poker Vibrator	106	0	0	1
Wheeled Mobile Telescopic Crane	106	2	4	4
Tower Crane	105	1	2	2
Lorry with Lifting Boom	105	1	0	0
Lifting Platform	95	0	0	0
Fork Lift Truck	103	0	0	4
Mini Tracked Excavator	102	0	0	0
Electric Core Drill (Drilling Concrete)	113	0	0	1
Concrete Floor Cutter	119	0	0	1
Hand-Held Circular Saw (Cutting Paving Slabs)	112	0	0	0
Diesel Generator for Site Cabins	94	2	4	4
Diesel Generator for Site Lighting	93	1	2	2
Road Sweeper	96	1	1	1
Angle Grinder	108	1	1	1
Hand-Held Cordless Nail Gun	101	0	0	0
Road Planer (road construction)	110	0	0	1
Vibratory Compactor (asphalt)	110	0	0	1
Asphalt Paver + Tipper Lorry	105	0	0	1
Electric Water Pump	96	2	2	2

Table A2: Summary of Construction Phase Noise Levels

Phase	Total L_w dB(A)	Site width/length	Site area m^2	Lw per m^2 dB(A)	60% on time correction dB(A)
Demolition	124	50	10000	84	82
Piling and Foundation Works	128	50	10000	88	86
Building and General Site Activity	127	50	10000	87	85

3 OPERATIONAL SITE MODELLING

Noise from the operational Slough Multifuel site has been modelled with Cadna-A® using ISO9613 noise prediction methodology. This methodology is accepted as the industry standard for modelling outdoor noise.

The impact of noise sources at nearby receptors has been assessed using the noise data as presented in Table A3 below. The layout of Slough multifuel showing the location of noise sources and buildings is presented in Figure A1. The modelled layout represents the maximum footprints for the buildings and structures for which planning permission is being sought, whilst omitting the extra noise attenuation that would be provided by the overlapping wall between the bunker house and boiler house (illustrated on Figure 5-1, Chapter 5: Project Description). The modelling is therefore still valid if later iterations of the design chose to omit this design measure.

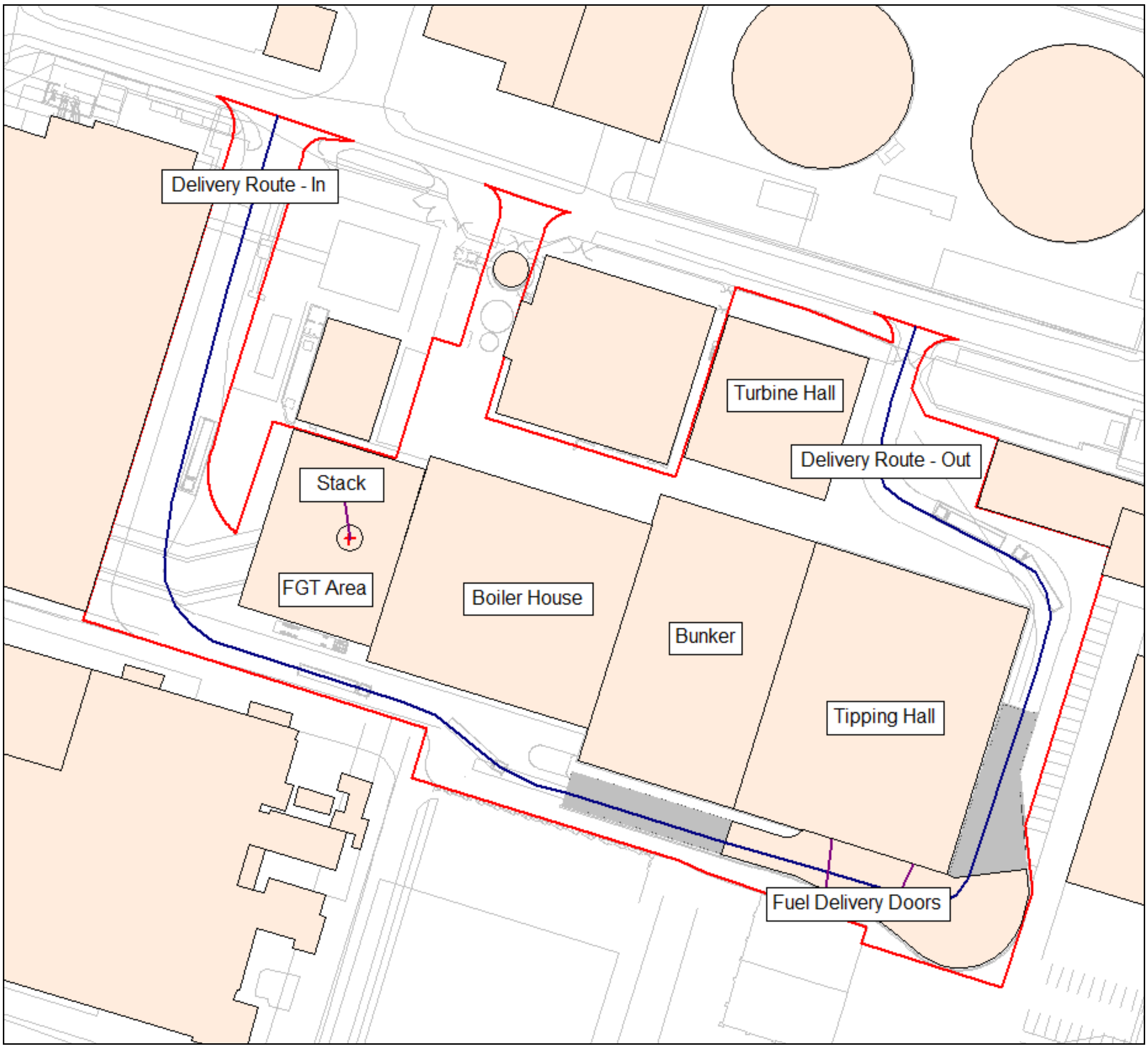
It has been assumed that the building envelopes will attenuate noise by 25 dB. A value of this magnitude assumes that the building is effectively covered by ventilation, which is considered to be the weakest point of the building envelope. In reality, the building envelope is likely to provide greater level of sound reduction; however, the use of a conservative sound reduction is considered to represent a worst case scenario where ventilation is oriented towards nearby noise sensitive receptors. The fuel delivery door is assumed to attenuate noise by 10dB.

Table A3: Noise Source Data

Source	Sound Power Level dB(A)	Source Type
Stack	96	Point
Deliveries	103	Line
Boiler House	85*	Area
Turbine Building	85*	Area
FGT Area	85*	Area
Fuel Delivery Door	85**	Area

*indoor sound pressure level with assumed building attenuation of 25 dB
**indoor sound pressure level with assumed building attenuation of 10 dB

Figure A1: Proposed Layout



Appendix E-2

Demolition/ Construction Noise and Operational Noise Contour Plots

Figure 1: Modelled Demolition Noise

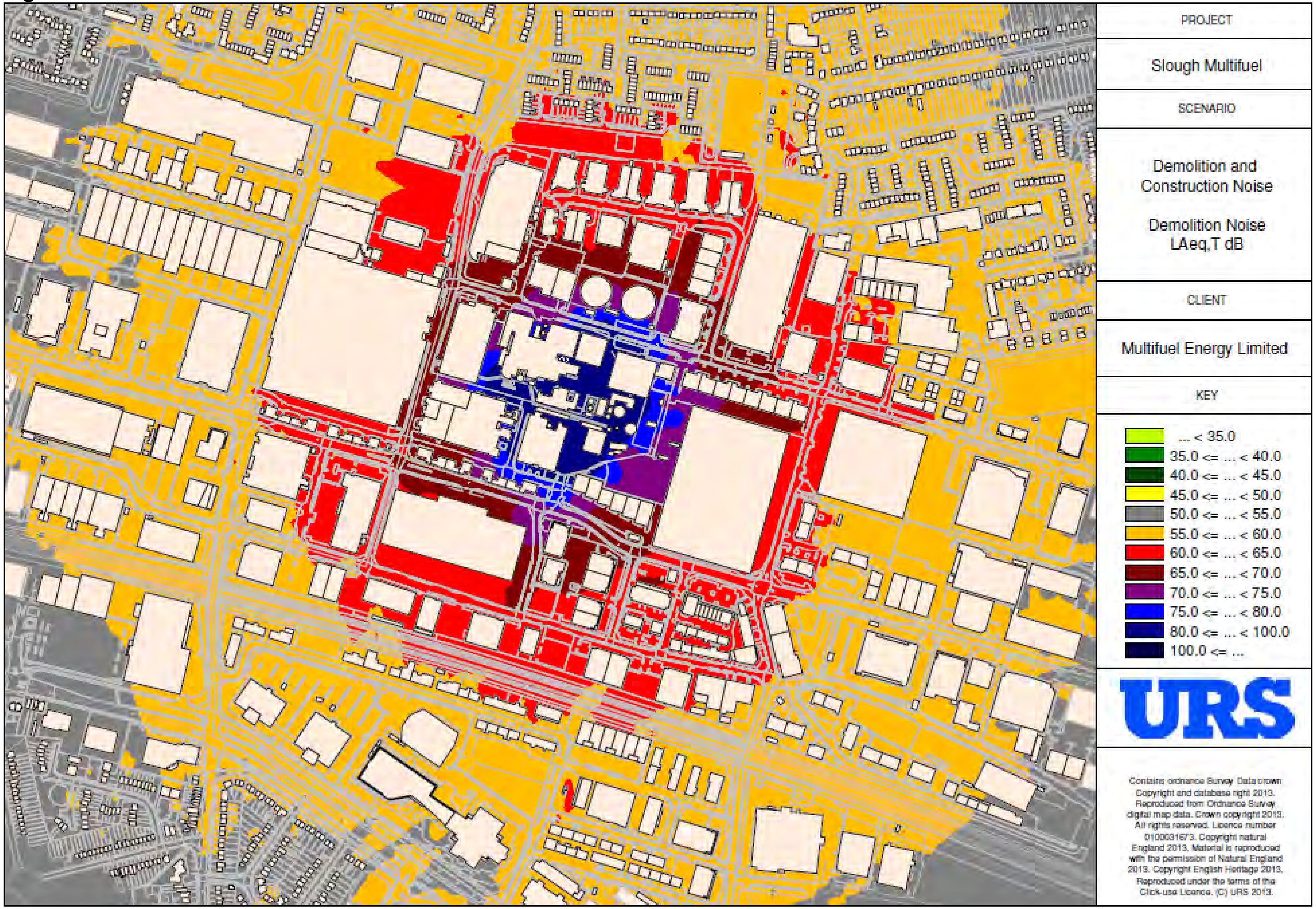


Figure 2: Modelled Piling and Foundation Noise

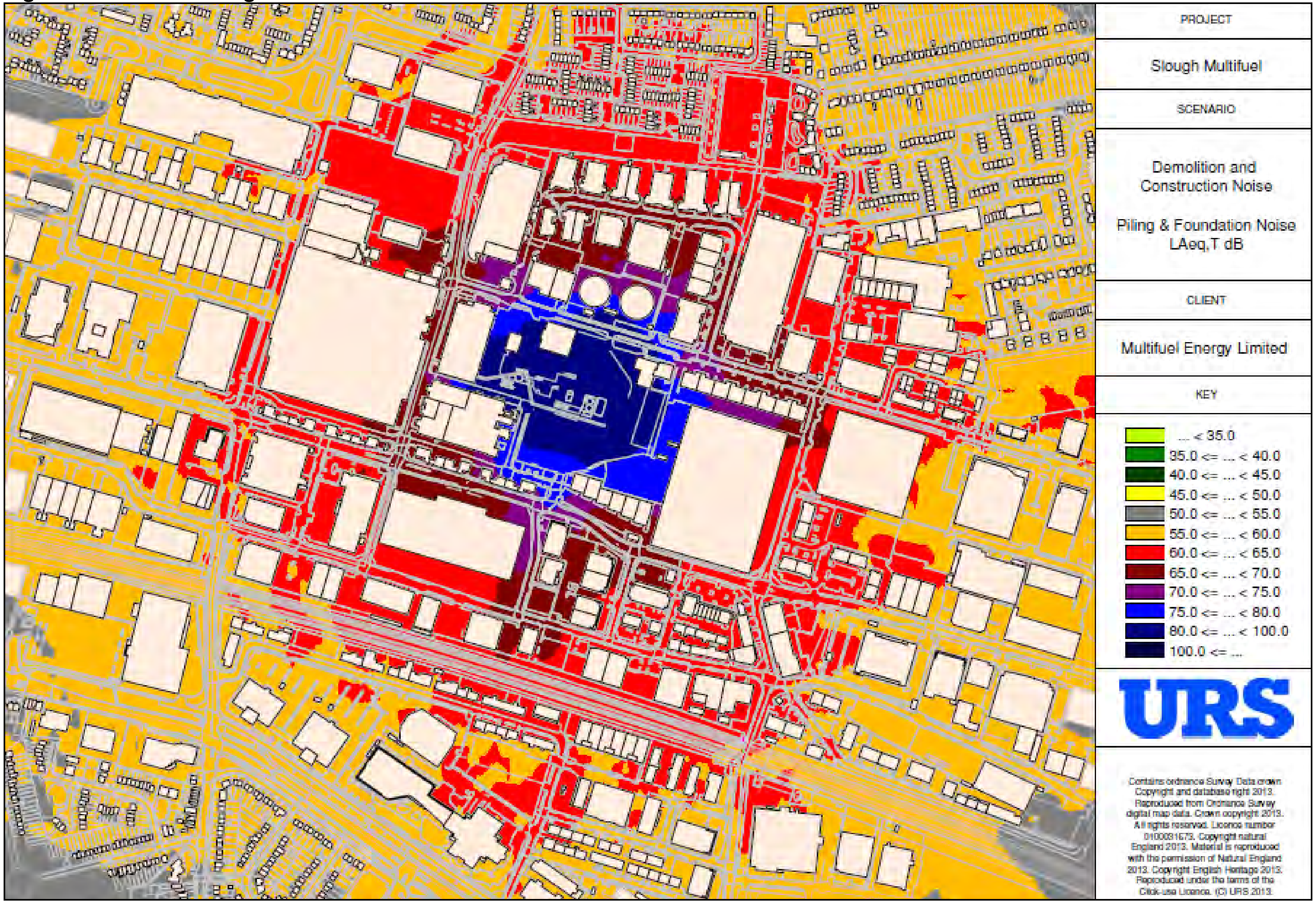


Figure 3: Modelled Construction Noise

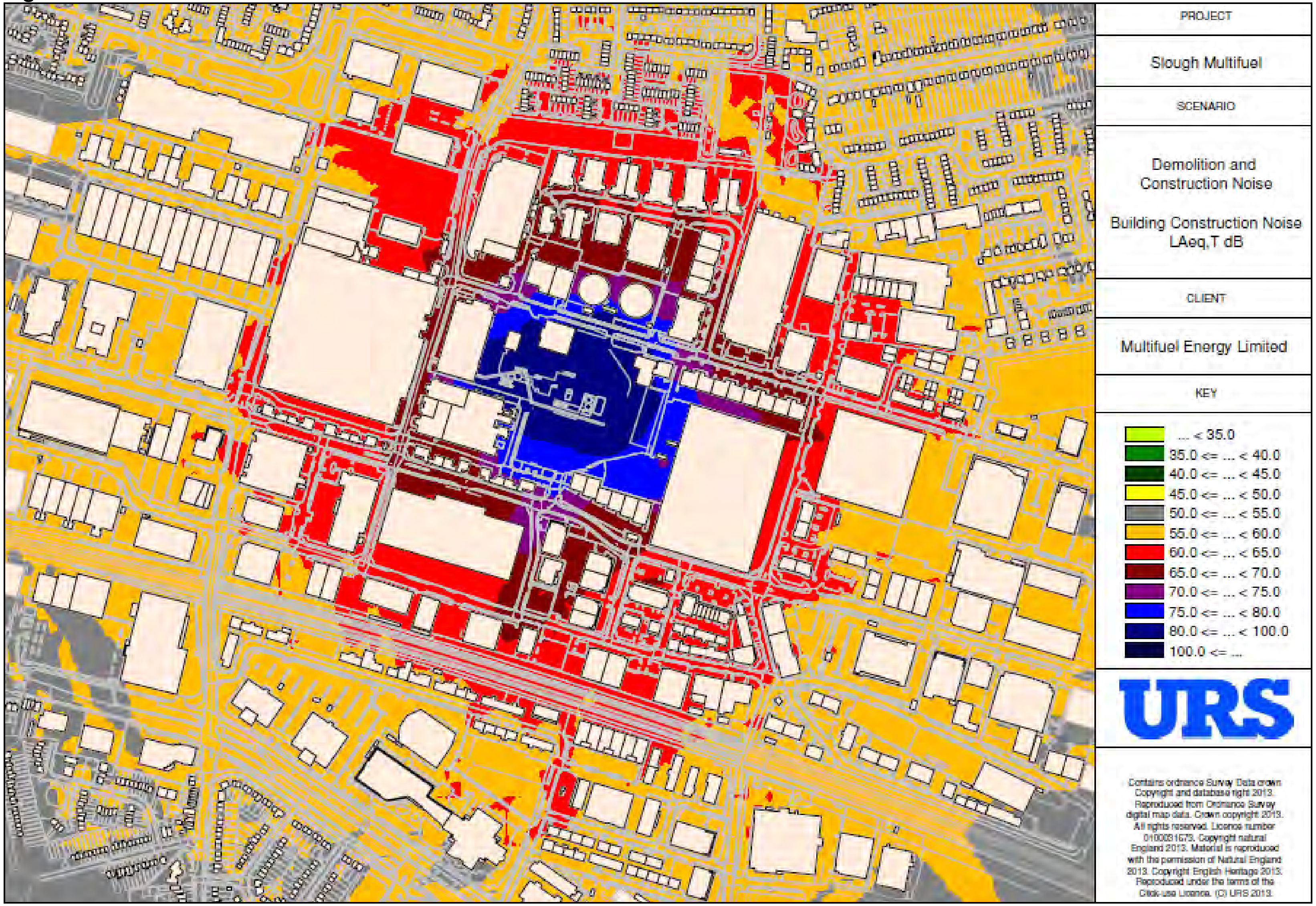


Figure 4: Modelled Operational Noise

Figure 5: All Plant (New and Existing) Operational Noise

Appendix F-1

Flood Risk Assessment

Slough Multifuel CHP Facility

Flood Risk Assessment

January 2014

47066339

Prepared for:
SSE Generation Ltd

UNITED KINGDOM & IRELAND

Rev	Date	Details	Prepared by	Checked by	Approved by
1	October 2013	Draft	Elizabeth Young Senior Environmental Consultant Richard James Flood Risk Consultant	Dr Rob Sweet Principal Consultant	Neil Titley Associate
2	January 2014	Final	Richard James Flood Risk Consultant	Elizabeth Young Senior Environmental Consultant	

URS Infrastructure and Environmental UK Ltd
Bridgewater House,
Whitworth Street,
Manchester
M1 6LT

Telephone: +44(0)161 907 3500
Fax: +44(0) 161 907 3599

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EXECUTIVE SUMMARY

URS was commissioned by SSE Generation Ltd (the ‘Applicant’) to undertake a Flood Risk Assessment for the development of a Multifuel Combined Heat and Power (CHP) facility providing up to 50 megawatt (MW) gross electrical capacity and up to 20 MW of heat (herein referred to as the ‘Proposed Development’). The Proposed Development is located within the existing Slough Heat and Power (SHP) Site within the Slough Trading Estate, 342 Edinburgh Avenue, Slough, SL1 4TU. The boundary of the Proposed Development Site covers an area of approximately 1.9 hectares (ha).

This assessment considers the existing flood risk posed to the Proposed Development Site from all sources and the effect of the Proposed Development on flood risk, both to the Proposed Development itself and elsewhere. The impacts of climate change on flood risk over the lifetime of the Proposed Development are also considered. In summary:

- The site lies within Flood Zone 1 and is therefore at low risk of flooding from fluvial and tidal sources, with an annual exceedance probability (AEP) of <0.1% from fluvial or tidal flooding;
- The existing flood risks from sewers and surface water are considered to be moderate;
- The existing flood risk from groundwater sources is considered to be low, with no risk from artificial sources;
- The Proposed Development will not increase the area of impermeable surfaces relative to the existing site and will therefore not increase the volumes and rates of surface water runoff generated by the Site;
- Surface water from the Proposed Development will be preferentially discharged to ground (ground conditions permitting), with the remainder being discharged into the Edinburgh Avenue sewer at a rate which does not exceed the existing situation, thereby meeting the requirements of Building Standards Regulations 2000 Part H and the NPPF;
- Opportunities to provide betterment upon the existing situation (i.e. reducing surface water discharge towards a greenfield runoff rate) will be investigated at the detailed design stage;
- The proposed site layout will be designed for exceedance in accordance with CIRIA 635, with controlled flooding being utilised to accommodate surface water from events exceeding the 3.3% AEP up to the 1% AEP critical duration storm plus climate change.
- A residual risk of flooding is associated with failure of the surface water drainage system or exceedance of the systems design capacity. Regular maintenance and inspection of the drainage system will be undertaken to ensure that the system continues to perform as designed.
- Flood resistant and resilient measures will be adopted where appropriate to manage the residual risk of flooding from pluvial and sewer sources at the Site.

As the Proposed Development Site is located in Flood Zone 1, the Proposed Development passes the Sequential Test and the Exception Test is not required.

1. INTRODUCTION

1.1 Background

URS was commissioned by SSE Generation Ltd to carry out a Flood Risk Assessment (FRA) for the development of a Multifuel Combined Heat and Power (CHP) facility providing up to 50 megawatt (MW) gross electrical capacity and up to 20 MW of heat at the site (herein referred to as the 'Proposed Development'). The Proposed Development is located within the existing Slough Heat and Power (SHP) site on Slough Trading Estate, 342 Edinburgh Avenue, Slough, SL1 4TU. The Proposed Development Site covers an area of 1.9 hectares (ha).

The Proposed Development Site lies within Flood Zone 1 and is therefore deemed to be at low risk of flooding from fluvial flooding. However, as it is larger than 1 ha, an FRA is required as per the guidance of the National Planning Policy Framework (NPPF) to accompany a planning application. The FRA primarily considers the management of surface water runoff, as per the recommendations of the Standing Advice of the Environment Agency (EA). However, it also considers the risk of flooding from other sources, such as groundwater, sewers and overland flow, and evaluates appropriate mitigation measures.

1.2 Scope of Services

The aim of this assessment is to undertake a FRA that is appropriate to the nature and scale of the Proposed Development which will meet the necessary requirements of current planning guidance and which will be sufficient to support an application for planning approval for the Proposed Development.

The general objectives of this FRA report are to:

- Review existing information relating to the flood risk posed to the proposed development site from all sources (e.g. fluvial, surface water, sewer flooding);
- Consult Slough Borough Council (SBC), the Environment Agency (EA) and Thames Water Utilities Ltd (TWUL) regarding the Proposed Development in relation to flood risk and the requirements of the National Planning Policy Framework (NPPF)[1];
- Assess the flood risk to the Proposed Development Site under existing and future conditions (taking into account climate change); and
- Outline any mitigation measures needed to meet the requirements of the NPPF.

1.3 Data Sources and References

Data collected during the course of this assessment are presented in Table 1, which also identifies the source of this data and provides comment on its use and suitability.

[1] National Planning Policy Framework (2012) Department of Communities and Local Government

Table 1: Sources of Data Reviewed

Purpose	Data and Source	Comments
Identification of Hydrological Features	Ordnance Survey mapping	Identifies the position of the site and local hydrological features
Identification of Existing Flood Risk	Environment Agency Indicative Flood Zone Map	Identification of fluvial/ tidal inundation extents and historical flooding
	Environment Agency Flood Inundation Mapping	Information on the risk of flooding from reservoirs (artificial sources)
	Slough Borough Council Strategic Flood Risk Assessment (SFRA)[2] and update[3], Preliminary Flood Risk Assessment (PFRA)[4], Surface Water Management Plan (SWMP)[5], Draft Local Flood Risk Management Strategy (LFRMS)[6]	Assess flood risk across Slough borough. Includes a high-level assessment of the flood risk from fluvial, pluvial, sewers and groundwater sources.
	Site Investigations (WSP)[7]	Details of groundwater levels in the vicinity of the site.
	Public sewer records (TWUL)	Identified the local drainage system near the site
Identification of Historical Flooding	Strategic Flood Risk Assessment (SFRA), Preliminary Flood Risk Assessment (PFRA), Site Waste Management Plan (SWMP)	Details of historical flooding
	Environment Agency, SFRA and PFRA	Details of historical flooding
Development Plans	Various development plans (Annex A)	Layout of the proposed development
Surface Water Drainage	Foul and Surface Water Drainage (Slough Estates, now owned by SHP (SSE)) Conceptual Surface Water Drainage Strategy – URS	Identifies existing site drainage, public drainage system near the site and contains details of proposed management of surface water runoff from Proposed Development.

[2] Slough Borough Council (2007) Strategic Flood Risk Assessment

[3] Slough Borough Council (2009) Strategic Flood Risk Assessment - Revision 1

[4] Slough Borough Council (2011) Preliminary Flood Risk Assessment

[5] Slough Borough Council (2011) Slough Surface Water Management Plan

[6] Slough Borough Council (2013) Draft Local Flood Risk Management Strategy

[7] WSP (2012) SSE Silo – Slough Heat and Power Intrusive Site Investigation and Geotechnical Assessment

2. DEVELOPMENT DESCRIPTION AND LOCATION

2.1 Type of Development and Location

The Proposed Development Site lies within the existing SHP site boundary within the Slough Trading Estate. The SHP site is mainly located on the south side of Edinburgh Avenue, while the two associated natural draught cooling towers occupy an area immediately to the north of Edinburgh Avenue. The SHP site contains numerous industrial buildings and structures of a variety of ages, including boiler houses, turbine halls, fuel storage facilities, switch rooms, control rooms, offices and various other ancillary plant.

The Proposed Development Site is predominately surfaced with impermeable hardstanding and covers approximately 1.9ha. A site location plan is presented in Figure 1 and the boundary of the Proposed Development Site is presented in Figure 2.

The Proposed Development will comprise a multifuel generating plant that will convert fuel derived from selected processed waste into electricity and heat. The plant will be fully compliant with the Industrial Emissions Directive (Directive 2010/75/EU). The proposed development will be designed to utilise up to 480,000 tonnes per annum (tpa) of Waste Derived Fuel (WDF).

The Proposed Development will comprise of an enclosed tipping hall and fuel bunker, up to two furnaces where the WDF will be combusted and boiler unit(s) to raise steam, a turbine hall with a steam turbine to generate electricity, up to two Flue Gas Treatment (FGT) plants to clean the flue gas, and a new stack for discharge of cleaned flue gas (which would replace the existing south stack on the SHP site) or an extension to the existing south stack. It will generate up to 50MW of gross electrical output with up to 20 MW of heat to supply the existing Slough Trading Estate heat network. The existing two natural draught cooling towers at the SHP site are expected to be retained and provide cooling water for the Proposed Development.

The Proposed Development is expected to increase current employment at SHP, provide approximately 300 temporary jobs per year during the construction period and act as a catalyst for future development within the Slough Trading Estate. Outline development plans are provided in Annex A.

Figure 1: Location of the Proposed Development Site

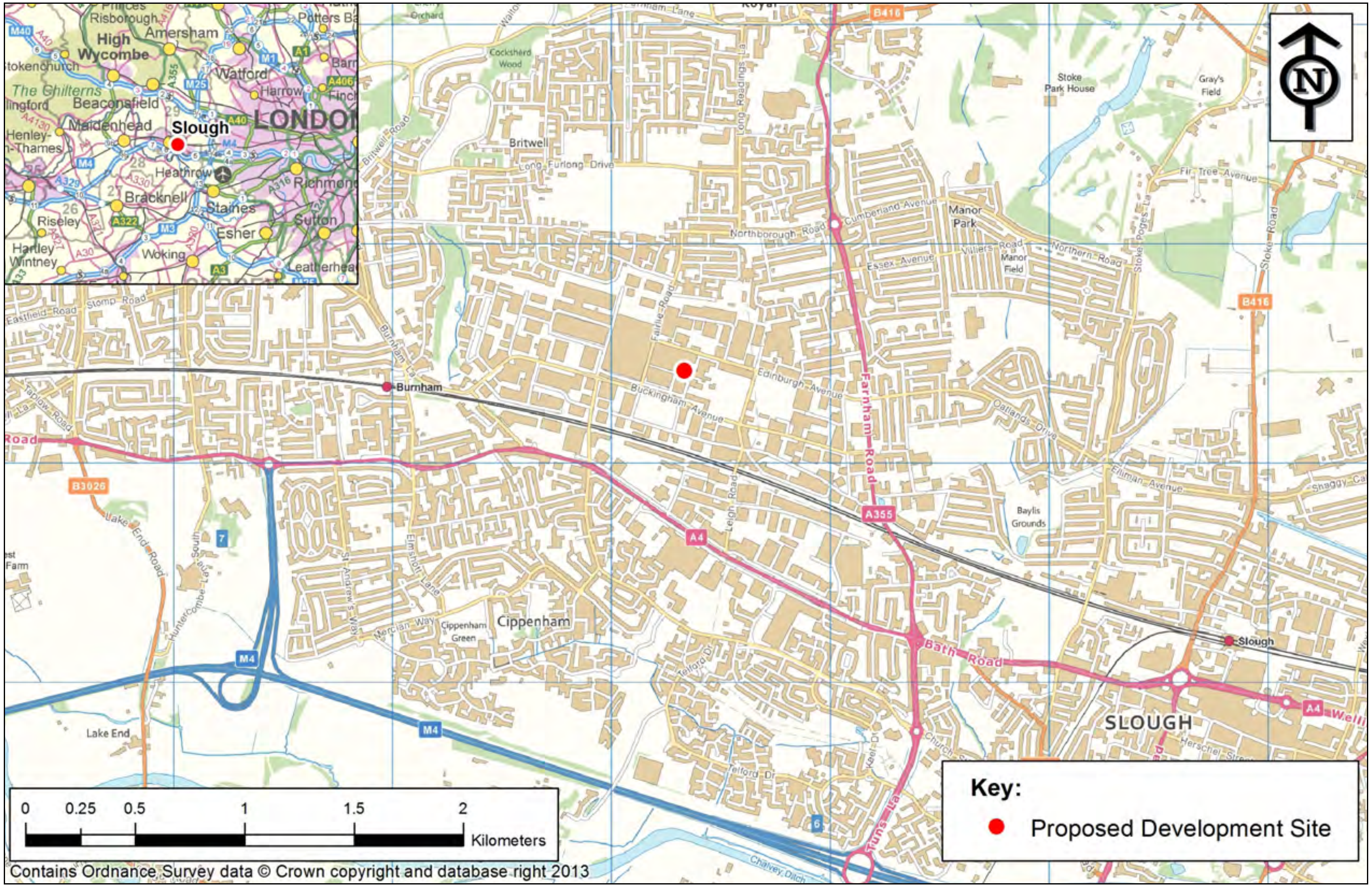
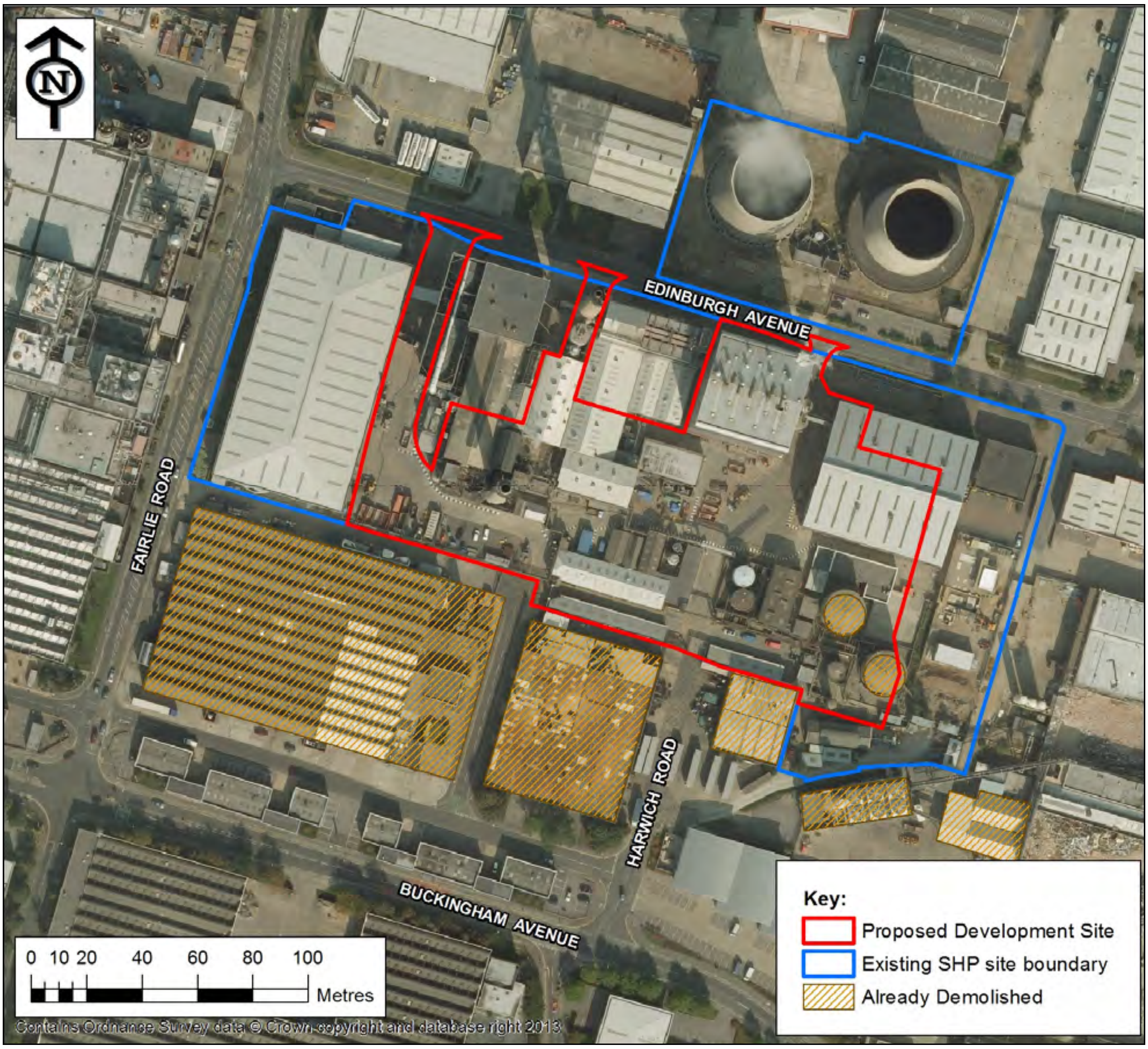


Figure 2: Site Boundary for the Proposed Development



2.2 Development Vulnerability Classification

The development is considered to be 'Essential Infrastructure', based on the Vulnerability Classification in Table 2 of the NPPF Technical Guidance.

2.3 Sequential and Exception Test

The Proposed Development is considered appropriate within the Environment Agency designated Flood Zones for the site, based on its classification as 'Essential Infrastructure' and location within Flood Zone 1 (see Table 2). The Sequential Test is therefore passed and Exception Test is not required.

Table 2: Flood Risk Vulnerability and Flood Zone Compatibility

Flood risk Vulnerability classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	×	Exception test required	✓
Zone 3b 'Functional Flood plain'	Exception test required	✓	×	×	×

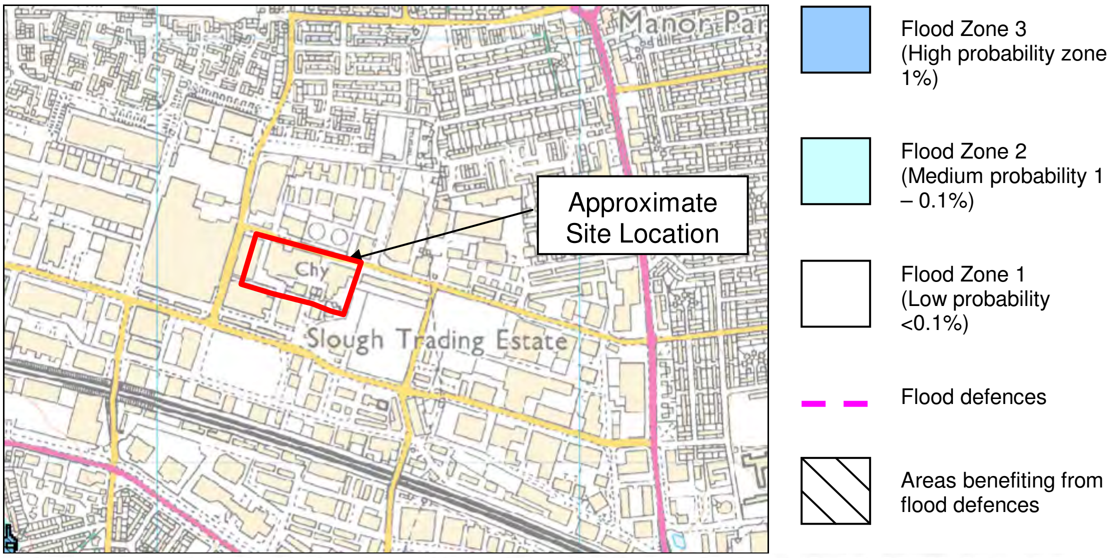
3. FLOOD RISK TO THE DEVELOPMENT

3.1 Fluvial – Main Rivers

Chalvey Brook runs approximately 950m to the west of the Proposed Development Site, whilst Salt Hill Stream runs approximately 1.1km to the east of the Site. According to the draft Local Flood Risk Management Strategy, the Site is located in the catchment of the Salt Hill Stream.

The SFRA Update and the Environment Agency indicative flood zone maps show that the Proposed Development Site lies in Flood Zone 1 and, therefore, is considered to be at low risk of flooding from fluvial sources (Figure 3).

Figure 3: Environment Agency Flood Zone Map



3.1.1 *Fluvial – Impact of Climate Change*

The SFRA Update states that even under the impacts of climate change, the site will remain in Flood Zone 1. The Proposed Development Site will therefore remain at low risk from fluvial sources in the future.

3.1.2 *Fluvial – Other Surface Water Features*

A review of 1:10,000 OS mapping and SFRA indicates that the nearest waterbody is a pond located approximately 925m southeast of the Site, known as Farnham Road balancing pond.

The risk from other surface water features is considered to be low.

3.2 Artificial Waterbodies

The EA risk of flooding from reservoirs map shows that the Proposed Development Site is not considered to be at risk from reservoirs in the event of failure.

The 1:10,000 OS maps show that there are no other artificial waterbodies in the vicinity of the Proposed Development Site. Therefore, the Proposed Development Site is not considered to be at risk from these sources and is not considered any further.

3.3 Groundwater Flooding

Groundwater flooding can occur when the sub-surface water levels are high and groundwater emergence occurs.

According to the PFRA there are no recorded instances of historical groundwater flooding within the vicinity of the Proposed Development Site. The SFRA Update states that groundwater flooding is not considered to be an issue at the Slough Trading Estate.

WSP undertook intrusive site investigations at the site in January 2012 and groundwater was encountered from 4.5m below ground level (bgl) through the underlying River Terrace Deposits from the top of the White Chalk. Standing groundwater was found to be at 4.6m bgl[8].

The risk of groundwater flooding at the Proposed Development Site under the current baseline is considered to be low.

3.3.1 *Groundwater – Impact of Climate Change*

The predicted increase in the wetness of winters and the intensity of storm events could impact the groundwater level fluctuations at the Proposed Development Site and possibly increase the level of the water table. However, it is not considered likely that the predicted increases in rainfall intensity under the climate change scenario will lead to a significant increase in the recharge of the underlying groundwater.

3.4 Overland Flow

The EA has produced surface water flood maps that give an indication of the areas that may be at risk of surface water flooding. This includes the 'Areas Susceptible to Surface Water Flooding' (AStSWF) mapping and the 'Flood Map for Surface Water' (FMfSW) for the area around the Proposed Development Site.

The former is first generation national mapping, outlining areas of risk from surface water flooding across the country with three susceptibility bandings (less, intermediate and more). The latter FMfSW dataset is based on revised modelling with two different annual probability rates; 3.3% and 0.5%. The modelling also provides two depth rates for each probability, 0.3m and 0.1m. The PFRA states that the AStSWF map provides a better representation of the flood risk estimated by SBC, based on knowledge of the Borough.

The AStSWF map shows that southern parts of the Site are 'more susceptible' to surface water flooding, with water ponded in the open spaces between buildings (Figure 4). The FMfSW also shows water ponded at the Site, with depths from less than 0.1m to over 0.3m (Figure 5) for the 0.5% annual probability flood.

The PFRA identifies historical surface water flooding incidents along Edinburgh Avenue and to the south on Buckingham Avenue (Figure 6). The Applicant has informed URS that it is understood that the flooding on Edinburgh Avenue occurred within the last 20 years due to blocked drains within the Slough Trading Estate, as opposed to excessive volumes of water.

The risk to the Proposed Development Site from overland flow under the current baseline is considered to be moderate.

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[8] WSP (2012) SSE Silo – Slough Heat and Power Intrusive Site Investigation and Geotechnical Assessment

Figure 4: Areas Susceptible to Surface Water Flooding Map

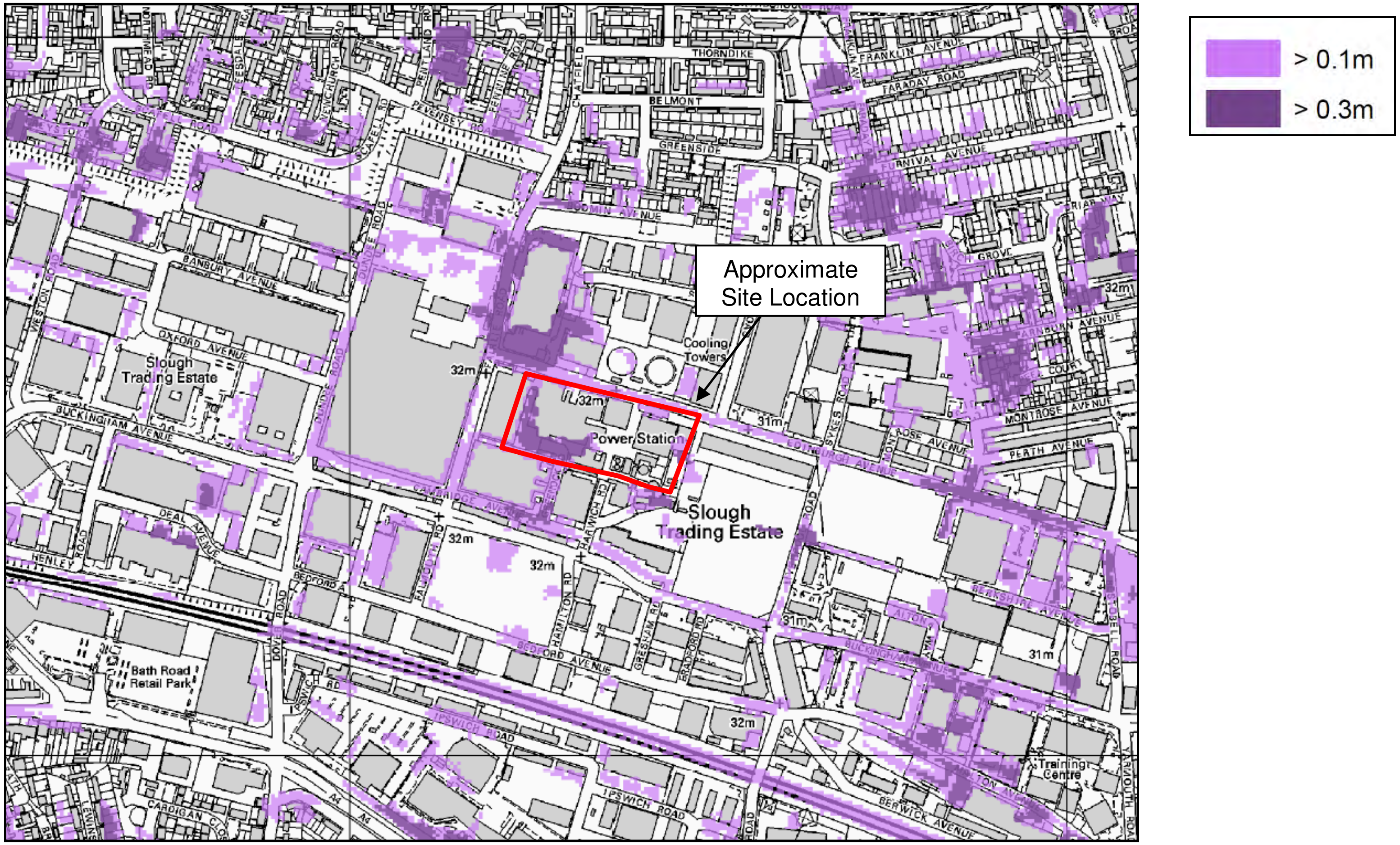
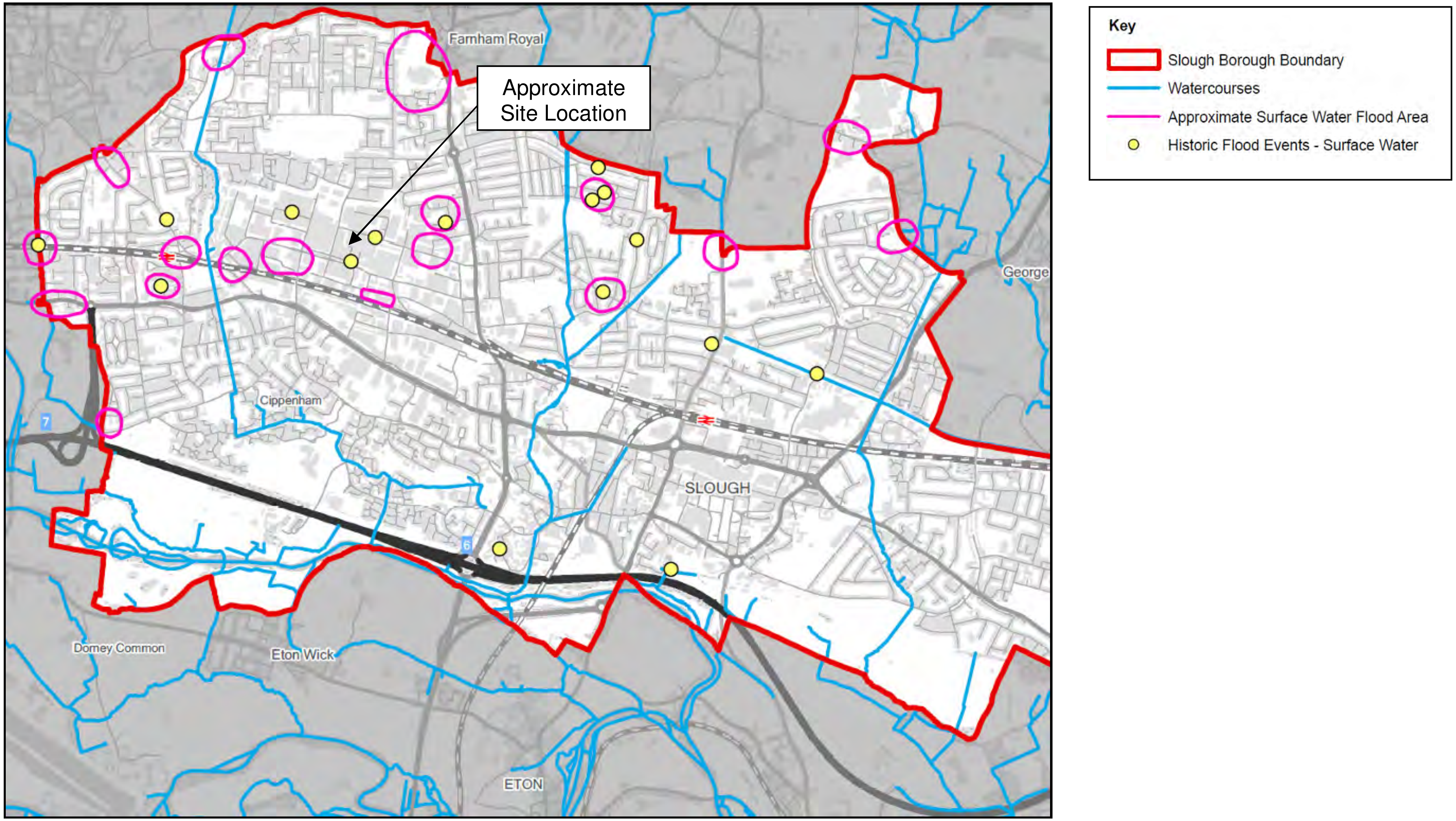

> 0.1m
> 0.3m
Approximate Site Location
Cooling Towers
Power Station
Slough Trading Estate
Bath Road Retail Park
Training Centre
BUCKINGHAM AVENUE
EDINBURGH AVENUE
OXFORD AVENUE
BANBURY AVENUE
BEDFORD AVENUE
IPSWICH ROAD
BERWICK AVENUE
HENLEY ROAD
DEAL AVENUE
MONTROSE AVENUE
PERTH AVENUE
FRANKLIN AVENUE
FARADAY ROAD
THORNDIKE
BELMONT
GREENSIDE
HAMILTON RD
32m
31m

Figure 6: Surface Water Flooding Events



(Source: PFRA)

3.4.1 *Overland Flow – Impact of Climate Change*

The 2009 SFRA Update states that the intensification of storms, together with the extent of paved areas within Slough will not significantly increase the extent of flooding, though it may increase risk to areas susceptible to flooding through more frequent and severe flooding. Climate change may also affect surface water flooding which is caused when the intensity of rainfall exceeds the capacity of the drainage systems, or when, during prolonged periods of wet weather, the soil becomes so saturated that it cannot accept any more water.

3.5 Surface Water and Sewer Flooding

Surface water and sewer flooding are often interconnected; insufficient drainage capacity in the sewer network can result in extensive surface water flooding and, by the same rationale, large volumes of surface water can overload the public sewers, causing the sewer network to back up, surcharge and ultimately flood.

The SFRA states that the majority of the sewers in the area have been adopted and maintained by TWUL; however some of the sewers in the Slough Trading Estate remain un-adopted. The SFRA states that there are known problems associated with sewer flooding in Slough, however, it is limited in geographical area and generally occurs during storm events when the combined sewer system becomes surcharged with surface water in excess of its capacity, rather than from overloading from sewerage. According to the SFRA, this problem is reportedly exacerbated by factors such as illegal domestic connections of roof/surface water drainage to foul sewers, capacity issues in the foul sewer system and the lack of surface water attenuation.

3.5.1 *Existing Sewer and Drainage Infrastructure*

A number of TWUL surface water and foul sewers are present both on and within the vicinity of the Proposed Development Site boundary (Annex B). Though constructed as separate systems, the flood risk specialist at SBC (Steve Brocklebank) has confirmed that there are several overflows between the surface water and foul sewers within the Trading Estate. An un-adopted sewer is present under Greenock Road to the south of the Proposed Development Site, which flows south and joins a sewer under Cambridge Avenue that flows in a southeast direction.

Surface water sewers are present along Edinburgh Avenue to the north of the Proposed Development Site, Fairlie Road to the west and Cambridge Avenue to the south. A further un-adopted surface water sewer is present under Harwich Road to the south. Private surface water sewers under the remit of SHP also pass underneath the western section of the Proposed Development Site.

A review of the TWUL sewer plans suggest that the surface water sewers all discharge into the 800 x 650mm sewer under Edinburgh Avenue, known as the Edinburgh Avenue Culvert, which is located to the north of the Proposed Development Site and flows in an eastern direction.

Steve Brocklebank of SBC (*pers comm,* 03/10/13) has informed URS that the Edinburgh Avenue sewer outfall is throttled by a length of 600mm diameter pipe. In dry weather conditions the Edinburgh Avenue sewer discharges to two balancing ponds, one at Farnham Road (in segment south of the junction with Whitby Road) and then subsequently into one at Woodland Avenue, before discharging into the Salt Hill Stream. SBC has also stated that in high flow conditions the Edinburgh Avenue sewer overflows to Haymill Valley Local Nature Reserve and the foul sewer network.

The Applicant has provided site drainage plans (Annex C), which show that the Site currently discharges to a combination of soakaways (10 spread across the SHP site) and to the sewer under Edinburgh Avenue. The Applicant has informed URS that the 3 soakaways located in the Fibre Fuel Yard were built in 2000 to an Environment Agency approved design for the Slough Trading Estate (available at the time) and are anticipated to be approximately 5–5.5m deep. The remaining 7 soakaways are understood to have been built in 1989 and are anticipated to be approximately 3m deep.

The Applicant has informed URS that process effluent generated onsite (i.e. discharge from cooling tower blowdown, water treatment plant effluent and boiler blowdown) is currently discharged into the foul sewers adjacent to the SHP site. Effluent discharged into the foul sewer is in accordance with the existing environmental permit for the SHP site (PPC Permit document B2.2.2.2.1), which states that the SHP site has permission to discharge up to $89m^3$/hour (the equivalent of approximately 25 litres/second). Process effluent is discharged into the foul sewer at 5 discharge points.

It is not currently known what proportion of the Proposed Development Site currently discharges surface water runoff to the Edinburgh Avenue culvert and what proportion discharges to soakaway. The volumetric capacity of the existing private drainage network is not currently known, nor is the infiltration potential of the existing soakaways. This is not considered a limitation to this FRA however.

3.5.2 *Historical Records of Surface Water and Sewer Flooding*

The following sources indicate there are sewer capacity issues in the local area:

- The 2009 SFRA Update states that there was a problem in the Edinburgh Avenue and Perth Avenue (east of the site) area with foul sewer flooding;
- The 2009 SFRA Update states that there were particular concerns regarding the ability of the surface water sewers in the Slough Estates area to accommodate any significant increase in flows;
- Liaison with SBC (Steve Brocklebank, *pers comm, 08/05/2013*) has stated that the surface water sewer under Edinburgh Avenue (immediately to the north of the site) is heavily surcharged. SBC understands that the Edinburgh Avenue sewer was constructed during the First World War and have stated that spare capacity of the sewer has reduced over time due to increases in surface water flows from the expansion of the wider Slough Trading Estate.
- In addition, the Buckingham Avenue foul sewer system (south of the site) apparently frequently surcharges even during dry weather (refer to Annex D for correspondence);
- A sewer flooding history enquiry was requested from TWUL, which states that: *"The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers."*
- The Applicant has informed URS that it is aware that there have been incidents of surcharging of sewers on the Slough Trading Estate and that Liverpool Road (to the east of the Proposed Development site) has been affected once by flooding over the past 20 years, which was reportedly associated with a blockage in the drains.

3.5.3 *Potential Flooding Hazard*

The Proposed Development Site could be subject to sewer flooding either directly, by surcharging of sewers beneath the site and flooding from on-site manholes, or from floodwater flowing onto the site from surrounding areas. The presence of kerbs along the surrounding roads affords some protection to the Proposed Development Site from shallow flooding of roads associated with surcharged sewers. However the topography around the Proposed Development Site is relatively flat (around 31m AOD) and the vehicle access points to the north and south of the site could present potential flowpaths onto the site if surcharging of sewers and flooding of the surrounding road network occurs.

Based on the reported sewer capacity issues and incidences of flooding both at and close to the Site, the risk of flooding from sewer sources is considered to be moderate under the current baseline.

3.5.4 *Impact of Climate Change*

Tables 4 and 5 in the Technical Guidance to the NPPF state that climate change is likely to have an impact on river flows and rainfall intensity. Therefore, the risk of flooding to and from the Proposed Development site could potentially increase in the future. Precautionary climate sensitivity ranges adopted from the NPPF are shown below in Table 3.

Table 3: Recommended National Precautionary Sensitivity Ranges for Peak Rainfall Intensities and Peak River Flows

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%		+20%	

An increase in rainfall intensity may increase surface water runoff rates and consequently runoff volumes, and increase the risk of flooding. Therefore, the proposed drainage systems will be required to take into account the likely impacts of climate change. This is accounted for in greater detail within the surface water management section (Section 4).

It is difficult to predict precisely the impact of climate change on sewer flooding, however, the anticipated increase in rainfall intensity may cause greater volumes of rainfall to enter the sewer network during storm events. The SFRA identified concerns regarding the ability of the surface water sewers in the Slough Estates area to accommodate any significant increase in flows. Therefore, the anticipated increase in surface water runoff under climate change scenarios may increase the risk from sewer sources.

4. CONCEPTUAL SURFACE WATER MANAGEMENT STRATEGY

4.1 Rationale

The primary objective of the proposed surface water management strategy is to ensure that the Proposed Development meets with the requirements of the NPPF and therefore does not increase flood risk above the existing situation. The secondary objective is to investigate the potential to provide betterment on the existing situation where this is considered to be feasible given the site-specific constraints.

At the planning application stage, it is necessary to make assumptions about the existing drainage network and the development proposals. Accordingly, the proposed surface water management strategy is presented in a conceptual form consistent with the nature and scale of the proposed development. The aim of this section is to therefore establish the principles which the drainage strategy will adhere to at the detailed design phase.

The following sources have been reviewed in the preparation of this strategy:

- NPPF Technical Guidance (2012)
- SBC: Core Strategy, Development Plan Document (2008)[9]
- SBC: SFRA (2007)
- SBC: SFRA – Revision 1 (2009)
- Building Standards Regulations 2000 Part H[10]
- CIRIA 635: Designing for Exceedance in Urban Drainage 635 (2006)[11]
- Correspondence with Steve Brocklebank, SBC (pers. comms, 2013)[12]

4.2 Assumptions

4.2.1 *Existing Drainage Arrangements*

As outlined in Section 3.5, it is understood that the existing SHP site is served by a private surface water drainage network which outfalls to the Edinburgh Avenue culvert (which falls under the remit of TWUL) and also 10 soakaways located at various points within the existing SHP site, all south of Edinburgh Avenue.

It is not currently known what proportion of the Site's contributing area currently discharges to the Edinburgh Avenue culvert and what proportion discharges to soakaway. The volumetric capacity of the existing private drainage network is not known, nor is the infiltration potential of the existing soakaways. Infiltration testing or detailed ground investigations have not been undertaken at this stage.

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[9] Slough Borough Council (2008) Core Strategy, Development Plan Document

[10] HMSO (2000) Building Standards Regulations 2000 Part H

[11] Balmforth D, Digman C, Kellagher R, Butler D (2006), Designing for Exceedance in Urban drainage – Good practice, (CIRIA 635)

[12] Steve Brocklebank, Slough Borough Council, personal communication 3/10/13

Though the dimensions of the Edinburgh Avenue culvert are understood to vary along its length, Steve Brocklebank of SBC (*pers comm, 08/05/2013)* has stated that the culvert's eventual outfall to a watercourse is effectively throttled by a section of 600mm diameter pipe. SBC has also stated that the Edinburgh Avenue culvert is understood to often be heavily surcharged.

4.2.2 *Development Proposals*

Indicative development proposals outline that the facility will be tightly constrained by space, with several large structures occupying the space above ground and the remainder of the space being used for vehicular access and the operation of the facility. It is also understood that the fuel storage bunker will occupy a significant volume of space partially beneath ground level.

It is also assumed that the Proposed Development will entail the removal of the existing drainage network in its entirety and its replacement with a new system.

4.3 Calculation of Pre- and Post-Development Runoff Rates

As the NPPF states that new developments should not increase the risk of flooding to their site and elsewhere, a comparison of the existing and proposed surface water runoff rates are required to quantify whether the rates of discharge leaving the Proposed Development Site increase or decrease as a result of the Proposed Development.

4.3.1 *Design Rainfall*

The rainfall used to derive surface water run-off rates and volumes is obtained from the Flood Estimation Handbook (FEH) CD-ROM v3, depth-duration-frequency model. This provides design rainfall intensities for a range of return periods and storm durations, which are presented in Table 4.

Table 4: Design Rainfall (mm/hour)

Frequency, Years (AEP)	Storm Durations					
	15min	30min	1hr	2hr	3hr	5hr
1.1	6.9	8.7	10.9	13.6	15.4	18.1
2 (50%)	10.6	13.0	15.9	19.4	21.8	25.1
5 (20%)	15.6	18.8	22.5	26.9	29.8	33.9
10 (10%)	20.2	24.0	28.3	33.3	36.6	41.3
30 (3.3%)	29.8	34.6	40.0	46.2	50.2	55.6
50 (2%)	35.6	41.0	46.9	53.6	57.9	63.7
100 (1%)	45.3	51.4	58.1	65.5	70.2	76.6
100 +30%*	58.9	66.8	75.5	85.2	91.3	99.6

** Denotes a 30% percentage increase in rainfall intensity to account for the effects of climate change as stipulated by the NPPF*

4.3.2 *Pre-Development Runoff Rates*

The area of the Proposed Development Site to be redeveloped is approximately 19,000 m^2 (1.9ha) and existing land use for the site comprises entirely of impermeable hard surfacing and structures (as based on an assessment from the topographic survey and aerial photography).

The Wallingford Modified Rational Method has been used to estimate the surface water runoff generated by the existing site during peak rainfall events. The Modified Rational Method has been selected as the Proposed Development Site is small (1.9 ha) and is considered to be effectively entirely impermeable. The Modified Rational Method estimates runoff based upon the nature of the ground surface and rainfall depth, duration and frequency information for the immediate area.

A runoff coefficient of 1 has been applied to the site to represent the impermeable surfacing.

The results of this calculation for a range of design events, including an increase in rainfall intensities to account for the effects of climate change, are presented in Table 5. Calculation summary sheets are located within Annex E.

Table 5: Existing Surface Water Runoff (litres/second)

Frequency, Years (AEP)	Storm Durations					
	15min	30min	1hr	2hr	3hr	5hr
1	148	93	58	36	27	19
2 (50%)	226	139	85	52	39	27
5 (20%)	333	200	120	72	53	36
10 (10%)	431	256	151	89	65	44
30 (3.3%)	637	369	214	123	89	59
50 (2%)	760	437	250	143	103	68
100 (1%)	966	548	310	175	125	82
100 + 30%	1,256	713	403	227	162	106

Table 5 shows that the 1 in 1 year storm results in a peak discharge of 148 l/s for the 15 minute storm duration. The 1% AEP storm results in 966 l/s for the 15 minute duration, whilst the 1% AEP plus climate change (+30%) results in 1,256 l/s.

4.3.3 *Post-Development Runoff Rates*

It is assumed that the Proposed Development will also entirely comprise impermeable surfaces and hard-standing. It will therefore (in principle) not result in an increase in the surface water runoff generated at the Site.

However, it is important to note that the Modified Rational Method calculations presented above do not take into account the effect of the existing (or proposed) drainage network, only the relative contributing impermeable area, thereby providing a conservative estimation of runoff rates. Prior to construction the existing surface water outfalls to the Edinburgh Avenue sewer will be surveyed to determine pre-development flow rates. This is discussed in greater detail in the subsequent section.

4.4 Proposed Water Management Strategy

4.4.1 *Proposed Outfalls*

The drainage hierarchy in the Building Standards Regulations 2000 Part H stipulates that it is preferable to discharge surface water to ground via infiltration techniques.

Given the high density of the Proposed Development and spatial constraints on the Site, it is not considered feasible to discharge the entirety of the Site's surface water runoff to ground via soakaway. Infiltration storage techniques typically require that a significant volume of storage be provided and are therefore likely to be unsuited to accommodate extreme rainfall events without supplementary drainage systems.

As the ground conditions across the Site are unproven it cannot be assumed that this approach could feasibly accommodate all of the surface water discharge from the Site. Moreover, it unlikely that all of the Site's surface water discharge would be appropriate for soakaway due to the risk of contamination from high-risk areas (e.g. around vehicular access routes). As the fuel storage bunker will also occupy a significant volume of space this will also preclude the use of infiltration or attenuation techniques in this area.

On the basis of the above, it is therefore deemed necessary to retain or replace the existing surface water connections to the Edinburgh Avenue sewer. It is therefore proposed that the Site's drainage be designed to mimic the existing arrangements, with as much surface water being preferentially discharged to ground as the Proposed Development site layout and ground conditions permits. The remainder will therefore have to be discharged to the Edinburgh Avenue sewer.

4.4.2 *Planning Policy Compliance*

The NPPF stipulates that the Proposed Development cannot increase flood risk above the existing situation.

On this basis, the existing surface water connections to the Edinburgh Avenue sewer will be surveyed in order to determine the maximum discharge rate permitted by the dimensions of the infrastructure. Ground investigations and infiltration testing will also be undertaken to determine the infiltration capacity of the soils where soakaways are proposed.

Once the above information is established, the Site's drainage network can be appropriately designed so as to ensure that surface water discharge to the Edinburgh Avenue sewer is not increased as a result of the Proposed Development.

The Applicant will retain its foul sewer discharge conditions for the SHP site, as permitted by PPC document B2.2.2.2.1 (i.e. maximum discharge of 89m^3/hr). Process effluent generated by the Proposed Development should not, therefore increase the pressure on the foul sewer network or, by virtue of the various sewer overflows, the surface water sewers within the wider Trading Estate. Therefore, the discharge of process effluent to the foul sewer system will not increase flood risk from the foul or surface water sewers.

4.4.3 *Surface Water Attenuation and SuDS*

The principles set out in SBC's Draft Simplified Planning Zone (SPZ) Scheme (2014) for the Slough Trading Estate with regards to brownfield discharge rate and surface water drainage design has provided a base case to which to develop the design of the Proposed Development.

Once the runoff restriction to the Edinburgh Avenue sewer has been established, it will be necessary to provide a sufficient volume of surface water attenuation storage on the Site to ensure that the Proposed Development does not result in the generation of overland flow which may increase flood risk elsewhere.

CIRIA 635 stipulates that the drainage network should be designed for exceedance, with a sufficient volume of attenuation storage provided within the network to accommodate the 3.3% AEP (1 in 30 year) critical duration storm event without surface water flooding. In addition, surface water should be retained on the site for all design storms up to the 1% AEP (1 in 100 year) critical duration storm plus climate change.

On the basis of the above it is therefore proposed that the Site's surface water drainage network be designed so as to accommodate the 3.3% AEP critical duration storm without surface water flooding occurring. Given the dense development proposals and spatial constraints at the site, this storage volume will be afforded within the Site's drainage network, through the provision of soakaways (pending confirmation of the ground conditions and proposed land use), or if additional storage is required, within the drainage network.

Given the site-specific spatial constraints it is proposed that ground-level controlled flooding of less-vulnerable areas be utilised to accommodate runoff from storms exceeding the 3.3% AEP up to the 1% AEP critical duration storm plus climate change. To manage the risk from exceedance flows, the drainage design will follow such guidance as CIRIA C635, to provide flowpaths such that any overland flow is directed away from impacting the Proposed Development.

The proposed drainage arrangements and the design of the attenuation storage will be refined at the detailed design stage.

4.4.4 *Betterment*

It is noted that SBC, under its forthcoming role as a SuDS approval board, would expect the detailed drainage design to consider the feasibility of reducing surface water runoff to a greenfield discharge allowance of 5l/s per hectare (i.e. 9.5 l/s for the 1.9ha Site).

WinDes Microdrainage 2013 design software has been utilised to estimate the indicative volume of attenuation storage that may be required to restrict to the aspiration of 9.5 l/s to the Edinburgh Avenue sewer for a number of design storm events. The indicative storage volumes are shown in Table 6 below and calculation summary pages are included within Annex E.

Table 6: Indicative Storm Water Attenuation Volume Requirements

Critical Duration Design Storm (Frequency)	Indicative Attenuation Storage Requirement (m^3)	
	Minimum	Maximum
3.3% AEP (1 in 30 year)	745 m^3	970 m^3
1% AEP (1 in 100 year)	1,248 m^3	1,497 m^3
1% AEP + Climate Change (+30%)	1,495 m^3	1,815 m^3

Table 6 demonstrates that in order for the development to be compliant with the best practice outlined in CIRIA C635[13], it would be necessary to provide approximately 745m^3 to 970m^3 of below ground attenuation storage to ensure that there is no surface water flooding of the Site during a 3.3% AEP (i.e. a 1 in 30 year) critical duration design storm.

The provision of this attenuation storage could be potentially achieved on the Site through a combination of soakaways, attenuation tanks and oversized pipes. For example, a 138m length of 3m diameter pipe (i.e. a volume of 974m^3) buried beneath the Proposed Development could potentially be utilised to provide the attenuation storage required to store and attenuate the surface water from the 3.3% AEP storm based on a restricted outflow of 9.5 l/s to the TWUL sewer. Controlled flooding of less-vulnerable areas could potentially be utilised to ensure that the Proposed Development retains surface water on the Site for events exceeding the 3.3% AEP storm and up to the 1% AEP storm plus a 30% increase in rainfall intensity (to account for the effects of climate change).

The Applicant also aims to delay the discharge of blow down effluent from the cooling towers to the sewer network during a heavy rainfall event, with an estimated mean retention time of approximately 1 to 2 hours. The aim of retaining the blow down effluent on site is to reduce the volume entering the sewer network during times when peak flows occur within the surface water sewer network (due to the connectivity between the foul and surface water sewers). This will reduce pressure on the wider sewer network capacity at peak flows.

The feasibility of a) storing blow down effluent on site during heavy rainfall events, b) restricting the rate of surface water discharge to the sewer network to a greenfield runoff rate, c) the storage required to retain surface water on the site for the 1% AEP storm event plus climate change allowance, and d) potential opportunities to implement SuDS, will be investigated at the detailed design stage.

4.4.5 *Surface Water and Sewer Flooding Mitigation*

Whilst the conceptual drainage strategy demonstrates how surface water can be managed on the Site, there remains a residual risk of flooding from pluvial and sewer sources.

On this basis the Proposed Development will include the use of flood resistant approaches (i.e. water exclusion) and flood resilient measures/ construction techniques where appropriate. Flood resilient measures and construction techniques measures would reduce/remove the impact of a flood event on the structure of the buildings.

Additionally, the buildings will be designed to accept the flow of water through passageways and to drain water (or pump) after flooding, particularly any basement levels. Access will be available to all spaces to permit drying and cleaning after a flood event.

4.5 Summary

In summary, it is proposed that prior to construction:

- A survey is undertaken to determine the existing flow rate to the Edinburgh Avenue sewer;
- Ground investigations are undertaken to determine the infiltration capacity of the soils;
- That surface water is discharged to both the Edinburgh Avenue sewer and to ground through the provision of soakaway (pending confirmation of ground conditions);

[13] Balmforth D, Digman C, Kellagher R, Butler D (2006), Designing for Exceedance in Urban drainage – Good practice, (CIRIA 635)

- That, as a minimum, surface water discharge to the Edinburgh Avenue sewer is restricted to the existing flow rate under the Proposed Development scenario;
- That opportunities to provide betterment upon the existing situation (i.e. reducing surface water discharge towards a greenfield runoff rate) will be investigated for feasibility at the detailed design stage;
- That a sufficient volume of attenuation storage is provided to restrict to the existing outfall rate whilst accommodating the 3.3% AEP design storm without resulting in ground-level surface water flooding;
- That the proposed site layout is designed for exceedance, with controlled flooding being utilised to accommodate surface water from events exceeding the 3.3% AEP up to the 1% AEP critical duration storm plus climate change; and
- Flood resistant and flood resilient measures are adopted to manage the residual risk of flooding from pluvial and sewer sources at the Site where appropriate.

5. OFF-SITE IMPACTS

5.1 Surface Water Runoff Generation

The previous section outlines the proposed strategy for on-site drainage and management of surface water runoff from the Proposed Development Site. The site's drainage system will discharge surface water to both ground and to the Edinburgh Avenue sewer at a rate which does not exceed the existing situation (as determined by survey of the existing connections).

As discharge to the Edinburgh Avenue sewer will be restricted to the existing rate, the Proposed Development will therefore not increase the risk of flooding elsewhere, thereby meeting with the requirements of the NPPF.

6. RESIDUAL RISKS

6.1 Surface Water Drainage System

There remains the risk of a failure of the surface water drainage system. The severity of this risk will depend upon the type of system chosen at the detailed design stage. There also remains the risk of surface water flooding in the event of a storm in excess of the 'design storm'. To manage the risk from exceedance flows, the drainage design will follow such guidance as CIRIA C635 to provide flow paths such that any overland flow is directed away from impacting any surrounding development.

It is proposed that regular maintenance of the drainage system is undertaken to ensure that the system continues to perform as designed. The Applicant recognises that they will ultimately be responsible for ensuring that the regular maintenance will be instructed and undertaken by themselves or a management company.

6.2 Surface Water and Sewer Flooding

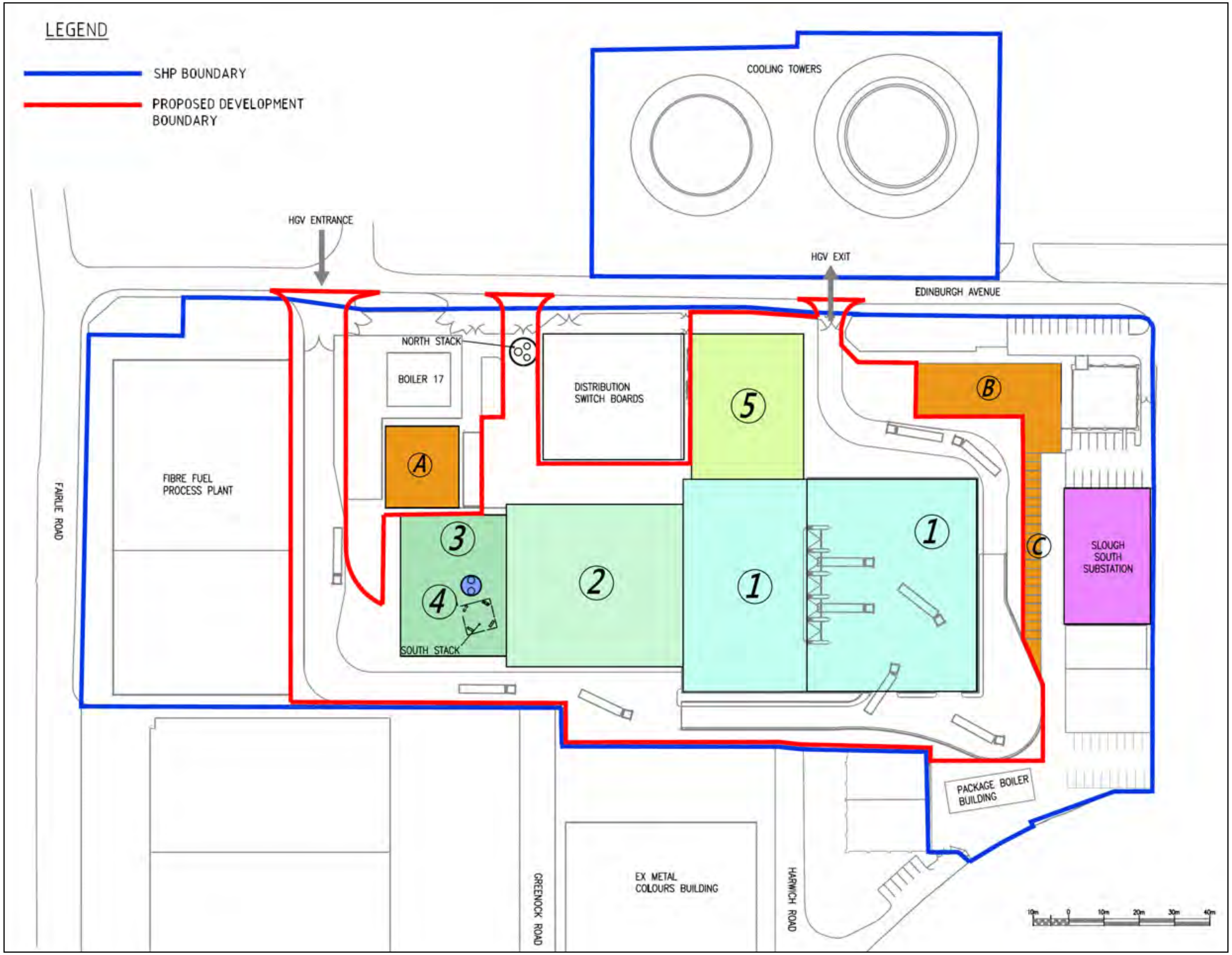
The assessment within Section 3.4 indicates that there is moderate potential for the Site to be impacted by surface water and sewer flooding. However, the implementation of flood resistant and resilient measures (where appropriate) should ensure that the risk from these sources is managed to the extent where damage to the Proposed Development is limited in the event of a flood.

7. CONCLUSIONS

This assessment considers the existing flood risk posed to the site from all sources and the effect of the Proposed Development on flood risk, both to the Proposed Development itself and elsewhere. The impacts of climate change on flood risk over the lifetime of the Proposed Development are also considered. In summary:

- The Proposed Development Site lies within Flood Zone 1 and is therefore at low risk of flooding from fluvial and tidal sources, with an annual exceedance probability (AEP) of <0.1% from fluvial flooding;
- The existing flood risks from sewers and surface water are considered to be moderate;
- The existing flood risk from groundwater sources is considered to be low, with no risk from artificial sources;
- The Proposed Development will not increase the area of impermeable surfaces relative to the existing site and will therefore not increase the volumes and rates of surface water runoff generated by the Site;
- Surface water from the Proposed Development will be preferentially discharged to ground (ground conditions permitting), with the remainder being discharged into the Edinburgh Avenue sewer at a rate which does not exceed the existing situation, thereby meeting the requirements of Building Standards Regulations 2000 Part H and the NPPF;
- Opportunities to provide betterment upon the existing situation (i.e. reducing surface water discharge towards a greenfield runoff rate) will be investigated for feasibility at the detailed design stage;
- The proposed site layout will be designed for exceedance in accordance with CIRIA C635, with controlled flooding being utilised to accommodate surface water from events exceeding the 3.3% AEP up to the 1% AEP critical duration storm plus climate change;
- A residual risk of flooding is associated with failure of the surface water drainage system or exceedance of the systems design capacity. Regular maintenance and inspection of the drainage system will be undertaken to ensure that the system continues to perform as designed; and
- Flood resistant and resilient measures will be adopted where appropriate to manage the residual risk of flooding from pluvial and sewer sources at the site.

ANNEX A PROPOSED DEVELOPMENT PLANS



Main Layout Features of the Proposed Development:

1 – Enclosed tipping hall and fuel bunker
2 – Boiler house
3 – Flue Gas Treatment (FGT) plant
4 – Possible new stack to replace the existing south stack
5 – Turbine Hall

Main Layout Features of the Further Development:

A – Water Treatment Plant
B – Central Site Service Building
C – Car Parking

ANNEX B EXISTING SEWER NETWORK PLANS

Asset Location Search

Thames Water Property Searches
12 Vastern Road
READING
RG1 8DB

Search address supplied	Slough Trading Estate 342 Edinburgh Avenue Slough SL1 4TU

Your reference	1011270223
Our reference	ALS/ALS Standard/2013_2564614
Search date	4 September 2013

You are now able to order your Asset Location Search requests online by visiting [redacted]

[redacted]

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0845 070 9148
E searches@thameswater.co.uk
I [redacted]

Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 8DB

Asset Location Search

Search address supplied: Slough Trading Estate, 342, Edinburgh Avenue, Slough, SL1 4TU

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: [redacted]k

[redacted]

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0845 070 9148
E searches@thameswater.co.uk
I [redacted]

Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 8DB

Asset Location Search

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0845 920 0800. The Customer Centre can

[redacted]

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0845 070 9148
E searches@thameswater.co.uk
I [redacted]

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No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 8DB

also arrange for a full flow and pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

[redacted]

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0845 070 9148
E searches@thameswater.co.uk
I [redacted]

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Clearwater Court, Vastern Road
Reading RG1 8DB

Asset Location Search

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

Should you require any further information regarding budget estimates, diversions or stopping up notices then please contact:

DevCon Team
Asset Investment
Thames Water
Maple Lodge STW
Denham Way
Rickmansworth
Hertfordshire
WD3 9SQ

Tel: 01923 898 072
Email: devcon.team@thameswater.co.uk

[redacted]

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0845 070 9148
E searches@thameswater.co.uk
I [redacted]

Asset Location Search

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

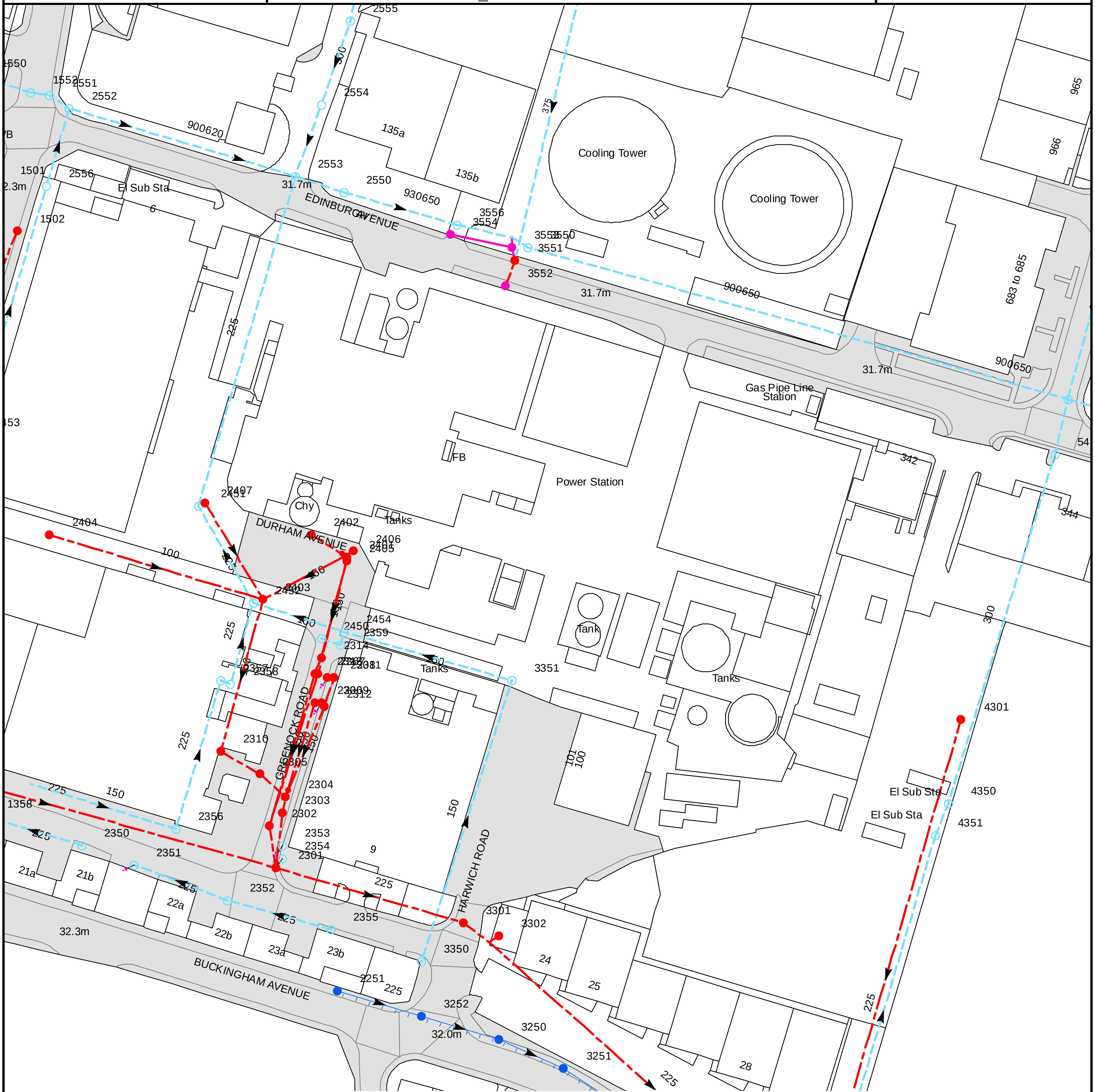
[redacted]

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0845 070 9148
E searches@thameswater.co.uk
I [redacted]

Asset Location Search Sewer Map - ALS/ALS Standard/2013_2564614	SU9581SW



The width of the displayed area is 336m and the centre of the map is located at OS coordinates 495359,181429

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
2401	31.99	30.15
2406	31.96	30.95
5451	32.14	30.32
5452	31.7	29.86
3552	32.08	30.73
3551	32.28	30.73
3550	32.46	30.07
3553	32.39	30.51
3554	31.91	n/a
3556	31.92	n/a
2550	32.11	30.25
2555	31.6	30.58
1502	n/a	n/a
1552	32.4	30.62
2556	n/a	n/a
2404	n/a	n/a
2551	31.83	30.51
2552	31.74	30.42
2356	32.18	31.43
2451	32.1	30.88
2407	n/a	n/a
2310	n/a	n/a
2357	n/a	n/a
2352	31.97	31.13
2358	n/a	n/a
2452	32.15	30.97
2305	32.26	29.78
2403	31.96	30.18
2302	31.99	28.88
2301	32.07	28.45
2353	32.14	31.37
2354	32.05	31.28
2303	32.03	29.62
2304	32.06	29.66
2553	n/a	n/a
2402	31.94	31.4
2313	32.13	n/a
2306	32.11	31.05
2307	32.1	n/a
2554	31.75	30.44
2309	32.2	31.21
2450	n/a	n/a
2314	32.12	29.64
2312	32.21	31.22
2308	32.26	31.39
3251	32.13	31
3250	32.26	31.15
3252	32.2	31.01
2251	32.31	31.28
3350	32.27	31.51
3302	32.47	31
2355	32.14	31.4
3301	32.18	28.21
4351	n/a	n/a
4350	n/a	n/a
4301	n/a	n/a
3351	n/a	n/a
2311	32.28	31.41
2359	n/a	n/a
2454	32.17	31.08
2405	32.02	30.17
2350	32.15	30.97
2351	31.97	31.09

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

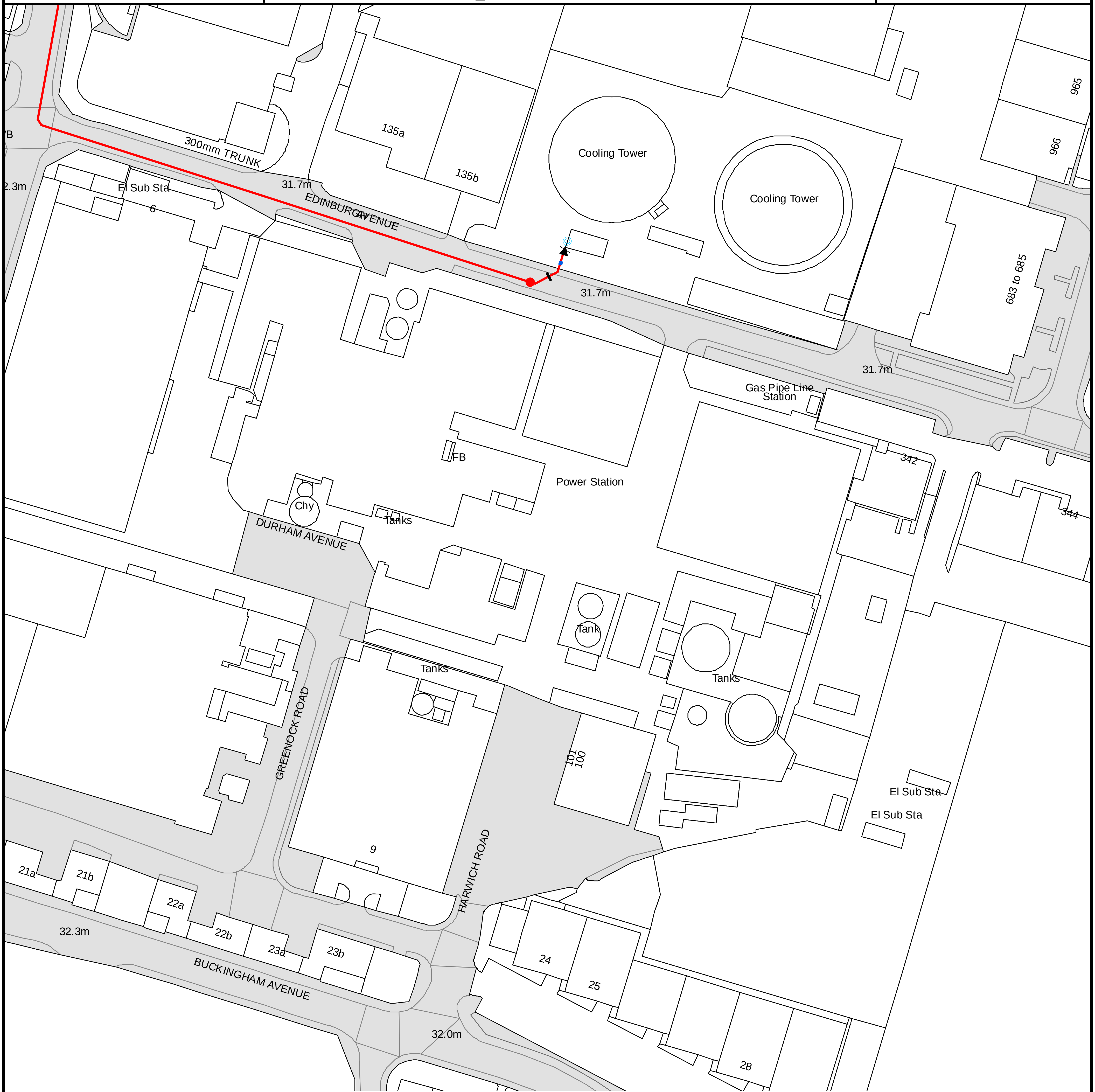
Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2013_2564614	SU9581SW



The width of the displayed area is 336m and the centre of the map is located at OS coordinates 495359,181429

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from [redacted]

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Sewer Flooding
History Enquiry

Thames Water Property Searches
12
Vastern Road
Reading
RG1 8DB

Search address supplied	Slough Trading Estate 342 Edinburgh Avenue Slough SL1 4TU
Your reference	1011270223
Our reference	SFH/SFH Standard/2013_2564613
Received date	**4 September 2013**
Search date	**4 September 2013**

[redacted]

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504
E searches@thameswater.co.uk
I [redacted]

Sewer Flooding

History Enquiry

Search address supplied: Slough Trading Estate, 342, Edinburgh Avenue, Slough, SL1 4TU

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

[redacted]

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504
E searches@thameswater.co.uk
I [redacted]

Sewer Flooding
History Enquiry

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0845 9200 800 or website www.thameswater.co.uk

[redacted]

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504
E searches@thameswater.co.uk
I [redacted]

ANNEX C SITE DRAINAGE PLANS

Revisions	
Project	IPPC DRG No. B2.2.2.1
Location	POWER-STATION SLOUGH TRADING ESTATE
Content	DRAINAGE LAYOUT
Date	MARCH-2002
Drawn	MCS
Scale	SCALE

THIS DRAWING IS NOT TO BE SCALED. ALL DIMENSIONS TO BE CHECKED ON SITE.

SLOUGH ESTATES

Slough Heat & Po[illegible]
Limited
342 Edinburgh Avenue
Slough, SL1 4TU
Telephone 01753 21320
Facsimile 01753 213213

Dwg no. 3963

Revision

THIS DRAWING IS GENERATED BY AUTOCA[illegible]

ANNEX D CORRESPONDENCE WITH SLOUGH BOROUGH COUNCIL

Slough Borough Council www.slough.gov.uk — Taking pride in our communities and town

Date 8th May 2013

Department: Highways Department
Contact Name: Steve Brocklebank
Contact No: [redacted]
Fax:
Email: [redacted]
Our Ref:
Your Ref: SHP Multifuel/MALT0001/FD

Ms Francesca Dee
URS Infrastructure & Environment UK Limited
Bridgewater House, Whitworth Street
Manchester
M1 6LT

Dear Ms Dee

Re: Proposed development at Slough Trading Estate, 342 Edinburgh Avenue, Slough, SL1 4TU (National Grid reference 49530, 1851450)

Thank you for your request of 18th April 2013 for information for a FRA on the above site

Our responses to your individual questions are given below.

- Details of any known surface water flooding problems in the area and confirmation of any designated critical drainage areas (CDAs);

I attach figures for surface water flooding extents for a 1 in 30 year and 1 in 100 year +CC. These are have been taken from the Surface Water Management Plan which was undertaken for SBC in June 2012. It should be noted that the surface water maps provide a general outline of surface water flooding across a large area and they are not intended for detailed information at individual property or site level.

- Information on flooding associated with the surcharging of the sewer network;

Edinburgh Ave culvert runs through the power station and is heavily surcharged. The Buckingham Ave foul system was often surcharged even in dry weather and has a number of foul to foul overflows before connecting to a relief outfall sewer. We know the foul system surcharges nearly to ground level with SW overflows in storm.

- Information on groundwater flooding;

There have been no problems with groundwater but the geology is very inconsistent and contamination is always a risk.

- Any requirements the Council may have on surface water management at the proposed development.

We have no information on private water supplies in the vicinity of the site.

The FRA should take into account the requirements of the Simplified Planning Zone and should be aware that we have some outline guidance on SUDS which I attach.

At present we do not charge for providing this information but we are currently reviewing our policy on charging fro this type of information and we may charge in the future.

Yours sincerely,

Steve Brocklebank
Interim Team Leader
Highways Development

ANNEX E SURFACE WATER RUNOFF CALCULATIONS

Site Area	Area (ha)	Area (m^2)	Runoff Coefficient	% cover of area
Impermeable site area	1.9200	19,200	1	**100%**
	0.0000			**0%**
	0.0000			**0%**
	0.0000			**0%**
	0.0000			**0%**
	0.0000			**0%**
	0.0000			**0%**

Average runoff co-efficient 1

Urban area (%) 100%
Total area 1.920

Rainfall (mm)
Storm duration

seconds	900	1800	2700	3600	5400	7200	9000	10800	12600	14400	18000	21600	28800	36000	43200	64800	86400	129600	172800	259200	345600	432000
minutes	**15**	**30**	45	60	90	120	150	180	210	240	300	360	480	600	720	1080	1440	2160	2880	4320	5760	7200
hours	0.25	0.5	**0.75**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**5**	**6**	**8**	**10**	**12**	**18**	**24**	**36**	**48**	**72**	**96**	**120**
days	0.010	0.021	0.031	0.042	0.063	0.083	0.104	0.125	0.146	0.167	0.208	0.250	0.333	0.417	0.50	0.75	1.00	1.50	2.00	3.00	4.00	5.00
Return period (yr)																						
1.1	6.92	8.69	9.91	10.87	12.37	13.56	14.56	15.42	16.19	16.89	18.12	19.19	21	22.52	23.84	27	29.48	33.37	36.43	40.66	43.95	46.69
2	10.60	13.00	14.63	15.89	17.85	19.38	20.65	21.75	22.72	23.59	25.12	26.44	28.67	30.52	32.11	35.88	38.81	43.35	46.87	51.62	55.27	58.28
5	15.63	18.78	20.88	22.49	24.95	26.85	28.42	29.77	30.95	32.01	33.86	35.44	38.09	40.28	42.15	46.53	49.89	55.04	59.01	64.19	68.14	71.37
10	20.22	23.96	26.42	28.3	31.15	33.33	35.11	36.64	37.98	39.18	41.26	43.03	45.98	48.41	50.47	55.26	58.92	64.47	68.72	74.16	78.27	81.61
30	29.84	34.63	37.71	40.04	43.54	46.18	48.33	50.16	51.75	53.17	55.61	57.69	61.11	63.9	66.26	71.66	75.75	81.88	86.52	92.23	96.5	99.94
50	35.64	40.96	44.36	46.92	50.73	53.6	55.92	57.89	59.6	61.12	63.73	65.95	69.58	72.53	75.03	80.69	84.95	91.32	96.11	101.88	106.18	109.62
100	45.29	51.39	55.23	58.1	62.35	65.53	68.08	70.24	72.11	73.76	76.6	78.99	82.9	86.06	88.72	94.7	99.16	105.8	110.76	116.52	120.79	124.19
100+5%	47.55	53.96	57.99	61.01	65.47	68.81	71.48	73.75	75.72	77.45	80.43	82.94	87.05	90.36	93.16	99.44	104.12	111.09	116.30	122.35	126.83	130.40
100+10%	49.82	56.53	60.75	63.91	68.59	72.08	74.89	77.26	79.32	81.14	84.26	86.89	91.19	94.67	97.59	104.17	109.08	116.38	121.84	128.17	132.87	136.61
100+20%	54.35	61.67	66.28	69.72	74.82	78.64	81.70	84.29	86.53	88.51	91.92	94.79	99.48	103.27	106.46	113.64	118.99	126.96	132.91	139.82	144.95	149.03
100+30%	58.88	66.81	71.80	75.53	81.06	85.19	88.50	91.31	93.74	95.89	99.58	102.69	107.77	111.88	115.34	123.11	128.91	137.54	143.99	151.48	157.03	161.45

Rainfall Intensities (mm/sec)
Storm Durations (hr)

Return Periods	**0.25**	**0.5**	**0.75**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**5**	**6**	**8**	**10**	**12**	**18**	**24**	**36**	**48**	**72**	**96**	**120**
1.1	0.00769	0.00483	0.00367	0.00302	0.00229	0.00188	0.00162	0.00143	0.00128	0.00117	0.00101	0.00089	0.00073	0.00063	0.00055	0.00042	0.00034	0.00026	0.00021	0.00016	0.00013	0.00011
2	0.01178	0.00722	0.00542	0.00441	0.00331	0.00269	0.00229	0.00201	0.00180	0.00164	0.00140	0.00122	0.00100	0.00085	0.00074	0.00055	0.00045	0.00033	0.00027	0.00020	0.00016	0.00013
5	0.01737	0.01043	0.00773	0.00625	0.00462	0.00373	0.00316	0.00276	0.00246	0.00222	0.00188	0.00164	0.00132	0.00112	0.00098	0.00072	0.00058	0.00042	0.00034	0.00025	0.00020	0.00017
10	0.02247	0.01331	0.00979	0.00786	0.00577	0.00463	0.00390	0.00339	0.00301	0.00272	0.00229	0.00199	0.00160	0.00134	0.00117	0.00085	0.00068	0.00050	0.00040	0.00029	0.00023	0.00019
30	**0.03316**	**0.01924**	**0.01397**	**0.01112**	**0.00806**	**0.00641**	**0.00537**	**0.00464**	**0.00411**	**0.00369**	**0.00309**	**0.00267**	**0.00212**	**0.00178**	**0.00153**	**0.00111**	**0.00088**	**0.00063**	**0.00050**	**0.00036**	**0.00028**	**0.00023**
50	0.03960	0.02276	0.01643	0.01303	0.00939	0.00744	0.00621	0.00536	0.00473	0.00424	0.00354	0.00305	0.00242	0.00201	0.00174	0.00125	0.00098	0.00070	0.00056	0.00039	0.00031	0.00025
100	0.05032	0.02855	0.02046	0.01614	0.01155	0.00910	0.00756	0.00650	0.00572	0.00512	0.00426	0.00366	0.00288	0.00239	0.00205	0.00146	0.00115	0.00082	0.00064	0.00045	0.00035	0.00029
100+5%	0.05284	0.02998	0.02148	0.01695	0.01212	0.00956	0.00794	0.00683	0.00601	0.00538	0.00447	0.00384	0.00302	0.00251	0.00216	0.00153	0.00121	0.00086	0.00067	0.00047	0.00037	0.00030
100+10%	0.05535	0.03141	0.02250	0.01775	0.01270	0.01001	0.00832	0.00715	0.00630	0.00563	0.00468	0.00402	0.00317	0.00263	0.00226	0.00161	0.00126	0.00090	0.00071	0.00049	0.00038	0.00032
100+20%	0.06039	0.03426	0.02455	0.01937	0.01386	0.01092	0.00908	0.00780	0.00687	0.00615	0.00511	0.00439	0.00345	0.00287	0.00246	0.00175	0.00138	0.00098	0.00077	0.00054	0.00042	0.00034
100+30%	0.06542	0.03712	0.02659	0.02098	0.01501	0.01183	0.00983	0.00845	0.00744	0.00666	0.00553	0.00475	0.00374	0.00311	0.00267	0.00190	0.00149	0.00106	0.00083	0.00058	0.00045	0.00037

Discharges at outlet (m^3/sec)
Storm Durations (hr)

Return Periods	**0.25**	**0.5**	**0.75**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**5**	**6**	**8**	**10**	**12**	**18**	**24**	**36**	**48**	**72**	**96**	**120**
1.1	0.1476	0.0927	0.0705	0.0580	0.0440	0.0362	0.0311	0.0274	0.0247	0.0225	0.0193	0.0171	0.0140	0.0120	0.0106	0.0080	0.0066	0.0049	0.0040	0.0030	0.0024	0.0021
2	0.2261	0.1387	0.1040	0.0847	0.0635	0.0517	0.0441	0.0387	0.0346	0.0315	0.0268	0.0235	0.0191	0.0163	0.0143	0.0106	0.0086	0.0064	0.0052	0.0038	0.0031	0.0026
5	0.3334	0.2003	0.1485	0.1199	0.0887	0.0716	0.0606	0.0529	0.0472	0.0427	0.0361	0.0315	0.0254	0.0215	0.0187	0.0138	0.0111	0.0082	0.0066	0.0048	0.0038	0.0032
10	0.4314	0.2556	0.1879	0.1509	0.1108	0.0889	0.0749	0.0651	0.0579	0.0522	0.0440	0.0382	0.0307	0.0258	0.0224	0.0164	0.0131	0.0096	0.0076	0.0055	0.0043	0.0036
30	0.6366	0.3694	0.2682	0.2135	0.1548	0.1231	0.1031	0.0892	0.0789	0.0709	0.0593	0.0513	0.0407	0.0341	0.0294	0.0212	0.0168	0.0121	0.0096	0.0068	0.0054	0.0044
50	0.7603	0.4369	0.3154	0.2502	0.1804	0.1429	0.1193	0.1029	0.0908	0.0815	0.0680	0.0586	0.0464	0.0387	0.0333	0.0239	0.0189	0.0135	0.0107	0.0075	0.0059	0.0049
100	0.9662	0.5482	0.3927	0.3099	0.2217	0.1747	0.1452	0.1249	0.1099	0.0983	0.0817	0.0702	0.0553	0.0459	0.0394	0.0281	0.0220	0.0157	0.0123	0.0086	0.0067	0.0055
100+5%	1.0145	0.5756	0.4124	0.3254	0.2328	0.1835	0.1525	0.1311	0.1154	0.1033	0.0858	0.0737	0.0580	0.0482	0.0414	0.0295	0.0231	0.0165	0.0129	0.0091	0.0070	0.0058
100+10%	1.0628	0.6030	0.4320	0.3409	0.2439	0.1922	0.1598	0.1374	0.1209	0.1082	0.0899	0.0772	0.0608	0.0505	0.0434	0.0309	0.0242	0.0172	0.0135	0.0095	0.0074	0.0061
100+20%	1.1594	0.6578	0.4713	0.3718	0.2660	0.2097	0.1743	0.1498	0.1319	0.1180	0.0980	0.0843	0.0663	0.0551	0.0473	0.0337	0.0264	0.0188	0.0148	0.0104	0.0081	0.0066
100+30%	1.2560	0.7126	0.5106	0.4028	0.2882	0.2272	0.1888	0.1623	0.1428	0.1279	0.1062	0.0913	0.0718	0.0597	0.0513	0.0365	0.0286	0.0204	0.0160	0.0112	0.0087	0.0072

Volume of discharge (m^3)
Storm Durations (hr)

Return Periods	**0.25**	**0.5**	**0.75**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**5**	**6**	**8**	**10**	**12**	**18**	**24**	**36**	**48**	**72**	**96**	**120**
1.1	132.9	166.8	190.3	208.7	237.5	260.4	279.6	296.1	310.8	324.3	347.9	368.4	403.2	432.4	457.7	518.4	566.0	640.7	699.5	780.7	843.8	896.4
2	203.5	249.6	280.9	305.1	342.7	372.1	396.5	417.6	436.2	452.9	482.3	507.6	550.5	586.0	616.5	688.9	745.2	832.3	899.9	991.1	1061.2	1119.0
5	300.1	360.6	400.9	431.8	479.0	515.5	545.7	571.6	594.2	614.6	650.1	680.4	731.3	773.4	809.3	893.4	957.9	1056.8	1133.0	1232.4	1308.3	1370.3
10	388.2	460.0	507.3	543.4	598.1	639.9	674.1	703.5	729.2	752.3	792.2	826.2	882.8	929.5	969.0	1061.0	1131.3	1237.8	1319.4	1423.9	1502.8	1566.9
30	572.9	664.9	724.0	768.8	836.0	886.7	927.9	963.1	993.6	1020.9	1067.7	1107.6	1173.3	1226.9	1272.2	1375.9	1454.4	1572.1	1661.2	1770.8	1852.8	1918.8
50	684.3	786.4	851.7	900.9	974.0	1029.1	1073.7	1111.5	1144.3	1173.5	1223.6	1266.2	1335.9	1392.6	1440.6	1549.2	1631.0	1753.3	1845.3	1956.1	2038.7	2104.7
100	869.6	986.7	1060.4	1115.5	1197.1	1258.2	1307.1	1348.6	1384.5	1416.2	1470.7	1516.6	1591.7	1652.4	1703.4	1818.2	1903.9	2031.4	2126.6	2237.2	2319.2	2384.4
100+5%	913.0	1036.0	1113.4	1171.3	1257.0	1321.1	1372.5	1416.0	1453.7	1487.0	1544.3	1592.4	1671.3	1735.0	1788.6	1909.2	1999.1	2132.9	2232.9	2349.0	2435.1	2503.7
100+10%	956.5	1085.4	1166.5	1227.1	1316.8	1384.0	1437.8	1483.5	1523.0	1557.8	1617.8	1668.3	1750.8	1817.6	1873.8	2000.1	2094.3	2234.5	2339.3	2460.9	2551.1	2622.9
100+20%	1043.5	1184.0	1272.5	1338.6	1436.5	1509.8	1568.6	1618.3	1661.4	1699.4	1764.9	1819.9	1910.0	1982.8	2044.1	2181.9	2284.6	2437.6	2551.9	2684.6	2783.0	2861.3
100+30%	1130.4	1282.7	1378.5	1450.2	1556.3	1635.6	1699.3	1753.2	1799.9	1841.0	1911.9	1971.6	2069.2	2148.1	2214.5	2363.7	2475.0	2640.8	2764.6	2908.3	3014.9	3099.8

Appendix G-1

Gazetteer/ Catalogue of Cultural Heritage Assets

Appendix D-1

Cultural Heritage Gazetteer and Assessed Significance of Cultural Heritage Assets

Asset No.	ASSET ID.	NGR	Site Name	Designation	Description	Period	Source	Assessed significance /Value
1	1113373	SU 95562 80542	Milestone at SU 9556 8054	Listed Grade II	White painted stone with black lettering. Angled square plan with weathered top and one corner faceted for inscription. Inscribed: to north: LONDON 22; to east: MAIDENHEAD 4; to west: SLOUGH 1	18th Century	National Heritage List	Medium
2	1391570	SU 95571 80982	Railway Bridge, Leigh Road	Listed Grade II	Railway overbridge for unclassified lanes, built in 1836 - 8 and 1878 - 2 with C20 extensions, designed by Brunel. Two semi-elliptical arches built in London stock brick with matching brick string courses. The southern span retains its original abutment and approach. The northern arch is a slightly later alteration, completed after the London to Bristol route was opened, with steeply angled wing walls. C19 and C20 rebuilding of parapets, terminal pilasters and the NW and SE corners.	19th Century	National Heritage List	Medium
3	1321979	SU 9491 480914	Nos 1 to 5 Cippenham Lodge	Listed Grade II	Range of 5 houses, now flats, at SU 9491 480914. Early to mid C18 with C20 additions. Red brick with grey headers, 2 storey with attic, moulded wooden eaves cornice, 3 flat topped dormers with glazing bar sashes. Glazing bar sashes with exposed wooden boxes and gauged heads. C20 gabled porch, one storey to the rear with centre-ridge stack.	18th Century	National Heritage List	Medium
4	MRM16688	SU 943 812	Burnham Lane Underbridge	Undesignated	Brunel single-span, semi-elliptical arch skew underbridge, constructed 1835-40 and widened 1875-4	19th Century	Berkshire Archaeology	Low
5	0303.00.000 – MSL8008	SU 9490 8210	Lynch Hill Gravel Pit and Palaeoliths (findspot of two handaxes and two flakes), Slough, Berkshire.	Undesignated	A large gravel pit was still working here until about 1954 and showed about 15 ft. of the typical even-bedded but coarse and ill-sorted gravel characteristic of the terrace named after this locality. The surface level is about 135 ft. O.D. Very few palaeoliths appear to have been found in this pit. Those found include two rolled and stained hand axes. Test pits and bore hole log survey undertaken in 1987 showed the most of pit now composed of made ground and the traces of old gravel workings as indicated on the Ordnance Survey map are now obliterated but areas of in situ gravel do survive in places.	Lower Palaeolithic	Berkshire Archaeology HER	Medium
6	00328.00.000 – MSL8037	SU 9580 8220	Palaeoliths (findspot) from Baker's Farm Pit, Berkshire	Undesignated	A gravel pit in the Lynch Hill terrace is variously called Baker's Farm, Biddle's Farm, or Chennel's Pit, It was worked until c.1939 during which time it produced many hundreds of artefacts which ended up in public and private collections. Finds include 19 handaxes, 4 cleavers, 1 chopper, 2 roughouts, 2 cores and 2 flakes.	Lower Palaeolithic	Berkshire Archaeology HER	Medium
7	00334.00.000 – MSL8071	SU 9560 8220	Pointed Handaxe, Farnham Royal, Slough, Berkshire	Undesignated	A pointed hand-axe Wymer Type F, tip broken, slightly rolled and stained. Dated to the Mid-Acheulian. It was found 1931 in a disused gravel pit.	Lower Palaeolithic	Berkshire Archaeology HER	Medium
8	00335.00.000 – MSL8072	SU 9540 8230	Palaeoliths (findspot), Deep Lane, Farnham Royal, Slough, Berkshire	Undesignated	The digging of drainage trenches in connection with new and extensive house-building south-west of Farnham Royal in 1954 exposed large quantities of gravel. Fifteen primary flakes and a chopper-core were found by Wymer in Lynch Hill Terrace gravel, and placed in Shoreditch Training College.	Lower Palaeolithic	Berkshire Archaeology HER	Medium
9	00337.00.000 – MSL8084	SU 9520 8210	Primary Flake (findspot), Gravel Pit South of Deep Lane, Slough, Berkshire	Undesignated	A primary flake was found in situ whilst cutting a section in a gravel pit at Deep Lane. The gravel was sandy and evenly bedded, typical of the Lynch Hill terrace deposits.	Lower Palaeolithic	Berkshire Archaeology HER	Medium
10	00339.00.000 – MSL8086	SU 9550 8120	Handaxes (findspot), Slough Trading Estate, Slough, Berkshire	Undesignated	Two pointed handaxes. One is slightly rolled and slightly stained, and the other is very rolled and is stained. The exact provenance of these handaxes is unknown, but it is presumed that they came from the Taplow Terrace, on which the whole of the Slough Trading Estate is built	Lower Palaeolithic	Berkshire Archaeology HER	Low
11	00340.00.000 – MSL8088	SU 9600 8100	Handaxes (findspot), Slough, Berkshire	Undesignated	Lower Palaeolithic handaxes found in the general area of Slough and held in various public and private collections.	Lower Palaeolithic	Berkshire Archaeology HER	Low
12	251655	SU 9800 8000	Handaxes (findspot), Slough, Berkshire	Undesignated	Three Lower Palaeolithic handaxes, 1 roughout and 3 flakes were found on the Slough Trading Estate. The objects probably came from the gravel of the Taplow Terrace on which the whole of the Slough Trading Estate is built. One of the handaxes was found by R J MacRae opposite Johnson and Johnson in 1968.	Lower Palaeolithic	Heritage Gateway	Low
13	MRM16388	SU 9473 8066	Flint Flakes (findpsot), Western House School, Cippenham	Undesignated	A small collection of nine struck flint flakes was recovered during the course of an archaeological evaluation in 2009. All were recovered from unstratified contexts, from spoilheaps. One was a narrow flake, and is possibly of Mesolithic/early Neolithic date. The others are not closely datable, but could be Neolithic or Bronze Age in date. Of these, 4 flakes were intact and 4 were broken. The presence of the flint flakes points to some prehistoric activity in the area.	Mesolithic / Neolithic / Bronze Age	Berkshire Archaeology HER	Low
14	00333.00.000 – MSL8070	SU 9600 8100	Neolithic Axe (findspot), Slough, Berkshire	Undesignated	The lower part (cutting end) of a Neolithic flint axe was found at Slough.	Neolithic	Berkshire Archaeology HER	Low
15	00274.00.000 – MSL7943	SU 9456 8139	Bronze Age Hoard (findspot), Slough Trading Estate, Slough, Berkshire	Undesignated	A hoard of 19 palstaves were found together at a depth of 2ft at Slough Trading Estate. A date of c.1200 BC is suggested. Only one of these 19 palstaves has a loop (now broken). All were in perfect condition when buried, suggesting a dealers hoard	Bronze Age	Berkshire Archaeology HER	Low
16	06030.01.000 – MSL6622; 06030.02.000 – MSL 15508; 06030.02.000 – MSL 15509	SU 9512 8072; SU 9511 8079; SU 9504 8069	Features and finds at 225, Bath Road, Slough, Berkshire	Undesignated	An archaeological evaluation revealed linear features of possible Late Bronze Age to Early Iron Age date, two prehistoric pits and two modern pits. These features included a north south aligned length of ditch, with Late Bronze Age or Early Iron Age date, potsherds and very small flint flakes in its fill. The function of the ditch is uncertain, but may have been a field boundary. Two linear ditches, which produced Late Bronze Age to early Iron Age material. Two circular pits were also revealed and they may also be prehistoric in date. Both pits produced quantities of burnt flint and worked flint. Another north-south aligned ditch, produced pottery of prehistoric, Roman and medieval date. There were also two features of more recent origin, one a pit probably dating from the 18th to 19th century and the other a modern 20th century drainage or sewerage soak away. Area 2 excavation revealed a number of ditches, pits, postholes and gullies with associated finds. Three ditches all aligned northeast to southwest were excavated and produced pottery dated to the 1st century AD. Two gullies were excavated and two pits were half-sectioned and contained a considerable assemblage Twelve postholes or small pits also excavated. None of the postholes formed patterns indicating structures. A small quantity of bone was recovered from the ditch fill. A single northeast-southwest aligned U-profiled ditch containing 1st century AD pottery. One of the three 1m wide slots excavated across the ditch showed that it had possibly been recut.	Bronze Age / Iron Age / Roman	Berkshire Archaeology HER	Medium

17	00305.00.000 – MSL8012	SU 9480 8180	Iron Age Jar (findspot), Slough Trading estate, Slough, Berkshire	Undesignated	A small situlate jar dated to the Iron Age was found near Slough Trading Estate. A small situlate jar. Rim upright, rounded at top; neck fairly straight in places, elsewhere slightly concave. Ware is fairly hard, porridgey in places, no grits. Dated to the Iron Age.	Iron Age	Berkshire Archaeology HER	Low
18	06041.00.000 – MSL6675	SU 9470 8090	Hill Rise Nursery, Bath Road, Slough, Berkshire	Undesignated	Seven pieces of flint were recovered during the evaluation, all from the stripped surfaces of the trenches, apart from a single flint flake. Seventeen sherds of possible Late Iron Age/Roman pottery were also recovered. A large body sherd of probable Late Iron Age pottery was found lying on the base of a trench. Subsequent cleaning of the surrounding area revealed a very ephemeral feature, which appeared to be just a shallow scoop in the brick earth, and a further sherd of similar pottery adjacent to the first.	Iron Age / Roman	Berkshire Archaeology HER	Low
19	00306.00.000 – MSL380	SU 9430 8134	Hay Mill, Slough, Berkshire	Undesignated	A mill in Cippenham called Aymill was given with the chapel there to Burnham Abbey by King Richard. In the grant were included the dam and fish-pond and also the water-course of the said dam made by the grantor leading from the mill to Burnham Abbey through Cippenham Manor. Henry III confirmed the grant in 1268. The mill is mentioned in disputes of 1583 and 1638. There is a mention of a place called Aymell in 1638, but no later trace of the mill. At some time the tail waters from the Hay Mill were dammed to drive more mills at the head of Two Mile Brook (two mill brook) (see Record SL15516) but like Hay Mill these mills have also now gone.	Medieval / Post-medieval	Berkshire Archaeology HER	Low
20	05053.03.000 – MSL6030	SU 9500 8225	Railway - Slough Station to Burnham Station, Berkshire	Undesignated	A section of the Great Western Railway (GWR) between Slough and Burnham Stations.	19th century	Berkshire Archaeology HER	Low
21	MRM16389	SU 9471 8063	Former 19th Century Farmhouse, Western House School, Cippenham, Berkshire	Undesignated	A number of elements of a former farmhouse (identified from 19th century maps) were revealed during an archaeological evaluation. These included a shallow pit measuring 2.2m wide and 0.17m deep containing roof tile and 19th-century pottery. Close to the pit were a series of three brick wall foundations, built with machine made red bricks and bonded with nonhydraulic mortar. A post-medieval drain was also noted, constructed of red bricks. Post-medieval finds were also recovered including five pieces of 19th and 20th century pottery were also recovered as well as a post-medieval iron horseshoe. The OS First Edition map of 1875-1876 shows the site occupied by a farm complex, Western Farm. This is more clearly shown on the Second Edition map of 1899, with the farm comprising a farmhouse and two outbuildings, and an orchard to the east. The farmhouse is shown during the 1930's, but by the 1950's, it is replaced by a school.	19th century	Berkshire Archaeology HER	Low
22	05052.46.000 – MSL6013	SU 9500 8090	A4 Bath Road, Slough, Berkshire	Undesignated	The A4 Bath Road from London to Bristol was a major route west. It has now been mostly replaced in importance by the M4 motorway. The Bath Road was a coach road, although the arrival of the Great Western Railway (GWR) reduced freight traffic use.	Post-medieval / Modern	Berkshire Archaeology HER	Low
23	MSL15510	SU 9433 8133	Possible well at Old Hill Site, 54 Burnham Lane, Slough, Berkshire	Undesignated	An evaluation revealed a brick built structure thought to be a late 19th or early 20th century capped well or soakaway.	Post-medieval / Modern	Berkshire Archaeology HER	Low
24	MRM 16686	SU 9626 8069	Farnham Road Overbridge, Slough, Berkshire.	Undesignated	A steel and brick late 19th-20th century girder overbridge, with brick-built abutments and steel columns at mid-span.	Post-medieval / Modern	Berkshire Archaeology HER	Low
25	MRM16302	SU 9516 8142	Slough Trading Estate, Slough, Berkshire	Undesignated	During the First World War, the War Office chose farmland close to Slough for the location of a military vehicle repair depot. In 1918 the 'Slough Project' was approved by government and 668 hectares of agricultural land was purchased by the War Office for the development of a central military vehicle repair depot. By the end of the war, however, the project was still far from complete, but work on site continued. The intention was to repair vehicles for government use or sell them on to the private sector and make a profit. However, progress was slow and the waterlogged site, full of rusting vehicles, became known as 'The Dump'. In 1920 the government sold the 'Slough Project' to a private investor and the Slough Trading Company Ltd. was formed. The investors were Sir Percival Perry and Noel Mobbs, who were successful businessmen with motor trade expertise, who paid the government £7 million for the land, buildings, vehicles and plant - a considerable sum at that time. The investors formed the 'Slough Trading Company Ltd' in May 1920 and the Trading Estate's passenger station was opened in the early 1920's. A trade paper from the time, the 'Motor News', commented 'It will be something of a miracle if they succeed in converting Slough into a money earning concern', although the Slough Observer, on May 15th, commented that the move would create 'The New Slough'. In 1920 Slough Urban District Council extended its boundary to include 312 acres of the Trading Estate which were in the parish of Farnham Royal and parts of Burnham, Stoke Poges and Langley Marsh. In 1926 optimism was justified when the name of the company was changed to Slough Estates Ltd. and the estate was to become the largest business park in Europe under single company ownership.	20th century	Berkshire Archaeology HER	Low
26	06491.00.000 – MSL15461	SU 9615 8086	Light Anti-Aircraft Artillery Site, Magnesium Casting Works, Slough, Berkshire	Undesignated	Light Anti-Aircraft artillery site. Recorded in a document dated 21 May 1940.	20th century	Berkshire Archaeology HER	Low
27	MRM16687	SU 9490 8117	Dover Road Overbridge, Slough, Berkshire	Undesignated	Post-1980 concrete railway overbridge. Single span concrete bridge consisting of a concrete bridge deck supported by concrete abutments.	20th century	Berkshire Archaeology HER	Not significant
28	ESL7	SU 9457 8010	Cippenham, Slough - Archaeological Evaluation	Undesignated	Field evaluation carried out In 1991 by Oxford Archaeological Unit on land to the south of Cippenham, Slough. 63 evaluation trenches, covering approximately 26ha, revealed five areas of significant archaeological activity: in Area 1 a Neolithic pit; in Area 2 an area of prehistoric and Roman occupation; in Area 3 an area of undated settlement; Area 4 prehistoric occupation; and also an area of clay pipe manufacturing in Trench 26. In 1994, following the extension of the proposed development site, a 25 evaluation trenches, divided into four additional zones, were excavated to the north and south of the original application area. Areas 5 and 7, located to the north and south of Area 2 respectively, revealed an arrangement of linear ditches similar to that previously recorded in Area 2. Most contained no dating material but one produced a small amount of Roman pottery. Area 6, to the southeast of Area 4, confirmed the presence of one Bronze Age ring ditch, previously noted on aerial photographs, it also revealed a number of Iron Age ditches, pits and post holes to the immediate south of Area 4. Area 8, covering the present allotments, revealed no archaeological by problems of access. Several tree-throw pits, notably in Areas 5 and 6, contained significant amounts of Bronze Age material. No further evidence of clay pipe waste was recovered.	Prehistoric (Neolithic – Iron Age) / Roman / Post-medieval	Berkshire Archaeology HER	Medium
29	ESL12	SU 9582 8216	33, Croft Road, Slough - Watching Brief	Undesignated	Watching brief undertaken by AOC. The work monitored the excavation of a number of test pits. In all test pits the gravels had been truncated horizontally by landscaping and construction dating to the late 19th / early 20th century.	Post-medieval / Modern	Berkshire Archaeology HER	Not significant

30	ESL20 and ESL28	SU 9582 8217 and SU 9582 8215	33, Croft Hill Road, Slough - Desk-based Assessment and Watching Brief	Undesignated	The desk-based assessment concludes that the development site is in an area of potential for Palaeolithic remains. Assemblages of Palaeolithic artefacts have been recorded to the north and west of the site during gravel extraction. There may be potential for remains of other date, but this is thought to be unlikely. The watching brief comprised the observation and recording of the foundation trenches for two houses. The footings were excavated to an average depth of 0.8m from the existing ground surface. The observed stratigraphy consisted of natural gravels. These were sealed beneath an orange brown clay silt with flint subsoil up to 0.3m thick, itself beneath an orange brown gravel clay mix up to 0.5m thick. No archaeological features were present within the observed trenches. The foundations for the remaining twenty houses were not observed as Foundations Archaeology were not notified.	No dateable material	Berkshire Archaeology HER	Not significant
31	ESL31	SU 9435 8136	Old Hill Site, 54 Burnham Lane, Slough - Archaeological Evaluation	Undesignated	In November 2003 Oxford Archaeology carried out a field evaluation at Old Hill, Burnham Lane, Slough. The evaluation comprised 3 trenches. Trenches 1 and 2 did not contain any archaeological features. Trench 3 contained a brick built structure thought to be a late 19th or early 20th century capped well or soakaway. No deposits or structures of any archaeological potential or significance were identified during the evaluation.	Post-medieval / Modern	Berkshire Archaeology HER	Not significant
32	ERM490	SU 9421 8005	Burnham Sewage Treatment Works Pumpaway Sewer and Cippenham Water Main, Berkshire - Detailed Excavation and Watching Brief	Undesignated	Wessex Archaeology was commissioned by Thames Water to undertake an archaeological watching brief during the construction of a 3.2 km length of pumpaway sewer between Burnham Sewage Works, Buckinghamshire (NGR SU 919811) and Slough Sewage Works, Berkshire (NGR SU 945797). No archaeological features or artefacts were found in the watching brief area in Berkshire, but a number of features were examined during the detailed excavation phases. These included two definite cremation burials, one of Middle/Late Bronze Age date and one of Late Iron Age date, and three further potential examples. A number of pits and ditches also indicated activity in the later prehistoric and Romano-British periods. Finds from the site included artefacts of prehistoric date including pottery and flint, Romano-British ceramic building material including brick and tile fragments and post-medieval ceramic building material and metalwork.	Bronze Age / Iron Age / Roman	Berkshire Archaeology HER	Medium
33	ERM679 and ERM680	SU 9474 809	Hill Rise Nursery, Bath Road, Slough, Berkshire - Archaeological Evaluation and Watching Brief	Undesignated	An archaeological evaluation was undertaken on the site of Hill Rise Nursery. A total of 19 trenches were excavated. No archaeological features were encountered in 13 of the trenches. The remaining 6 trenches revealed post-medieval drainage features, modern pits, undated tree throw holes, undated pits and post holes and an ephemeral, possibly Iron Age pit / scoop. A watching brief was undertaken during groundworks for the construction of sixty-six dwellings. A number of modern features disturbing the subsoil were observed, such as pits with clinker and brick debris, however, no deposits or finds of archaeological significance were noted.	Iron Age / Post-medieval / Modern	Berkshire Archaeology HER	Not significant
34	ERM830 and ERM836	SU 9453 8099 and SU 9453 8090	14 - 18 Brook Path, Cippenham, Slough, Berkshire - Desk-based Assessment and Archaeological Evaluation	Undesignated	An archaeological desk-based assessment was compiled in response to development proposals. It concluded Low potential for Palaeolithic and Mesolithic remains. Evidence of activity and occupation during the later prehistoric period is well attested to the south of the site, with more moderate results witnessed closer to the study site itself and therefore a moderate to high potential was assessed for the Neolithic, Bronze Age and Iron Age periods. Evidence of Roman occupation continuing from prehistoric activity is also apparent to the south of the study site and the site is assessed as having a moderate to high archaeological potential for this period. Overall the archaeological potential for the Saxon and Medieval periods within the study site was defined as low, although evidence of agricultural activity and land division could conceivably be present. The potential of the study site for the post-medieval and modern periods was also defined as low. An archaeological evaluation by trial trenching was recommended. An archaeological evaluation was undertaken by TVAS. Three trenches were excavated. Apart from modern material, no artefacts of archaeological inte	No archaeological remains	Berkshire Archaeology HER	Not significant
35	ERM882	SU 9518 8090	260-366 Bath Road, Slough, Berkshire - Archaeological Evaluation	Undesignated	An archaeological field evaluation was carried out by TVAS. Two trenches were machine excavated. No archaeological remains, finds, features or deposits were encountered.	No archaeological remains	Berkshire Archaeology HER	Not significant
36	ERM1031	SU 9495 8135	Slough Trading Estate, Slough, Berkshire - Desk-based Assessment	Undesignated	This suggested that much of the site had been previously developed and disturbed in the 20th century and no further work was recommended.	No archaeological remains	Berkshire Archaeology HER	Not significant
37	ERM1062 and ERM1075	SU 9473 8064	Western House School, Brook Path, Lower Cippenham Lane, Cippenham Desk-based Assessment and Archaeological Evaluation	Undesignated	An archaeological desk-based assessment was produced by TVAS. It concluded that use of the area commences in the Middle Iron Age and it remains in use, perhaps continuously, through into later Roman times. Pottery possible dating to the Late Iron Age/early Roman period was also found to the north and north-east of the proposal site. The site lies immediately adjacent to the hamlet at Cippenham which has medieval origins. A trial trench field evaluation was recommended. The archaeological evaluation revealed no evidence for the presence of medieval or earlier deposits on the site. The three walls located in trench 8 were dated to the 19th-century and relate to former farm buildings on the site. The evaluation concluded that the site has no archaeological potential.	No archaeological remains	Berkshire Archaeology HER	Not significant
38	ERM1158	SU 9448 8096	Land at Mason's Court, Brook Path, Cippenham, Slough, Berkshire - Archaeological Evaluation	Undesignated	An archaeological field evaluation was carried out by TVAS. Three trenches were excavated. No archaeological remains, features, finds or deposits were revealed. The site is considered to have no archaeological potential.	No archaeological remains	Berkshire Archaeology HER	Not significant
39			329 Bath Road	Locally Listed	2 storey red brick house	19^{th} Century	Slough Local Development Plan	Low
40			Slough Trading Estate Marker Post, Burnham Lane / Buckingham Avenue	Locally Listed	Trading estate entrance sign	20^{th} Century	Slough Local Development Plan	Low
41	1124496	SU93839831 39	Burnham Beeches Hotel entrance gates and curtain walls	Listed Grade II*	By James Gibbs. Four stone gate piers. Square and with vermiculated rustication in bands and at the corners. Flat heads. The 2 centre piers taller and with carved swags on all 4 sides at the top, which is corniced. Between the latter, disused C18 wrought iron gates. Curtain walls, partly, low stone base with cast iron pointed railings and partly, low red brick topped with shorter cast iron pointed railings. Designed for Richard Phillips Governor of Nova Scotia (1661-1751).	18^{th} Century	National Heritage List	High

42	1000606	SU 92019 84145	Nashdom Abbey Gardens	Grade II Park and Garden	The gardens lie predominately to the south-west and south-east fronts of Nashdom House (Lutyens c 1905, Grade II*). There are two main divisions: A straight path below the south-east garden front leads north-eastwards to the circular rose garden (Lutyens c 1912, Grade II, the interior of which is derelict), enclosed by a 4m high curved brick wall. Beyond the garden front lies the open east lawn, the western edge of which is defined by a level, balustraded terrace which runs at right angles from the south corner of the house, along the top of a massive retaining wall. To the west is a long drop to the second main division: the lower, west lawn, now a car park, reached from the terrace by a double flight of grand stone staircases. The outer, southern edges of the lawns merge into the woodland to the south, with banks of rhododendrons breaking up the boundary. The mixed woodland pleasure grounds to the south retain their central drive, although none of the chestnut avenue survives. The trees at the southern end are relatively young, but those at the north are mature, with mature rhododendrons underplanted in some areas. An early to mid C20 concrete-lined windin emerging, via a concrete cascade, into a concrete-lined pool, now much overgrown and unused. A small cemetery used by the Abbey also lies in the woodland, adjacent to the Taplow Common Road.	20th Century	National Heritage List	Medium
43	1000323	SU 90998 84472	Cliveden	Grade I Park and Garden	The site consists of gardens, pleasure grounds and woodland with parkland to the east and west of Green Drive on the eastern side. The house (rebuilt by Sir Charles Barry 1853, listed grade I) lies at the centre of the garden and adjacent pleasure grounds, facing south across and beyond Lord Orkney's Great Parterre to the River Thames 1km away. The Great Parterre is the main formal feature. It includes William Winde's arcaded terrace and steps (1670s, listed grade I) forming the north boundary, Leoni's classical Octagon Temple (1735, listed grade I, now a chapel) on the precipitous west edge, the Borghese balustrade (1618, listed grade II*) and the circular Ring at the south end with the bronze Rape of Proserpine (c 1565, listed grade II), also from the Villa Borghese, at its centre. The outer parts of the site, to the east and south of the house, consist of some parkland and pasture surrounded by woodland.	18th and 19th Century	National Heritage List	High
44	1014781	SU 90628 82169	Saxon Barrow, church and cemeteries in the old churchyard at Taplow Court	Scheduled	The barrow, or hlaew, at Taplow has been dated to the seventh century AD and is an exceptional example, both in the wealth of finds from the site and the excellent state of preservation of the surviving remains. The barrow, despite being partly excavated, survives almost in its original form and will contain further important archaeological remains. The buried remains of the adjacent Anglo-Saxon church are also quite exceptional in their importance, as buildings of this type are very rare. The foundations of this structure evidently survive well, retaining detailed information about the date and appearance of the church which will be valuable for the wider study of the development of church building in England. Furthermore, the church's close proximity to the barrow provides a fascinating link between the pagan and Christian use of the site, reflecting the site's continued religious significance, and illuminating the transition from paganism to Christianity. Whether or not the porticus of the early church provided for the burial of the descendants of the occupant of the barrow, they demonstrate ostentatious burial in a similar vein to the earlier monument. The juxtapositi significant at the time. The monument includes a large Saxon burial mound, the buried remains of an early Anglo-Saxon and later medieval church, and part of the pagan and Christian cemeteries throught to have surrounded these features within the old churchyard immediately to the southwest of Taplow Court. The site lies at the southern end of a small spur commanding extensive views to the west over the River Thames, Maidenhead and the Berkshire countryside. The barrow mound stands towards the western side of the now disused churchyard, and measures c.21m in diameter and 4m high. The small rectangular churchyard measures approximately 80m by 35m and formerly served as the curtilage of St Nicholas' Church, a small parochial church which stood in the northeastern corner adjacent to the south wall of Taplow Court, some 15m to the northwest of the barrow. The church fell into a state of disrepair in the early 19th century, was partly demolished in 1828, and finally levelled during a period of major refurbishment at Taplow Court itself in 1852. The medieval church superseded a still earlier structure on the same site.	Early Medieval / Medieval	National Heritage List	High
45	1000607	SU 90657 82427	Taplow Court	Grade II Park and Garden	Taplow Court lies close to the eastern edge of Maidenhead, 5km west of Slough, forming the western boundary of the village of Taplow. The 25ha site is bounded to the west by the River Thames, to the north by Cliveden, to the east by Cliveden Road, and to the south largely by Mill Lane. Much of the site lies on a plateau high above the Thames, The setting is agricultural to the north-east and south, with the designed landscapes of Cliveden to the north and Berry Hill to the south-east, the village of Taplow to the east, and Maidenhead prominent in the views down to the west and south-west. The formal elements of the gardens lie close to Taplow Court house, linked by straight gravel paths. Adjacent to the north front is a rectangular rose garden leading north to a former bowling green, now converted to a formal feature with a brick and wood pergola along the north axis and formal beds surrounding it, and to the north of this is a hard tennis court. West of the house, the formal west lawn, with gravel paths in a cruciform shape, and terracing, has long views towards Maidenhead. The panoramic views from the path running parallel with the south wall of the churchyard are spec	19th Century	National Heritage List	Medium
46	1000135	SU 90718 81599	Berry Hill	Grade II Park and Garden	The 11ha estate occupies a long, narrow, rectangular site which runs from north to south down the south-facing Taplow Hill. It is bounded to the north by Mill Lane and beyond this the Taplow Court estate, to the south by Bath Road, to the east by Berry Hill lane, and to the west by fields which run down to the nearby River Thames. The setting is agricultural to the west and east, with the village of Taplow to the north and Maidenhead prominent in the views down to the west and south-west. The open parkland is laid out in the form of two large paddocks lying to the north-west and south-west of the site of the (demolished) house. It is planted with a variety of ornamental specimen trees. Some of Marnock's family groupings of tree species still exist although the shorter-lived shrubberies and floral embellishments which were a particular feature of the site have gone. Tree plantings, particularly of evergreens, form screens around the perimeter of the plot.	19th Century	National Heritage List	Medium
47	1000602	SU 93269 80640	Huntercombe Manor	Grade II Park and Garden	The 7ha site is bounded to the north by the grounds of a research laboratory, to the west by Huntercombe Lane South, to the east by the Huntercombe spur of the M4 motorway, and to the south by Huntercombe Farmhouse and a path which runs east of it. The small, flat park lies east of the Huntercombe Manor formal garden, with sparse, single trees set in pasture. It appears to have extended north as far as the Bath Road, but this is now covered by the research station buildings, although some mature trees still remain in this area.	19th Century	National Heritage List	Medium
48	1309887	SU93143806 52	Huntercombe Manor	Listed Grade I	Huntercombe Manor lies to the west of the registered park and gardens. It is based around a C14 timber-framed hall on its south side, with further work in the late C17, early C18 and 1880s. Plain tile roofs, plaster render and colourwashed brick with a mostly late C19 exterior. The 1770 stables, adjacent to the south entrance, are of rustic brickwork, with a stone cartouche of arms on the north side and a timber lantern, and have been converted to office accommodation. The stable yard south of the stables has been incorporated in hospital development, and several associated buildings demolished.	17th, 18th and 19th Century	National Heritage List	High

49	1124475	SU9307880478	Burnham Abbey	Listed Grade I	Founded in 1266; restored 1915 and now used as a convent. Flint and chalk rub- ble with C16 brick restorations and additions; hand made tile roofs. Chapter House, Sacristy, and parts of Frater and Infirmary remain. East range of the cloister with 6 small 2-light casements, one larger 2-light casement and one extended window formerly loft entrance, all with leaded lights. Chapter House with C13 moulded 2-centred arched doorway and the room itself with 3 lancets in its recently extended east end. Sacristy with C16 windows and fireplace. Original south wall of Frater with C16 doorway and fireplace.	Medieval, 19th Century	National Heritage List	High
50	1162809	SU9249479001	Church of St. James	Listed Grade I	Parish Church. C12 and early C16 tower. Porch 1661. North Chapel early Cl7. Random rubble walls; old tile roofs. Chancel with Gothic trefoil window and east rectangular window. Other windows with mullions. Tower, red brick, stepped stone quoins. Fairly complete fittings; monuments.	Medieval, 17th Century	National Heritage List	High
51	1124439	SU 92524 79028	Dorney Court	Listed Grade I	Circa 1500, altered. Timber-framed with red brick infill; old tile roof. East (entrance) front essentially symmetrical. Two storeys; 5 bays, all gabled and barge-boarded, the centre one an open porch with 4-centred arch and oriel window above. First floor of left-hand gable oversails. Bold star-shaped chimneys. Interior with original C15 hall with fine roof with arched braces, big fireplace with tracery and linenfold panelling from Faversham Abbey, Kent	Medieval	National Heritage List	High
52	1117481	SU 92265 77626	Oakley Court Hotel	Listed Grade II*	Very large Victorian Gothic mansion, in landscaped surrounds by the river Thames. Altered and extended late C20. Buff brick with Portland stone dressings; fishscale tile roof with ridge cresting. Irregular plan with former lower service wing and courtyard, now conference centre, adjoining on the south. Castellated tower part of and rinsing above the south-east front. Part one storey, part 2 storeys, part 3 storeys. Several chimneys with offset heads and ornamental terracotta pots. Perpendicular mullioned windows with traceried heads in main building, with carved stops to drip moulds; some windows contained in canted and oriel bays. Machicolated and crenellated angle and stair turrets; crow stepped gables with flanking pinnacles and finials, surmounted by heraldic beasts.	19th Century	National Heritage List	High
53	1309414	SU 94002 77681	Chapel of St. Mary Magdalene, Boveney	Listed Grade I	C12. Chalk and flint coursed rubble with ashlar dressings. C15 windows; weather-boarded tower.	Medieval	National Heritage List	High
54	1319431	SU9144179148	Monkey Island Hotel	Listed Grade I	Fishing lodge, now restaurant and bars. Part timber framed with painted, rusticated, wooden walls, part painted brick. Slate roofs, hipped roof over part, flat roofs over C20 extensions. Oldest part, the lodge, is octagonal and 2 storeys with one storey built forward on front with a pediented top, known as The Monkey Room. Large extensions at rear and at each side, of one and 2 storeys. Centre chimney to octagonal part. South (entrance) front: centre section; former lodge octagonal with Diocletian windows with glazing bars, wide eaves with shaped wooden brackets; pedimented projection in front of this; all with rusticated wooden walls. Each side of the centre section are two, C19 gables with shaped bargeboards, 2 sash windows in each on first floor; the left gable projects in front of the centre section; the right is set back and is larger.	18th Century	National Heritage List	High
55	1117469	SU9127679023	The Temple	Listed Grade I	Summerhouse, now offices for the Monkey Island Hotel. Stone, now rendered; small, hipped, slate roof surmounted by ball finial. Nearly square plan, with splayed projecting bay on west, and large extension on north. Formerly open on the ground floor. 2 storeys. Symmetrical, each front is of 3 bays; rusticated ground floor, plat band at first floor, Ionic pilasters above, with dentil cornice and blocking course over. Pedestals below pilasters with cap and base; balustrade between. Sash windows with glazing bars, those on ground floor with semi-circular heads, and balustrade under.	18th Century	National Heritage List	High
56	1210944	SU 94877 78758	Bell Barn Farmhouse	Listed Grade II*	Timber frame, modern ground floor brick nogging, 1st floor tile banging, 2 main elevation end gables, modern porch. 2 storeys, casements. Centre of North elevation is C16. Good interiors hall with King post roof, parlour with late C16 panelling, C16 newel staircase, 1st floor original trefoil window now blocked. A house of considerable antiquarian interest.	Medieval	National Heritage List	High
57	1290001	SU 96500 77783	Lower Chapel, Eton College	Listed Grade II*	College chapel with an unified design in the Perpendicular style. The nave and chancel form a single space of six bays with a lower aisle to the S. A distinction is made between the nave and sanctuary through the use of differing tracery forms of the clerestory and parapet. In the aisles there are paired two-light windows in four of the five bays, the W bay having a two-light window and a doorway. The bays are delineated by buttresses with offsets and terminated with pinnacles. At the E end is a large Perpendicular window of five lights. At the W is a high-set W window and at ground level a series of one-light openings. At the SW corner the octagonal stair turret is of three stages and has an openwork top with crenellations. There are entrances into all four corners of the building.	19th Century	National Heritage List	High
58	1210908	SU9663577800	St. Christopher's	Listed Grade II*	Stucco. 2 storeys, 2:1:1 double-hung sashes in surrounds with sills. Slight central projection has round-headed doorway with archivolt; above is an architrave moulding supported by consoles; right hand similar doorway; 6-panel doors, main door with 4 panels replaced by glass, semi-circular fanlights. Frieze and cornice, the frieze descending splayed over 1st floor windows to imitate a raised flat arch. Central pediment, parapet, old tile roof.	18th Century	National Heritage List	High
59	1211362	SU9668577466	42, High Street	Listed Grade II*	Originally 2 houses - left hand 2-storey red brick house, right hand 3-storey grey brick with red dressings and quoins. Altogether 3 double-hung sashes in surrounds. Excellent shop front circa 1797: 2 large windows with glazing bars; 3 doors, 2 end ones with traceried fanlights, central door with plain fanlight, right hand door of 6 panels, 4 panels fielded, 2 flush; carved brackets with guttae and paterae, entablature with modillion cornice. 1st floor shallow splayed bay with dentil and modillion cornice, 3 windows in architraves. Left hand moulded wood cornice, right hand brick modillion cornice. Second floor brick band. Old tiled roofs.	18th Century	National Heritage List	High
60	1290036	SU9669077412	The Cock Pitt Café	Listed Grade II*	Timber frame with ground floor brick nogging, 1st floor plaster oversailing on brackets and exposed soffits. 2 storeys, 4 3-light casements with late C17 or early C18 glazing bars. 4 modern ground floor bays. 2 small gables, old tile roof. Early C19 east wing with 2 doorways, 1 with reeded door surround, both with bracketed hoods.	15th Century	National Heritage List	High

61	1001434	SU 97679 76466	The Royal Estate Windsor Castle and Home Park	Grade I Park and Garden	The Home Park lies adjacent to Windsor, the town forming its west boundary. The north and east park boundaries are formed by the River Thames, the south boundary being marked by the A308 Albert Road connecting Windsor and Old Windsor. The Castle is situated on a promontory above the river on the western boundary of the park, with a steep slope, the North Slopes, descending to the north, and ground sloping gently down from the Castle to the south and east. The North Slopes extend south-east in a curve from the Castle to Adelaide Cottage, dividing the level riverside ground of the park from the higher land to the south. The setting is urban to the west (Windsor and Eton) and east (Datchet), with the playing fields of Eton College (qv) adjacent to the river to the north, and further open riverside land to the east of this. The Home Park surrounds the Castle to the north, east and south, and is laid largely to pasture, encompassing, outside the immediate precincts of the Castle, the North Slopes, Frogmore House (qv), the Royal Gardens, the Shaw Farm complex (1840s, listed grade II) and the Prince Consort's Home Farm complex (1840s, listed grade II).	17^{th} Century	National Heritage List	High
62	1000363	SU 97121 82700	Stoke Park	Grade II Park and Garden	Stoke Park lies at the south-west end of the village of Stoke Poges, adjacent to the 1930s' Stoke Poges Gardens of Remembrance, 3km north-east of the centre of Slough at the southern extremity of Buckinghamshire. The c 115ha park is bounded largely by C20 suburban housing, and partly by roads marking the former north and east boundaries: Park Road and Church Lane respectively. The land is gently undulating, with a valley running north to south through the western edge of the park; a second valley runs north-east to south-west across the eastern half of the park. The setting, once rural, is now largely suburban, with the substantial housing estate of Manor Park lying adjacent to the south. Long views extend south from the house and the southern edge of the pleasure grounds towards the River Thames and Windsor Castle.	18^{th} Century	National Heritage List	Medium
63	1009477	SU 97027 82223	Bowl barrow in Stoke Park	Scheduled	The monument includes a substantial bowl barrow situated at the summit of a gentle south facing slope in a public recreation ground. The barrow mound has a diameter of 29m and stands to a height of 2.5m. A surrounding ditch, from which material for the mound was quarried, survives as an earthwork 7m wide and 0.3m deep around the north-west and south-west sides; elsewhere it survives as a buried feature having become infilled over the years.	Bronze Age	National Heritage List	High
64	1332731	SU 97008 82653	Stoke Park House	Listed Grade I	Stuccoed. Balustraded core of 3 storeys and 7 bays, the centre 3 advanced a little. Above, a dome on a drum with widely-spaced Composite capitals. Lantern with closely-set pilasters. In front, a single-storeyed Greek Doric portico and, left and right, single-bay solid ends. An Oval entrance hall leads to the staircase hall with groined vault extended to north and south by segmental tunnel vaults. Staircase itself later. The former library with 4 screens of grey marble columns with arches. South-east corner room with fine details and a north-east room with panelling incorporating Jacobean pieces.	18^{th} Century	National Heritage List	High
65	1165194	SU97537828 65	Manor House	Listed Grade I	Red brick; old tile roof; prominent chimney stacks in groups of 3 or 4 octagonal cut brick shafts. Two storeys and attic. Rear elevation of 3 bays with pilasters at corners and stringcourse at lst- floor level. Window range of 3 sashes framed in raised brickwork and with glazing bars. Three dormers with hipped tiled roofs. Garden elevation with on left hand 2 gables. First floor and in gables, paired windows in stone surrounds with mullions and leaded lights. Ground floor with 3-light casements. On right hand, 2-storey hall with a bay window, projecting stepped chimney stack and large leaded casement window.	16^{th} Century	National Heritage List	High
66	1164966	SU97555827 26	Church of St. Giles	Listed Grade I	Parish church. C12-C16. Flint rubble and red brick. Monuments. Closely associated with the poet Gray to whom tablet on external wall. The 'Elegy' may refer to this church and churchyard.	Medieval	National Heritage List	High
67	1124347	SU 97466 82332	Entrance gates, lamps and lodges to Stoke Park	Listed Grade II*	Symmetrical composition of gates, piers, quadrant railing screens, curtain walls and 2 lodges. Wrought iron carriage gate flanked immediately by smaller gates for pedestrians. Tall stucco piers, each with pair of detached Greek Doric columns carrying entab- labture surmounted by a stucco demi-lion rampant. Quadrant wrought iron screens. Curtain walls, each with case iron gate with central oval panel on which is bas relief of pair of busts in profile superimposed. Symmetrical pair of lodges facing each other. Stuccoed slate roofs. One-storey with chimney stacks astride roof ridge. Road elevation, one sash set in round-headed panel and flanked by niches with oblong panels above. Drive elevation with a Doric porch flanked on each side by one sash with panel above. Right hand lodge with glazing bars. Left hand lodge without glazing bars. Between lodges and gate piers are 2 cast iron lamps and standards on truncated Doric columns.	19^{th} Century	National Heritage List	High
68	1124346	SU 97787 82667	Gray's Monument	Listed Grade II*	Large stone pedestal with panels inscribed with verses from Gray's 'Elegy'. On it a sarcaphagus with strigillated side panels.	18^{th} Century	National Heritage List	High
69	1124358	SU 97273 82636	Stoke Park Bridge	Listed Grade II*	Stone faced, comprising three semicircular arches, the central arch higher than the others, divided by piers. Pointed cutwaters. Originally stone balustrading with four stone panels sweeping round to stone piers. Balustrading not in situ.	18^{th} Century	National Heritage List	High
70	1013960	SU 95523 83925	East Burnham animal pound	Scheduled	Rectangular walled enclosure is aligned with the road and measures c.8.5m by 5m. The walls are built in red brick and stand to the original full height of c.1.5m; varying between 0.22m and 0.35m in width depending on the thickness of the revetment added below the top two or three courses on the eastern sides of the two long walls, and on both sides of the northern wall. There is a single, narrow entrance near the southern end of the west wall containing a modern wooden gate, which is not included in the scheduling.	Medieval	National Heritage List	High
71	1013932	SU 95547 90891	Bowl barrow on Beaconsfield golf course, known as `The Mount'	Scheduled	Situated in the southern part of the Beaconsfield golf course, to the south of the railway line between Beaconsfield and Gerrards Cross and about 1km to the west of the club house. The barrow mound is circular with a conical profile, measuring c.2.5m in height and c.22m in diameter. At a height of c.1m there is a slight change in the angle of the slope suggesting a berm. The position of the ditch, from which material for the barrow was quarried, is indicated by a minor undulation surrounding the foot of the mound which averages 2m in width and 0.2m deep.	Bronze Age	National Heritage List	High
72	1006922	SU 97697 88312	Templars' site at Moat Farm, Hedgerley	Scheduled	13th century. Owned by the Knights Templar who had preceptory by 1276. After Templars suppressed in 1308, the land was seized by the Crown and in 1337 they were given to Bisham Priory. After the dissolution, the site had a series of owners until 1686 when Judge Jeffreys bought it and united it with Bulstrode Manor. A change in ownership and proposed use for the field (grazing by horses) prompted a site visit accompanied by the EH monument warden. The earthworks were visible as a low undulating platform on the east side of the field with a broad low depression on the south and west sides. There is also a bank linking the hedgerow bank to the platform. It is unclear whether these are original elements of the site or the result of disturbance from adjacent grazing /road construction. However, the possibility that the platform does define the moated island ought to be considered.	Medieval	National Heritage List	High

74	1006995	SU 99702 75101	Early medieval and medieval palace and associated monuments, Kingsbury	Scheduled	The site of a palace used by Edward the Confessor and the early Norman Kings of England at Kingsbury, Old Windsor, was excavated by Berkshire Archeaology Society in 1953 and Brian Hope-Taylor for the Ministry of Works from 1954 to 1958. The site began as a small settlement, the earliest phase of which probably lies under the churchyard. Phase II was probably a farm or small village dated circa 650 to 700 to 750 AD. Phase III probably went on to the 9th century, and a water-mill with three vertical wheels is probably of that period. A stone building nearby was destroyed by fire in the late 9th or 10th century. (Possibly due to a Viking raid) It seems probable that the tradition of a Royal residence at Old Windsor had begun by the 9th century. A water mill of Norse type with horizontal wheel was in use up to early 11th century; Later features of the site are timber buildings on sleeper beams of 10th or 11th century. A gilt bronze sword guard of just pre-conquest date was among the finds. Old Windsor features as an important vill in Domesday Book but was abandoned for the New Windsor site in the reign of Henry I. The site was levelled by the plough in the 12th century and a bu 13th/14th century was the last notable feature of the site. A great deal of pottery and other debris was recovered. Fragments of ditch and a pit, visible	Early Medieval / Medieval	National Heritage List	High
75	1006944	TQ 04077 79599	Two concentric ditches showing as crop marks at Thorney	Scheduled	Aerial Photographs show cropmarks of field system, double ring ditch, other circular features and large keyhole-shaped feature which seems to partly enclose ring ditch. Aerial Photographs show that rectilinear field system respects inner, but not outer, ring ditch. Partly destroyed by gravel extraction, but remains clear. An area of raised topsoil susceptibility was further investigated by geophysical survey carried out in advance of the widening of the M25. A 60m x 60m magnetometer grid was investigated and revealed linear and curvilinear features. The principle feature being a double ring ditch with rings some 4m apart with a diameter of 28m. Other strong anomalies were interpreted as at least four linear striations running diagonally N-S (probably agricultural). A second stong curvillinear feature was noted 12m south of the double ring ditch apparently cut by a 5m x 20m 'trench' possibly from 1960s excavation. Further linear features were noted some 5-6m apart and running northwest-southeast (possibly modern drainage). Two parallel linears, spaced c.25m apart, run southwest from the southwest side of the double ring ditch and its truncated neighbour.	Prehistoric	National Heritage List	High
76	1006954	SU 99487 88013	Bulstrode Park camp	Scheduled	Bulstrode Camp, is situated on a plateau about 275 ft. above Ordnance Datum, between the Misbourne and the Alderbourne valleys. It covers 22 acres. The western side follows the steep escarpment formed by two lateral valleys, mainly dry, which meeting at an acute angle, open out into the main valley, which trends in a south-westerly direction. The defences consist of a double rampart for the greater part of the circumference: the outer bank and ditch fades away on the western side where the escarpment is steepest. There are five openings, none of which is obviously original: none shows overlapping ramparts, flanking defences or advance posts. Excavations were carried out in 1924. The only definite evidence of human occupation found, was three small fragments of pottery, almost certainly pre-Roman, and of the Early Iron Age; and one hearth made of pebbles. The interior is covered in later ridge and furrow of a fairly uniform width of 6m. Ridge and furrow on the east side of the interior is aligned north-south, while that on the west is aligned northwest-southeast. The rampart comprises a ditch with inner and outer banks and is covered, for the most part, in survives to a maximum height of 1.5m above the interior and to c.3m above the height of the ditch bottom. The outer bank still stands to a maximum height of 1.5m above the bottom of the ditch.	Iron Age	National Heritage List	High
77	1006974	SU 89154 79012	Mesolithic site, Moor Farm, Holyport, Bray Wick	Scheduled	A Mesolithic site was excavated at Moor Farm in 1970. Over 8,000 pieces of flint were recovered. A range of tools including a tranchet axe, cores, scrapers, microlithics, microburins and unretouched blades and flakes were found during excavations by R Rutland.	Mesolithic	National Heritage List	High
78	1013958	SU 94719 84668	Slight univallate hillfort at Seven Ways Plain, Burnham Beeches.	Scheduled	Seven Ways Plain is situated in the southern part of Burnham Beeches, between Victoria Drive and Lord Mayors Drive, deriving its name from the junction of several tracks in a former woodland clearing. The hillfort stands in the centre of this area: a broad, level spur with slight gradients descending to the south and east, a narrow valley or coombe to the west, and higher ground rising to the north separated by a shallow, natural hollow. A wide ditch encircles the fort, which is roughly oval in plan measuring approximately 140m north to south by 100m east to west. The ditch is well-defined around the western side of the enclosure, averaging 10m in width and 0.7m in depth, and containing deep deposits of accumulated humus and silts. The interior, particularly the south eastern third of the site, contains numerous undulations, largely resulting from the construction and removal of War Department huts erected in the 1940s when the whole of the Beeches was fenced off for use by the army.	Late Bronze Age	National Heritage List	High
79	1013358	SU 95762 75286	Moated site at Moat Park, New Windsor	Scheduled	A small sub-rectangular moated site situated in a low- lying area at the northern end of Windsor Great Park and bisected from north- west to south-east by the Bourne Ditch. The site is orientated ENE-WSW with maximum external dimensions of c.60m and 45m respectively. The island survives as a platform standing c.0.5m above the level of surrounding ground with an area c.50m by 35m in size. It is encircled by a dry moat surviving to a depth of up to 0.5m and a maximum width of 5m.	Medieval	National Heritage List	High
80	1007928	SU 96661 80042	Montem Mound: a motte at Salt Hill, Upton-cum Chalvey	Scheduled	Remains of a substantial mound situated alongside Montem Lane, on the edge of a valley terrace overlooking a small stream. Though the original form of the mound is somewhat obscured by later modification, it has the appearance of a small motte, possibly constructed to control a fording point. It is roughly circular in shape with a diameter of 28m and remains up to 6m high around the best preserved north-western half. The south-eastern part of the mound is less well preserved, having the appearance of being unfinished.	Medieval	National Heritage List	High
81	1017478	SU 95370 88496	Moated site in Bower Wood, 560m south west of Bower Wood Cottages	Scheduled	Includes both a small medieval moated site and adjoining fishpond situated on the floor of a shallow valley separating Bower Wood from Burtley Wood, some 0.7km to the south of Junction 2 on the M40 near Beaconsfield. The greater part of the site lies to the south of a seasonal stream course which follows the valley as it descends to the south east, and which occasionally flows through the north eastern arm of the moat. The island is roughly rectangular, enclosed by a pronounced internal bank with breaks on all but the south western side. The internal area measures c.20m along the longer WSW-ENE axis by 11m, and contains minor undulations which suggest the position of former structures towards the western side. A slight depression runs across south eastern side of the island leading from the gap in the north eastern bank suggesting that this served as the original entrance.	Medieval	National Heritage List	High

82	1007943	TQ 00415 72622	Ankerwyke Priory: a Benedictine nunnery with associated moat and fishponds	Scheduled	Includes the site of Ankerwyke Priory, a Benedictine nunnery situated on the north bank of the River Thames. Today the remains consist of a portion of a ruined 13th century building, Listed Grade II, moat, fishponds and an extensive area of earthworks. The standing remains represent the north-eastern corner of a once substantial two storied building, orientated east to west with portions of walling surviving 8m to 10m long and up to 3m high. Three window openings can be recognised in the walling, their styles suggesting 13th, 15th and 17th century phases of construction. The fabric of the building is of random chalk boulder and rubble with chalk and sandstone dressings and later brick infilling. The earthwork remains are extensive and well preserved. In the pasture field to the immediate south of the standing walling and above the river floodplain is a substantial rectangular platform 50m square.	Medieval, 17th Century	National Heritage List	High
83	1013168	SU 97344 73855	Moated Royal Manorial site at Bear's Rails	Scheduled	This example is of particular importance as it surrounds a rare Royal Manorial site, and survives well with a wide range of features. The site is very well documented historically and has been partially excavated demonstrating the survival of important archaeological remains. The monument includes a moated Royal Manorial site at Bear's Rails, within the Windsor Great Park. The manor was added to the park of Windsor Castle in 1359. The moat is rectangular and comprises an inner ditch and outer earthworks aligned NNE- SSW. There is no visible causeway and the site has maximum external dimensions of 125m NW-SE and 150m NE-SW. The outer earthworks are considered to represent a second moat which, although dry, survives to a depth of 1m and a width of between 5 and 7m. The inner of the two moats is far more substantial, is water-filled and survives in good condition.	Medieval	National Heritage List	High
84	1018576	SU 94618 85688	Hartley Court moated site and enclosure	Scheduled	Moated site stands on a slightly elevated gravel plateau near the north western corner of Burnham Beeches, to the north of the junction of Morton Drive and Halse Drive. The monument includes a sub-rectangular moated island, covering approximately 0.6ha, which is situated within a larger, diamond-shaped enclosure of approximately 3.7ha. The island is surrounded by a broad ditch, measuring 5m to 7m in width and about 1.5m in depth, which retains water for much of the year supplied by rainfall and the natural water table.	Medieval	National Heritage List	High
85	1013174	SU 90281 74456	Moated site at Foliejon Park	Scheduled	A rectangular moated site aligned east-west and situated 50m north of Home Farm. The site is visible as an earthwork, surviving in the form of a raised area with external dimensions of 55m by 50m. The moat is dry but survives to a width of c.17m and a depth of 0.7m. Only three arms are now visible. The fourth (southern) arm is thought to lie under the approach road to Home Farm.	Medieval	National Heritage List	High
86	1013186	SU 87974 77037	Moated site at Foxley Green Farm	Scheduled	A moated site immediately south-east of Foxley Green Farm. The moat island, which has dimensions of 50m NE-SW by 55m NW-SE, is surrounded by a deep quadrangular, water-filled moat in good condition. The site measures approximately 80m by 70m externally. The moat has no causeway but an external bank surviving to a height of up to 1m runs around the southern and eastern perimeter.	Medieval	National Heritage List	High
87	1013173	SU 97823 74529	Moated site at Tileplace, Old Windsor	Scheduled	A trapezoidal moat 25m east of Tileplace Farm. The site is aligned north-south and has maximum external dimensions of 125m north-south and 100m east-west. The site has two causeways, to the west and east. The moat is partly water-filled and varies in width between 5m and 12m. An external bank survives to a width of 10m to the north and south of the moat while an internal bank of 10m width survives to the north of the eastern causeway and runs for a length of 18m.	Medieval	National Heritage List	High
88	1013455	SU 95194 79767	Moated site at Cippenham Court	Scheduled	A moated site and associated earthworks situated adjacent to and to the east of Wood Lane. The moat, which measures c.115m east-west by 100m north-south, is trapezoidal and aligned WNW-ESE with a causeway to the west. The ditch varies between 10 and 15m in width, has an average depth of 1.5m and encloses an island some 75m square. A pronounced inner bank (c.1.2m high) encloses a level interior with vague depressions and banks, interpreted as representing the location of the foundations of a large manor house.	Medieval	National Heritage List	High
89	1012812	SU 88675 87019	Round barrow cemetery on Cock Marsh	Scheduled	A round barrow cemetery situated on the floodplain of the River Thames at Cock Marsh, 1km west of Bourne End. The cemetery comprises four bowl barrows, all of which survive as earthworks. The northernmost barrow (SU88658706) has a maximum diameter of 25m and survives to a height of 0.5m. A ditch, c.3m wide and from which mound material was quarried, surrounds the mound surviving as a buried feature. The mound at SU88638700 has been truncated on its western side by the construction of a drainage ditch and, subsequently, by ploughing. The eastern side survives to a maximum diameter of 40m from north to south and stands to a height of 1m. The ditch is clearly visible around the eastern side of the mound, surviving to a width of 5m and a depth of up to 0.5m. The barrow at SU88708700 has a diameter of 30m and survives to a height of 2m, while the southernmost barrow (SU88738693) is 35m in diameter and 0.75m high. Both mounds are surrounded by ditches c.3m wide.	Bronze Age	National Heritage List	High
90	1113389	SU 96947 80868	Baylis House including Forecourt Walls and Pavilions adjoining to Northeast.	Listed Grade I	House; south-east block: red brick with hipped slate roof. 2 storeys. Entrance front: gauged brick window heads and giant order of pilaster strips at ends and flanking slightly projecting centre 3 bays; sunken semi circular panels above ground floor windows, plat band, wooden dentil eaves cornice with central 3 bay triangular pediment, coped parapet, lead downpipes, and 4 ridge stacks off-centre to left and right.	17th Century	National Heritage List	High
91	1117473	SU 87554 78890	Stables and Gatehouse at Ockwells Manor	Listed Grade I	Stables and gatehouse, the gatehouse is now disused. Part brick, part timber frame with brick infill. Gatehouse is timber framed with plaster infill. Old tile gabled roof. Long rectangular plan of 10 framed bays with gatehouse of 2 framed bays attached at right angles on south west end.	15th Century	National Heritage List	High
92	1117616	SU 87756 80872	Church of All Saints	Listed Grade I	Parish church. Red brick with horizontal bands of blue brick and stone dressings. Steeply pitched slate roof, terra cotta ridge tiles, gabled parapet stone bellcote over east gable. Octagonal stone broached spire on brick tower with alternate stone band on upper levels. Circular brick stair turret on west, covered entrance with polychromatic 4-centred arches underneath base.	19th Century	National Heritage List	High
93	1117619	SU 90145 81356	Maidenhead Bridge	Listed Grade I	Portland stone. 5 arches over river with four diminishing arches in the approaches, stone projecting verniculated voussoirs, moulded cornice and balustrade.	18th Century	National Heritage List	High
94	1117644	TQ 01474 75821	Church of St Michael	Listed Grade I	Parish Church. three-bay nave, church walls, fine ornamented Norman north doorway. C15 north transept and late C16 tower of flint, some early brick, and dressed stone quoins. 1875-76 restoration of chancel, south aisle and vestry. Nave roof has chamfered crown posts traced two ways on to collar purlins.	Medieval	National Heritage List	High

95	1117752	SU 96823 76831	The Town Hall	Listed Grade I	Designed by Wren, 2-storey rectangle, open on ground floor. The ground floor is of stone, with 6-bay front to west with chamfered rusticated angle piers and 3/4 engaged Doric columns, between openings, supporting entablature with curved frieze, which is carried round building. The upper part brick with stone entablature and 6 windows with stone architrave and cills. The principal decoration is on the south front which has 3 arched openings (3 central arches) between the angle piers on ground floor, and Corinthian pilasters on upper part supporting entablature and pediment. The 2 upper windows have stone aprons with richly carved swags and drops, flanking a central stone niche with elaborate cartouche to base and statue of Prince George of Denmark. The north front repeats this general design but with swag and drop ornament to base of niche which has a statue of Queen Anne.	17th century	National Heritage List	High
96	1117776	SU 97002 77033	Windsor Castle including all the buildings within the walls	Scheduled and Listed Grade I	England's largest castle and a royal palace, covering some 13 acres. The castle dates back to William the Conqueror but the first stone buildings were erected by Henry II between 1165 and 1179. The round keep stands on an artificial motte and there are baileys known as the Lower, Middle and Upper Wards.	Medieval	National Heritage List	High
97	1117780	SU 97554 75915	Mausoleum of the Duchess of Kent	Listed Grade I	Heavy late French neo-classical detail. Galleried, ribbed copper dome to ashlar rotunda surrounded by pink granite colonnade with bronze Ionic capitals and bases. Bronze urns on entablature. Rusticated basement. Main approach, facing bridge over lake, has double flight of balustraded steps, heavy rustication to retaining wall with central niche and bust, returning to meet on terrace in front of heavily rusticated projecting portal to basement of rotunda. Heavy panelled round headed gun metal doors.	19th Century	National Heritage List	High
98	1117781	SU 97445 75940	The Royal Mausoleum	Listed Grade I	Ashlar, Romanesque on Greek cross plan with tall octagonal drum, arcaded windows and shallow hipped copper roof. Bowed, lower, arcaded window ambulatories between arms of cross. East portico with 3 arches giving onto terrace and flight of steps. 2 full size bronze angels in front of portico. Ornate lamp standards to base of steps. Interior has rich Raphaelesque decoration programmed by Gruner. Barrel vaulted arms, giant pilasters to main piers, large statue niches and painted spandrels above arches, oval medallions between tripartite windows of the drum.	19th Century	National Heritage List	High
99	1125041	SU 91028 85179	Cliveden	Listed Grade I	Three storeys; 9 bays. Ground floor with central 3-bay porte cochere of 1869 by H Clutton with coupled Tuscan columns flanked by arched windows in Gibbs surrounds. Upper floors rusticated and with front Ionic pilasters: First floor windows with pediments and blank balconies. Second floor windows in moulded surrounds. Frieze with incised Latin inscription. Balustrade with urns.	19th Century	National Heritage List	High
100	1125044	SU 91007 85164	Terrace Wall to Garden Front, Cliveden	Listed Grade I	Red brick, balustraded with cornice and centre piece of stone and cement. Double flight of stairs each side of rusticated stone archway with carved keystone.	17th and 19th Century	National Heritage List	High
101	1125045	SU 91283 85563	Blenheim Pavilion, Cliveden	Listed Grade I	Stone, lead roofs. Arched opening with paired Ionic pilasters flanked by single-storeyed rusticated one-bay wings. Garlands in the spandrels of the arch. Pediment with trophies. Alcove within has Ionic pilasters and opens towards the wings which have each a single sash window and a crowning balustrade terminating in obelisks.	18th Century	National Heritage List	High
102	1135750	TQ 00483 79533	Church of St Mary	Listed Grade I	Flint and rubble with stone dressings, red brick south transept, cement rendered porch, and old tile roofs, separately over nave, aisle and lower chancel. Red brick tower with flint base to north and west, and cement rendered dressings. Nave, chancel, north aisle and chapel, south transeptal chapel, south transeptal library, west porch and north-west tower. Tower: 4 stages with angle buttresses, except that to north-west which is diagonal. Moulded strings between second and third stages and above top stage, coped battlemented parapet, and flagpole with weathervane.	Medieval	National Heritage List	High
103	1136298	SU 87569 78919	Barn at Ockwells Manor	Listed Grade I	Large threshing barn, now disused. Timber frame, brick infill; old tile gabled roof. Long rectangular plan of 9 framed bays with two gabled midstreys of 2 framed bays each in the third and seventh bays on the south west front.	Medieval	National Heritage List	High
104	1165582	SU 90917 85058	Chapel	Listed Grade I	Originally a gazebo; in course of erection in 1735 converted by the 1st Viscount Astor into a chapel in which he lies buried.	18th Century	National Heritage List	High
105	1251374	SU 96972 80892	Former Service Block adjoining Baylis House to northeast	Listed Grade I	Red brick with slate roof. 1 storey. Gauged brick cornice band, coped parapet, triangular pedimented gables to front and back over slightly projecting centre 3 bays with clock in each tympanum, parapeted gable ends with globe finials, 2 ridge stacks off-centre to left and right, large panelled stack in centre at rear, and central square timber arched cupola with incurved lead cap, globe finial, and weathervane.	18th Century	National Heritage List	High
106	1251379	SU 98074 79094	Church of St Laurence	Listed Grade I	Uncoursed rubblestone and puddingstone with ashlar dressings. Old tile roofs, separately over nave and aisle, and timber bellcote at east end of aisle with hipped roof and cross. Nave, south aisle, central tower, chancel and south vestry. Tower: 2 stages with cornice and coped parapet to low pyramidal cap with weathervane. Small rectangular louvred bellstage openings to north and south, small rectangular first stage windows to north.	Medieval	National Heritage List	High
107	1290278	SU 96715 77868	Eton College	Listed Grade I	An outstanding group of buildings surrounding 2 courtyards. Mainly red brick with stone dressings, chapel ashlar. 1441-6: most of School Yard and Green Court, including College Hall (restored 1858) and buttery, Lower School, Headmaster's chambers, etc,; also Provost's house and kitchen.	Medieval, 18th century	National Heritage List	High
108	1309911	SU 92001 82588	Church of St Mary	Listed Grade I	Parish Church of Hitcham. C12 nave; C14 chancel. C16 tower. Flint rubble and red brick. Chancel windows with some original stained glass.	Medieval	National Heritage List	High
109	1312870	SU 87556 78941	Dovecote at Ockwells Manor	Listed Grade I	Brick, with stone buttresses and dressings. Old tile conical roof with open turret and weathervane on top. Circular plan. Four, 2-stage weathered buttresses of stone and brick.	Medieval	National Heritage List	High
110	1313126	SU 96972 80918	Godolphin Court approximately 40m to north of Baylis House (Q.V.)	Listed Grade I	Stable block, now offices. Red brick with stone dressings, and hipped slate roof. 2 storeys and attic. Gauged window heads, plat band, cornice band, coped parapet, triangular pedimented gable over centre 2 slightly projecting bays with circular window in tympanum, and central octagonal arcaded cupola consisting of round arches with impost, keystones, dentil cornice and lead covered dome with weathervane.	18th Century	National Heritage List	High
111	1317133	SU 92668 86027	Dropmore	Listed Grade I	Cement rendered and colourwashed; slate roof. ENTRANCE FACADE. 5 bays; 2 storeys except bays 2 and 4 which are of 3 and advanced somewhat. Central hexastyle single-storeyed portico with Tuscan columns. Ground floor with Tuscan pilasters supporting a triglyph entablature.	18th Century	National Heritage List	High
112	1319304	SU 97720 75974	Frogmore House	Listed Grade I	House. Stucco faced 3 storey central block of 7 bays with lower wings, enlarged early C19 with bow fronted pavilions linked to main block by one storey portico links with entablatures. Glazing bar sashes. Projecting eaves cornice hipped slate roof. The Tuscan colonnade to ground floor of main block was originally open, now glazed.	17th Century	National Heritage List	High
113	1319434	SU 87503 78886	Ockwells Manor and wall attached on the southeast	Listed Grade I	Large manor house and attached wall. Timber frame with part rendered infill, but with mostly brick infill, some in herringbone pattern. Part brick. Old tile gabled roofs of different heights. Small central courtyard with cloisters on 2 sides. Hall of 4 framed bays, screens passage and porch on the east side; 3-framed bay solar crosswing on the north. Former servants and service wing of 6 framed bays on the south, and an additional former kitchen wing of 4 framed bays on the west. C19 extension projecting at right angles on the north.	Medieval	National Heritage List	High

114	1323671	SU 96744 72706	Statue of George III	Listed Grade I	Bronze statue of horse and figure on stone base. The figure of George III is in classical robes with laurel wreath. High, irregular rusticated stone base inscribed: GEORGIO TERTIO/ PATRI OPTIMO/ GEORGIUS REX On all sides of the mould on which it stands are large scattered stones.	19th Century	National Heritage List	High
115	1332401	SU 92563 86046	Aviary at Dropmore	Listed Grade I	Cast-iron cage; ceramic green tiles around base, as uprights and as frieze imported from China. Built against wall with 3 projections on which cupolas. Central cupola higher than outer 2. Inside the cages, 4 fountains with shells in basins.	19th Century	National Heritage List	High
116	1332449	SU 97452 91021	Jordans Meeting House	Listed Grade I	Red brick, hipped old tile roof with coved cornice. Left hand section containing meeting room is one storeyed with 2 cross mullion diamond lattice casements with flat arches and panelled shutters. Four panel 2 fold door with astragal moulding and oblong 2-light wood mullion fan. Right hand section is 2 storeyed with paired casements. Panelled shutters. Ground floor flat arches.	17th Century	National Heritage List	High
117	1332743	TQ 03978 81172	Church of St Peter	Listed Grade I	Parish church, no meaningful description in National Heritage Listing	Medieval, 19th Century	National Heritage List	High
118	1319439	SU90194793 67	Jesus Hospital, including Chaplain's House, The Almshouses and The Chapel	Listed Grade I	Brick, in English bond, with stone dressings. Large quadrangular plan with chapel in the centre of the west side and Chaplain's house to the left of the main entrance-way through, which has a meeting room over. One storey, Chaplain's house is 2 storeys. Almshouses: all one storey. North and south sides of the quadrangle are identical. Each 5 bays. Chimneys are placed diagonally on plan having 6 chimneys with coupled shafts on large rectangular bases, and clay pots on each side. Stone window openings with chamfered mullions; metal casements with diamond panes, of 2-lights. Central, gabled dormer to each dwelling with two, 2-light windows, lighting a vestibule below which has plank door and a 4-centred stone entrance archway. Chapel: coped gable to quadrangle with a large window of 5, trefoiled lights with vertical traceried head. Below this is a plank entrance dooorway under a 4- centred arch within a square head.	17th Century	National Heritage List	High
119	1125021	SU90168810 45	Maidenhead Railway Bridge (MLN12327)	Listed Grade I	Fine red brick with Bramley Fall gritstone dressings, and thick York stone slabs for the deck. The two phases are tied together internally with iron tie rods. Across the whole length of the elevation is a parapet with gritstone coping above a bold gritstone cornice with roll moulding and a plain frieze.	19th Century	National Heritage List	High
120	1113376	SU 96684 79569	Church of St Peter	Listed Grade II*	Neo-Gothic church. Knapped flint with stone dressings and red brick lacing courses. Tiled roofs with change of pitch over aisle. Nave, north aisle, north porch, chancel, and vestry. Angle and clasping buttresses, cill string to east, parapeted gable ends, and bellcote to west with 2 trefoil arched openings. North aisle: 4 trefoil headed lancets to left; doorway to right with chamfered arch, moulded imposts, and 2 boarded doors. Gabled north porch with moulded arch and two C20 wrought iron gates.	19th Century	National Heritage List	High
121	1113384	TQ 00471 79491	2,4,6,8, St Marys Road	Listed Grade II*	4 almshouses. Red brick with cement- rendered porch, window dressings and quoins. Old tile roof. 1 ½ storeys North-front: plat band, 4 gabled eaves dormers with 2-light diamond shafts and central ridge stack with 4 diamond shafts. Central projecting 2 storey gabled porch with first floor 2-light diamond leaded casement and round entrance arch with 2 boarded doors to left and right within. 4 ground floor 2-light diamond leaded casement and boarded doors between first and second and third and fourth with four-centred arched heads,and raised brick architraves with triangular pediments.	17th Century	National Heritage List	High
122	1113387	TQ 00466 79595	12, 14, 16, 18, 20, 22, St Marys Road	Listed Grade II*	6 almshouses. 1679 and 1687. Red brick with cement rendered window dressings, porch, and ground floor to left. Old tile roof. 1 1/2 storeys. South front: plinth, plat band, parapeted gable ends crowned with triangular pediments 8 gabled eaves dormers with 2-light diamond leaded casements and 3 ridge stacks each with 4 diamond shafts. Central projecting 2 storey porch with moulded string course and shaped gable end crowned by a traingular pediment; first floor 2-light diamond leaded casement with circular stone panel beneath, rusticated round entrance arch with impost bands, and small round arched windows in sides. 6 ground floor 2-light diamond leaded casements and boarded doors between first second and third and fourth, fifth and sixth with four- centred arched heads, cement rendered architraves and triangular pediments with circular motifs in tympana. Stone plaque on left-hand return wall of porch inscribed: Seymour Almshouses Founded 1679 Restored 1960	17th Century	National Heritage List	High
123	1117476	SU 90206 77581	Stroud Farmhouse	Listed Grade II*	Hall house altered and extended Cl7, C18, Cl9 and C20. Part timber frame mostly encased in brick, partly rendered, part brick partly tile-hung. Tiled gabled roof of different heights. Originally L-plan of 3x2 framed bays with 2 framed bay hall on east, one framed bay cross-passage on west of hall and 2 framed bay solar on west of cross-passage. Early C19 extension on west of solar. 2 storeys and attic. 3 chimneys with clay pots. Entrance (north) front: former hall section on left; former gabled solar crosswing and larger gabled Cl9 extension on right. Small lean-to extensions at each end. Left section has the remaining part of the original hall window on the first floor, of 3-lights, altered, with glazing bars added, the 2 outer lights having 4-centred heads.	Medieval	National Heritage List	High
124	1117492	SU 90176 79644	Lych Gate	Listed Grade II*	Timber frame, part render, part brick infill. Old tile gabled roof. Rectangular plan of 4 framed bays with east wing forming an L-plan. Jettied front and back; passage through under with lych gate on north. 2 storeys. One tall early C20 chimney on west wall with clay pot. Diamond-leaded casement windows.	Medieval	National Heritage List	High
125	1117496	SU 93156 76534	The Old Farmhouse	Listed Grade II*	Hall house, altered and extended C19 and C20. Part timber frame with painted brick and render infill, part brick. Old tile gabled roofs of different heights. Irregular plan of different builds; the earliest 2 framed bays running east-west with a 2 framed bay gabled extension on the west running south forming an L, and a further 2 framed bay gabled extension at right angles on the north. Brick extension forming a double depth plan on the west. 2 storeys. 1 chimney on ridge with 4 attached shafts and small offset heads, one tall chimney with clay pot on side wall of earliest build. Scattered fenestration mostly of early C20 leaded casements	Medieval	National Heritage List	High
126	1117568	SU 89705 85513	Church of Holy Trinity	Listed Grade II*	Parish Church. Part chalk, part flint with chalk diapering; tile gabled roof. Chancel, 5-bay nave, 4-bay north aisle and 2-bay north chapel. 6-bay south aisle and chapel. Tower: 3 stages with embattled parapet and diagonal buttress of 4 offsets at its western angles. An embattled stair turret in the north east angle rises above the parapet. The west doorway has a 4-centred head within a square external label. Above this is a window of 3 uncusped lights with 4-centred heads, also within a square external head and label. The ringing chamber has a west window of two 4-centred lights with square external head and label. The bell chamber has similar windows on all 4 sides.	Medieval, 19th Century	National Heritage List	High
127	1117606	TQ 00125 73942	Church of St Andrew	Listed Grade II*	Parish Church. Three bay nave, C13 arches and pillars with keel edge rolls on angles. Rubble stone, tiled roof. Broach spire added 1862. South porch 1935.	Medieval, 19th Century	National Heritage List	High
128	1117615	SU 87765 80831	All Saints Cottage	Listed Grade II*	Parish Centre. Brick. 2 storeys, gable with chimney on LH flush with wall and breaking eaves. Steeply pitched plain tile roof terra cotta ridge tiles. Small hipped dormer on RH. Polychromatic brick relieving arches and pointed arch over entrance.	19th Century	National Heritage List	High
129	1117617	SU 87775 80859	The Vicarage	Listed Grade II*	2 storeys polychrome brickwork, sleeping pitched plain tile roof. Four bays, 2 projecting gables, pointed Gothic windows, irregular with polychromatic relieving arches, brick cills. Terra cotta ridge tiles.	19th Century	National Heritage List	High

130	1117620	SU 89946 81291	Oldfield Lodge	Listed Grade II*	3 storeys yellow stock brick, moulded stone cornice, parapet with moulded stone coping and balustrade panels over windows, hipped slate roof and flanking chimneys. Three windows with glazing bars and red brick arches on 2nd floor the one on RH blocked and painted in. On first floor the principal floor, two Parradian windows in arched recesses with radiating fan ornament in tympamum, that on RH blocked and painted in. Central six-panelled door with side lights and radiating fanlight in similar surround approached by flight of moulded stone steps with central landing and plain tailings. Three windows ground floor with glazing bars, semi-circular head with pilasters and moulded surround. Screen wall to road has brick piers with stone strings, moulded stone caps with composite rosettes between. Gate piers have original wrought iron lampholders.	18^{th} Century	National Heritage List	High
131	1117676	SU 96822 77117	Old Bank House (Brewery Office)	Listed Grade II*	3 storey yellow stock brick symmetrical substantial house. Stone plinth and stone sill courses. Moulded bracketed stone cornice with pediment over centre 3 bays of slight projection. 7 windows to upper floors, 6 on ground floor, recessed glazing bar sashes with flat gauged arches, Venetian shutters to 2nd floor windows. Central door of 8 fielded panels in stone Doric surround of 3/4 columns, entablature and pediment. Inter secondary 6 panel door to left hand in arched opening and similar surround in one storey extension.	18^{th} Century	National Heritage List	High
132	1117708	SU 96880 76793	Church of St John the Baptist	Listed Grade II*	Flat, tripartite elevation to the high street. In the centre there rises the W tower, of four stages with an entrance under a square-headed doorway on the ground floor with two think decorated bands above; then a stage with a two-light window under a square head; a clock stage with an unusual thin glazed band beneath the clock-face; and finally a tall, stately belfry stage. This has corner projections with a foiled cross-section which rise above the embattled parapet to tall octagonal pinnacles. The vestibules either side of the tower each as a W-facing entrance and above this a three-light window with plain cast-iron mullions and uncusped arches.	19^{th} Century	National Heritage List	High
133	1117722	SU 95512 77142	The Limes	Listed Grade II*	2 storeys, roughcast, old tile roof. 6 mullioned and transomed windows on the 1st floor. 5 similar windows on the ground floor, the 3rd from left hand is blocked. 1 half-glazed door to left hand. A small 1-bay C18 addition to left hand. 2 storeys, colour-washed brick, string at 1st floor level, cut brick window heads, hipped old tile roof. Wing at back 2 storeys, timber framed with brick infilling old tile roof. Irregular windows with leaded upper lights.	17^{th} Century	National Heritage List	High
134	1117723	SU 95508 77100	Edgeworth House Youth Hostel Association	Listed Grade II*	2 storeys and attic rendered, string at 1st floor level, heavy wood moulded and modillioned cornice, old tile roof. Flanking chimneys. A 4-bay front with half-glazed door in second bay from right hand with rectangular fanlight, semi-circular and radiating glazing pattern. Door case has architrave surround, flat brackets, plain frieze and enriched cornice and pediment. The house is set back with brick wall to road.	18^{th} Century	National Heritage List	High
135	1117728	SU 96991 76647	Dial House	Listed Grade II*	3 storeys, attic and cellar, red brick on projecting rendered plinth, parapet with stone coping, old tile mansard roof. The house has 2 dormers with small moulded cornices, 3 windows on upper floors, 2 windows on ground floor and 6-panelled door to right hand.	18^{th} Century	National Heritage List	High
136	1117729	SU 96955 76663	9-11, Park Street	Listed Grade II*	3 early C19 houses forming a symmetrical group, 3 storeys and basement, London stock brick, small modillioned Portland stone cornice and blocking course over 2nd floor windows, slate roof. No 9 has 4 windows on upper floors, 3 windows on ground floor and tall 6-panelled flush door to left hand of centre. The door has a rectangular moulded wooden panel at its head and a semi-circular, radiating and concentric fanlight, all under an Ionic portico consisting of 2 columns, 2 pilasters, entablature and pediment at the top of 5 moulded stone steps. There are 3 windows in the basement and the areas have light geometrical cast-iron railings.	19^{th} Century	National Heritage List	High
137	1117730	SU 96960 76699	20, Park Street	Listed Grade II*	3 storeys and basement, brick on chamfered brick plinth, brick string over 2nd floor windows, brick parapet with stone coping, old tile roof. The house has 3 windows with stone cills on upper floors, 2 windows on ground floor, and 6 panelled door to the left hand with rectangular fanlight with radiating and concentric glazing. The doorcase consists of Doric pilasters, broken architrave, plain frieze and denticulated and moulded flat cornice. The pilasters stand on tall plinths on 3 stone steps. There are 2 blocked windows in the basement.	18^{th} Century	National Heritage List	High
138	1119795	SU 99002 73251	Beaumont College	Listed Grade II*	Large country house in parkland, now offices and training school. Original house 1705 by James Gibbs for Lord Weymouth. Re-built and extended in early C19 by Henry Emlyn of Windsor for Henry Griffiths. Part painted stucco, part stock brick; slate roofs of different heights. PLAN: original house on north-west; C20 extension in similar style, adjoining on north-west. C19 extensions adjoining original house on south-east, forming a large L-plan, with a former service court on the north, closed on the north side by the chapel. There is a C20 extension on the north side of the chapel and a C20 extension on the south end of the 'L'.	18^{th} Century	National Heritage List	High
139	1119797	SU 98909 73252	War Memorial at Beaumont College approximately 45m from northwest corner of Main Building	Listed Grade II*	Ashlar. Symmetrical. Podium of 4 steps which rises to a plain altar with flanking bench seats, and tall cenotaph. Console brackets to projecting inscription panel bearing a bronze commemorative plaque, with blocking course with acroteria and finial of laurel wreath and swords. Above is a large round arched opening containing a bronze Christ on stone cross; moulded cornice and pediment top and frieze with motto. The incised text below the inscription plaque reads:- REQVIEM AETERNAM DONNA EIS DOMINE	20^{th} Century	National Heritage List	High
140	1119805	SU 99255 74644	Church of St Peter and St Andrew	Listed Grade II*	Parish church. Restored by George Gilbert Scott, north chancel aisle, south porch and spire added at the same time. MATERIALS: flint with stone and chalk dressings; old tile gabled roof, shingled broach spire. PLAN: continuous nave and chancel, north chancel aisle, west tower and spire; south porch. EXTERIOR: tower: one-stage buttresses each with one offset at the extreme angles. 3 lancets at the ground stage. 4 single light windows to the bell-chamber, one on each wall, the south window is 4-centred, the other pointed. Over the west window of the ringing chamber is a small square-headed light. C19 door on west face with pointed-arched head.	Medieval, 19^{th} Century	National Heritage List	High
141	1119806	SU 99213 74505	The Priory	Listed Grade II*	House. Built for Richard Bateman, a friend of Horace Walpole pioneer of the "Sharawagge" or Chinoiserie style. Constructed in the 1740s but modified in Gothic style in 1759 when a cloister (since demolished) was added by Richard Bentley; further altered in 1761-2 when a Gothic octagon room was added to designs by Johann Heinrich Muntz. Red brick with stone dressings; tile roof with end brick chimneystacks. Front of 2 parallel ranges; 2 storeys, 7 windows, the 3 at each side in full height canted bays, now with late C19 windows. Stone coped brick parapet has tall open arch with pyramidal finial over the centre of both bays. 2 steps to replaced central glazed door, recessed in plain reveal. Side elevation has projecting 2 bay brick wing with parapet having panels of intersecting circles, late C19 casements and French windows to ground floor. Large early C20 Jacobean style porch with Tuscan columns and strapwork decoration to frieze.	18^{th} Century	National Heritage List	High
142	1124367	TQ 02652 77095	The Ostrich Public House	Listed Grade II*	Timber-framed with plaster infilling; machine tile roof. Two storeys. First floor oversails on brackets and corbels. Gables at each end. First floor with 7 modern casements. Ground floor with central carriageway. On right hand, C19 shopfront; on left hand, C19 saloon bar entrance with traceried door and side windows. Three C18 sashes, 2 single-hung, one double-hung.	18^{th} Century	National Heritage List	High
143	1124384	TQ 02406 81107	Iver Grove	Listed Grade II*	Brick; hipped slate roof. Two storeys attic and basement; 5 bays, quoins left and right, the centre 3 bays pilastered and pedimented. In the pediment a lunette. Ground floor with central later porch with pediment on Tuscan columns. All window sashes, those of the ground floor segment-headed, the central one on the 1st floor round-arched.	18^{th} Century	National Heritage List	High
144	1124389	TQ 00093 87924	Church of St James	Listed Grade II*	Parish Church. White and yellow brick with red brick diapering; Welsh slate roof; cruciform plan with octagonal dome surrounded by 4 square turrets with concave conical roofs. Campanile at north-west.	19^{th} Century	National Heritage List	High

145	1124399	SU 97014 87673	Shell House	Listed Grade II*	Brick, red stretchers, blue-grey headers; old tile-hipped roof. Moulded brick string course at first floor level. Two storeys and attic. Road elevation with one, side elevation with 2 dormers. Heavy timber eaves cornice with wooden corbels. First floor with two 2-light casements with timber mullions and transoms and leaded lights. Ground floor with one 2-light casement and 2-fold 6-fielded panel door with rectangular fanlight at top of flight of steps and framed by brick Ionic pilasters carrying a hood with carved consoles. On left hand, one-storey modern addition in matching materials with shaped gable end.	17th Century	National Heritage List	High
146	1124420	SU 99904 85689	Church of St James	Listed Grade II*	Parish Church. 1610 and modern. Red brick, quoins and dressings plaster. Chancel and south aisle 1877-84, by G E Street. Inside a large monument to Sir Marmaduke Dayrell, 1631.	17th Century	National Heritage List	High
147	1124518	SU 94412 90039	Hall Place	Listed Grade II*	Red brick; old tile roof with chimney banks on side walls. Two storeys and attic. Heavy moulded eaves cornice. Five dormers with hipped tile roofs. Window range of 5 sashes with flat decorated heads and glazing bars. Ground floor with 4 similar sashes and a central enclosed porch with Doric pilasters, triglyph frieze and pediment.	18th Century	National Heritage List	High
148	1124522	SU 93450 86457	Church of St Anne	Listed Grade II*	Flint rubble and red brick tile roof. Stained glass window memorial to Courtauld Thomson family. Complete fittings by Butterfield including wood screen and marble font. East window by Gibbs 1866	19th century	National Heritage List	High
149	1124528	SU 93056 82397	Church of St Peter	Listed Grade II*	Parish Church. C13 lengthened in C14, north porch C15. Top of tower and spire 1864. South porch by G E Street.	Medieval, 19th Century	National Heritage List	High
150	1124547	SU 94490 90003	Parish Church of St Mary and All Saints	Listed Grade II*	Late C15, heavily restored and portions rebuilt. Contains an altar tomb of freestone, and Easter sepulchre of Purbeck marble. Monument of Edmund Burke in the Church.	Medieval	National Heritage List	High
151	1124572	SU 94602 90085	Africa House Burke Lodge	Listed Grade II*	U-shaped in plan. C16/17 origin, refronted C18. Timber-framed; colourwashed cement rendered; old tile roof behind parapet. Quoins at both ends of elevation. Five canted bay windows through 2 storeys 2 of them with the porches to the houses set in their lower part. First floor with five 1:3:1 windows with C18 glazing bars in form of octagons and a similarly glazed semicircular window over the carriage entrance. Ground floor with three 1:3:1 windows, 2 Tuscan pedimented porches, that to Africa House with metopes and triglyphs, that to Burke Lodge, smaller. Between the houses, a carriage entrance with panelled door and pointed arches opening with decorated spandrels.	16th Century	National Heritage List	High
152	1125028	TQ 00909 81591	Langley Park Including Quadrant Walls, Corner Towers, Pavilions and Orangery	Listed Grade II*	Ashlar, largely replaced 1983 by stucco lined as ashlar, with slate roof behind balustraded parapet. 2 storey and attic, double pile plan. The east front originally a plain 7 window range of sashes, the centre 3 advanced slightly and pedimented. Modillion cornice and roundel in pediment. The ground floor was extended forward and far projec- ting single storey quadrant wings were added c1850-60 in ashlar. 4 stone-piers with niches correspond to the corners and centre of the house, between the centre pair a stone pedimented doorway with balustrade section over flanked by glazed openings. Between the outer pair each side an open loggia with pair of Tuscan columns in centre. From these extend plain quadrant walls terminating in corner towers in the style of Vanbrugh, 2 storey with arched openings on each face of upper floor, cornice above with corner pinnacles linked to a central octagonal stone pedestal.	18th Century	National Heritage List	High
153	1125043	SU 90967 85266	Stable Buildings at Cliveden	Listed Grade II*	Heavy cement rendering; slate-hipped roofs with elaborate finials. Moulded cornice and string courses. Upper windows break into roof and have heavy surrounds with curved pediments supported on side consoles. Ground floor with carriage andgarage entrance doors. Above the yard rises very large square clock tower with 4 balustraded balconies below the 4 clock faces. Clocks in elaborate bronze surrounds. Italianate turret on top. To left and right of tower an open loggia with iron screens.	19th Century	National Heritage List	High
154	1125047	SU 91083 85565	Shell Fountain, Cliveden	Listed Grade II*	Three groups of statuary around a large shell dish set in round pond.	19th Century	National Heritage List	High
155	1125541	SU 91002 90035	Clapton Revel	Listed Grade II*	Chequer brick with vitreous headers, the E. front and one bay of N. front with tuck pointing and gauged brick band. Coved plaster eaves, hipped old tile roof, brick chimneys. 2 storeys with lower ground floor and attic, 3 X 4 bay fenestration. First floor band course. Main S. front has 3 bays of 4-pane sashes with chequered segmental heads and panelled blind boxes . Central ground floor opening altered to French doors. 2 hipped dormers with paired wooden casements.	18th Century	National Heritage List	High
156	1125542	SU 90953 87795	Church of St Paul	Listed Grade II*	Parish church. Knapped flint, stone dressings, tiled roof to N. chapel, lead roofs to remainder. W. tower, nave, aisles, chancel, N. chapel now used as vestry. C19 off-set buttresses. Re-fenestrated 1868, except for N. chapel, with traceried windows in Decorated style with segmental heads, hoodmoulds and carved head stops. W. Tower is of 3 stages with battlemented parapet, moulded plinth and strings, diagonal buttresses, and pinnacled octagonal stair turret at S.E. corner. Bell chamber has 2-light openings; W. side has single light to second stage, large 3-light window, and moulded doorway. Nave has battlemented clerestory with C19 carved head gargoyles and 4 bays of 2-light windows.	Medieval, 19th Century	National Heritage List	High
157	1135976	SU 99638 74530	King Johns Hunting Lodge	Listed Grade II*	Three storey timber framed house with two storey jettied porch linked to former aisled hall on south. Old tile gabled roof, plaster and brick nogging infill to timber framed walls, some replaced with modern brick. Modern leaded casements. Porch has four centred arch with quatrefoils in spandrels, first floor three-light window with wood mullions.	Medieval	National Heritage List	High
158	1136003	SU 87774 80846	Vicarage Cottage	Listed Grade II*	2 storeys, steeply pitched plain tile roof, terra cotta ridge tiles. Brick, polychromatic arches over openings. Brick circular stair turret in south-east corner with octagonal metal covered roof. Single storey hipped and gabled projection on south-west.	? 19th Century	National Heritage List	High
159	1136053	SU 89483 81336	Smythes Almshouses	Listed Grade II*	2 storeys, brick on projecting plinth, string at lst floor level, moulded brick eaves broken in centre with coat of arms and inscription. 1st floor windows in brick gables with parapet extensions. Old tile roof lain to pattern. 2 groups of diamond-shafted chimneys. 6 gables on 1st floor, each with 3-light casement window, the two centre gables joined by a brick pediment on curved brick bracketted cornice over central panel.	17th Century	National Heritage List	High
160	1136397	SU 90256 77600	Barn at Stroud Farm, approximately 35m east of Stroud Farmhouse	Listed Grade II*	Timber frame, weatherboarded; corrugated iron roof with half hips and gablets. Gabled midstrey. Rectangular plan of 5 large framed bays with central midstrey on west.	Medieval	National Heritage List	High
161	1160086	SU 90419 87249	Cores End Cottage Cores End House	Listed Grade II*	Front range is of red and vitreous brick, irregularly chequered, with old tile roof, half-hipped to left. Brick chimneys with c.1800 cogged caps to right and rear. Double pile, 2 storeys and attic, 5 bays. Gauged first floor band with central dentil course, wooden eaves cornice with shaped modillions. Boxed 3-pane sashes, all renewed C20, with gauged brick heads and stone sills. Central first floor window is blind and painted. 2 flat-roofed dormers with paired wooden casements and dentil cornices. Central 6-panelled door with 4-pane rectangular fanlight and wooden cornice hood on shaped scroll brackets.	18th Century	National Heritage List	High
162	1160418	SU 94342 89223	Hall Barn	Listed Grade II*	Brick; stone dres- sings; stone slate hipped roof with lantern. Three storeys plus attic; 5 bays with coupled pilasters at the angles and between the windows. Ionic on the ground floor, Corinthian on the first and Composite on the second. The centre bay emphasized by detached columns carrying pediments, segmental on the first floor and triangular on the second.	17th Century	National Heritage List	High

163	1160900	SU 94523 89980	Tomb of Edmund Waller southeast of Parish Church of St Mary and All Saints	Listed Grade II*	A marble obelisk is set on 4 winged skulls, the whole on a chest tomb type base in grey stone with relief carved drapery and flaming urns. Iron spearhed railing around.	17th Century	National Heritage List	High
164	1160916	SU 94528 89904	The Old Rectory (Adjoining west side of Churchyard)	Listed Grade II*	Brick; timber and plaster; tiled roof. Surrounds 3 sides of a courtyard. Hall on west, and enclosing wall and doorway on east.	16th Century, 20th Century	National Heritage List	High
165	1164777	TQ 03964 82968	Dairy in grounds of Elk Meadows	Listed Grade II*	Red brick and knapped flint; thatched roof much overhanging, supported on rustic columns and gabled over the door, which is approached by a pergola. Diamond glazed windows. Painted arched door with strap hinges.	19th Century	National Heritage List	High
166	1205343	SU 96998 76643	Ann Foorde's House	Listed Grade II*	A tall C18 house 3 storeys, attic and cellars red brick, parapet with stone coping, old tile mansard roof. There are 2 casement dormer windows in the attic, 3 windows on the upper floors and one late C19 rectangular moulded brick bay to right hand on ground floor with a 12-light mullioned and transomed window and moulded brick corbelled apron. The 6-panelled door with semi-circular radiating and wreathed fanlight over, in arched panelled reveals is to the left hand approached by 4 stone steps	18th Century	National Heritage List	High
167	1210902	SU 96699 77910	Statue of Henry VI, Eton College	Listed Grade II*	Bronze statue on stone pedestal. Sculptor: Francis Bird, 1718	18th Century	National Heritage List	High
168	1221042	SU 96863 76852	5 and 6, Church Street	Listed Grade II*	3 storeys and attic, brick (ground floor colour washed), string at 1st floor level and moulded string over 1st floor windows, heavy moulded and modillioned eaves cornice, old tile roof. A symmetrical composition consisting of the main building and flanking narrow rectangular bays over entrances. The main building has one hipped dormer window to the left hand and one modern dormer to the right hand, 4 windows on the upper floors, the 1st floor left hand windows have heavy early C18 sashes. No 5 has a late C18 shop on the ground floor consisting of half glazed door to the left hand and a small bow window to the right hand on a cut bracket under and plain frieze and small cornice. No 6 has 2 windows on the ground floor. The flanking bays timber framed and roughcast, project about 4ft and are 2 storeys high (1st and 2nd floors) supported on heavy elaborately carved console brackets with a moulded beam round the soffit. The main cornice is carried round and each has a small hipped old tile roof	17th Century	National Heritage List	High
169	1251585	SU 98037 79058	Upton Court	Listed Grade II*	Timber framed with later rendering and planted timbers, and later rendered brick additions with some planted timbers. Hipped old tile roof. Former aisled open hall of 3 framed bays with later inserted floor, cross wing off-centre to right of 3 framed bays, later gabled cross wing to left of 2 framed bays with catslide over outshot to left, and central projecting gabled porch.	Medieval, 19th Century	National Heritage List	High
170	1272281	SU 97902 75995	Prince Alberts Dairy and Cottage	Listed Grade II*	2 storey stock brick and ashlar dressings, heavy Italianate detail. Pendant finialed brackets to eaves of hipped roof, grouped chimneys. 2 and 3 light casements in architraves. The dairy is on north side with 4 bay arcaded screen or verandah, set back pierced stone balustrade with spiked ball finials.	19th Century	National Heritage List	High
171	1280741	SU 96932 76676	12-16, Park Street	Listed Grade II*	An early C19 terrace of 5 houses, 3 storeys and basement, stucco rusticated ground floor treatment, string at 1st floor level, Nos 12 and 19 are recessed with composite piers at the outer angles and 2 engaged composite columns between the windows. An entablature runs the whole length of the terrace with balustradin pierced over windows. Slate mansard roof. Each house has 2 dormer windows	19th Century	National Heritage List	High
172	1280766	SU 97018 76631	The Gate House	Listed Grade II*	3 storeys, red brick on projecting rendered plinth, string at 1st floor level, projecting brick band over 2nd floor windows, capped with stone moulding, rendered parapet with stone coping, old tile roof. The house has 4 windows on the upper floors, those on 2nd floor being square, and 3 windows on the ground floor	18th Century	National Heritage List	High
173	1280920	TQ 02818 76974	King Johns Palace	Listed Grade II*	Courtyard plan range of buildings with barn parallel to road front and central elliptical archway reaching to eaves level. Two storeys and attics on timber-framed plinth. Four two-storey bays with many-paned modern wood casements. Moulded wooded bressumer, jettied to right of archway. Front plastered with remains of wide rustication. Archway is moulded with key block. Rough wooden entablature below tiled roof. Three gabled dormers, 3 chimneys the right hand one with T-plan	17th Century	National Heritage List	High
174	1281315	SU 96870 76839	Church Rooms	Listed Grade II*	2 storeys and attic, roughcast, timber framed, projecting rendered plinth. Heavy moulded and modillioned eaves cornice and old tile roof. 4 hipped 2-light casement dormer windows in attic, 5 windows with architrave frames on the 1st floor. One 4 paned fixed window to left hand on ground floor. A recessed half-glazed double door with architrave surround plain frieze and small cornice, one window and central doorcase (now a window) with architrave surround, plain frieze, cornice and pediment, and 2 windows to the right hand. Elevation to Church Lane, C16 roughcast, timber framed, oversailing the ground floor. 2 irregular windows on 1st floor. Thin buttress shaft with bracket to overhang. Nos 4 to 7 (consec),The Church Rooms, Nos 12 and 13 and the cobble sets in Church Street form a group.	16th Century, 18th Century	National Heritage List	High
175	1303445	SU 89712 85443	Church Gate House	Listed Grade II*	Timber framed, painted render and brick infill, old tile gabled roof. L-plan, formerly 2 x 2 framed bays extended to 2 x 5 framed bays. 2 storeys. Large chimney on left side. C16 ridge chimney on right with diagonal shafts and offset head. South front: some false timbers over original. Projecting gable on left with sash window on first floor with glazing bars, centre pane an opening light; 2-light leaded casement on ground floor. On right, two 2-light leaded casements on first floor, similar ground floor. Half glazed entrance door on right under C19 gabled porch.	Medieval	National Heritage List	High
176	1309053	SU 99271 81512	Parish Church of St Mary	Listed Grade II*	Rough flint walls, old tile roof. Low timber spire supported internally on open timber frame.	Medieval	National Heritage List	High
177	1310579	SU 94240 88968	Boathouse at Foot of Lake at Hall Barn	Listed Grade II*	Porch with 4 columns, pediment, entabla- ture with decorated frieze.	18th Century	National Heritage List	High
178	1310581	SU 93870 89182	Obelisk at Hall Barn	Listed Grade II*	Stone with designs of contemporary tools and other utensils at the base.	18th Century	National Heritage List	High
179	1312975	SU 87748 80829	Parish Centre	Listed Grade II*	Single storey north-west elevation, gabled dormers breaking eaves. Polychromatic brick arches over openings. 3 brick chimneys projecting from wall.	? 18th Century	National Heritage List	High
180	1312986	SU 90377 76757	Yew tree Cottage	Listed Grade II*	Timber frame, part painted render, part painted brick infill. Old tile gabled roof. Rectangular plan of 4 framed bays, including 2 framed bay hall, with one framed bay pent extension at rear and C20 extension on right end. 2 storeys, part one storey. Large ridge chimney, left of centre; chimney at rear on extension.	Medieval	National Heritage List	High
181	1312994	SU 90169 79704	Church of St Michael	Listed Grade II*	Large Parish church. Flint with stone dressings, originally of chalk; steeply pitched, tiled gable roofs. South tower, nave, north and south aisles, chancel, north and south chapels. Tower: flint rubble with chalk dressings. 3 receding stages with angle buttresses of 4 offsets at the southern corners. Square stair turret, slightly projecting, in the north-west angle with the nave, with embattled parapet rising above the embattled parapet of the tower. The doorway in the south wall, restored 1875, has a moulded 2-centred head, and jambs with traceried spandrels within a square external label. Above this is a pointed arch of chalk.	Medieval, 19th Century	National Heritage List	High

182	1317834	SU 96941 87453	The Old Quaker House and Garden Wall	Listed Grade II*	Timber-framed front, brick side; old tile roof. First floor oversails on beam with brackets spaced at intervals. Two storeys and attic. Central small barge-boarded gable rises from wall and breaks into roof. First floor with 4 restored or modern 3-light casements and a pair of small windows. Ground floor with 3 small windows, one restored 3-light and one 4-light window, a modern door and one tripartite window. Small one-storey wing at right angle on right hand. Timber frame with plaster nogging; old tile half-hipped roof. Lean-to on end.	16th Century	National Heritage List	High
183	1319270	SU 97988 76512	Adelaide Cottage	Listed Grade II*	Picturesque. One and 2 storeys, banked site, stucco faced with elaborate pierced bargeboards. Drip moulds and casement windows. South entrance front flanked by paired diagonally set chimneys with stepped bases. Porte cochere. Date in gable. Slate roof. Stepped weathered external chimney. Casement with drip moulds. Verandah with bargeboard eaves on east side with glazing bar.	19th Century	National Heritage List	High
184	1319295	SU 94320 73120	Cranbourne Tower	Listed Grade II*	Polygonal tall red brick tower with taller stair turret, stone copings. Pointed windows with intersecting glazing.	? 18th Century	National Heritage List	High
185	1319297	SU 96053 77289	Railway Bridge carrying the Windsor Slough Line over the Thames	Listed Grade II*	One of his bow and string designs of wrought iron truss girder construction, a forerunner of the final masterpiece at Saltash. 202 ft single span from arcaded brick abutments.	19th Century	National Heritage List	High
186	1319305	SU 97586 76074	Gothic Ruin of Temple by Lake in Frogmore Gardens	Listed Grade II*	One storey with battlements. Perpendicular windows. Early Victorian interior with niches and panelled ceiling	18th Century	National Heritage List	High
187	1319319	SU 97006 76638	Number 4 with Entrance to Black Lion Yard	Listed Grade II*	The entrance to the Yard is a large rectangular opening the height of the ground floor, and the lst, 2nd and attic floors over form part of No 4 but are of different design and are described separately. Late C18 red brick, parapet with stone doping old tile Mansard roof. There is one dormer window in the attic with small moulded cornice and a 2-storeyed shallow bay, stuccoed, with small moulded cornice and lead flat over.	18th Century	National Heritage List	High
188	1319325	SU 96906 77209	St Georges School	Listed Grade II*	London Stock bricks, projecting stone plinth, slate roof. The central part has a Greek Doric loggia of stone columns and entablature carrying upper storey of 11 bays with modillioned stone cornice and small stone parapet with coping. The parapet has a raised central panel with an inscription - FOUNDED BY - TRAVERS ESQ ERECTED MDCCCIII. The building has flanking wings each of 3 bays, of similar general design. Each has a modillioned cornice and pedimented with a stone oval enclosing a coat of arms in the tympanum of the pediment. The 3 ground floor windows are arched, in arched yellow rubber recesses.	19th Century	National Heritage List	High
189	1319329	SU 94556 75139	St Leonards Dale	Listed Grade II*	2 storeys, colourwashed stucco, narrow string at 1st floor level, delicate bracketted and moulded eaves cornice and hipped slate roof (small slates). The walls are colourwashed yellow and the string cornice woodwork, etc are painted white. There are 2 squarewindows on the 1st floor flanking central semi-circular window in stucco fan recess, 2 tall 3-light sash windows on the ground floor With moulded frames each with segmental stucco fan tympanum in segmental headed recess, and tall 6-panelled central door with arched, radiating and wreathed fanlight with moulded architrave round the arch.	18th Century	National Heritage List	High
190	1319337	SU 96740 77189	The Old House Hotel	Listed Grade II*	Painted inscription dates building as being 1676 and records that Sir C Wren apparently lived here. The front appears to be early C18 with later C18 glazing bar sash windows. The main block is set back from street and is of brick on stuccoed plinth with centre break of 3 windows and bracketed cornice and pediment; the flanking bays, each of 2 windows have stone coping on offset shallow brick parapet. Hipped slate roof. Pediment over centre has lunette attic window. Glazed door in wood Tuscan porch of 2 engaged columns, entablature With triglyph frieze, enriched cornice and pediment - moulded stone bases to columns. 3 steps up. Paved forecourt and later C18 wrought iron rails with urn finialed standards to street. Late C18 wing to left hand: 3 storeys and ttic; 1st floor stone sill course, stone cornice and blocking course. Mansard slate roof with 2 dormers. 3 windows to upper floors, 2 on ground floor, glazing bar sashes, flat gauged arches. Door of 6 flush panels to right hand in doorcase of panelled pilasters with carved caps, entablature with dentil cornice and radiating and wreathed fanlight.	17th Century	National Heritage List	High
191	1319371	SU 89752 85369	Tarrystone House, including iron gates and gate piers and adjoining wall	Listed Grade II*	Large town house, now flats. Red brick with vitreous headers, slate roof gabled on left hand section. Rectangular plan with C19 extension in same style on right hand. 2 storeys and cellar. 2 end ridge chimneys, one tall chimney on extension. Moulded brick string at first-floor level, moulded brick cornice over first-floor windows to later parapet with frieze and architrave. Symmetrical 5-bay front in left hand section. Sash windows, with glazing bars and gauged arches. C20 panelled central entrance door in moulded door frame and fanlight with lancet shaped panes. Gauged brick pilasters on each side of door with moulded bases and caps and similar above either side of central window. Moulded brick segemental pediment with brick console brackets below, over door.	18th Century	National Heritage List	High
192	1319441	SU 89384 79289	Braywick House	Listed Grade II*	Large country house with laundry block, now offices. Brick, part painted brick; mansard roof with Cumberland stone slates. Originally rectangular central staircase plan; later laundry block adjoining on north west, extension on south west. 2 storeys and attics, former laundry block one storey, part 2 storey. 3 large chimneys with clay pots in main part. South east front: probably former entrance front. Symmetrical. 7 bays. Moulded brick plinth and string to first floor. Carved wooden cornice. Sash windows with glazing bars, in moulded architraves with stone cills. Recessed centre section of 3 bays and 2 pedimented dormers, middle bay has windows with moulded, eared architraves.	17th Century, 20th Century	National Heritage List	High
193	1321977	SU 97634 79581	Church of St Mary	Listed Grade II*	Church. Decorated Gothic style. Red brick with stone dressings and lacing courses, some banded flint and brick chequer-work, some diaper work, and string courses. Tile roofs with parapeted gable ends and lead aisle roofs. 5 bay nave, aisles, south-west porch, north-west tower, north and south transeptal chapels at west end of nave, lower 2 bay chancel, and south vestry.	19th Century, 20th Century	National Heritage List	High
194	1323741	SU 87755 86895	Noahs House Boathouse	Listed Grade II*	Boathouse and workshop. Monolithic reinforced thin wall construction, rendered and painted white, with flat roof which forms overhanging hood. Modern Movement style. Single storey with first-floor music room. Long rectangular block with curved workshop at landward end and rectangular music room to river. Eleven windows.	20th Century	National Heritage List	High
195	1332434	SU 91035 85125	Balustrade from The Villa Borghese, Rome, to the south of Cliveden	Listed Grade II*	Sections of red Roman brick and stone balusters between stone piers. Moulded stone cornice rail.	19th Century	National Heritage List	High
196	1332613	SU 93916 88964	Temple of Venus at Hall Barn	Listed Grade II*	Open circular building. Six Roman Doric columns, entablature and frieze decorated with swags. Dome. Inside the dome, plaster decoration of putti with vines.	18th Century	National Heritage List	High
197	1332673	SU 91993 84292	Nashdom	Listed Grade II*	Colourwashed stock bricks; machine tiled roof sloping from all sides to lead flat. A symmetrical composition comprising a central single-storeyed entrance bay and 2 flanking bays each of 4 storeys and 5 bays. The entrance bay a portico with Tuscan columns and piers carrying an enta- blature with balustrade.	20th Century	National Heritage List	High

198	1332738	TQ 04089 81362	Bridgefoot House	Listed Grade II*	Brown brick with red brick dressings; old tile roof. Moulded brick cornice with projecting brick course. Three storeys. Ground and first floors with 5 flush segment-headed sashes with keystones. First floor windows with aprons. First and second floor windows with aprons. Second floor windows with flat heads. All windows with glazing bars.	18^{th} Century	National Heritage List	High
199	1380282	SU 95191 76180	1881 Chapel at Convent of St John the Baptist	Listed Grade II*	Chapel of Anglican convent. Red brick. Steeply-pitched slate roof with gabled and hipped ends. Tall 5-bay nave with aisles, chancel and apse. Long and tall chancel with polygonal apse with pierced brick parapet, buttresses with crocketed pinnacles to apse and tall moulded brick 3-light windows with Geometrical tracery under crocketed gables. The roof of the nave is carried down over aisles with turrets in the angles. West gable end has pair of tall 3-light windows with statue in canopied niche between. Elaborate lead-clad fleche on the ridge of the roof.	19^{th} Century	National Heritage List	High
200	1319407	SU91180750 29	New Lodge	Listed Grade II*	Large country house in parkland; now offices. Jacobeen style for the Belgian family Van de Weyer. Stock brick with stone dressings, steeply pitched slate roofs with coped gables. Rectangular plan with courtyard and former service wing on east; many gables on all fronts; water tower on south east. 2 storeys, cellars, and attics. Several chimneys with clustered shafts and spiral ornament; offset and moulded heads. Mullion and transom windows on ground and first floors, casement windows in attic floors; all with hood moulds. Weathered plinth; moulded string course at first and second floors; parapet with stone coping, pierced parapet over bay Windows; stone quoins.	19^{th} Century	National Heritage List	High
201	1117721	SU 95596 77201	Church of St Andrew	Listed Grade II*	Norman church. Flint with stone dressings. Short west tower with shingled breach spire. Norman aisle windows and south arcade with round piers, flat leaf and waterleaf capitals. Similar tower and capitals. The north arcade rebuilt by Woodyer. C14/C15 clerestorey windows. Good Norman font. Reredos designed by Woodyer, tall wood screen.	Medieval, 19^{th} Century	National Heritage List	High
202	1000584	SU 97054 78208	Eton College	Grade II Park and Garden	Eton College occupies the north side of the town of Eton, adjacent to the north bank of the River Thames. The largely level, c 18ha site is bounded to the north by the B3026 Pocock's Lane linking Eton with Datchet, and to the west by the B3022 Slough to Windsor road, part of which forms the north end of Eton High Street. The west boundary is marked at the northern end by a brick wall, incorporated within the remains of Fifteen Arch Bridge standing c 150m north of the main buildings, to the west of which lie further playing fields and college buildings. The south boundary is marked by village buildings, that to the east being formed by the north bank of the River Thames. The setting is partly rural, to the north-west and east, with views north over Agar's Plough towards the M4 and beyond this the urban centre of Slough. Views also extend east over the river and the long, narrow Romney Island to the northern tip of Windsor Home Park (qv). The college is directly overlooked by Windsor Castle and its terrace (qv), standing c 1km south of the site on a commanding promontory.	Medieval, 19^{th} Century	National Heritage List	Medium
203	1000587	SU 97627 75966	The Royal Estate Windsor: Frogmore gardens	Grade I Park and Garden	Frogmore today (1999) lies within Windsor Home Park (qv), lying 1km south-east of Windsor Castle and 500m east of Windsor. The c 15ha, roughly triangular site is largely enclosed by belts of trees, being bounded to the north-east by Frogmore Drive, a former public road linking Windsor and Old Windsor which was closed in 1851; to the west by Frogmore Border Drive, the road to Shaw Farm which was created in the 1790s slightly to the west of an earlier road enclosed within the pleasure grounds; and to the south by parkland into which the serpentine lake emerges, terminating at its southern end around an island. The land is largely level, with artificial mounds on which stand various features. The setting is largely rural, with the Home Park surrounding the estate, the C19 Prince Consort's Home Farm standing adjacent to the east, on the site of the C17 Ranger's Lodge, Shaw Farm buildings standing 400m to the south-west and the vast Royal Gardens lying 400m to the south-east.	18^{th} Century	National Heritage List	High
204	1000592	SU 96569 71487, SU 98582 68851	The Royal Estate Windsor: Windsor Great Park	Grade I Park and Garden	The Great Park, covering undulating, hilly ground, is divided into two unequal halves by the A322, and contains many ancient oak trees, including some which are up to 1000 years old. The west half contains Cranbourne Park to the south, and is laid (1990s) to agricultural land and woodland with rides cut through. Cranbourne Tower stands towards the centre. To the north lies Moat Park, formerly a separate area within Windsor Forest, ornamented during the early C18 as landscaped parkland.	18^{th} Century	National Heritage List	High
205	1000598	TQ 03939 87291	Denham Place	Grade II Park and Garden	The park, shown in part in the 1705 painting with a formal arrangement of trees, now occupies only the north half of the estate, starting 50m north of the house, although in the late C18 (1783 map) it surrounded the house, incorporating the lake, and extending south to the walled garden. It consists (1997) of an open meadow surrounded by a shelter belt on all but the south side, with a circuit walk through it and glimpses of the house to the south. The circuit walk, through mature trees including several pollarded sweet chestnut trees of great girth under-planted with evergreen shrubs including holly, yew, box and ruscus, has been restored (1990s) and may not currently lie on its original course in places. Almost none of the parkland trees shown on the 1783 map in clumps and singles survive, although it is still largely meadow, with orchard trees at the north end, and a small C20 iron railing-bounded cemetery at the west edge.	18^{th} Century	National Heritage List	Medium
206	1000599	SU 92343 85388	Dropmore	Grade II Park and Garden	The gardens lie south and west of the house. South of the garden front an open, largely level lawn is bounded by rhododendron clumps in front of woodland to the south-west and east, with a long view south-east towards Windsor Castle 12km away. The base of a semicircular stone seat (early C20, listed grade II) lies at the south-west corner of the house (stone structure stolen 1997). The park lies south of the house, on lower ground, and retains some clumps and belts of trees, bounded to the west and north by woodland. It contains a golf course (late C20), with a new drive c 1km south-east of the house to give access to the club house within the park.	19^{th} Century	National Heritage List	Medium
207	1000334	SU 94063 88922, SU 94447 89706	Hall Barn	Grade II* Park and Garden	The pleasure grounds are divided into two main sections: the mainly open areas closest to the house to the south-west, south and east, and the area of ornamental woodland adjacent, known as The Grove. The house lies at the north-east edge of the pleasure grounds, but is not directly visually linked into the main part of the design. A lawn, which may once have held a parterre (Elizabeth Banks Associates 1993), links the south front of the house with the sunken area to the south-east which held the C17 Little Canal. This was drained in the early C19 and now carries a lawn with a swimming pool at the east end. To the north of the sunk area is a terrace with, at its east end, a flint and stone pedimented alcove (C18, listed grade II) in the form of a small temple. Large yews surround the area on all sides but the west. A path at the west end leads south into the large, open, Great Terrace, a broad gravel path laid out along the top of a grass slope which runs west down to the Great Canal. East of the Great Terrace is the 1.8ha Yew Grove with many mature yews, some possibly dating from the C17/C18, and further low terraces on its west side.	17^{th} Century	National Heritage List	High
208	1000603	TQ 00906 81782	Langley Park	Grade II Park and Garden	The garden lies close to the house, encircling it on the north, west and south sides, with straight, formal gravel paths, terracing connected by short flights of stone steps and level lawns near to the south and west fronts. Closer to the perimeter is less formal lawn with mature trees and shrubs and curved paths. The north and south boundaries are largely separated from the park by a brick ha-ha, with the west boundary formed by the lake. The formal areas were created between 1882 and 1899 (OS), replacing an informal layout of trees and lawn.	19^{th} Century	National Heritage List	Medium

209	1001255	SU 97478 82506	Stoke Poges Garden of Remembrance	Grade I Park and Garden	Stoke Poges Gardens lie at the southern end of the village of Stoke Poges, adjacent to the C18/C19 landscaped Stoke Park, 3km north-east of the centre of Slough. The c 9ha roughly triangular site is bounded to the east by Church Lane from Stoke Poges to Slough, to the west by the east drive to Stoke Park House leading off this road north-west, and to the north by the north lake of Stoke Park and parkland to the east of it leading to the parish churchyard. The main path continues west from the circular pond and the steps up to the entrance to the Formal Gardens. Three paths extend off each side of the main walk, to north and south, providing access to the yew-hedged areas which line either side of the central path. They are intricately planned and are kept as memorials to individuals or family groups. At the eastern end of the northern panel of Formal Gardens is the memorial to Noel and Helen Mobbs, entered through an elaborate iron gate. It is balanced at the eastern end of the southern panel of Formal Gardens by a memorial to the Gurkhas.	20th Century	National Heritage List	High
210	1001290	SU 99858 78078	Ditton Park	Grade II Park and Garden	Ditton Park lies to the south-east of Slough in the hamlet of Ditton. The site is defined by residential development to the north, open farmland to the west, Ditton Park Road to the east, and to the south by Riding Court Road and Farm, the adjacent research station (built on part of the former parkland) and the M4. The house stands set within a 6ha rectangle of pleasure grounds enclosed by a moat. The present moat is first shown on the 1718 survey, at which date the land within was laid out with complex formal gardens. At its north-west corner the moat is extended as a pool with an island, formed between 1718 and 1725 from an earlier fishpond. This is dammed at Gibraltar Bridge, perhaps named in commemoration of the end of the Siege of Gibraltar in 1783, west of which is a long informal canal extending across the park to Longmead Bridge. Below the south front of the house is a lawn, while the western half of the area is laid out with wooded walks. A brick-walled garden which survives from the early C18 scheme (walls listed grade II) occupies the south-east corner of the moated enclosure. On the outer face of its west wall is a brick-built summerhouse (listed gr	18th Century	National Heritage List	Medium
211	1001371	SU 98622 87282	Bulstrode Park	Grade II* Park and Garden	Bulstrode Park lies adjacent to the west edge of Gerrards Cross, 4km east of Beaconsfield, in the Chiltern Hills. The c 140ha site is bounded to the north by the A40 London to Oxford road, to the east by C20 housing surrounding the Old Camp hillfort (scheduled ancient monument), originally part of the landscape park, to the south by the M40 motorway and to the west by gravel workings. The gardens lie west and south of the house, being formal in style close to the house and becoming less so further away. The main formal feature lies on the west front, dating from the 1860s/70s. Below the west front, overlying the cellars of the earlier building, lie two rectangular, sunk parterres with stone steps down to the north and south sides, separated by a grass bank with traces of a gravel path along its length. This area is dominated by the Gothic Keep or Pigeon House (James Wyatt 1805, listed grade II) on the west side of the garden, which separates the lime avenue beyond from the west front of the house.	17th Century	National Heritage List	High
212	1001373	SU 91160 85836	Hedsor House	Grade II Park and Garden	Hedsor Park lies 3km south-east of Bourne End and 10km north of Maidenhead, above a loop in the River Thames which lies south of Bourne End. The c 85ha site is bounded to the south and west by Bourne End Road, to the north-west by the former White Hill lane and Harvest Hill lane, and to the east by Cliveden Road, being located on undulating Chiltern Hills, including a scarp and associated plateau on which the House stands. The House is linked to formal gardens to the south-east and north, created c 1900-7 and after, before which there appear to have been no formal garden areas. The garden to the south-east forms a series of contiguous rectangular features bounded to the north by clipped yew hedges and includes a former rose garden and lily pool garden, now largely having lost their detail and a hard tennis court having been placed over part of the rose garden.	18th Century	National Heritage List	Medium
213	1001435	SU 97056 72020	The Royal Estate Windsor: Royal Lodge	Grade I Park and Garden	Royal Lodge lies towards the centre of Windsor Great Park, c 5km south of Windsor Castle. The c 40ha landscape surrounding the Lodge is enclosed by the Great Park, and bounded to the south-east by the estate road connecting Sandpit Gate on the western boundary of the Great Park with Bishop¿s Gate on the eastern boundary. The Lodge is largely enclosed by woodland, some remaining from the C18 and early C19, and is divided into two sections: that to the east of the Lodge consists largely of open woodland and informal lawns; to the west and south-west of the Lodge lies the garden, surrounded by further woodland.	18th Century	National Heritage List	High
214	1001436	SU 96551 70894	The Royal Estate Windsor: Cumberland Lodge	Grade I Park and Garden	Cumberland Lodge lies towards the centre of Windsor Great Park, c 6km south of Windsor Castle. The c 120ha landscape surrounding the Lodge is enclosed by the Great Park, and bounded to the north by the road connecting Sandpit Gate on the west boundary of the Great Park to Bishop's Gate on the east boundary. The informal gardens, laid largely to lawn, lie to the west and south-west of the house. The lawn extends from the west, garden front to a fence dividing it from the parkland beyond, and south into a wooded area planted with mature evergreen shrubs including rhododendron and laurel. The Wilderness woodland lies south of the garden, separated from it by a field. The woodland is bisected by a curving path running southwards, and contains many mature limes and two small ponds lying adjacent to each other towards the centre of the area. Views extend west from the western boundary of the woodland over the associated parkland and Meadow Pond towards the distant Great Park.	17th Century	National Heritage List	High
215	1001648	SU 97614 79174	Herschel Park (Formerly Upton Park	Grade II Park and Garden	Herschel Park lies in the southern suburbs of Slough, in the parish of Upton, c 1km south of the town centre and railway station. The park, situated on land which slopes gently down from north to south, is the focal element of what began as a 13ha residential development built over some twenty years from the 1840s. Of this 13ha it appears that only c 9ha was actually developed in the C19. The 3.5ha, roughly rectangular park lies at the south boundary of this development. It is bounded to the west by an estate road, the west side of which is occupied by West Villas, to the north by the houses and former gardens of Victoria Terrace, to the east by an estate road leading to Spring Cottage set in its own grounds, and on the east side of this road by East Villas and The Mere. To the south the site is bounded by a small stream, screened from the park by a mixed tree and shrub belt. Herschel Park is of compact, informal design, laid largely to lawns and planted with scattered specimen trees in variety. Some of the trees may be of the original 1840s planting, amongst which are several varieties of oak, including Lucombe, holm, Turkey, and cork. The site is enclosed by a perimeter belt of trees and laid out with an informal network of paths, some of which in the eastern half have been grassed over.	19th Century	National Heritage List	Medium

Appendix G-2

Gazetteer of Conservation Areas

Appendix D-2

Gazetteer of Conservation Areas within 5km of the Proposed Development Site

Site Name	Designation
Boveney Conservation Area	Conservation Area
Burnham Conservation Area	Conservation Area
Farnham Royal Conservation Area	Conservation Area
Framewood Road Conservation Area	Conservation Area
Stoke Poges West End Conservation Area	Conservation Area
Stoke Green Conservation Area	Conservation Area
Stoke Park Conservation Area	Conservation Area
Taplow Conservation Area	Conservation Area
Taplow Riverside Conservation Area	Conservation Area
Mill Lane (Clewer Village) Conservation Area	Conservation Area
Conservation Area	Conservation Area
St Bernard's School Conservation Area	Conservation Area
Sussex Place/Clifton Road Conservation Area	Conservation Area
Huntercombe Conservation Area	Conservation Area
Dorney Conservation Area	Conservation Area
Upton Park/Upton Village Conservation Area	Conservation Area
Eton Conservation Area	Conservation Area
Windsor Town Centre Conservation Area	Conservation Area

Appendix H-1

Phase 1 Habitat Report

Slough Heat and Power

Extended Phase 1 Habitat Survey

Job Number: 46369029

Prepared for:
SSE Generation Ltd

UNITED KINGDOM & IRELAND

Rev	Date	Details	Prepared by	Checked by	Approved by
1	July 2011	Draft	GR Consultant Ecologist	SP Technical Director	MD Project Manager
2	September 2013	Update	PP Senior Ecologist	RH Principal Environmental Consultant	RH Principal Environmental Consultant

URS Infrastructure & Environment UK Limited
St George's House, 5 St George's Road
Wimbledon, London
SW19 4DR
United Kingdom
Tel: +44 (0)20 8944 3300
Fax: +44 (0)20 8944 3301
[redacted]

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1. EXECUTIVE SUMMARY

URS completed a desk study and an extended Phase 1 Habitat Survey at the Slough Heat and Power (SHP) facility to provide an assessment of ecological constraints. Records of statutory and non-statutory sites, UK Biodiversity Action Plan Priority Habitats and records of protected and notable species were sourced for the site and surrounding area. The extended Phase 1 habitat survey was completed in June 2011 and was updated in 2013.

The review identified no designated sites within the boundary of the site. There are two statutory and three non-statutory sites within 2km of the site. There were no bat records within 2km of the site. Green woodpecker was the only notable or protected bird species recorded within 2km of the site. A number of notable invertebrate species have also been recorded within 2km.

The site contains a range of industrial buildings and surrounding habitats. The industrial buildings are connected with energy generation, including boiler houses, turbine halls, switch rooms, a control room, offices and various other ancillary buildings and structures. There are areas of amenity planting around the perimeter of the site. There are also some scattered trees, a species-poor hedgerow and areas of introduced shrub.

Use of land for temporary laydown areas and a contractor's compound will be required. These may be accommodated onsite, although the Contractor may prefer to use offsite locations within the Slough Trading Estate if land is available. Potential use of off-site laydown or contractors compound include, for example, the vacant building immediately east of the SHP site, Baden House (Buildings 343-350), along Edinburgh Avenue which may be available for use as contractor accommodation, and the adjacent plots of the Former Metal Colours site immediately to the south of the SHP site which could potentially be used for laydown areas during demolition and construction, subject to availability and agreement of commercial terms.

The cooling towers site to the north of Edinburgh Avenue contains two natural draught cooling towers, surrounded by a mosaic of ephemeral/short perennial vegetation, bare ground and tall ruderal vegetation.

The following ecological surveys were recommended and completed on the dates shown:

- Bat roost scoping and inspection surveys of buildings between May and August 2011 and July 2013; and
- Breeding bird survey, especially for peregrine falcons, between March and June 2011.

These protected species surveys are presented in a separate report.

2. INTRODUCTION

2.1 Background

SSE proposes to submit a planning application for the development of a Multifuel Combined Heat and Power (CHP) facility within the Slough Heat and Power (SHP) site (herein referred to as the *'Proposed Development'*). The site is located in Slough and is centred at Ordnance Survey (OS) grid reference SU953814.

URS was commissioned by SSE to undertake an ecology survey to identify ecological constraints and inform the Ecology Chapter of an Environmental Statement, which will be submitted in support of a future planning application.

3. METHODOLOGY

3.1 Desk Study

URS commissioned Thames Valley Environmental Record Centre (TVERC) to complete a data search for statutory and non-statutory sites, UK Biodiversity Action Plan (BAP) Priority Habitats (Ref. 1) and records of protected and notable species, from the site and surrounding area (Ref. 2). Information on designated sites and the majority of the species records were requested from within a 2 kilometre (km) radius from the site. However, bat records were requested from within a 5km radius of the site because bats are mobile and use a large area to fulfil their roosting and feeding requirements. The majority of bird records held by TVERC, except those in the north of the county, have been provided by the Oxford Ornithological Society. Records of statutory sites provided by TVERC were verified using the MAGIC (Ref. 3) and Natural England's Nature on the Map (Ref. 4) websites.

The northern extent of the 2km search area falls within Buckinghamshire (Figure 1), as well as the northern part of the 5km data search for bats. TVERC only holds records for Berkshire and Oxfordshire. This was not considered to be a significant limitation, as the majority of the 2km and 5km search areas fall within Berkshire.

3.2 Extended Phase 1 Habitat Survey

An extended Phase 1 Habitat Survey was completed in June 2011 and updated in July 2013. The site included the existing SHP facility and adjacent areas. This comprises a fenced area to the north of the existing SHP facility, opposite Edinburgh Avenue, which contains two operational, natural draught cooling towers. This area is referred to as the cooling towers site. It also encompasses an area of land to the south of the existing SHP facility that could be used for laydown during construction of the Proposed Development.

The survey followed the Joint Nature Conservation Committee (JNCC) Phase 1 Survey Guidelines (Ref. 5). The habitats on site were classified and mapped according to the Phase 1 habitat survey methodology and the survey was 'extended' to also assess the potential of the site to support protected and notable species. Incidental faunal observations were recorded during the survey. Target notes were recorded on the map and described, in order to provide supplementary information on habitats or features of interest. The survey included a search for invasive species, such as Japanese knotweed (*Fallopia japonica*). Furthermore, the surveys were carried out within the optimal period for habitat surveys (May to September) and the weather was dry and warm.

4. RESULTS

4.1 Desk Study

There are no Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Sites of Special Scientific Interest (SSSIs) or National Nature Reserves (NNR) within a 2km radius of the site. There are two statutory sites within 2km of the site; these are Cocksherd Wood and Haymill Valley Local Nature Reserves (LNR) (Figure 1).

Cocksherd Wood LNR - This small ancient woodland site is located at OS National Grid reference SU946829, approximately 1.38km northwest of the site. It covers an area of 4ha. It contains beech (*Fagus sylvatica*) woodland in association with the well-drained, thinner soils found on the chalk running along the northern edge of the site, which has a sparse shrub layer and ground flora. It also supports pedunculate oak (*Quercus robur*) woodland on the heavier, damper soils found on the clays of the Reading beds that dominate the central part of the site. This area has some ash (*Fraxinus excelsior*) with an understory of hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*) and elder (*Sambucus nigra*). The ground flora includes bluebell (*Hyacinthoides non-scripta*), wood anemone (*Anemone nemorosa*) and violets (*Viola* sp.). The southern edge of the wood is dominated by suckers of English elm (*Ulmus procera*). There are also small areas of rough grassland with scrub in the west of the site.

Haymill Valley LNR – This LNR is the closest designated site, located at OS National Grid reference SU943817 approximately 0.88km west of the site. It covers an area of 8.67ha and comprises an area of marshy wet woodland, reedbed, streams and open water. The site lies in a shallow valley that runs from the north edge of Slough. In the past, the water has been managed to power a mill and the present open water and reedbed occupy the old millpond. The site is described as a valuable haven for wildlife within Slough.

4.2 Non-Statutory Sites

There are three non-statutory sites located within 2km of the site (Figure 1). Two of these are described above: Cocksherd Wood Local Wildlife Site (LWS); and Haymill Valley LWS and Berkshire, Buckinghamshire & Oxfordshire Wildlife Trust (BBOWT) site. All of Cocksherd Wood LWS is also designated as an LNR and the majority of Haymill Valley LNR is designated as an LWS and BBOWT site. There is one additional non-statutory site within 2km of the site, which is Boundary Copse Woodland Trust Reserve (WT). This site is described below.

Boundary Copse WT – This is 1.23ha woodland, which originated from the remains of a large private garden.

The update data search undertaken in 2013 revealed that, in addition to the above, Haymill Valley Biodiversity Opportunity Area (BOA) and Bray to Eton Pits & Meadows BOA were located within 2km

4.3 Protected and Notable Species

4.3.1 Mammals

TVERC holds no mammal records within 2km of the site for the past 10 years.

4.3.2 Birds

Only green woodpecker (*Picus viridis*) has been recorded within 2km of the site over the past 10 years. This species is listed on the Royal Society for the Protection of Birds' (RSPB) Amber list of Birds of Conservation Concern (BoCC) (Ref. 6).

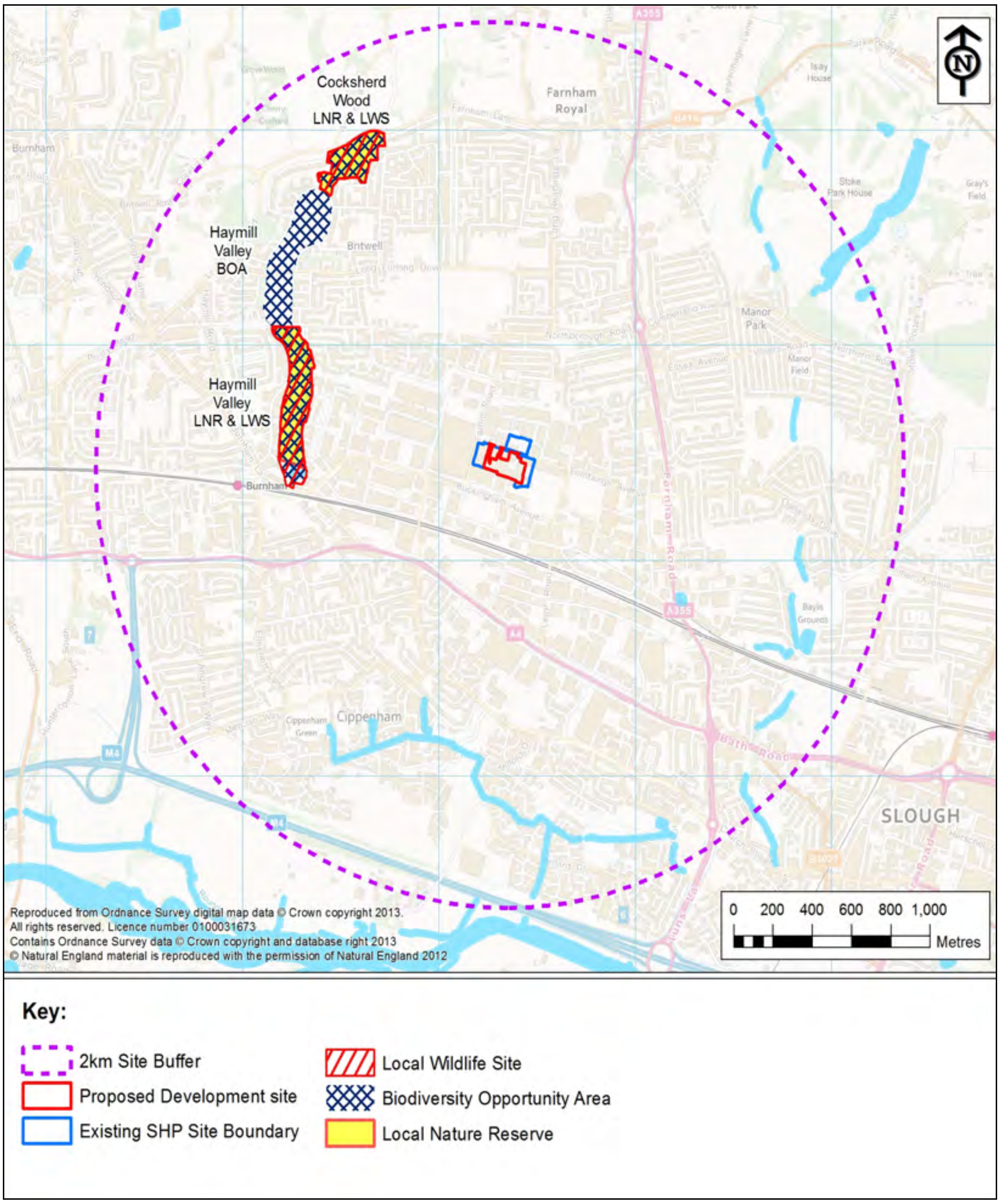
4.3.3 Herpetofauna

TVERC holds no herpetofauna records within 2km of the site over the past 10 years.

4.3.4 Invertebrates and Plants

Bluebell (*Hyacinthoides non-scripta)* has been recorded in Haymill Valley and Cocksherd Wood. This species is protected from sale under Section 13 of the Wildlife and Countryside Act 1981 (as amended) (WCA) (Ref. 7). Stag beetle (*Lucanus cervus*) and a few species of moth have also been recorded in Haymill Valley, including small phoenix (*Ecliptopera silaceata*) and white ermine (*Spilosoma lubricipeda*). White letter hairstreak (*Satyrium w-album*) and small heath (*Coenonympha pamphilus*) were also recorded at SU943814, within Slough Trading Estate. These records are located approximately 900m west of the site, adjacent to Haymill Valley. These species are protected under Section 41 of the NERC Act 2006 and are listed on the UK BAP. Stag beetle is also protected from sale under the WCA.

Figure 1: Designated Sites within 2km



4.4 Extended Phase 1 Habitat Survey

4.4.1 Land Use

The existing SHP facility contains various industrial buildings connected with energy generation including boiler houses, warehouses and associated offices, as well as some areas of amenity planting around the perimeter. The proposed laydown areas contain two hoarded areas, which are primarily bare ground, as well as an area of hardstanding. There are also small areas of amenity grassland with scattered trees to the south of one of the hoarded areas. The cooling towers site contains two natural draught cooling towers, surrounded by fencing.

4.4.2 Habitats

The Phase 1 habitat types that were recorded during the survey are described below.

4.4.3 Dense Scrub

An area of dense scrub was recorded growing over the eastern boundary fence of the cooling towers site. This was dominated by bramble (*Rubus fruticosus* agg.), with frequent woody nightshade (*Solanum dulcamara*).

4.4.4 Broadleaved Scattered Trees

Four young to semi-mature hybrid black poplar (*Populus x canadensis*) trees were recorded to the south of the car park in the northeast corner of the SHP facility. One wild cherry (*Prunus avium*) was recorded within introduced shrub in the northeast corner of this car park, with a further five adjacent to (outside) the boundary of the site. Ten young whitebeam (*Sorbus sp*) trees were also noted within an area of amenity grassland within the SHP facility, adjacent to the site building labelled Building 27 (B27) in Figure 2. Six semi-mature Norway maple (*Acer platanoides*) trees were recorded within areas of amenity grassland to the southeast and southwest.

4.4.5 Tall Ruderal

Tall ruderal vegetation was recorded around the perimeter of the cooling towers site. This was dominated by field horsetail (*Equisetum arvense*), with a wide range of species recorded occasionally, including creeping thistle (*Cirsium arvense*), petty spurge (*Euphorbia peplus*), stinging nettle (*Urtica dioica*), and hogweed (*Heracleum sphondylium*). Rarely noted species included common ragwort (*Senecio jacobaea*), black nightshade (*Solanum nigrum*) and yarrow (*Achillea millefolium*). Local abundant species were mugwort (*Artemisia vulgaris*) and rat's tail fescue (*Vulpia myuros*), with locally frequent perennial sow thistle (*Sonchus arvensis*).

A strip of tall ruderal vegetation was also noted growing through the edges of hardstanding car park in the eastern part of the SHP facility. Numerous species were occasionally recorded, including creeping thistle, hedge mustard (*Sisymbrium officinale*), woody nightshade and Yorkshire fog (*Holcus lanatus*). Wall barley (*Hordeum murinum*) was locally abundant. Rarely noted species included opium poppy (*Papaver somniferum*) and common ragwort. A strip of tall ruderal vegetation was recorded along the eastern boundary of the site and north of the fenced off area. Creeping thistle was abundant, with frequent field horsetail and creeping buttercup (*Ranunculus repens*). Occasional species included Yorkshire fog, hedge mustard and broad-leaved dock (*Rumex obtusifolius*). A small patch of tall ruderal vegetation dominated entirely by great willowherb (*Epilobium hirsutum*) was also noted in a damp area in the corner adjacent to B26.

4.4.6 Amenity Grassland

Patches of amenity grassland were recorded adjacent to the car park north of B20. This was dominated by annual meadow grass (*Poa annua*), with frequent hop trefoil (*Trifolium campestre*) and rough hawkbit (*Leontodon hispidus*). Occasional species were perennial rye grass (*Lolium perenne*), common bent (*Agrostis capillaris*) and wall barley, with rarely noted species including common ragwort, smooth sow thistle (*Sonchus oleraceus*) and groundsel (*Senecio vulgaris*). Another area of amenity grassland was recorded adjacent to B27, at the western end of the site. This was also dominated by annual meadow grass, with frequent autumn hawkbit (*Leontodon autumnalis*) and occasional species including yarrow, cocksfoot (*Dactylis glomerata*) and daisy (*Bellis perennis*). Rare species included dandelion (*Taraxacum officinale*), meadow buttercup (*Ranunculus acris*) and hogweed.

In the 2013 Extended Phase 1 Habitat survey, there were two small areas of amenity grassland in the south of the Former Metal Colours site (Figure 2). These areas were dominated by annual meadow grass, with occasional yarrow, hop trefoil, cocksfoot and daisy and common mallow (*Malva sylvestris*) recorded rarely. Amenity grassland was also noted to the south and southwest of B22 along with the surrounding hardstanding. Annual meadow grass was dominant, with abundant ribwort plantain (*Plantago lanceolata*), frequent yarrow and daisy and occasional red fescue (*Festuca rubra*).

4.4.7 Ephemeral/Short Perennial

This habitat type was recorded within the cooling towers site. A wide variety of species were recorded in this area, including species typically associated with wasteland and disturbed ground. Black medick (*Medicago lupulina*) and rat's tail fescue were abundant, with creeping thistle, creeping cinquefoil (*Potentilla reptans*), daisy, dandelion and autumn hawkbit seen occasionally. Rarely noted species included wall barley, annual meadow grass, bramble, annual wall rocket (*Diplotaxis muralis*) and hedge bindweed (*Calystegia sepium*). Common fleabane (*Pulicaria dysenterica*) was locally abundant. A small area of ephemeral/short perennial vegetation was recorded immediately south of B6. Common ragwort and narrow leaved pepperwort (*Lepidium ruderale*) were frequent, with petty spurge and smooth sow thistle recorded rarely.

Figure 2: Extended Phase 1 Habitat Map

4.4.8 Introduced Shrub

Frequent firethorn (*Pyracantha coccinea*) and wall cotoneaster (*Cotoneaster horizontalis*) was recorded along the northern fence line of the cooling towers site. Beds of introduced shrub were recorded around car parking areas. A range of ornamental species were recorded, as well as some self-seeded species, including abundant Aaron's beard (*Hypericum calycinum*) and firethorn, frequent rosemary (*Rosmarinus officinalis*) and occasional wall cotoneaster and hedge bindweed. Rarely noted species included butterfly bush (*Buddleja davidii*), ornamental rose (*Rosa* sp.) and wall barley. Scattered stands of butterfly bush were also recorded within the potential laydown area immediately to the south of the existing SHP facility.

4.4.9 Species-Poor Intact Hedge

Two hedges were recorded within the site: a beech hedgerow adjacent to B27; and a firethorn hedge above a wall to the south of B22.

4.4.10 Buildings

A total of 45 buildings were recorded within the site. This included two concrete cooling towers (B18) in the northern part of the site; one of these was encased in metal sheeting at the base. There are two concrete chimneys (B18), two office buildings (B20, and the northern section of B27) and various modern metal-framed warehouses and boiler houses within the SHP facility.

There are also numerous ancillary single and two-storey brick buildings associated with the SHP facility and the sites to the south of the existing SHP boundary. The majority of these have flat roofs; however a number of pitched-roof buildings were recorded, including B1, B7, B9 and B10. The majority of the buildings were in use, with the exception of a small brick building sub-station associated with the Former Metal Colours site to the south of the Proposed Development Site.

4.4.11 Other Habitats

Large areas of bare ground were recorded within the sites to the south of the SHP facility. Fencing was recorded around much of the boundary of the site, as well as sectioning off certain areas of the site. Hoarding around the two sites to the south of the existing SHP facility has also been labelled as fencing on Figure 2. Short sections of brick and concrete wall were recorded within the site. Large areas of hardstanding were also recorded within the SHP facility.

4.4.12 Target Notes

The following target notes are shown as TN1-6 on Figure 2 and provide supplementary information on habitats or features of interest:

1. In 2011 peregrine falcon (*Falco peregrinus*) were recorded calling from ledge of top explosion relief vent on the east façade of B17;
2. The cryogenic energy storage is a temporary (2 years) test facility;
3. Portacabin;
4. Portacabins;

5. Fibreglass; and

6. Metal tanks.

5. ASSESSMENT AND RECOMMENDATIONS

5.1 Bats

The modern, metal framed warehouses and boiler houses are not considered to offer features that could support roosting bats, such as crevices and voids. However, certain buildings on the site were considered to offer potential roosting habitat for bats. This includes B1, B7, B9 and B10. These are brick buildings with pitched roofs, which could have roof voids that are accessible to bats and could therefore provide roosting habitat. Sections of the lead flashing were also lifted at the northern gable end of B10. Holes were noted in the eastern elevation of B25 near to the roof, where it appears that wooden poles have been installed in the wall, which have degraded, providing potential access for bats into crevices in the walls. Lifted barge boards on this building also provide potential crevices for roosting bats. Furthermore, a section of lifted roofing felt was noted on the southeast corner of B26, which could offer crevices for roosting bats. These buildings would need to be demolished to facilitate the Proposed Development.

All species of bat are European Protected Species (EPS), receive full protection under the WCA and the Conservation of Habitats and Species Regulations 2010 (Ref. 8) (as amended) (Habitat and Species Regulations). Several species of bat are also Priority Species on the UK BAP, including soprano pipistrelle (*Pipistrellus pygmaeus*) and noctule. Noctule and brown long-eared bat are also listed under Section 41 of the NERC Act 2006 (Ref. 9) as species of principal importance in conserving biodiversity in England (Ref. 10).

Bat roost surveys were recommended and subsequently undertaken in 2012 according to current bat survey guidelines (Ref. 11). No evidence of roosting bats was recorded and no further surveys or mitigation is required for bats. The bat survey is presented in a separate report.

5.2 Reptiles

The site is not considered to have the potential to support reptiles. The areas of tall ruderal vegetation are not suitable to support reptiles, as they are small and surrounded by buildings and hardstanding. There are also no reptile records from within 2km of the site over the past 10 years.

5.3 Amphibians

The only waterbodies located within the site are within the cooling towers. Due to disturbance associated with their use as cooling towers, as well as the lack of connectivity to suitable terrestrial habitat, concrete form and lack of bank side and aquatic vegetation, these were not considered suitable to support notable or protected herpetofauna, including great crested newt (*Triturus cristatus*). There are also no records within 2km of the site.

5.4 Birds

The buildings, trees, dense scrub and introduced shrub provide nesting habitat for birds. This may include notable species that have been recorded in the local area, such as house sparrow and possibly black redstart (*Phoenicurus ochruros*). The results of the survey also indicate that the pair of peregrine falcon could hold a breeding territory at the site, which could be centred on the eastern elevation of B17. The ledges on the explosion relief vents provide suitable nesting habitat for this species, as well as ledges on other buildings on the site, including the chimneys.

It is an offence under the WCA 1981 (as amended) to kill, injure or take any wild bird or to take damage or destroy the nest of any wild bird while that nest is in use or being built. It is also illegal to intentionally disturb any wild bird listed on Schedule 1 while it is building a nest or is in, or near a nest containing eggs or young or to disturb the dependent young. Both peregrine falcon and black redstart are listed on Schedule 1.

A breeding bird survey was recommended and subsequently undertaken in 2012. The findings are presented in a separate report and summarised here. No evidence of peregrine nesting on the site was recorded. Three species exhibited breeding behaviour were on site: feral pigeon, wood pigeon and dunnock. The territory of the dunnock included the car park area of site as well as areas to the north and east of site. The feral pigeons and wood pigeons were nesting in the buildings on site including those areas proposed for development.

It is recommended that building demolition and vegetation clearance is undertaken between October and February to avoid the bird nesting season.

Invertebrates

The habitats within the site are not considered to have the potential to support notable or protected invertebrates, including those recorded within 2km of the site. This is partly on account of the built up and industrial context of the site, but also due to the lack of suitable habitats within the site.

The cooling towers site contains an area of brownfield habitat, characterised by a mosaic of ephemeral/short perennial vegetation, bare ground and tall ruderal vegetation. The two sites to the south of the existing SHP are only recently cleared and dominated by bare ground. However, the vegetation within these areas would be expected to become increasingly varied and extensive over time if left unmanaged, which could support notable and protected invertebrates. It is recommended that these areas are regularly managed to prevent habitat development. Provided that these areas are subject to regular management, no invertebrate survey work is considered necessary at this time.

5.5 Plants and Habitats

As highlighted above, the cooling towers site contains an area of brownfield habitat. *‘Open mosaic habitats on previously developed land’* is a UK BAP Priority Habitat. The assemblage of plant species recorded during the survey, including rat’s tail fescue, indicates that land has been recently disturbed. Brownfield habitats are considered to be worthy of conservation efforts in the UK on account of the mosaic of species and communities at different stages of succession that enrich the urban environment.

The two sites to the south of the existing SHP facility do not currently support brownfield habitats, but would be expected to in the future in the absence of management or development.

No notable or protected plants were recorded during the survey. However, an invasive species listed in Part II of Schedule 9 of the WCA was noted. Plants listed in Part II are invasive species that are considered to pose a threat to our native biodiversity and ecosystem and it is considered to be an offence for any person to plant or otherwise cause to grow in the wild any plant on the list. Wall cotoneaster was recorded during the extended Phase 1, however, the presence of this species is not considered a significant constraint, considering that this species has been planted on managed land, where it is expected that the spread of the plant will be limited, and where the plant is not having an appreciable adverse impact on habitats and their native biodiversity (Ref. 12). This species should therefore continue to be managed regularly.

6. REFERENCES

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Appendix H-2

Bat Report

URS

Slough Heat and Power Multifuel Facility

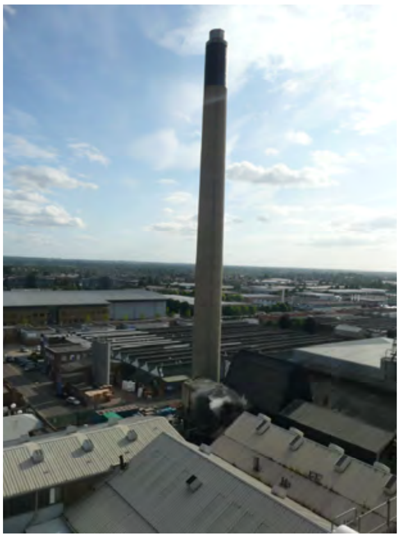
Bat Report

11th October 2012

46369029

Prepared for:
SSE Generation Ltd

UNITED KINGDOM & IRELAND



REVISION RECORD

Rev	Date	Details	Prepared by	Reviewed by	Approved by
1	05.10.12	Draft	Laura Cobden Graduate Ecologist	Gemma Russell Ecologist	Rachel Holmes Principal Environmental Consultant
2	11.11.12	Final	Laura Cobden Graduate Ecologist	Gemma Russell Ecologist	Rachel Holmes Principal Environmental Consultant

URS Infrastructure & Environment UK Limited
St George’s House, 5 St George’s Road
Wimbledon, London
SW19 4DR
United Kingdom

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The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by URS has not been independently verified by URS, unless otherwise stated in the Report.

The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken between 21st June and 5th October 2012 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

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Where field investigations are carried out, these have been restricted to a level of detail required to meet the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in issuing this Report.

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1. INTRODUCTION

1.1 Background

This Bat Report has been prepared by URS Infrastructure & Environment UK Limited (URS) on behalf of SSE Generation Ltd (the Applicant), which is seeking planning permission from Slough Borough Council (SBC) for the demolition and removal of redundant generating plant and buildings and the development of a multifuel combined heat and power (CHP) facility at the Site (herein referred to as the 'Proposed Development').

The Site is located within the existing Slough Heat and Power (SHP) site within the Slough Trading Estate, 342 Edinburgh Avenue, Slough, SL1 4TU (Ordnance Survey (OS) grid reference SU953814)

An extended Phase 1 habitat survey was undertaken at the site in August 2011 and a data search was conducted (Ref. 1). It was concluded that some of the buildings on the site had a potential to support roosting bats. As such, it was recommended that a building inspection and bat emergence and return surveys be undertaken to assess the presence or likely absence of bats on the site.

1.2 Scope of Work

URS was appointed to undertake a bat inspection survey and bat emergence and return surveys, the findings of which are presented in this report. This report outlines the methods and results of these surveys and details any requirements for further survey work. It also identifies mitigation and compensatory measures that should be implemented to ensure that the Proposed Development proceeds in accordance with wildlife legislation.

1.3 Legislative and Biodiversity Context

1.3.1 Bats

All UK native bat species and their roosts (whether bats are present or not) are protected under the Conservation of Habitats and Species Regulations 2010 (Ref. 2) and under the Wildlife and Countryside Act 1981 (Ref. 3) (as amended). Taken together, under this legislation it is an offence to:

- Deliberately, intentionally or recklessly capture, injure or kill a bat;
- Damage/destroy, a breeding site or resting place of a bat (N.B. this is an offence whether the act is deliberate or not);
- Deliberately, intentionally or recklessly disturb a bat; or
- Intentionally or recklessly disturb access to any structure which a bat uses for shelter or protection.

A bat roost is defined as *'any structure or place, which is used for shelter or protection' or a 'breeding site or resting place'*. Because bats commonly return to roosts after periods of absence, the roosts are protected even when the bats are not resident.

Given the above legislation, the potential presence of bats at a site represents a material consideration in the planning process and there is a legal responsibility placed on the developer to ensure that a Natural England licence (Ref. 4) is obtained to cover any works that have the potential to result in an offence under the above legislation.

2 METHODOLOGY

2.1 Bat Inspection Survey

External and internal building inspections were conducted by FOA Ecology Ltd on 21st June 2012. This involved an external inspection of the buildings within and adjacent to the site and an internal inspection of those considered to have the potential to support roosting bats (access permitting). The site and the survey area are shown on Figure 1.

The survey was conducted by an experienced bat surveyor who holds a Natural England licence to disturb roosting bats in accordance with the Bat Conservation Trust's (BCTs) Good Practice Guidelines for Bat Surveys (Ref. 5).

2.1.1 External Inspection

Close focusing binoculars were used to conduct an external assessment of the buildings. All potential bat access/egress points and features with the potential to support roosting bats (e.g. cracks, crevices, roof voids) were identified and recorded along with any evidence which may have indicated the location of roosts, such as:

- Stains around entrance holes (resulting from the deposition of oil secretions in bat fur);
- Scratch marks around entrance holes (resulting from bat claw holds);
- Bat droppings;
- Feeding remains; and
- Odours or noise characteristic of bats.

2.1.2 Internal Inspection

An internal inspection of fifteen of the buildings namely: B8; B10; B15; B16; B18; B19; B21; B22; B28; B30; B32; B33; B34; B46; and B47 was conducted. This included an internal inspection of the roof space of B16. During the inspection, floors, surfaces and beams were examined using a powerful torch for any droppings, urine staining, feeding remains and other signs of roosting bats.

2.1.3 Assessment of Bat Potential

A level of bat potential was assigned to the buildings based on the findings of the external and internal inspections and an assessment of the suitability of the site and surrounding habitat to support foraging and commuting bats, in accordance with the BCT guidelines (Appendix A).

2.2 Bat Emergence and Return Survey

An emergence and return survey was undertaken on the site on 21st August and 22nd August 2012, in accordance with the BCTs guidelines. Two surveyors were stationed around the buildings that were deemed to have a low potential to support roosting bats following the bat inspection survey (B10, B15, B16, B18, B19, B22, B23, B30, B52 and B53).

The surveyors were positioned in key locations around the buildings, observing potential access/egress points for bats that were identified during the extended Phase 1 habitat survey. The locations of the surveyors are shown in Figure 1. The surveyors were equipped with Batbox Duet detectors attached to Roland Edirol R-09 portable stereo recorders. The Edirol data was analysed using Bat Scan, with reference to current guidelines (Ref. 5). The dates, times and weather conditions during the bat survey are provided in Table 1.

Table 1: Conditions during the Bat Emergence and Return Surveys

Date	Type of Survey	Time of Sunset/Sunrise	Start – Finish Times	Weather Conditions
21.08.12	Dusk	20:12	19:59 - 21:42	Minimum temperature 16.2°C. 7/8 cloud cover
22.08.12	Dawn	06:00	04:22 - 06:00	Minimum temperature 11.7 °C. 2/8 cloud cover

2.2.1 Limitations

The bat surveys were completed within the appropriate survey period and during suitable weather conditions. There were therefore no limitations to these surveys.

3 RESULTS

3.1 Inspection Survey

Following the bat inspection survey, a total of ten buildings were determined to have a low potential to support roosting bats. These are B10, B15, B16, B18, B19, B22, B23, B30, B52 and B53. These buildings are described in Table 2 below and shown in Figure 1. The remaining buildings were assessed as having negligible potential to support roosting bats, lacking any access or egress points or features that could support roosting bats, such as potential voids or crevices. No signs to indicate the presence of roosting bats were recorded.

Table 2: Descriptions of Buildings with a Low Potential to Support Roosting Bats

Building Number	Construction	Bat Roost Features
B10 - Heavy Oil Pump Station	Brick, wooden barge boards with varying sizes of gaps behind.	Crevice between barge board and walls. Access into building. Missing mortar. Section of lifted felt.
B15 – Weighbridge office	Brick with flat felt roof, wooden barge boards and suspended ceilings.	Raised barge boards and gaps. Missing brick/mortar. Old timber hole.
B16 - Instrument Workshop	Corrugated (asbestos) pitched roof, brick walls.	No mortar under the ridge. Pipework created hole into the roof space and there were crevices between timber at eave level and the brick wall.
B18 - Stores Building	Slatted louver style area below pitched roof. Wooden clad north gable.	Slatted wooden areas. Open pipe.
B19 - Stores Building	Pitched corrugated with brick walls.	Gaps between barge boards. Missing mortar. Ends of corrugated roof are open and lifted sections of lead flashing.
B22 – Main Stores Building	Metal corrugated pitched roof. Brick walls.	Gap behind barge board. Pipe work holes into void. Long strips missing in the mortar.
B23 - First Aid Hut/Archive	Pitched roof, suspended ceilings. Gables.	Gaps in lead flashing.
B30 - MP Plant Boilerhouse	Corrugated pitched roof, brick.	Occasional crevices in basement.
B52 - Auxiliary plant area - battery rooms	Old exposed roof timbers.	Hole into void (possible old chimney position).
B53 - Storage hut	Brick with wooden barge boards and felt flat roof.	Gap between brick and barge boards around all sides.

Figure 1: Bat Survey Plan

3.2 Bat Survey

No bats were recorded during the emergence and return surveys.

4 DISCUSSION

Considering that no bats were recorded during any of the surveys, as well as the lack of foraging and commuting habitat for bats and the absence of bat records within 2km of the site (Ref. 1), it was concluded that the buildings had a negligible potential to support roosting bats. The Proposed Development can commence and comply with the associated legislation with regards to bats.

5 RECOMMENDATIONS

5.1 Mitigation and Compensation

As no bats were recorded during the surveys, mitigation and compensation methods are not required and the buildings can be demolished at any time of the year without checks by an ecologist. However, in the unlikely event that a bat is found during the demolition of the buildings on the site, all works must cease immediately and the advice of a suitably qualified ecologist should be sought.

6 REFERENCES

Ref. 1 URS Scott Wilson Ltd, (2011); 'Slough Heat and Power – Proposed Multi-Fuel Facility. Desk Study and Extended Phase 1 Habitat Survey.'

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7 APPENDIX A

Criteria for assessing the potential of the buildings to support roosting bats, in accordance with the BCT guidelines:

- Negligible potential - No features that could be used by bats (for roosting, foraging or commuting);
- Low potential – A small number of potential roosting features, isolated habitat that could be used by foraging bats, e.g. a lone tree or patch of scrub but not parkland and an isolated site not connected by prominent linear features (but if suitable foraging habitat is adjacent it may be valuable if it is all that is available);
- Moderate potential - Several potential roosting features in the buildings, habitat could be used by foraging bats e.g. trees, shrub, grassland or water and the site is connected with the wider landscape by linear features that could be used by commuting bats e.g. lines of trees and scrub or linked back gardens;
- High potential – Buildings with features of particular significance for roosting bats, habitat of high quality for foraging bats e.g. broadleaved woodland, tree-lined watercourses and grazed parkland and the site is connected with the wider landscape by strong linear features that would be used by commuting bats e.g. river/stream valleys or hedgerows, site is close to known roosts; and
- Confirmed roosting - Evidence indicates the buildings are used by bats, e.g. bats seen roosting or observed flying from a roost or freely in the habitat; droppings, carcasses, feeding remains, etc. found; and/or bats heard *'chattering'* inside on a warm day or at dusk and bats recorded/observed using an area for foraging or commuting.

Appendix H-3

Breeding Bird and Peregrine Survey Report

URS

Slough Multifuel Power Station

Breeding Bird and Peregrine Survey Report

4th February 2013

46369029

Prepared for:
SSE Generation Ltd

UNITED KINGDOM & IRELAND

Rev	Date	Details	Prepared by	Checked by	Approved by
1	18th October 2012	Draft report	David Plant Ecologist	Paul Benyon Associate	Paul Benyon Associate
2	1st February 2013	Final following comments from client	David Plant Ecologist	Paul Benyon Associate	Neil Titley Associate

URS Infrastructure & Environment UK Limited
St George's House, 5 St George's Road
Wimbledon, London
SW19 4DR
United Kingdom
Tel: +44 (0)20 8944 3300
Fax: +44 (0)20 8944 3301
[redacted]

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The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken between April and June 2012 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

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1. INTRODUCTION

1.1 Background

SSE Generation Ltd (hereinafter referred to as 'the Applicant') will be seeking planning permission from Slough Borough Council (SBC) for the demolition and removal of redundant generating plant and buildings and the development of a multifuel combined heat and power (CHP) facility (herein referred to as the 'Proposed Development').

The Proposed Development site is located within the existing Slough Heat and Power (SHP) Site within the Slough Trading Estate, 342 Edinburgh Avenue, Slough, SL1 4TU (Ordnance Survey (OS) grid reference SU953814), as shown in Figure 1.

1.2 Structure of the Report

This report presents the results of a breeding bird survey. This was conducted, as habitats were suitable for breeding birds to occur on site. Breeding birds are protected under the Wildlife and Countryside Act 1981 (as amended); this is a general protection for all wild birds, and prohibits the killing, injuring, taking, or selling, of any wild bird or their nests or eggs. Peregrine *Falco peregrinus* is also known to occur on site and this species is especially protected under Schedule 1 of the Wildlife and Countryside Act where not only are they protected as described above, it is also an offence to disturb any nesting birds or their young during the breeding season. This includes causing the parent birds or fledglings apparent stress, and/or which may lead to the parents abandoning their nest or young.

1.3 Site Description

The Proposed Development site lies within the existing SHP Site boundary within the Slough Trading Estate. The SHP Site is mainly located on the south side of Edinburgh Avenue, while the two associated natural draught cooling towers occupy an area immediately to the north of Edinburgh Avenue. The SHP Site contains numerous industrial buildings with a variety of ages and structures, including boiler houses, turbine halls, fuel storage facilities, switchrooms, control rooms, offices and various other ancillary plant. The site is predominately surfaced with impermeable hardstanding.

2. BREEDING BIRD SURVEY

The survey followed standard Breeding Bird Survey (BBS) methodology as described in Bibby *et al*. (Ref 1), four survey visits were undertaken, the dates for these are shown in Table 1. This was combined with a specific survey for peregrine, a Schedule 1 Protected Species, which followed the 4-visit methodology outlined in Hardey *et al.* (Ref 2) presented in Table 2 below. All surveys were conducted during early morning visits.

Table 1 – Dates of survey visits

Survey visit	Date
Visit 1	03/04/2012
Visit 2	01/05/2012
Visit 3	11/06/2012
Visit 4	21/06/2012

Table 2 – Visit schedule taken from Hardey *et al.* (2009)

Visits	Time of year
Visit 1	March to early April
Visit 2	Late March to early May
Visit 3	Late May to mid-June
Visit 4	Mid-June to early July

On each survey occasion, a surveyor walked a transect through the site and a survey of the peregrine activity was also conducted. Given the relatively small size (1 ha) of the site, this was considered to be sufficiently thorough to detect breeding birds. The locations and activities of all recorded bird species were entered onto field maps using the standard British Trust for Ornithology (BTO) symbols. Behaviour indicative of breeding (displays or singing, the presence of nests, eggs or young, repeated alarm calls from adults or when territorial disputes were seen) was recorded.

This report follows the current standard reference on the national conservation status of the UK bird fauna (Ref 3). Species of bird are placed on one of three lists (Red, Amber or Green). Red List birds are of high conservation concern; Amber List birds are of medium conservation concern; and Green List birds are not considered currently to be of conservation concern.

3. RESULTS

3.1 Field Survey

3.1.1 *Environmental Conditions*

The environmental conditions encountered during each survey are presented below in Table 3.

Table 3 – Weather Conditions recorded during the four survey visits

Date	Weather conditions
03/04/2012	F1 W, 10^{o}C, cloud 1/8
01/05/2012	F1 SW, 6^{o}C, cloud 8/8
11/06/2012	F2 SW, 11.5^{o}C, cloud 8/8
21/06/2012	F1 SW, 12^{o}C, cloud 8/8

3.1.2 *Survey Results*

There were 14 species of bird recording on site during the four surveys; these are shown in Table 4 below. Birds of Conservation Concern (BoCC) (Ref 3) are listings that reflect each species' global and European status as well as that within the UK, red species have had the greatest decline with amber species a less of a decline.

Table 4 – Bird species recorded on site

Common name	Scientific name	BoCC	Maximum count recorded on site
Blackbird	*Turdus merula*		1
Carrion crow	*Corvus corone*		1
Dunnock	*Prunella modularis*	Amber	1
Feral pigeon	*Columba livia*		12
Goldfinch	*Carduelis carduelis*		3
Herring gull	*Larus argentatus*	Red	5
Lesser black-backed gull	*Larus fuscus*	Amber	6
Magpie	*Pica pica*		1
Peregrine	*Falco peregrinus*	Sch 1	3
Pied wagtail	*Motacilla alba*		2
Robin	*Erithacus rubecula*		1
Starling	*Sturnus vulgaris*	Red	3
Swift	*Apus apus*	Amber	2
Wood pigeon	*Columba palumbus*		8

A pair of peregrines has been observed around the site for a number of years including rearing young in one year. During the first survey, a juvenile peregrine was observed being chased off to the north of the site by the resident male. Mating between the male and female was also observed taking place during this initial visit (Position 2, Figure 1)). These activities indicate that this pair occupies the area as a nesting territory. The further surveys aimed to establish the nesting location and young produced.

The further three surveys produced evidence of killing of local feral pigeons as prey and feeding at a number of locations around the site (Figure 1). Roosting locations of both male and female within the explosion panel on the side of the boiler house (Position 1) were also observed. No nesting location was found and no evidence of eggs or young or carrying of prey items to any one location was observed. One of the top two explosion panels on the side of the boiler house appeared the most likely nesting locations for attempts in subsequent years. The reason for the lack for nesting is unknown though the wet spring may have been part of the reason.

The other species which exhibited breeding behaviour were feral pigeon, wood pigeon and dunnock. The territory of the dunnock included the car park in the northeast of the site next to the main offices building (known as 'Building 20'), as well as areas to the north and east of site. The feral pigeons and wood pigeons were nesting in the buildings on site including those areas proposed for development.

4. CONCLUSIONS & RECOMMENDATIONS

Demolition of the large structures on site should as far as possible take place outside of the breeding bird season; this would be from the beginning of October to the end of February.

Should this not be possible, then prior to commencement a check for nesting birds should be made. Based on the results obtained in 2012, there is only a low risk that nesting birds would be present; none were recorded from the smaller buildings within the Proposed Development Site. However, in the unlikely event that nesting birds are found, then an appropriate stand-off would be required until such time as the young have fledged.

It is recommended that demolition of structures near to the eastern end of the CFB Boilers in the north east of the site (known as 'Building 17') should also be undertaken outside the breeding season to avoid disturbance to possible breeding peregrine, as this is the location closest to the possible nesting location at Position 1 (Figure 1). If this is not possible, then prior to commencement it is recommended a survey be undertaken to determine if the peregrines are nesting within the boiler house location. If no nesting activity is recorded then work can commence immediately. Should they be found to be nesting at this time, then a risk assessment should be undertaken to determine the likelihood of the work disturbing the birds.

The potential for disturbance should they be found to be nesting at this location is already low, as the activities would not be in a direct site line from the nest. These birds have also already been accustomed to regular loud noises including traffic, the loud boiler house activities and other activities within the site and adjacent areas.

5. REFERENCES

Ref. 1 Bibby, C.J., Burgess, N.D., Hill, D.A. and Mustoe, S.H. (2000). *Bird Census Techniques*, 2nd Edition. British Trust For Ornithology (BTO) [redacted]

Ref. 2 Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D. (2009). Raptors: A Field Guide for Surveys and Monitoring.

Ref. 3 Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R., Aebischer, N.J., Gibbons, D.W., Evans, A. and Gregory, R.D. (2009) Birds of conservation concern 3: the population status of birds in the United Kingdom, Channels Islands and the Isle of Man. *British Birds*: **102**, 296-341

Ref. 4 Bibby, C.J., Burgess, N.D. & Hill D.A. (1992). *Bird census techniques.* Academic Press, London

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Figure 1 – Locations of peregrine activity on site

[redacted]

Key:

Peregrine activity on site

- Feeding
- Mating
- Perching
- Existing SHP Site Boundary

0 20 40 60 80

Metres

Title Locations of peregrine activity on site

Project Slough Multifuel Power Station

Client SSE plc

URS

App'd:	Drawn: DP	Ch'kd:	Drg Size: A3
Version: 1		Ref: 01/DP/BED	
Scale: 1:1,500		Job No: 46369029	
Date: Oct 2012		FIGURE 1	

Appendix I-1

Landscape Impact Assessment

Appendix I-1: Landscape Impact Assessment

Landscape Character Area (LCA) & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
Slough Business Low sensitivity	Medium	Minor Adverse	Low	Minor Adverse	The demolition and construction phase would have a medium impact on this LCA. The presence of construction vehicles and machinery, including cranes, would not be wholly out of place within the LCA, but would change its baseline characteristics. The predicted effect of the demolition and construction phase is minor adverse, which is not significant. The completed and operational development would have a low impact on this LCA. There would be a discernible change in the appearance through a change in form and materials, and in the scale of the Proposed Development, which would be larger in both buildings and stacks than the existing SHP station. The predicted effect of the completed and operational development is minor adverse, which is not significant.
Slough Urban Medium sensitivity	Low	Minor Adverse	Imperceptible	Negligible	The demolition and construction phase of the Proposed Development would have a low impact on this LCA as a result of good access routes to Slough Trading Estate, reducing indirect impacts from vehicles. There would be a slight change in intervisibility as a result of construction vehicles and machinery. The predicted effect of the demolition and construction phase is minor adverse, which is not significant. There would be virtually no perceivable change to the landscape character of the LCA from the completed and operational development. The predicted effect is negligible which is not significant.

Landscape Character Area (LCA) & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
Thames Floodplain Medium sensitivity	Imperceptible	Negligible	Imperceptible	Negligible	The demolition and construction phase of the Proposed Development would have an imperceptible impact on this LCA. The cranes associated with construction would be visible, but would not have a perceivable effect on the characteristics of the LCA. The predicted effect is negligible which is not significant. The completed and operational development would have an imperceptible impact on this LCA. There would be an increase in the size of the buildings and south stack, which would not impact on the characteristics of the LCA. The predicted effect is negligible which is not significant.
South Bucks District Landscape Character Assessment					
Floodplain High sensitivity	Imperceptible	Negligible	Imperceptible	Negligible	The demolition and construction phase of the Proposed Development would have an imperceptible impact on this LCA. The cranes associated with construction would be visible, but would not have a perceivable effect on the characteristics of the LCA. The predicted effect is negligible which is not significant. The completed and operational development would have an imperceptible impact on this LCA. There would be an increase in the size of the buildings and south stack, which due to the distance from the LCA would not impact on its characteristic features. The predicted effect is negligible which is not significant.
Lowland Fringe Medium sensitivity	Imperceptible	Negligible	Imperceptible	Negligible	The demolition and construction phase of the Proposed Development would have an imperceptible impact on this LCA. The cranes associated with construction would be visible, but would not have a perceivable effect on the characteristics of the LCA. The predicted effect is negligible which is not significant. The completed and operational development would have an imperceptible impact on this LCA. There would be an increase in the size of the buildings and south stack, which due to the distance from the LCA would not impact on its characteristic features. Important views towards Windsor Castle from this LCA would not be impacted. The predicted effect is negligible which is not significant.

Landscape Character Area (LCA) & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
Undulating Farmland High sensitivity	Imperceptible	Negligible	Imperceptible	Negligible	The demolition and construction phase of the Proposed Development would have an imperceptible impact on this LCA. The cranes associated with construction would be visible, but would not have a perceivable effect on the characteristics of the LCA. The predicted effect is negligible which is not significant. The completed and operational development would have an imperceptible impact on this LCA. There would be an increase in the size of the buildings and south stack, which due to the distance from the LCA would not impact on its characteristic features. The predicted effect is negligible which is not significant.
Wooded Terrace High sensitivity	Imperceptible	Negligible	Imperceptible	Negligible	The demolition and construction phase of the Proposed Development would have an imperceptible impact on this LCA. The cranes associated with construction would be visible, but would not have a perceivable effect on the characteristics of the LCA. The predicted effect is negligible which is not significant. The completed and operational development would have an imperceptible impact on this LCA. There would be an increase in the size of the buildings and south stack, which due to the distance from the LCA would not impact on its characteristic features. The predicted effect is negligible which is not significant.
Landscape Character Assessment for the Royal Borough of Windsor and Maidenhead					
Settled Farmed Floodplain Medium sensitivity	Imperceptible	Negligible	Imperceptible	Negligible	The demolition and construction phase of the Proposed Development would have an imperceptible impact on this LCA. The cranes associated with construction would be visible, but would not have a perceivable effect on the characteristics of the LCA. The predicted effect is negligible which is not significant. The completed and operational development would have an imperceptible impact on this LCA. There would be an increase in the size of the buildings and south stack, which due to the distance from the LCA would not impact on its characteristic features. Important views towards Windsor Castle from this LCA would not be impacted. The predicted effect is negligible which is not significant.

Landscape Character Area (LCA) & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
Settled Developed Floodplain Medium sensitivity	Imperceptible	Negligible	Imperceptible	Negligible	The demolition and construction phase of the Proposed Development would have an imperceptible impact on this LCA. The cranes associated with construction would be visible, but would not have a perceivable effect on the characteristics of the LCA. The predicted effect is negligible which is not significant. The completed and operational development would have an imperceptible impact on this LCA. There would be an increase in the size of the buildings and south stack, which due to the distance from the LCA would not impact on its characteristic features. The predicted effect is negligible which is not significant.
Farmed Parkland High sensitivity	Imperceptible	Negligible	Imperceptible	Negligible	The demolition and construction phase of the Proposed Development would have an imperceptible impact on this LCA. The cranes associated with construction would be visible, but would not have a perceivable effect on the characteristics of the LCA. The predicted effect is negligible which is not significant. The completed and operational development would have an imperceptible impact on this LCA. There would be an increase in the size of the buildings and south stack, which due to the distance from the LCA would not impact on its characteristic features. The predicted effect is negligible which is not significant.
Estate Parkland High sensitivity	Imperceptible	Negligible	Imperceptible	Negligible	The demolition and construction phase of the Proposed Development would have an imperceptible impact on this LCA. The cranes associated with construction would be visible, but would not have a perceivable effect on the characteristics of the LCA. The predicted effect is negligible which is not significant. The completed and operational development would have an imperceptible impact on this LCA. There would be an increase in the size of the buildings and south stack, which due to the distance from the LCA would not impact on its characteristic features. The predicted effect is negligible which is not significant.

Appendix I-2

Visual Impact Assessment

Appendix I-2: Visual Impact Assessment

Visual Receptor & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
People working on or visiting Slough Trading Estate **Representative Viewpoint 1** *Low sensitivity*	Medium	Minor Adverse	Low	Minor Adverse	For people working on or visiting Slough Trading Estate there is less interest in the view, which is presently an industrial area, than if it was a more susceptible location. Therefore the receptor has been assigned low sensitivity. At the demolition/construction phase there would be a medium magnitude of change as the Site would have cranes and construction vehicles operating which would be noticeable but not substantially uncharacteristic within the baseline view. The predicted effect is minor adverse, which is not significant. The completed/operational development would have a low magnitude of change. The proposed South Stack and buildings would be larger than those of the existing SHP station, but not uncharacteristic of the baseline view. (For photomontages see Figures 14-6b to 6d). The predicted effect is minor adverse which is not significant.
Residents to the north living in close proximity to Slough Trading Estate **Representative Viewpoint 2** *High sensitivity*	Medium	Moderate Adverse	Low	Minor Adverse	Residents to the north living in close proximity to Slough Trading Estate have a high interest in the existing view. Therefore the receptor has been assigned high sensitivity. At the demolition/construction phase cranes, construction vehicles and the demolition of buildings which are not characteristic of the baseline view would be present; these features would be prominent but not substantially uncharacteristic of views in a busy industrial area; there would be a medium magnitude of change. The predicted effect is moderate adverse, which is **significant**. The completed/operational development would be a minor alteration to the baseline view; the proposed South Stack is slightly larger than that in the baseline view, but still smaller than the existing North Stack, and the proposed buildings would be larger yet in keeping with the scale of those of the existing SHP station (for photomontages see Figures 14-7b to 7d). There would be a low magnitude of change; there is a minor change to a key feature of the baseline which is not uncharacteristic of the view. The predicted effect is minor adverse which is not significant.

Visual Receptor & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
Recreational users of public open space on the north boundary of Slough Trading Estate **Representative Viewpoint 2** *Medium sensitivity*	Medium	Moderate Adverse	Low	Minor Adverse	Public open space users on the northern boundary of Slough Trading Estate have a medium interest in the existing view with focus not on an appreciation of the landscape; they have been assigned medium sensitivity. At the demolition/construction phase cranes, construction vehicles and the demolition of buildings would be noticeable; there would be a medium magnitude of change. The predicted effect is moderate adverse, which is **significant**. The completed/operational development would be a minor alteration to the baseline view; the proposed South Stack is slightly larger than that in the baseline view, but still smaller than the existing North Stack, and the proposed buildings would be larger yet in keeping with the scale of those of the existing SHP station (for photomontages see Figures 14-7b to 7d). There would be a low magnitude of change; there is a minor change to a key feature of the baseline which is not uncharacteristic of the view. The predicted effect is minor adverse which is not significant.
Recreational users of Kennedy Park **Representative Viewpoint 3** *Medium sensitivity*	Medium	Moderate Adverse	Low	Minor Adverse	Recreational users of Kennedy Park have a medium interest in the existing view; they have been assigned medium sensitivity. At the demolition/construction phase of development, cranes and the demolition of buildings would be prominent from this slightly raised viewpoint, but not substantially uncharacteristic when set within the attributes of the urban baseline view. There would be a medium magnitude of change. The predicted effect is moderate adverse, which is **significant**. The completed/operational development would be a minor alteration to the baseline view; the proposed South Stack is slightly larger than that in the baseline view, but still smaller than the existing North Stack, and the proposed buildings would be larger than those of the existing SHP station yet in keeping with the scale of the buildings in the existing view. The proposed development forms a minor change to a key baseline feature, and is seen in the context of the wider far-reaching views towards the south, it is not an uncharacteristic change to the view (for photomontages see Figures 14-8b to 8d). There would be a low magnitude of change. The predicted effect is minor adverse, which is not significant.

Visual Receptor & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
4a &5a. People travelling along the A4 Bath Road **Representative Viewpoints 4 and 5** *Low sensitivity*	Low	Minor Adverse	Imperceptible	Negligible	People travelling east along the A4 Bath Road have a low interest in this existing view and have been assigned low sensitivity. The demolition/construction phase would be slightly noticeable on this receptor with cranes on the construction site visible above the townscape, views would be oblique, sequential and glimpsed. There would be a low magnitude of change. The predicted effect is minor adverse which is not significant. The completed/operational development would cause a very minor alteration to the existing view from this viewpoint; the difference in size of the south stack and proposed buildings from the existing SHP station would not be out of scale, or uncharacteristic of the baseline view from this oblique, sequential and glimpsed perspective (for photomontages see Figures 14-9b, 14-9c, 14-10b, 14-10c and 14-10d). There would be an imperceptible magnitude of change. The predicted effect is negligible which is not significant.
4b & 5b. People working at or visiting commercial and retail premises on the A4 Bath Road **Representative Viewpoints 4 and 5** *Low sensitivity*	Low	Minor Adverse	Imperceptible	Negligible	People working at or visiting commercial and retail premises along the A4 Bath Road have a low interest in this existing view and have been assigned low sensitivity. The demolition/construction phase would be slightly noticeable on this receptor with cranes on the construction site visible above the townscape, views would be oblique, sequential and glimpsed. There would be a low magnitude of change. The predicted effect is minor adverse which is not significant. The completed/operational development would cause a very minor alteration to the existing view from this viewpoint; the difference in size of the south stack and proposed buildings from the existing SHP station would not be out of scale, or uncharacteristic of the baseline view from this oblique, sequential and glimpsed perspective (for photomontages see Figures 14-9b, 14-9c, 14-10b, 14-10c and 14-10d). There would be an imperceptible magnitude of change. The predicted effect is negligible which is not significant.

Visual Receptor & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
4c & 5c. Pedestrians walking along the A4 Bath Road **Representative Viewpoints 4 and 5** *Low sensitivity*	Low	Minor Adverse	Imperceptible	Negligible	Pedestrians travelling along the A4 Bath Road have a low interest in this existing view and have been assigned low sensitivity. The demolition/construction phase would be slightly noticeable on this receptor with cranes on the construction site visible above the townscape, views would be oblique, sequential and glimpsed. There would be a low magnitude of change. The predicted effect is minor adverse which is not significant. The completed/operational development would cause a very minor alteration to the existing view from this viewpoint; the difference in size of the south stack and proposed buildings from the existing SHP station would not be out of scale, or uncharacteristic of the baseline view from this oblique, sequential and glimpsed perspective (for photomontages see Figures 14-9b, 14-9c, 14-10b, 14-10c and 14-10d). There would be an imperceptible magnitude of change. The predicted effect is negligible which is not significant.
People living in the northern Slough urban area **Representative Viewpoint 6** *Medium sensitivity*	Medium	Moderate Adverse	Low	Minor Adverse	People living in the north of the Slough urban area would have a medium interest in the view towards the power station from this distance; they have therefore been assigned medium sensitivity. At the demolition/construction phase the cranes and demolition works would be noticeable and cause a partial alteration to the existing view, they would not be substantially uncharacteristic within the context of the baseline urban view; there would be a medium magnitude of change. The predicted effect is moderate adverse which is **significant**. The completed/operational development would be a minor alteration to the baseline view; the proposed South Stack is slightly larger than that in the baseline view, but still smaller than the existing North Stack, and the proposed buildings would be larger than those of the existing SHP station yet in keeping with the scale of the buildings in the baseline view. The Proposed Development forms a minor change to a key baseline feature, and is not uncharacteristic of the busy urban view. The predicted effect is minor adverse, which is not significant (for photomontages see Figures 14-11b to 14-11d).
People travelling through the northern Slough urban area. **Representative Viewpoint 6** *Low sensitivity*	Medium	Moderate Adverse	Low	Minor Adverse	People travelling through the north of the Slough urban area would have a low interest in the view towards the power station; they have therefore been assigned low sensitivity. At the demolition/construction phase the cranes and demolition works would be noticeable and cause a minor alteration to the existing view; there would be a low magnitude of change. The predicted effect is moderate adverse which is **significant**. The completed/operational development would be a minor alteration to the baseline view and a low magnitude of change as the proposed south stack and buildings would be slightly larger than those of the existing SHP station yet in keeping with the scale of the buildings in the baseline view. The predicted effect is minor adverse, which is not significant (for photomontages see Figures 14-11b to 14-11d).

Visual Receptor & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
People travelling through the area south-west of Slough **Representative Viewpoint 7** *Low Sensitivity*	Low	Minor Adverse	Imperceptible	Negligible	People travelling along the M4 motorway or through the south-west of Slough have a low interest in the existing view and have been assigned low sensitivity. The demolition/construction phase would be noticeable on this receptor with cranes on the construction site visible above the townscape. There would be a low magnitude of change. The predicted effect is minor adverse, which is not significant. The completed/operational development would cause a very minor alteration to the existing view from this viewpoint; the differences in size between the proposed south stack and buildings and the existing SHP station would be barely perceptible from this distance and perspective (for photomontages see Figures 14-12b to 14-12d). The predicted effect is negligible which is not significant.
Recreational users of the Jubilee River corridor, including pedestrians, cyclists and horse-riders on the Jubilee River footpath, cycle path and bridleway. **Representative Viewpoints 8 and 10** *Medium Sensitivity*	Low	Minor Adverse	Imperceptible	Negligible	People walking along the Jubilee River Bridleway are engaging in outdoor recreation with a medium appreciation of the view; the attention is not wholly focussed on the view and it is not a view from within or towards a designated landscape. Therefore the receptor has been assigned medium sensitivity. The demolition/construction phase would be noticeable on this receptor with cranes on the construction site visible above the townscape. There would be a low magnitude of change from this distance. The predicted effect is minor adverse which is not significant. The completed/operational development would cause a very minor alteration to the existing view from this distance; the slight difference in size between the proposed south stack and buildings and the existing SHP station would be barely perceptible from this distance and perspective (for photomontages see Figures 14-13b, 14-13c, 14-13d, 14-15b and 14-15c). The predicted effect is negligible which is not significant.

Visual Receptor & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
Recreational users of Dorney Common **Representative Viewpoint 9** *Medium Sensitivity*	Low	Minor Adverse	Imperceptible	Negligible	Recreational users of Dorney Common are engaging in outdoor recreation with a medium appreciation of the view; the attention is not wholly focussed on the view and it is not a view from within or towards a designated landscape. Therefore the receptor has been assigned medium sensitivity. The demolition/construction phase would be slightly noticeable on this receptor with cranes on the construction site visible above the townscape. There would be a low magnitude of change from this distance. The predicted effect is minor adverse which is not significant. The completed/operational development would cause a very minor alteration to the existing view from this viewpoint; the difference in size between the proposed south stack and buildings and the existing SHP station would be barely perceptible from this distance and perspective (for photomontages see Figures 14-14b and 14-14c). The predicted effect is negligible which is not significant.
Motorists on the A332 Eton relief road, north of Eton **Representative Viewpoint 11** *Low Sensitivity*	Low	Minor Adverse	Imperceptible	Negligible	Motorists on the A332 Eton relief road, north of Eton, are travelling through the area with a low interest in the view and have been assigned low sensitivity. The demolition/construction phase would be slightly noticeable on this receptor with cranes on the construction site visible above the townscape. There would be a low magnitude of change from this distance. The predicted effect is minor adverse which is not significant. The completed/operational development would cause a very minor alteration to the existing view from this viewpoint; the difference in size between the proposed south stack and buildings and the existing SHP station would be barely perceptible from this distance and perspective (for photomontages see Figures 14-16b and 14-16c). The predicted effect is negligible which is not significant.
Walkers of the Thames Path National Trail, including visitors to Boveney Lock **Representative Viewpoint 12** *Medium Sensitivity*	Low	Minor Adverse	Imperceptible	Negligible	Walkers of the Thames Path National Trail are engaging in outdoor recreation with a medium appreciation of the view; the attention is not wholly focussed on the wider view and therefore the receptor has been assigned medium sensitivity. The demolition/construction phase would be slightly noticeable on this receptor with cranes on the construction site visible above the townscape. There would be a low magnitude of change from this distance. The predicted effect is minor adverse which is not significant. The completed/operational development would cause a very minor alteration to the existing view from this viewpoint; the difference in size between the proposed south stack and buildings and the existing SHP station would be barely perceptible from this distance and perspective(for photomontages see Figures 14-17b and 14-17c). The predicted effect is negligible which is not significant.

Visual Receptor & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
Residents of and visitors to Windsor Castle **Representative Viewpoint 13** *High Sensitivity*	Low	Minor Adverse	Imperceptible	Negligible	Residents and visitors to Windsor Castle have a high interest and appreciation of the view from this raised chalk outcrop that currently has panoramic views of the area. Therefore they have been assigned high sensitivity. The demolition/construction phase would be slightly noticeable on this receptor with cranes on the construction site visible above the townscape and the existing horizon. This would be prominent but not substantially uncharacteristic from this distance. There would be a low magnitude of change. The predicted effect is minor adverse which is not significant. The completed/operational development would cause a minor alteration to the existing view from this viewpoint; the difference in size between the proposed south stack and buildings and the existing SHP station would be barely perceptible from this distance. The proposed buildings although larger would not breach the horizon (for photomontages see Figures 14-18b to 14-18d). The predicted effect is negligible, which is not significant.
Recreational users of Upton Court Park **Representative Viewpoint 14** *Medium Sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Recreational users of Upton Court Park have a medium interest in the view; they have been assigned medium sensitivity. The demolition/construction phase would be barely perceptible from this vantage point; the upper extents of the cranes involved with construction would be intermittently visible from within the park. The predicted effect is negligible which is not significant. The completed/operational development would be a barely perceptible difference to the baseline view, the upper extents of the south stack would be visible in roughly the same location as the existing south stack. No part of the proposed buildings would be visible. The predicted effect is negligible which is not significant.
Recreational users of public footpaths north of Slough **Representative Viewpoint 15** *Medium Sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Recreational users of public footpaths north of Slough have a medium interest in the view; they are engaged in activity in this area that is not necessarily focussed on an appreciation of the landscape. They have been assigned medium sensitivity. The demolition/construction phase would be barely perceptible from this receptor; the upper extents of cranes involved with construction would be intermittently visible. The predicted effect is negligible which is not significant. The completed/operational development would be a barely perceptible difference to the baseline view, the upper extents of the south stack would be visible in roughly the same location as the existing south stack. No part of the proposed buildings would be visible. The predicted effect is negligible which is not significant.

Visual Receptor & Sensitivity	Demolition and Construction Phase		Completed/Operational Development		Description
	Magnitude of Change	Significance	Magnitude of Change	Significance	
Visitors to Stoke Park House **Representative Viewpoint 16** *High Sensitivity*	Low	Minor Adverse	Low	Minor Adverse	Visitors to Stoke Park House have limited to non-existent views of the existing SHP station from ground level, however from the upper viewing platform on the roof of the House there are panoramic far-reaching views of the landscape to the south, including the built-up area of Slough. Views are mostly focussed towards Windsor Castle. The receptor has been assigned high sensitivity. At the demolition/construction phase of development, cranes and the demolition of buildings would be prominent but not substantially uncharacteristic from this raised viewpoint. The cranes and activity associated with construction would not obstruct views towards Windsor Castle, or be dominant within the overall view. Cranes would be seen in the context of the adjacent retained North Stack which is a prominent vertical feature. The anticipated magnitude of change is low. The predicted effect is minor adverse, which is not significant. The completed/operational development would difference minor and not uncharacteristic change to the baseline view; the upper extents of the south stack would be visible in roughly the same location as the existing south stack; and the proposed buildings, although larger than the existing SHP station buildings, are not out of scale with the baseline view from this distance (for photomontages see Figures 14-21b to 14-21d). The predicted effect is minor adverse, which is not significant.

Appendix I-3

LVIA Cumulative Assessment

Appendix I-3: Cumulative Landscape and Visual Impact Assessment

Part 1: Cumulative Landscape Impact Assessment

Landscape Character Area (LCA) & Sensitivity	Scheme 1: Leigh Road/Bath Road Central Core 1 and 2		Scheme 2:1ha of land in the east / northwest of the SHP Site		Scheme 3: Britwell Regeneration	
	Magnitude of Change	Landscape Effect	Magnitude of Change	Landscape Effect	Magnitude of Change	Landscape Effect
Slough Business LCA *Low Sensitivity Landscape*	Low	Minor Beneficial	Low	Minor Adverse	Imperceptible	Negligible
Slough Urban LCA *Medium Sensitivity Landscape*	Imperceptible	Negligible	Imperceptible	Negligible	Low	Minor Beneficial
Thames Floodplain LCA *Medium Sensitivity Landscape*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
South Bucks District Landscape Character Assessment						
Floodplain *High Sensitivity Landscape*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Lowland Fringe *Medium Sensitivity Landscape*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Undulating Farmland *High Sensitivity Landscape*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Wooded Terrace *High Sensitivity Landscape*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible

Landscape Character Area (LCA) & Sensitivity	Scheme 1: Leigh Road/Bath Road Central Core 1 and 2		Scheme 2:1ha of land in the east / northwest of the SHP Site		Scheme 3: Britwell Regeneration	
	Magnitude of Change	Landscape Effect	Magnitude of Change	Landscape Effect	Magnitude of Change	Landscape Effect
Landscape Character Assessment for the Royal Borough of Windsor and Maidenhead						
Settled Farmed Floodplain *Medium Sensitivity Landscape*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Settled Developed Floodplain *Medium Sensitivity Landscape*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Farmed Parkland *High Sensitivity Landscape*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Estate Parkland *High Sensitivity Landscape*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible

Part 2: Cumulative Visual Impact Assessment

Visual Receptor & Sensitivity	Scheme 1: Leigh Road/Bath Road Central Core 1 and 2		Scheme 2: 1ha of land in the east / northwest of the SHP Site		Scheme 3: Britwell Regeneration	
	Magnitude of Change	Visual Effect	Magnitude of Change	Visual Effect	Magnitude of Change	Visual Effect
People working on or visiting Slough Trading Estate **Representative Viewpoint 1** **Cumulative development photomontage: Figure 14-6e** *Low sensitivity*	Low	Minor Beneficial	Low	Minor Adverse	Imperceptible	Negligible

Visual Receptor & Sensitivity	Scheme 1: Leigh Road/Bath Road Central Core 1 and 2		Scheme 2: 1ha of land in the east / northwest of the SHP Site		Scheme 3: Britwell Regeneration	
	Magnitude of Change	Visual Effect	Magnitude of Change	Visual Effect	Magnitude of Change	Visual Effect
Residents to the north living in close proximity to Slough Trading Estate **Representative Viewpoint 2** **Cumulative development photomontage: Figure 14-7e** *High sensitivity*	Imperceptible	Negligible	Low	Minor Adverse	Imperceptible	Negligible
Recreational users of public open space on the north boundary of Slough Trading Estate **Representative Viewpoint 2** **Cumulative development photomontage: Figure 14-7e** *Medium sensitivity*	Imperceptible	Negligible	Low	Minor Adverse	Imperceptible	Negligible
Recreational users of Kennedy Park **Representative Viewpoint 3** **Cumulative development photomontage: Figure 14-8e** *Medium sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Low	Minor Adverse
4a & 5a. People travelling along the A4 Bath Road **Representative Viewpoints 4 and 5** **Cumulative development photomontage: Figure 14-10e** *Low sensitivity*	Low	Minor Beneficial	Imperceptible	Negligible	Imperceptible	Negligible

Visual Receptor & Sensitivity	Scheme 1: Leigh Road/Bath Road Central Core 1 and 2		Scheme 2: 1ha of land in the east / northwest of the SHP Site		Scheme 3: Britwell Regeneration	
	Magnitude of Change	Visual Effect	Magnitude of Change	Visual Effect	Magnitude of Change	Visual Effect
4b & 5b. People working at or visiting commercial and retail premises on the A4 Bath Road **Representative Viewpoints 4 and 5** **Cumulative development photomontage: Figure 14-10e** *Low sensitivity*	Low	Minor Beneficial	Imperceptible	Negligible	Imperceptible	Negligible
4c & 5c. Pedestrians walking along the A4 Bath Road **Representative Viewpoints 4 and 5** **Cumulative development photomontage: Figure 14-10e** *Low sensitivity*	Low	Minor Beneficial	Imperceptible	Negligible	Imperceptible	Negligible
People living in the northern Slough urban area **Representative Viewpoint 6** **Cumulative development photomontage: Figure 14-11e** *Medium sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Low	Minor Adverse
People travelling through the northern Slough urban area. **Representative Viewpoint 6** **Cumulative development photomontage: Figure 14-11e** *Low sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Low	Minor Adverse
People travelling through the area south-west of Slough **Representative Viewpoint 7** **Cumulative development photomontage: Figure 14-12e** *Low Sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible

Visual Receptor & Sensitivity	Scheme 1: Leigh Road/Bath Road Central Core 1 and 2		Scheme 2: 1ha of land in the east / northwest of the SHP Site		Scheme 3: Britwell Regeneration	
	Magnitude of Change	Visual Effect	Magnitude of Change	Visual Effect	Magnitude of Change	Visual Effect
Recreational users of the Jubilee River corridor, including pedestrians, cyclists and horse-riders on the Jubilee River footpath, cycle path and bridleway. **Representative Viewpoints 8 and 10** **Cumulative development photomontage: Figure 14-13e** *Medium Sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Recreational users of Dorney Common **Representative Viewpoint 9** *Medium Sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Motorists on the A332 Eton relief road, north of Eton **Representative Viewpoint 11** *Low Sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Walkers of the Thames Path National Trail, including visitors to Boveney Lock **Representative Viewpoint 12** *Medium Sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Residents of and visitors to Windsor Castle **Representative Viewpoint 13** **Cumulative development photomontage: Figure 14-18e** *High Sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible

Visual Receptor & Sensitivity	Scheme 1: Leigh Road/Bath Road Central Core 1 and 2		Scheme 2: 1ha of land in the east / northwest of the SHP Site		Scheme 3: Britwell Regeneration	
	Magnitude of Change	Visual Effect	Magnitude of Change	Visual Effect	Magnitude of Change	Visual Effect
Recreational users of Upton Court Park **Representative Viewpoint 14** *Medium Sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Recreational users of public footpaths north of Slough **Representative Viewpoint 15** *Medium Sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible
Visitors to Stoke Park House **Representative Viewpoint 16** **Cumulative development photomontage: Figure 14-21e** *High Sensitivity*	Imperceptible	Negligible	Imperceptible	Negligible	Imperceptible	Negligible

Appendix I-4

Character Assessment of Green Belt

Appendix I-4

Slough Multifuel CHP Facility

Supplementary Character Assessment of Green Belt

1. Introduction

During the process of consultation with Slough Borough Council (SBC), the Planning Officer requested an additional assessment of the potential effects of the Proposed Development on the character of the Green Belt land surrounding the Borough.

The Proposed Development Site lies centrally in the Slough Borough area within the densely developed Slough Trading Estate. Most of the land immediately surrounding the Slough Borough area is designated Green Belt. Parts of the fringes of the Borough beyond the built-up edge of Slough are also Green Belt, notably along the southern side within the floodplain landscapes of the River Thames. The Green Belt is shown on Figure I-1 of this appendix, overlaid onto the landscape character areas (LCAs) described in Chapter 14: Landscape and Visual of this ES.

Green Belt is a local statutory land use and planning designation intended to prevent urban sprawl by keeping land permanently open; the essential characteristics of Green Belts are their openness and their permanence. The NPPF defines the five purposes of Green Belt as follows:

1. To check the unrestricted sprawl of large built-up areas;
2. To prevent neighbouring towns merging into one another;
3. To assist in safeguarding the countryside from encroachment;
4. To preserve the setting and special character of historic towns; and
5. To assist in urban regeneration, by encouraging the recycling of derelict and other urban land.

This supplementary assessment has been undertaken by considering the five purposes of Green Belt in relation to the predicted effects on the LCAs within the 5km study area as described in Chapter 14: Landscape and Visual of this ES. It is important to understand that the character of the Green Belt around Slough would be affected only indirectly by the Proposed Development, as a result of inter-visibility with the existing buildings located on the SHP site. To assist in the interpretation of the potential effects, reference is therefore made to the representative viewpoints and photomontages forming part of the Landscape and Visual Impact Assessment (LVIA) for the Proposed Development.

2. Defining the Scope

The scope of this supplementary assessment has been refined by reviewing the Proposed Development against the five purposes of Green Belt, as follows:

Purpose 1: The Proposed Development Site is located within the existing SHP site on the Slough Trading Estate, therefore the Proposed Development would not result in sprawl;

Purpose 2: The Proposed Development Site is located centrally within the Slough urban area, therefore the Proposed Development would not cause any neighbouring towns to merge;

Purpose 3: The Proposed Development Site is located within the built up area of Slough, therefore the Proposed Development would not encroach on the countryside;

Purpose 4: The existing plant on the SHP site is widely visible from varying distances within parts of the Green Belt, as would be the Proposed Development. This is discussed further below; and

Purpose 5: The Proposed Development Site is located within the existing SHP site on the Slough Trading Estate, and therefore comprises previously developed urban land.

The Proposed Development accords with the objectives of Purposes 1, 2, 3 and 5 and therefore requires no further consideration. Consideration of Purpose 4 therefore forms the basis of this appendix. Even so, the 'setting' aspect has been interpreted in its broadest form and assessed principally by reference to the landscape character descriptions set out in the following published landscape character assessments, as considered in Chapter 14: Landscape and Visual of this ES:

- Landscape Character Assessment for the Royal Borough of Windsor and Maidenhead (RBWM) 2004; and
- South Bucks District (SBD) Landscape Character Assessment, 2011.

3. Character Assessment

Floodplain landscapes to the south and southwest of Slough

The flat, low-lying, floodplain landscapes share similar attributes in terms of views and inter-visibility. Within the 5km study area, the Green Belt land comprises the following LCAs:

- Thames Floodplain (Slough Borough);
- Floodplain (SBD);
- Settled Farmed Floodplain (RBWM); and
- Settled Developed Floodplain (RBWM).

The nature of views towards Slough from these floodplain landscapes is illustrated by representative viewpoints 7, 8, 9, 10, 11, 12 and 14 (see Figure I-1).

The Thames Floodplain LCA, which extends along the southern side of Slough Borough (for which there is no published character assessment), essentially comprises part of the wider floodplain landscapes of South Bucks District and the Royal Borough of Windsor and Maidenhead.

The Floodplain (SBD) landscapes are described as low-lying, flat and open allowing for occasional long views and panoramic vistas, particularly towards Slough and also to higher ground in the north. However, the long views noted towards Windsor Castle are unlikely to be seen at the same time as the SHP site. Views are said to be intermittently disrupted by development and occasionally interrupted and enclosed by wooded field boundaries, although the flat landscape and the limited woodland are said to accentuate the visual sensitivity of the landscape. Guidelines include aspirations to conserve open views towards the north, and to monitor vertical development along the floodplain, which would impact greatly on the low-lying, open character.

The Settled Farmed Floodplain (RBWM) landscapes are described as open and flat, resulting in high inter-visibility with adjacent areas, particularly the sensitive landscapes of the Chiltern escarpments in the north of the Borough. Linear woodlands and parkland trees are said to be important for containing and framing views across the floodplain. The outline landscape strategy includes an aspiration to resist development which would be highly visible within the open floodplain landscape.

Within the Settled Developed Floodplain (RBWM), the flat nature of this landscape results in low inter-visibility between it and adjacent landscape types, which appears to contradict the interpretation of the Settled Farmed Floodplain, although the outline landscape strategy includes a similar aspiration to resist further visual intrusion of large industrial/infrastructure within the floodplain.

Undulating landscapes to the north and north-west of Slough

The more elevated and undulating land in the Green Belt within the 5km study area to the north and north-west of Slough, comprises the following LCAs:

- Undulating Farmland (SBD);
- Lowland Fringe (SBD); and
- Wooded Terrace (SBD).

The nature of views towards Slough from the landscapes to the north is illustrated by representative viewpoints 15 and 16 (see Figure I-1).

The Undulating Farmland (SBD) landscapes are said to afford extensive, long views across open fields on higher ground, over Slough and lowland areas towards the south. There are varying degrees of enclosure contrasting between enclosed rural roads, dense woodland edges and open expansive fields. The LCA is described as forming a transitional landscape between Slough on the low-lying floodplain to the south and the higher, heavily wooded landscape to the north, which provides a strong visual boundary. Guidelines include an aspiration to maintain open views across fields, and avoid introducing large-scale elements (such as pylons and masts) which would disrupt important views and the legible landscape character.

From the Lowland Fringe (SBD) landscapes, where tree cover is sparse beyond the golf courses and parkland of Stoke Park and Langley Park, the low-lying topography is described as allowing for extensive views across open fields, particularly southwards over lowland areas towards Windsor Castle. However, views are sometimes fragmented by settlement and urban development. The stated guidelines include considering opportunities for further tree (in-field) and woodland planting to reduce the visual impact of urban development, and conserving views to the south, particularly towards Windsor Castle.

Within the Wooded Terrace (SBD) landscapes, views are said to be restricted by dense woodland cover, and there is limited inter-visibility with adjacent landscapes.

Parkland landscapes at Windsor

Small areas of the following parkland landscapes lie at the edge of the 5km study area within the Green Belt to the south-east:

- Farmed Parkland (RBWM); and
- Estate Parkland (RBWM).

Representative viewpoint 13 is at Windsor Castle and is located on the fringes of these LCAs (see Figure I-1).

The Farmed Parkland and Estate Parkland (RBWM) landscapes are described as being vulnerable to indirect impacts that modern development might have on their visual context.

4. Assessment of Landscape Character Areas

Set out below is a summary of the findings of the assessment of impact of the Proposed Development on landscape character from Chapter 14: Landscape and Visual of this ES. It is structured to correspond to the three sections of the character assessment, above.

Floodplain landscapes to the south and south-west of Slough

The completed, operational development would have an imperceptible, indirect impact on each of the four LCAs which make up the floodplain landscapes to the south and south-west of Slough. A slight increase in the size of the buildings and south stack would be apparent, as illustrated in the photomontages from representative viewpoints 7 to 12; this would not impact on the characteristic features of the LCAs. Views towards Windsor Castle would not be impacted. The predicted effect is negligible which is not significant.

Undulating landscapes to the north and north-west of Slough

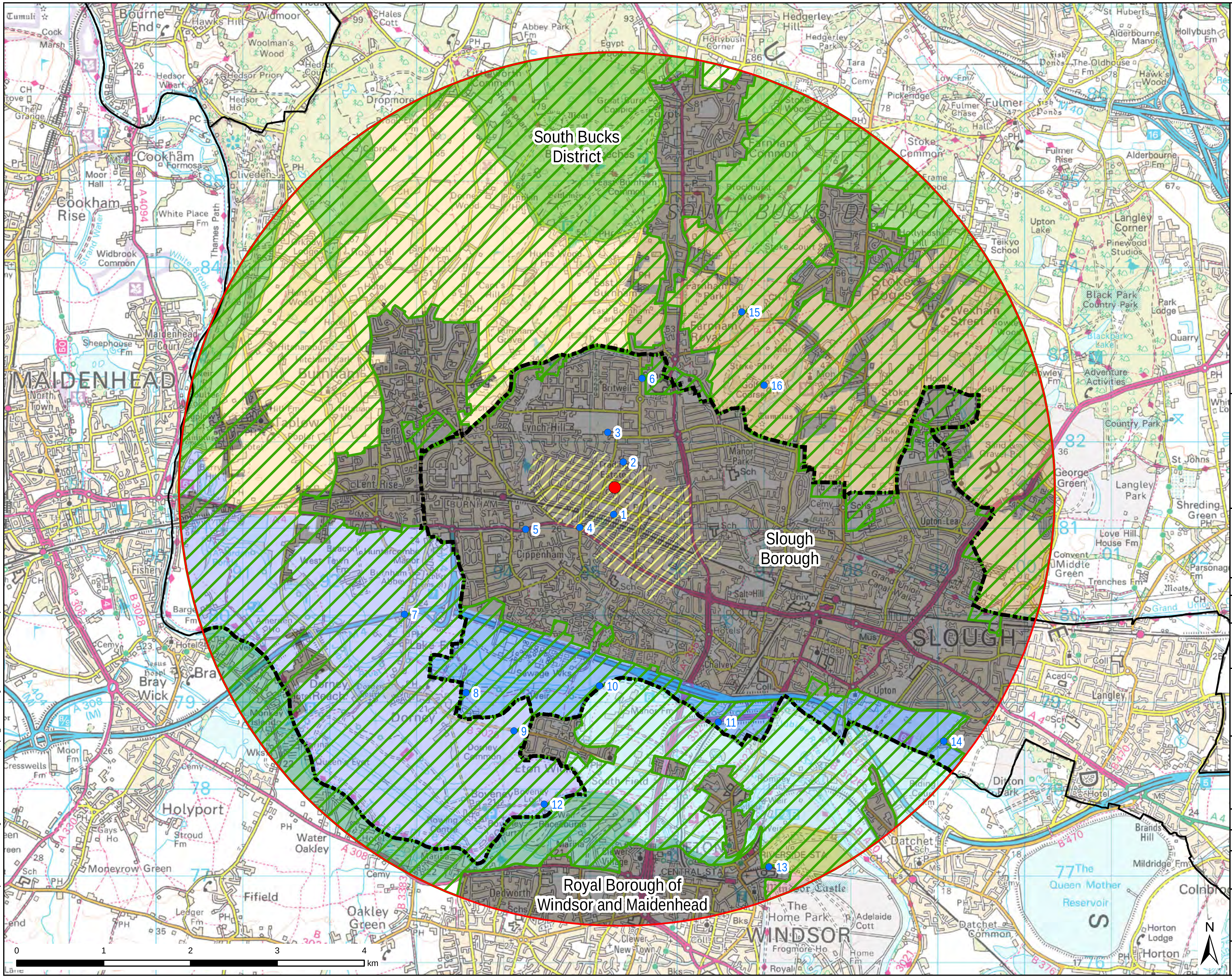
The completed, operational development would have an imperceptible, indirect impact on each of the three LCAs which make up the undulating landscapes to the north and north-west of Slough. A slight increase in the size of the buildings and south stack would be apparent, as illustrated in the photomontage from representative viewpoint 16; this would not impact on the characteristic features of the LCAs. Views towards Windsor Castle would not be impacted. The predicted effect is negligible which is not significant.

Parkland landscapes at Windsor

The completed, operational development would have an imperceptible, indirect impact on both of the two LCAs which make up the parkland landscapes at Windsor. A slight increase in the size of the buildings and south stack would be apparent, as illustrated in the photomontage from representative viewpoint 13. Due to the distance from the LCA, this would not impact on the characteristic features of the LCA, and the predicted effect is negligible which is not significant.

5. Conclusion

There would be no significant impact on the character of the landscape beyond the built up area of Slough, as a result of inter-visibility with the Proposed Development. That area comprises entirely Green Belt (with the exception of some larger settlements). It can therefore be concluded that no harm would result to the openness or permanence of the Green Belt. For that reason, "*the setting and special character of historic towns*" would be preserved. There is therefore no conflict with any of the 5 purposes of the Green Belt.



LEGEND

- Proposed Development Site
- Representitive viewpoint locations (as agreed with Slough Borough Council)
- 5km distance band
- Administrative boundaries
- Administrative boundaries within study area
- Green belt

Slough Borough Landscape Character Areas (no published study)

- Slough Business Area
- Slough Urban Area
- Thames Floodplain

Landscape Character Assessment for the Royal Borough of Windsor and Maidenhead (2004) - Landscape Character Areas

- Estate Parkland
- Farmed Parkland
- Settled Developed Floodplain
- Settled Farmed Floodplain
- Urban Area

South Bucks District Landscape Character Assessment (2011) - Landscape Character Areas

- Floodplain
- Lowland Fringe
- Undulating Farmland
- Urban Area
- Wooded Terrace

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Revision Details	By / Check	Check Date	Suffix

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Client: SSE

Project Title: SLOUGH MULTIFUEL CHP FACILITY

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URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

Drawing Number: FIGURE I-1

Rev: 1

Plot Date: 01 May 2014
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Appendix J-1

WRATE Assessment

Slough Multifuel CHP Facility

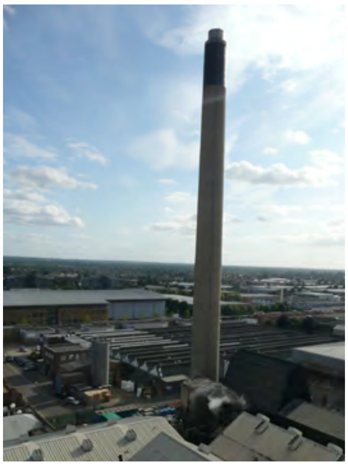
WRATE Assessment

47066339

Prepared for:
SSE Generation Ltd

UNITED KINGDOM & IRELAND



REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Reviewed by**	**Approved by**
1	November 2013	Draft	Rachel Hamblin Consultant, Waste Minerals and Resources	Mike Bains Associate, Waste Minerals and Resources	Mike Bains Associate, Waste Minerals and Resources
2	February 2014	Draft	Rachel Hamblin Consultant, Waste Minerals and Resources	Mike Bains Associate, Waste Minerals and Resources	Mike Bains Associate, Waste Minerals and Resources
3	April 2014	Final	Rachel Hamblin Consultant, Waste Minerals and Resources	Mike Bains Associate, Waste Minerals and Resources	Mike Bains Associate, Waste Minerals and Resources
4	August 2014	Final	Rachel Hamblin Consultant, Waste Minerals and Resources	Mike Bains Associate, Waste Minerals and Resources	Mike Bains Associate, Waste Minerals and Resources

URS Infrastructure & Environment UK Limited
Royal Court
Basil Close
Chesterfield
S41 7SL
United Kingdom

Tel: +44 (0)1246 209 221

[redacted]

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CONTENTS

1. INTRODUCTION TO WRATE

1.1 Introduction

SSE Generation Ltd (the 'Applicant') is seeking planning permission from Slough Borough Council (SBC) for the demolition and removal of redundant generating plant and buildings and the development of a multifuel combined heat and power (CHP) facility providing up to 50 megawatts electrical (MWe) gross electrical capacity and a capacity of 20 megawatts thermal (MWth) of heat at the site (the Proposed Development).

The carbon assessment of the Proposed Development was undertaken using the Environment Agency's WRATE (Waste and Resources Assessment Tool for the Environment) lifecycle assessment tool to evaluate the relative environmental burden of the chosen waste management routes.

The WRATE tool is a Life Cycle Assessment (LCA) model that was first developed by the Environment Agency in 2007. WRATE allows users to quantify and compare the relative environmental burdens of equivalent integrated waste management systems across their entire life cycle.

WRATE calculates the potential carbon impacts arising from all processes in the waste management system including the collection, transportation, transfer, treatment, disposal and recycling of materials. The model takes account of the construction and operation of infrastructure and vehicles, and offsets this burden against the avoided burdens associated with materials and energy recovery. The key inputs of waste, energy and materials, and key outputs of energy, process residues, materials and emissions are accounted for.

Background data is provided by built-in databases, namely:

- The energy-mix database, which contains information related to the electricity generation mix, energy generation efficiency, losses during electricity transport and marginal electricity production; and
- The waste composition database, which contains the information relating to the type and quantity of waste, including a pre-defined elemental waste composition for each waste fraction, a default waste composition and calorific value and moisture content.

In using WRATE, the user specifies the waste stream(s) to be managed, then defines the way in which the waste is to be managed, step by step, including (as appropriate) the collection medium, vehicles, intermediate facilities, treatment, recovery and/or final disposal. WRATE calculates and presents the environmental impact in terms of six default impacts: abiotic resource depletion, freshwater aquatic ecotoxicology, acidification, eutrophication, global warming potential and human toxicity.

The results generated by WRATE show the best case scenario for the waste stream. For the purpose of this assessment, the impact in terms of global warming potential (GWP) only is considered in detail. It was not considered necessary to comment on other outputs such as acidification, which is dealt with in detail in *Chapter 8: Air Quality* for example.

In completing the WRATE assessment, the software Version 2.0.1.8, (built 26/10/2012) was used, which is the latest version of the model and draws on guidance provided in:

- ISO 14040:1997 – Principles and framework
- ISO 14041:1998 – Goal and scope definition and inventory analysis
- ISO 14042: 2000 – Life cycle impact assessment
- ISO 14043: 2000 – Life cycle interpretation
- ISO 14048: 2002 – Data documentation format
- ISO 14049: 2000 – Examples of application of ISO 14041 to goal and scope definition and inventory analysis

1.2 Impact Assessment

The primary purpose of this assessment is to assess the carbon impact of the proposed facility. Climate change (i.e. Global Warming Potential) (GWP100a) is an assessment of the amount of carbon dioxide and other gases emitted that cause global warming. Apart from CO_2, the other major greenhouse gas is methane (CH_4). Methane is considered 23 times more potent than CO_2 in terms of its effect on global warming over a 100 year period. Climate change impact in WRATE is expressed in kg CO_2-equivalent (eq).

It is important to note that where the model results show a minus value for the kg CO_2-eq this is not indicative of a process being a carbon 'sink' but of a process displacing conventional energy or electricity use, and hence resulting in lower global emissions than would be the case under the default scenario.

The baseline energy mix selected for this assessment is the default WRATE 2020 energy mix. The electricity displaced by the Proposed Development is made up of a mix of generation types known as the 'marginal' mix.

The model for the Proposed Development has been undertaken using two different marginal energy mixes. The first marginal mix modelled is the mix forecast by WRATE (using Department of Energy and Climate Change [DECC] data). WRATE forecasts the marginal energy mix for 2020 in the UK to be 33.8% Coal, 4.2% Gas and 62.0% Gas – Combined Cycle Gas Turbine (CCGT).

The second marginal mix modelled as a comparison is a 'user defined' mix set at 100% Gas CCGT. The Defra publication 'Energy from Waste – A guide to the debate Feb 2014' states that "A gas fired power station (Combined Cycle Gas Turbine – CCGT) is the current standard comparator as this is the marginal technology if you wanted to build a new power station today."

2. ASSESSMENT

2.1 Assessment Summary

The model used for this assessment has been set up to compare the following two scenarios:

- Scenario 1 - the disposal of waste to landfill as the baseline; and
- Scenario 2 - the combustion of Waste Derived Fuel (WDF) at the Proposed Development (see Figure 1).

The source of waste, the collection methodology and the transport impact of the waste collection prior to pre-treatment is not included in the WRATE assessment as the specific sources of waste that will result in the feedstock for the Proposed Development are not yet known. However, because the sources of waste and the collection arrangements would be the same for both of the scenarios modelled the impact of this element when compared would be neutral, as will the impact of the pre-treatment process as this is also assumed to occur prior to disposal to landfill.

Scenario 1 shows the waste being pre-treated by removing a proportion of the metal content and the remaining waste being disposed of to landfill without any further materials recovery or recycling.

Scenario 2 shows the waste being pre-treated by removing a proportion of the metal content and the remaining waste being sent to the Proposed Development as WDF. Specific information about the Proposed Development has been used in the WRATE model wherever possible. Where specific design information is not finalised, assumptions have been made or input data taken from the defaults in the WRATE model.

2.2 Waste Composition

It is not possible to define the specific mix of WDF that might comprise the fuel for the Proposed Development at present. It is also not possible at the current time to specify the exact geographical sources of the fuel or the specific average Net Calorific Value (NCV).

The Proposed Development has been designed to accept WDF from various sources of processed municipal solid waste (MSW), Commercial and Industrial (C&I) waste and waste wood. The NCV of fuels will be variable over time, but the design case of 12 MJ/kg) is expected to result in a throughput of circa 400,000 tonnes per annum. This throughput tonnage has therefore been modelled for this assessment.

Both scenarios modelled (Scenario 1 and 2) have been based on a 50/50 MSW/C&I waste input. The default WRATE Municipal Solid Waste (MSW) composition for England has been used for the MSW composition in the models as the specific sources for the facility are not known. The composition of the C&I waste has been based on the data from a study undertaken for the Environment Agency Wales in 2007.

The WRATE default MSW composition is as shown in Table 1.

Table 1. MSW Composition

Waste Type	% Composition
Paper and Card	23.99
Plastic Film	3.81
Dense Plastic	6.17
Textiles	2.79
Absorbent hygiene products	2.34
Wood	3.60
Combustibles	6.09
Non-combustibles	2.66
Glass	7.89
Organic	31.59
Ferrous Metal	3.06
Non-ferrous metal	1.32
Fine material <10mm	1.98
WEEE	2.23
Specific Hazardous Waste	0.48
Processed Materials	0
Non-MSW waste	0

The composition of the C&I sourced waste is shown in Table 2. The source of the C&I Composition is the Environment Agency Wales I&C Waste Analysis Study (Nov 2007). The composition has been slightly altered as follows, in order to comply with the waste input categories of the WRATE model:

- 0.1% biodegradable industrial sludge reallocated as fines;
- The total percentage composition in the data totals 99.6% therefore an additional 0.4% has been added to the fines; and
- There is no option to input "black sack residual waste" into WRATE so the 0.6% black sack residual waste has been reallocated as "other combustibles".

The resulting C&I waste composition is shown in Table 2.

Table 2. C&I Waste Composition

Waste Type	% Composition
Paper and Card	32.2

Waste Type	% Composition
Plastic Film	7.0
Dense Plastic	7.7
Textiles	1.6
Absorbent hygiene products	0.1
Wood	5.6
Combustibles	11.4
Non-combustibles	6.0
Glass	3.5
Organic	14.9
Ferrous Metal	3.6
Non-ferrous metal	0.8
Fine material <10mm	3.9
WEEE	1.1
Specific Hazardous Waste	0.6
Processed Materials	0
Non-MSW waste	0

The total tonnage of waste input in the model is a function of the amount of waste which, after pre-treatment would equal the proposed throughput of the Proposed Development (400,000 tonnes of WDF for the twin line option). The total tonnage of input waste modelled is 422,072 tonnes.

Should the Applicant choose to only construct a single line (one unit) facility, the waste throughput would be expected to be approximately 300,000 tonnes per year. The WRATE model has been based on the former, to demonstrate the potential kg CO_2-eq contribution.

2.3 Waste Pre-treatment

Waste that is sent to the Proposed Development will have undergone some processing/pre-treatment to refine its composition. For the same reasons set out previously regarding fuels composition and NCV value, it is not possible to define specifically what pre-treatment will occur prior to the fuel arriving at the site as this will depend on the nature of the contracts let for the Proposed Development.

A relatively basic pre-treatment process has therefore been assumed for the WRATE analysis. This is based on the likelihood that fuel contracts are likely to involve relatively simple Materials Recovery Facilities (MRFs) rather than more complex MRFs or MBT facilities. The simplest option within the WRATE model that aligns with this assumption is a simple MBT pre-treatment process (noting this is not full MBT, purely the pre-treatment aspect of that option).

The pre-treatment process used for both modelled scenarios shows a proportion of the metals (ferrous and non-ferrous) being extracted from the input waste and recycled. A proportion of the WEEE waste is also removed and sent for recovery. The pre-treatment process modelled is a WRATE pre-treatment process for a Mechanical Biological Treatment (MBT) facility. Some of the MBT facilities in WRATE require the user to model a separate pre-treatment process before the user can model an MBT. The process used in this model is the 'MBT crushing and metals GENERIC process'. This would usually precede an MBT process but in this case has been used as a stand-alone process for metals removal.

The pre-treatment process modelled has been included in both the scenarios showing waste being sent to the Proposed Development and waste being disposed of to landfill. This results in a more conservative assessment when comparing the Proposed Development to the baseline scenario as the benefit of the metals recycling is attributable to both scenarios and not just to the Proposed Development.

The pre-treatment process receives both the MSW and the C&I waste and produces circa 400,000 tonnes of residuals with the following composition.

Table 3. WDF Composition

Waste Type	WDF Composition
Paper and Card	29.65
Plastic Film	5.70
Dense Plastic	7.32
Textiles	2.32
Absorbent hygiene products	1.29
Wood	4.85
Combustibles	9.23
Non-combustibles	4.57
Glass	6.01
Organics	24.53
Ferrous Metal	0.43
Non-ferrous Metal	0.18

Waste Type	WDF Composition
Fine Material <10mm	3.10
WEEE	0.26
Specific Hazardous Household	0.57

It should be noted that whilst the pre-treatment process has been used as the most appropriate standard input for this particular assessment it does not preclude WDF fuels from other sources and waste treatment facilities.

2.4 Transport

WDF is modelled as being transported 64.4km (40 miles) from the pre-treatment facility to the Proposed Development Site. It is likely that fuel will be sourced from a range of waste treatment facilities including MBT plants and MRFs, C&I waste treatment facilities and Construction and Demolition (C&D) waste treatment facilities predominantly within 40 miles of the Proposed Development Site, however there may be suitable waste sources identified in the future that are located further than 40 miles away.

10% of the journey is modelled as being by urban roads and 90% by motorway (transport emissions are discussed in *Chapter 8: Air Quality* of this ES). The available information for the scheme on the transportation of the fuel assumes that vehicle capacity will be 22 tonnes. The largest capacity vehicle available in WRATE is 17.559 tonnes and this has therefore been used in the model in the absence of a larger vehicle type. This means that the number of journeys factored into the model by WRATE for the same tonnage of fuel will be higher, leading to a more conservative assessment. If waste sources are located further afield than the distance modelled then the kg CO_2- eq transport value will increase, however in the context of the overall assessment the kg CO_2- eq contribution of the journey from WDF source to Proposed Development Site is relatively insignificant and a doubling of the journey distance (for example) would result in a 0.5% difference in overall kg CO_2- eq.

Transport from the pre-treatment to the landfill in Scenario 1 is modelled as being transported by intermodal road transport to a landfill 64.4km away with 10% of the journey by urban roads and 90% of the journey by motorway.

2.5 Waste Composition

The ferrous and non-ferrous metal outputs from the pre-treatment process have been modelled within WRATE as a direct off-take; as opposed to utilising a transport function as an intermediary. The process has an internal calculation which approximates transport to a recycling centre, and therefore does not need a dedicated transport option, the ferrous metal, non-ferrous metal and WEEE is all allocated as being transported 50 km to a recycling/recovery facility.

The outputs from the pre-treatment process that are sent for recycling/recovery include:

- 3,745 tonnes of non-ferrous metal;
- 12,354 tonnes of ferrous metal; and
- 5,973 tonnes of WEEE.

2.6 The Proposed Development

The energy from waste process depicted within WRATE is a 'Flexible Energy from Waste Process'. This process allows the WRATE user to define a variety of different parameters in relation to gross heat and electrical efficiencies, the assumed method of power off-take (electricity, Combined Heat and Power (CHP) and heat only), the flue gas cleaning and reduction systems, and the recovery rate of ferrous and non-ferrous metals at the grate. These variable parameters therefore focus on the key processes and the outputs with the greatest environmental impacts.

The process properties used in this model have been selected on the basis of the available information about the Proposed Development. The recovery type has been selected as Combined Heat and Power with the heat being supplied to a district heating scheme.

For the purposes of this assessment, based on indicative design data, the gross electrical efficiency has been calculated as 30% and the gross heat efficiency as 12%[1] based on a throughput of 400,000 tonnes per year over 8,000 operating hours with a fuel NCV of 12 MJ/kg and a gross electrical output of 50MW and a gross heat output of 20MW. This is the design capacity based on a twin line facility (two boiler units) and represents the maximum parameters being sought within the planning application. Should the Applicant choose to only construct a single line (one unit) facility, the waste throughput would be expected to be approximately 300,000 tonnes per year. The WRATE model has been based on the former, to demonstrate the potential kg CO_2-eq contribution

For the type of plant modelled in WRATE the maximum gross electrical efficiency that can be selected for a Combined Heat and Power plant is 26%. A gross electrical efficiency of 26% has therefore been modelled. This is similar to the 27% design assumption used for the Proposed Development, as discussed in *Chapter 5: The Proposed Development* of this ES. The difference between the modelled gross efficiency and the actual gross efficiency is likely to mean that the kg CO_2-eq benefit of the Proposed Development in the model has been slightly underestimated. The gross heat efficiency has been modelled as 12%.

The proposed flue gas treatment system will consist of Selective Non-Catalytic Reduction (SNCR) of NOx, activated carbon injection, hydrated lime scrubbing and fabric filters. The ferrous metal and non-ferrous metal recovery at the grate has been specified as 0% and the metal content of the waste is shown to pass straight to the bottom ash.

[1] Note: 12% is not the absolute thermal efficiency of the Proposed Development, it is a figure calculated by the WRATE model. For the type of plant modelled in WRATE, 12% is the maximum gross thermal efficiency that can be selected for a Combined Heat and Power plant.

Although it is proposed that there will be some recovery of the ferrous metal from the bottom ash on site it is not possible to model this in WRATE and therefore all of the bottom ash is modelled as being sent to a bottom ash recycling facility where the metals are subsequently recovered and the ash is used to produce incinerator bottom ash (IBA) aggregate.

The outputs from the Proposed Development model include:

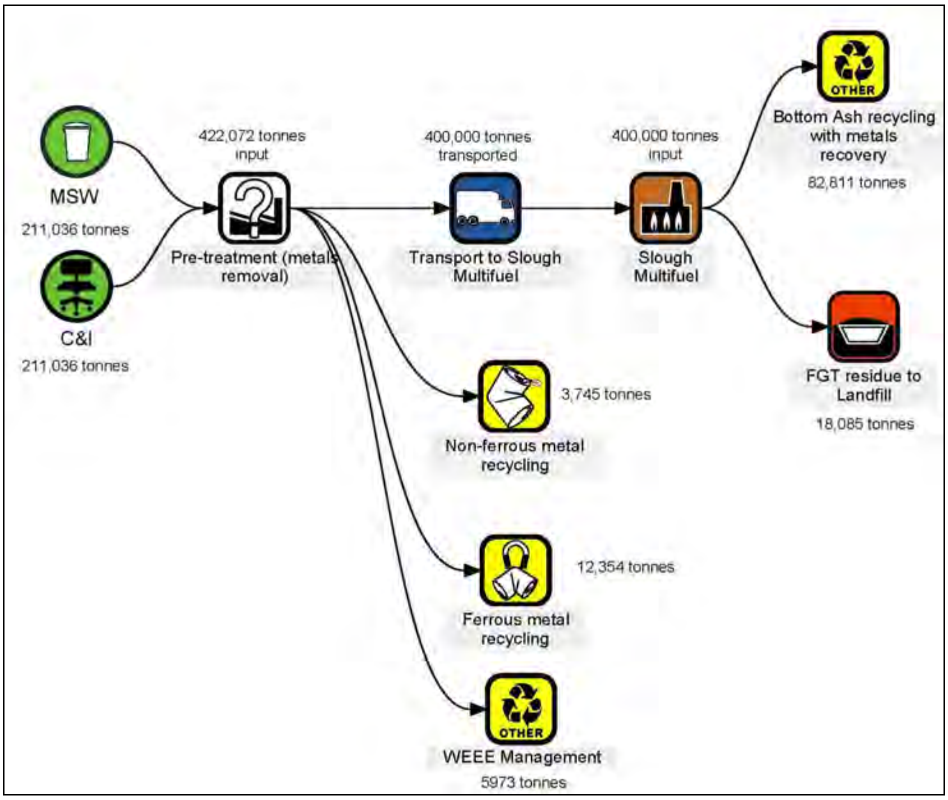
- 82,811 tonnes of bottom ash; and
- 18,085 tonnes of FGT residue.

The tonnes per annum of bottom ash and FGT residue are higher than those stated in other sections of the ES (the ES states 80kt/a and 15kt/a respectively) and therefore represents a worst case scenario.

2.7 Landfill

The flue gas treatment (FGT) residue from the facility will be classified as hazardous waste and will be treated and disposed of to an appropriate landfill. A default landfill site with a High-density Polyethylene (HDPE) liner and a HDPE cap is used in the model. It may be that options for the treatment and recycling of this type of waste will be considered in the future however, WRATE does not include the relevant data to be able to model other types of FGT residue management.

Figure 1 – Scenario 2: Proposed Development



3. RESULTS

3.1. Global Warming Potential

Table 4 presents the results of the WRATE model for both scenarios and for both marginal energy mixes. Where the model shows a negative unit value this is indicative of a process displacing conventional energy or electricity or material use, therefore the process that places the least burden on the environment is that which shows the lowest of most negative value.

Table 4. Global Warming Potential

Impact Assessment	Unit	Marginal Energy Mix	Scenario 1 - Baseline	Scenario 2 – Combustion of WDF at the Proposed Development
Climate change GWP 100a	Kg CO_2-eq	WRATE Default UK 2020	65,982,632	-117,627,292
Climate change GWP 100a	Kg CO_2-eq	100% Gas CCGT	81,141,959	-56,076,355

The WRATE model shows that the transfer of waste to the Proposed Development (Scenario 2) presents significant carbon savings, of over 183 million kg CO_2-eq in comparison to the baseline (Scenario 1) when displacing the WRATE Default UK marginal mix for 2020. Carbon savings of over 137 million kg CO2-eq in comparison to the baseline are shown when the marginal energy mix is set to 100% Gas CCGT.

Figure 2 shows the detailed comparison for the breakdown of the global warming potential for both the baseline scenario and the Proposed Development. The graph clearly shows the burdens and avoided burdens (negative and positive values) and how these compare to each other.

Figure 2 shows that the major carbon impact is from the landfilling of the waste as modelled in the baseline scenario. The metals recycling in both scenarios is the dominant beneficial element in terms of carbon impact (shown in yellow) with the additional recycling of IBA from the Proposed Development increasing this benefit in scenario 2.

The treatment and recovery process (shown in light blue) incorporates both the pre-treatment process and the Proposed Development process impacts. It can be seen here that in scenario 1 the impact of the pre-treatment process is a positive figure – most likely to be predominantly related to the energy required by that process. In contrast scenario 2 also includes this burden but offset by the Proposed Development’s process which is a net producer of energy and which reduces carbon emissions by displacing energy that would otherwise be generated in part from fossil fuels.

Figure 2 – The Difference in Global Warming Potential between Scenarios 1 and 2 for the WRATE Default UK 2020 Marginal Mix

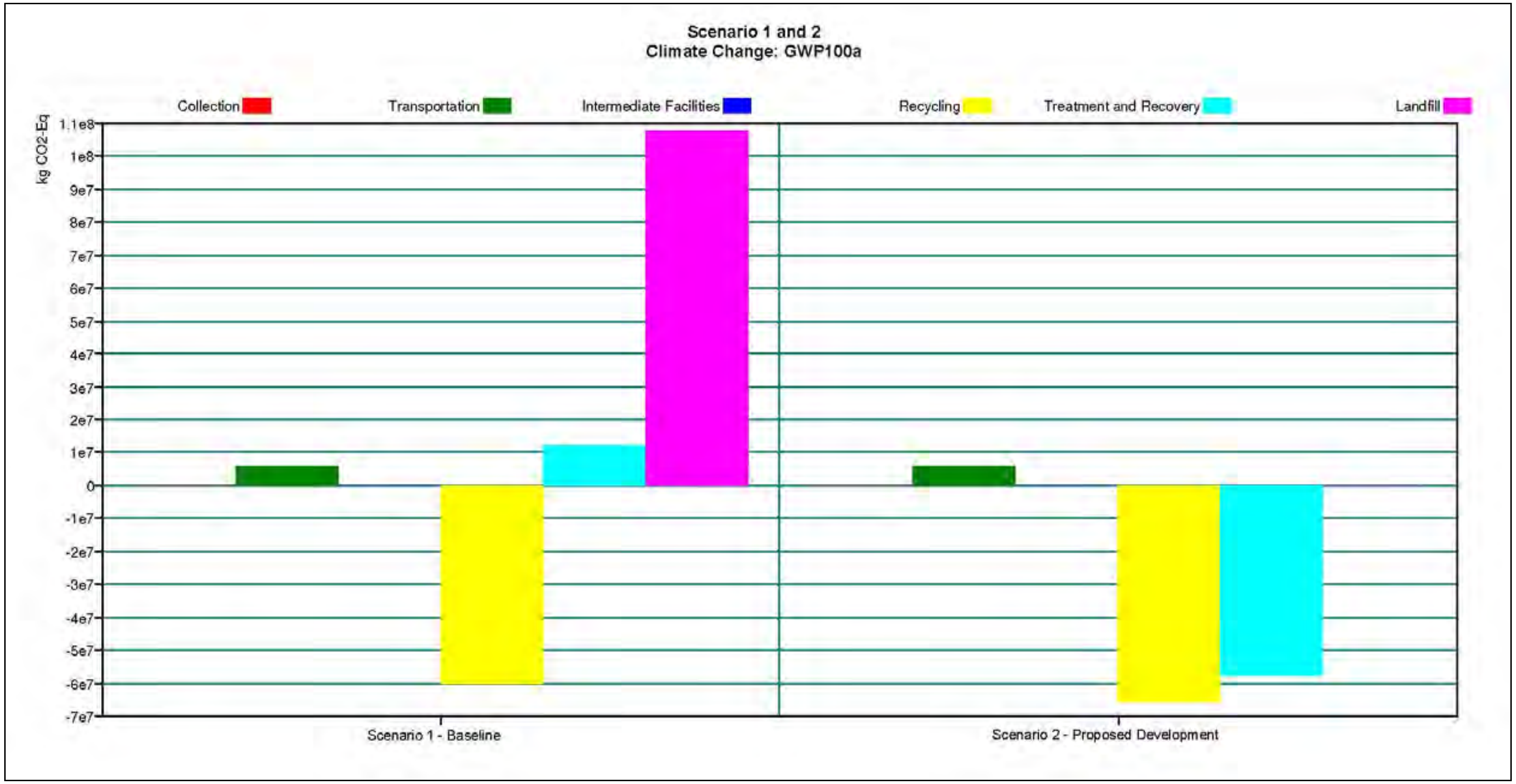


Figure 3 – The Difference in Global Warming Potential between Scenarios 1 and 2 for the 100% Gas CCGT Marginal Mix

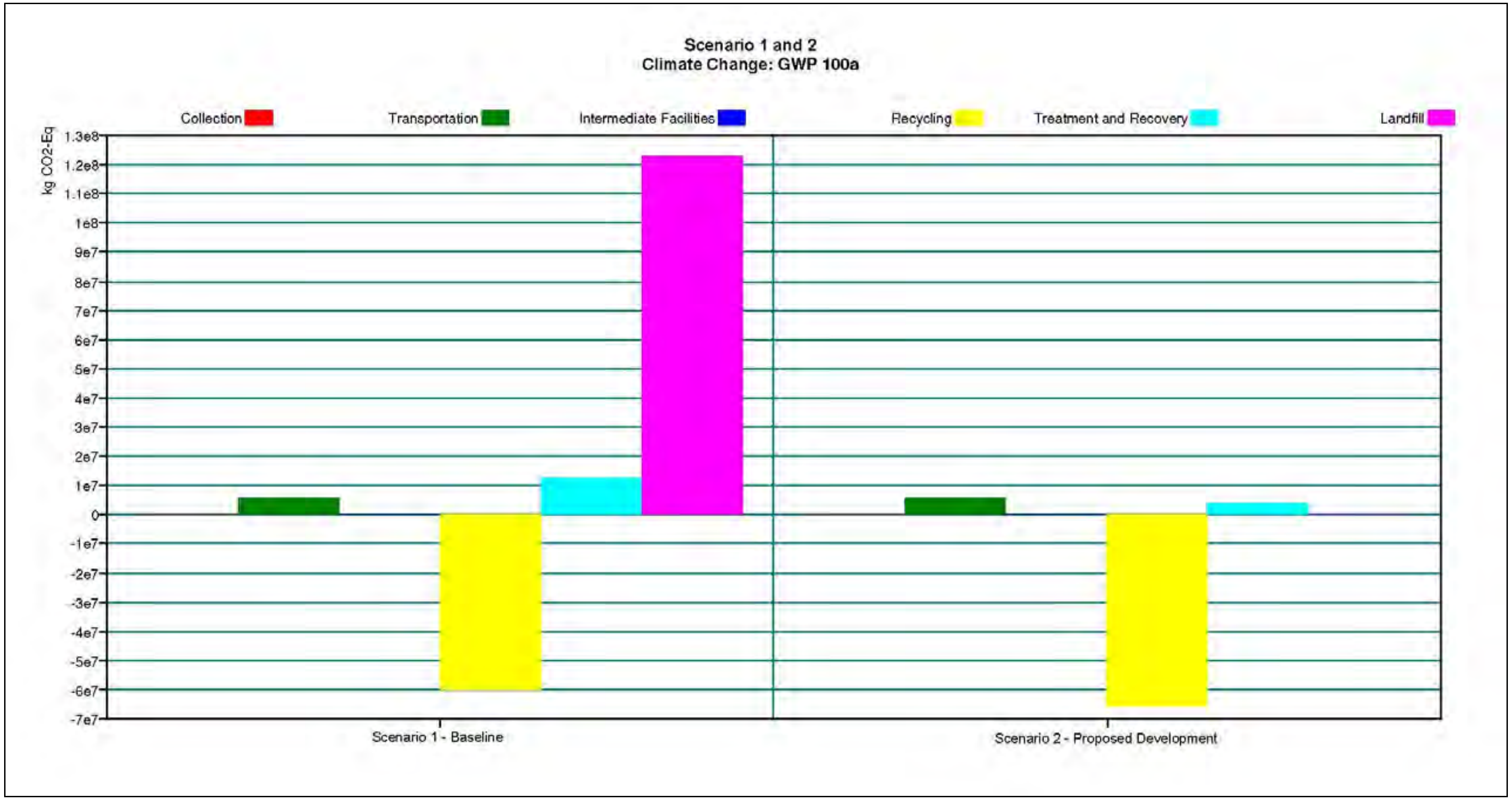


Table 5 summarises the global warming potential of each element of the Proposed Development scenario in kg CO_2-eq.

Table 5. Global Warming Potential of each element of Scenario 2

Project Headline Indicators	Unit (kg CO_2-eq) WRATE Default UK 2020 Marginal Mix	Unit (kg CO_2-eq) 100% Gas CCGT Marginal Mix
Transportation		
Transport to the Proposed Development from pre-treatment	5,788,724	5,788,724
Recycling		
Non-ferrous metal recycling	-40,147,256	-40,147,256
Ferrous metal recycling	-20,051,512	-20,051,512
Incinerator Bottom Ash recycling	-5,591,031	-5,591,031
Treatment and Recovery		
Pre-treatment process	12,506,747	12,506,747
Proposed Development	-70,182,482	-8,631,545
Landfill		
Landfill of FGT residues from the Proposed Development	49,518	49,518
Total	**-117,627,292**	**-56,076,355**

3.2. Model Analysis – Marginal Energy Mix

The model shows differences in the carbon savings assessed for the Proposed Development between the two different marginal energy mixes. When Scenario 2 is modelled with the marginal energy mix set to 100% Gas CCGT the model shows a reduction in carbon savings i.e. less carbon displaced than when the Proposed Development is modelled using the WRATE Default UK 2020 marginal energy mix. These results reflect the fact that a future marginal energy mix of 100% Gas CCGT would be less carbon intensive than a future marginal energy mix of coal, gas and Gas CCGT. Because the energy produced by a Gas-CCGT marginal mix, which would be displaced by energy produced by the Proposed Development, is less carbon intensive the Proposed Development shows less of an overall benefit than if it were displacing a more carbon intensive marginal mix. However, both models show that the Proposed Development is preferential to the baseline scenario in carbon equivalent terms.

3.3. Model Analysis – Pre-treatment

One of the main elements of the assessment that could vary considerably is the pre-treatment of the waste prior to transportation to the Proposed Development. At present this is a relative unknown although it is likely that the waste will be sourced from a number of different facilities that can produce a residual fraction or WDF suitable for energy recovery at the Proposed Development.

The use of different pre-treatment facilities will result in different impacts when modelled in WRATE, variation will include energy utilised by the process, tonnages and range of recyclables recovered from the incoming waste, the resulting composition of the waste sent to the Proposed Development and the distances between the facilities and the Proposed Development. All of these variables have knock-on implications for the other elements of the assessment and the overall results. A number of iterations of this model have been tested with different pre-treatment facilities modelled resulting in different compositions of WDF to be treated at the Proposed Development. All of the test models with different waste pre-treatment processes performed better than the baseline scenario of sending the same waste for disposal to landfill.

3.4. Model Analysis – WDF Design Case

The WRATE assessment assesses the 400,000 tonnes per year design case. The assessment demonstrates a beneficial effect, mainly through diverting waste from landfill. Therefore the impact of avoiding the landfilling of a further 20% of WDF i.e. 480,000 tonnes per year (the maximum capacity of the Proposed Development) would also be beneficial in comparison to the baseline scenario.

3.5. Model Analysis – Transport Distances

The transportation of waste has a relatively minor carbon impact in comparison to the other elements of the assessment. The distance of 64.4km (40 miles) for waste to be sourced is an assumed distance and so a sensitivity analysis has been undertaken to determine how much of a difference different journey distances would make to the overall global warming potential assessed by WRATE. Table 6 below shows how the impact of the transport element of scenario 2 varies over a range of different distances.

Table 6. Transport Sensitivity

Project Headline Indicators	Distance (km)	Scenario 2 (kg CO2-eq)
Transport to the Proposed Development from pre-treatment (Intermodal Road Transport with max capacity of 17.559 tonnes. Total waste tonnage transported: 400,000 tonnes)	120	10,786,443
	100	8,988,702
	80	7,190,962
	64.4	5,788,724
	40	3,595,481
	20	1,797,740
	10	898,870
	1	89,887

Table 6 shows that if waste sources are located further afield than the 64.4km (40 miles) distance modelled then the kg CO_2- eq transport value will increase, however in the context of the overall assessment the kg CO_2- eq contribution of the journey from WDF source to Proposed Development Site is relatively insignificant and a doubling of the journey distance (for example) would result in a 0.5% difference in overall kg CO_2- eq.

3.6. Model Analysis – Proposed Development Outputs

The figures for IBA and FGT residue are somewhat higher than those anticipated for the Proposed Development however the outputs in WRATE are a direct function of the type of facility modelled and the waste input into that facility. The fact that the outputs are slightly higher in the model provides a conservative assessment as the related impacts will be higher than are expected in reality.

3.7. Conclusions

Based on the outputs from the modelled scenarios, the environmental impact of the Proposed Development against a baseline of the same waste being disposed of to landfill can be summarised as shown in Table 7 (default UK 202 Marginal Mix) and Table 8 (100% Gas CCGT Marginal Mix).

Table 7. Summary of Results (WRATE Default UK 2020 Marginal Mix)

Scenario	Waste Management Route	Total Kg CO_2 eq	Kg CO_2/T waste
1	Baseline – disposal of waste to landfill	65,982,632	156.3
2	Production of WDF for combustion at the Proposed Development	-117,627,292	-278.7

Table 8. Summary of Results (100% Gas CCGT Marginal Mix)

Scenario	Waste Management Route	Total Kg CO_2 eq	Kg CO_2/T waste
1	Baseline – disposal of waste to landfill	81,141,959	192.2
2	Production of WDF for combustion at the Proposed Development	-56,076,355	-132.8

The WRATE model identifies the global warming potential of the baseline option as a positive number i.e. a net increase in emissions of CO_2. In contrast, the model assesses the Proposed Development as a facility that, in the processing of a waste source to produce heat and power, displaces conventional energy or electricity use and therefore represents a net reduction in CO_2 emissions.

The assessment undertaken allows for the comparison of the Proposed Development with an alternative 'do-nothing' baseline scenario where the same waste that would be treated at the Proposed Development is disposed of to landfill.

Table 7 shows that the transfer of waste to the Proposed Development will provide annual carbon savings of over 183 million kg CO_2-eq in comparison to the baseline of disposal of the equivalent waste directly to landfill (when displacing the WRATE Default UK Marginal Mix for 2020).

Table 8 shows that the transfer of waste to the Proposed Development will provide annual carbon savings of over 137 million in comparison to the baseline of disposal of the equivalent waste directly to landfill (when displacing the 100% Gas CCGT Marginal Mix).

The assessment therefore demonstrates that the treatment of waste at the Proposed Development is environmentally preferable to the disposal of waste to landfill in terms of global warming potential. The two different marginal energy mixes used in this assessment indicate a higher benefit if the energy displaced is modelled as being more carbon intensive (i.e. WRATE Default UK 2020) than if the energy displaced is of a lower carbon intensity (i.e. 100% gas CCGT displacement as advised in the Defra guidance). However, the Proposed Development is shown to be of net benefit for both of the future energy mix scenarios modelled.

Appendix J-2

Climate Change Assessment

Slough Multifuel CHP Facility

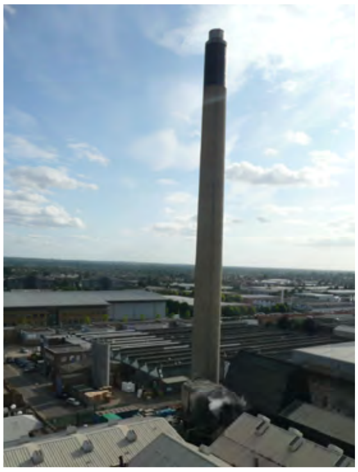
Climate Change Impact Assessment

47066339

Prepared for:
SSE Generation Ltd

UNITED KINGDOM & IRELAND



REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Reviewed by**	**Approved by**
1	September 2013	Draft	Emily Ghedia Sustainability Consultant Anna Hatley Sustainability Consultant	Alex Greenwood Sustainability Consultant	Jayne Nippress Principal Consultant
2	March 2014	Final	Emily Ghedia Sustainability Consultant	Jayne Nippress Principal Consultant	Jayne Nippress Principal Consultant
3	September 2014	Final	Anna Hatley Sustainability Consultant	Jayne Nippress Principal Consultant	Jayne Nippress Principal Consultant

URS Infrastructure & Environment UK Limited
Scott House, Alencon Link
Basingstoke
RG21 7PP
United Kingdom
Tel: +44 (0)1234 349 641
Fax: +44 (0)1234 216 268
[redacted]

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CONTENTS

1. INTRODUCTION

SSE Generation Ltd (the 'Applicant') is seeking planning permission from Slough Borough Council (SBC) for the demolition and removal of redundant generating plant and buildings and the development of a multifuel combined heat and power (CHP) facility providing up to 50 megawatts electrical (MWe) gross electrical capacity and a capacity of 20 megawatts thermal (MWth) of heat for export to the local network.

URS has been commissioned to undertake an assessment of the operational carbon emissions/footprint from the combustion and transport of waste derived fuel (WDF) for the Proposed Development. The results of this assessment together with commentary on the proposed mitigation measures are presented in this Climate Change Impact Assessment.

A WRATE (Waste and Resources Assessment Tool for the Environment) assessment has also been undertaken for the Proposed Development to compare two scenarios: the disposal of waste directly to landfill (the baseline); and the pre-treatment and combustion of WDF at the Proposed Development. WRATE is a Life Cycle Assessment (LCA) tool developed by the Environment Agency. WRATE allows users to quantify and compare environmental burdens of equivalent waste management systems across their entire life cycle. The WRATE Assessment Report was undertaken by URS in March 2014.

The objectives of this report are to provide information regarding the following:

- The national and local carbon emissions reduction policy/target framework in place;
- A prediction of the carbon emissions associated with the operation of the Proposed Development; and
- The measures proposed to manage carbon emissions during operation of the Proposed Development.

2. LEGISLATION AND PLANNING POLICY CONTEXT

The Environmental Statement (ES) for the Proposed Development presents more detailed information on planning policy; an overview of policies relating to climate change is presented here.

2.1 International Regulations

Greenhouse Gas Emissions Trading Scheme Regulations 2012

The EU Emissions Trading Scheme (EU Emissions Trading Directive 2003/87/EC) is enforced in the UK under the Greenhouse Gas Emissions (GHG) Trading Scheme Regulations 2012. The revised EU ETS Directive forms part of the EU 2020 Climate & Energy Package agreed in December 2008. The EU ETS is now in Phase III, running until 2020. The EU ETS is the largest multi-country, multi-sector GHG emissions trading system in the world. It includes more than 11,000 power stations and industrial plants across the EU with around 1,000 of these in the UK. The EU ETS works on a 'cap and trade' basis, so there is a 'cap' or limit set on the total GHG emissions allowed by all participants covered by the System and this cap is converted into tradable emission allowances.

Tradable emission allowances are allocated to participants in the market; in the EU ETS this is done via a mixture of free allocation and auctions. One allowance gives the holder the right to emit one tonne of carbon dioxide (CO_2) (or its equivalent). Participants covered by the EU ETS must monitor and report their emissions each year and surrender enough emission allowances to cover their annual emissions. The Applicant will investigate whether the Proposed Development should participate in the EU ETS following receipt of planning consent and in liaison with the Environment Agency.

2.2 National Policy

Climate Change Act 2008

A landmark piece of environmental legislation, the Climate Change Act sets a legally binding target for the UK to reduce its greenhouse gas emissions from 1990 levels by at least 80% by 2050. This overall target is supported by a system of binding five-year ‘carbon budgets’ as well as an independent body, the Committee on Climate Change.

Environmental Permitting (England and Wales) Regulations 2010 (as amended)

The Permitting regulations bring together a range of previous regulations including the Pollution Prevention and Control (PPC), Waste Incineration and Waste Management Licensing (WML) regulations and also transpose the Industrial Emissions Directive (IED). They require certain facilities to obtain a permit from the Environment Agency, with the authority regulating approximately 300 combustion plants in England and Wales with a rated **thermal** input of 50MW or more. Lower thresholds apply to the incineration of waste for example.

The IED aims to minimise pollution from various industrial activities. The plant will be fully compliant with the requirements of the IED and specifically Chapter IV (*Special Provisions for Waste Incineration Plants and Waste Co-Incineration Plants)*.

The Energy White Paper ‘Meeting the Energy Challenge’ 2007

Published by the Department for Trade and Industry, this formed the basis of the Energy Act 2008 and sets out the Government’s plans for tackling climate change through reducing carbon emissions whilst ensuring the availability of secure, clean and affordable energy.

Government Review of Waste Policy in England 2011

This review highlights the importance of sustainable waste policies as part of tackling national and international climate change, due to the significance of energy impacts of material resource use and the direct greenhouse gas emissions from biodegradable wastes in landfill. In particular the Government supports efficient energy recovery from residual waste and promises to ensure the correct blend of incentives are in place to support the development of recovery infrastructure as a renewable energy source. It also identifies carbon as a good proxy for the overall environmental impacts of waste, with the greenhouse gas impacts generally being reduced the higher up the waste hierarchy waste is treated.

Overarching National Policy Statement (NPS) for Energy (EN-1) (2011)

This emphasises the importance of a diverse mix of energy generating technologies, including renewables, nuclear and fossil fuels, to avoid over-dependence on a single fuel type and thereby ensure security of supply. It also recognises the increasingly prominent role waste can play in providing a diversified and decarbonised electricity generation capacity as a future source of fuel on a large scale. This supports Government policy on waste, i.e. to use it as a resource wherever possible.

Overarching National Policy Statement (NPS) for Renewable Energy (EN-3) (2011)

This emphasises the importance of energy from waste (EfW) within waste management strategies in the UK. It also recognises that the recovery of energy from the combustion of waste, where in accordance with the waste hierarchy, will play an increasingly important role in meeting the UK's energy needs.

2.3 Local Planning Policy

Since 2011 the six Berkshire unitary authorities have been responsible for minerals and waste planning policy in their own areas.

The main minerals and waste planning documents are the saved policies from the Joint Minerals and Waste Development Framework Core Strategy, the Replacement Minerals Local Plan and from the Waste Local Plan. These policies form part of the 'development plan' and are one of the main considerations in deciding planning applications.

The Joint Minerals and Waste Development Framework Core Strategy (2007) identifies that within Berkshire waste will need to be treated and disposed of through a range of measures including recovery of energy from waste.

Core Policy 8 (Sustainability and the Environment) of Slough Borough Council: Local Development Framework - Core Strategy 2006 – 2026 Development Plan Document (December 2008) requires all development to address the impact of climate change.

3. CARBON FOOTPRINT ASSESSMENT METHODOLOGY

3.1 Methodology

The Greenhouse Gas Protocol (Ref. 1) has been used to calculate the Proposed Development's carbon footprint. A widely used standard for emissions reporting, the Protocol has become the basis for many other reporting standards around the world. It provides a methodology for calculating the carbon footprint of a project or a business entity and was developed by the World Resources Institute and the World Business Council for Sustainable Development.

Where possible design values for the Proposed Development have been used within this preliminary assessment, however some assumptions have been made where data is not yet available or where exact values are not known at this stage. The assumptions made are set out in this assessment including a justification for their selection.

3.2 Greenhouse Gas Emission "Scopes"

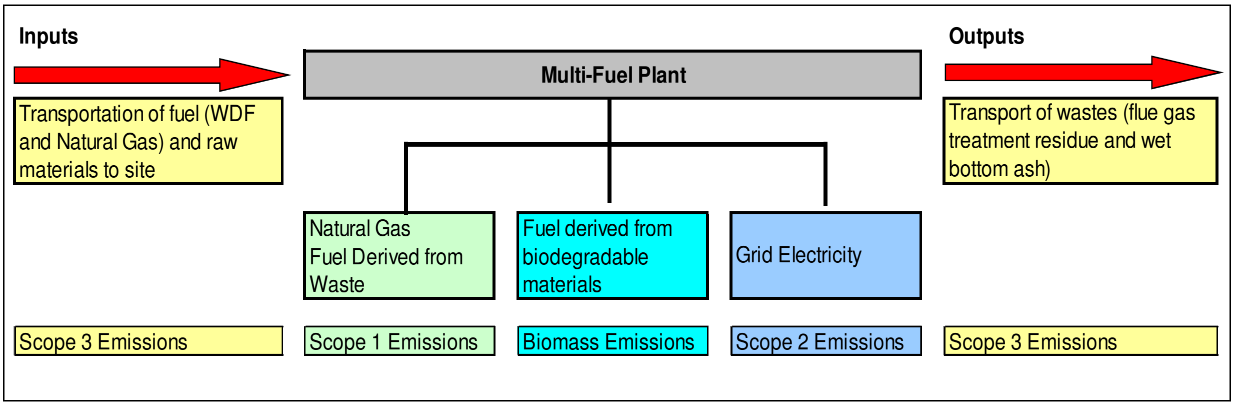
The Greenhouse Gas Protocol defines different sources of greenhouse gas (GHG) emissions into a series of categories or "scopes". These definitions have been used in this assessment to determine the scope and sources of emissions to be considered for the carbon footprint of the Proposed Development:

Table 1 Greenhouse Gas Emission Scopes

Scope	Assessment Details
Scope 1: Direct Emissions	• Fossil Fuel combustion on site: Minor quantities of natural gas used at start up to enable the grate boilers to reach operating temperature and the plant to meet air emission limits when solid fuel is introduced); and • Combustion of waste derived fuel (WDF), comprising fossil and non-fossil fuel (biomass) elements. The composition of the WDF is discussed in Section 4.2. Note: In accordance with the WRI/WBCSD Greenhouse Gas Protocol and Defra's guidance on GHG conversion factors *"direct CO_2 emissions from the combustion of biomass are not included in Scope 1"*. See Section 4.3 (Emission Conversion Factors) for further information.
Scope 2: Electricity Indirect Emissions	Imported grid electricity during periods of no generation.
Scope 3: Other Indirect Emissions	For the purpose of this assessment, Scope 3 emissions focus on those elements over which the Applicant has significant control and influence during the operation of the power station and are also anticipated to differ from any equivalent power plant: • Transport of WDF feedstock to site; • Transport of major raw materials to site; and • Transport of waste materials from the site.

A breakdown of emissions sources for the Proposed Development is displayed diagrammatically in Figure 1.

Figure 1 Breakdown of Emission Types for the Multifuel Generating Plant



4. DATA AND ASSUMPTIONS

The data, assumptions and emission factors used in the carbon footprint calculation are described in the following section.

4.1 Assumptions

Several broad assumptions have been developed to enable the current assessment:

- The Proposed Development is assumed to operate for 8,000 hours per annum (assuming 91% operating time);
- The net generation capacity is assumed to be 45MWe (i.e. up to 50MW gross and 5MW ancillary demand);
- The maximum heat generating capacity of the CHP is expected to be 20MWth. As this will require 6MW of ancillary demand, it has been assumed that when the maximum CHP capacity is implemented, the plant will produce 20MWth and 39MWe net; and
- Whilst the last few years of operation saw a shift to wood and waste fuels, figures for the previous coal and gas fired electricity generation capacity on the site have been based on 100% gas and coal consumption to reflect gas and coal-fired power stations of a similar capacity to the Proposed Development. A net/net thermal efficiency of the Proposed Development of 27% has been used as advised; this does not take into account the efficiency improvements through the use of CHP and/or design development.

4.2 Composition of Waste Derived Fuel (WDF)

The maximum capacity of WDF at the Proposed Development is 480,000 tonnes. Only WDF that has been processed to be within an appropriate fuel composition range will be sourced for the Proposed Development. The sources of the WDF will typically comprise fuels made from:

- Municipal Solid Waste (MSW) and Commercial and Industrial Waste (C&I); and;
- Waste wood.

It is not possible to define the specific mix of WDF that might comprise the fuel for the Proposed Development at present. It is also not possible at the current time to specify the exact geographical sources of the fuel or the specific average Net Calorific Value (NCV).

The Proposed Development has been designed to accept WDF from various sources of processed municipal solid waste (MSW), Commercial and Industrial (C&I) waste and waste wood. The NCV of fuels will be variable over time, but the design case of 12 MJ/kg is expected to result in a throughput of circa 400,000 tonnes per annum. This throughput tonnage has therefore been modelled for this assessment.

Both the WRATE assessment and the carbon footprint assessment have been based on a 50/50 MSW/C&I waste input. The default WRATE Municipal Solid Waste (MSW) composition for England has been used for the MSW composition in the models as the specific sources for the facility are not known. The composition of the C&I waste has been based on the data from a study undertaken for the Environment Agency Wales in 2007.

The composition of MSW and C&I are presented in Table 2 and 3 respectively.

Using waste wood as a separate fuel source has not been accounted for in this assessment.

In the absence of information regarding the exact sources of WDF to be taken by the Proposed Development, this WDF composition is considered representative and is also considered to represent the worst case.

Table 2 MSW Composition used in the carbon footprint calculation

Waste Type	% Composition
Paper and Card	23.99
Plastic Film	3.81
Dense Plastic	6.17
Textiles	2.79
Absorbent hygiene products	2.34
Wood	3.60
Combustibles	6.09
Non-combustibles	2.66
Glass	7.89
Organic	31.59

Waste Type	% Composition
Ferrous Metal	3.06
Non-ferrous metal	1.32
Fine material <10mm	1.98
WEEE	2.23
Specific Hazardous Waste	0.48
Processed Materials	0
Non-MSW waste	0

Table 3 C&I Composition used in the carbon footprint calculation

Waste Type	% Composition
Paper and Card	32.2
Plastic Film	7.0
Dense Plastic	7.7
Textiles	1.6
Absorbent hygiene products	0.1
Wood	5.6
Combustibles	11.4
Non-combustibles	6.0
Glass	3.5
Organic	14.9
Ferrous Metal	3.6
Non-ferrous metal	0.8
Fine material <10mm	3.9
WEEE	1.1
Specific Hazardous Waste	0.6
Processed Materials	0
Non-MSW waste	0

The source of the C&I Composition is the Environment Agency Wales I&C Waste Analysis Study (Nov 2007). The composition has been slightly altered as follows, in order to comply with the waste input categories of the WRATE model:

- 0.1% biodegradable industrial sludge reallocated as fines;

- the total percentage composition in the data totals 99.6% therefore an additional 0.4% has been added to the fines; and
- there is no option to input “black sack residual waste” into WRATE so the 0.6% black sack residual waste has been reallocated as “other combustibles”..

4.3 Emission Conversion Factors

The emission conversion factors used in the assessment for the Proposed Development were derived from a range of sources and are summarised here by source:

- Derived from factors published annually by Defra (Ref. 2):
  - Natural gas: 0.1840kg CO_2e per kWh
  - Grid electricity: 0.44548kg CO_2e per kWh
  - Transport by heavy goods vehicle (HGV Articulated (>3.5-33t), average laden): 0.16159kg CO_2e per tonne-kilometre
  - Transport by average cargo ship: 0.01315kg CO_2e per tonne-kilometre (for activated carbon only)
- In the absence of emission factors specific to the combustion of WDF the following emission conversion factors have been sourced from data collected by the Environment Agency in support of the development of the WRATE assessment tool (Ref. 3). These emission factors are based on the process emissions of CO_2e associated with the treatment of various waste types via Mechanical Biological Treatment (MBT) with WDF combustion. Normally waste treatment (i.e. MBT) is considered outside the scope of the carbon footprint assessment, as it will be undertaken by a third party. However, emission factors associated with the combustion of WDF only are not available, therefore the presented carbon footprint calculation is considered to overestimate and represents the worst case:
  - Plastic: 1,333 (film) or 1,544 (dense) kgCO_2e per tonne of treated waste;
  - Textiles: 578 kgCO_2e per tonne of treated waste;
  - Fine material: 202 kgCO_2e per tonne of treated waste;
  - Miscellaneous non-combustible waste: 105 kgCO_2e per tonne of treated waste;
  - Ferrous metal: 3 kgCO_2e per tonne of treated waste;
  - Non-ferrous metal: 3 kgCO_2e per tonne of treated waste;
  - Glass: 5 kgCO_2e per tonne of treated waste; and
  - Miscellaneous combustible waste: 556 kgCO_2e per tonne of treated waste.

A number of recognised sources provide guidance on how to manage reporting of biogenic emissions *(*emissions from the combustion or decomposition of biologically-based materials other than fossil fuels e.g. wood, vegetation):

- The Carbon Trust indicates that when calculating a carbon footprint with the combustion of biofuels or biomass as a fuel source, these are considered zero carbon at point of use, i.e. the carbon released into the atmosphere when the material is burnt is equivalent to the amount absorbed by the plant during its growth cycle. Greenhouse gas inventories and carbon footprints tend to differentiate between biogenic carbon (from biomass) and fossil carbon; one of the key differences is the typical period over which the carbon is recycled back into the atmosphere. For biogenic carbon this tends to be over a short period and is therefore considered to be zero from a footprinting perspective to enable differentiation from the releases from fossil fuels.

- Guidance published by Defra defines a method for managing biomass combustion in greenhouse gas footprinting and reporting: 'Within the scope 1 conversion factors for biofuels the CO_2 emissions value is set as net '0' to account for the CO_2 absorbed by fast growing bioenergy sources during their growth'.

- The EU presents a similar set of guidance (Ref. 4) establishing guidelines for the monitoring and reporting of greenhouse gas emissions. It lists the following materials as CO_2 neutral, i.e. they are considered biomass with an emission factor of 0 (tonnes CO_2):

  – Biomass wastes, products and by products, inter alia:

  – Industrial waste wood (waste wood from woodworking and wood processing operations and waste wood from operations in the wood materials industry);

  – Used wood (used products made from wood, wood materials) and products and by-products from wood processing operations; and

  – Wood-based waste from the pulp and paper industries, e.g. black liquor.

  – Biomass fractions of mixed materials, inter alia:

  – The biomass fraction of municipal and industrial waste; and

  – The biomass fraction of processed municipal and industrial wastes.

Therefore, when calculating the carbon footprint associated with the combustion of the proposed WDF, a zero carbon emission factor (tonnes CO_2 produced per tonne fuel used) has been used for the biomass content (i.e. the paper, wood and organic content) which equates to approximately 59% of the overall feedstock by weight.

4.4 Other Data Inputs

The tables below detail all other assumptions and data required for the carbon footprint calculation.

Table 4 Data Inputs

Scope	Aspect of Footprint	Annual quantity consumed
Scope 1	Annual quantity of natural gas used on site in normal operation	300,000 therms
Scope 1	Annual quantity of WDF combustion on site	400,000 tonnes
Scope 2	Imported electricity from the National Grid	1750 MWh

Predicted annual quantities of major raw materials consumed and waste streams generated during the operation of the Proposed Development are presented below. The scope 3 emissions associated with the transport of these materials/wastes in addition to the transport of the Multi-fuel feedstock have been included in the assessment for the Proposed Development.

Table 5 Annual Raw Material Consumption and Waste Generation

Scope	Aspect of Footprint	Annual quantity
Scope 3	Raw materials consumption: Hydrated lime	6,500 tonnes
Scope 3	Raw materials consumption: Ammonia	1,500 tonnes
Scope 3	Raw materials consumption: Activated Carbon	200 tonnes
Scope 3	Waste material: Flue gas treatment (FGT) residue	15,000 tonnes
Scope 3	Waste material: Wet bottom ash	80,000 tonnes

Table 6 summarises the distances assumed for fuel, raw material and waste transportation, for the purposes of this assessment. The actual distances will depend on the selected supplier and award of contracts.

Table 6 Distances and Assumptions for Resource and Waste Transportation

Material Transported	Approx. Distance transported by HGV (km)	Distance transported by Ship (km)	Assumptions
Multifuel Feedstock	64[1]	n/a	Average assumption provided by the Applicant. See Table 8 for additional sensitivity tests.
Hydrated Lime	275	n/a	Transportation from the Peak District (Buxton used as a proxy) to the site.
Ammonia	317	n/a	Transportation from Ince (closest of three possible production sites) to the site.
Activated carbon	534	50	Transportation from Amsterdam to site, via boat from Calais to Dover.

Material Transported	Approx. Distance transported by HGV (km)	Distance transported by Ship (km)	Assumptions
FGT residue	241	n/a	Average assumptions provided by the Applicant.
Wet bottom ash	80	n/a	

[1] Note the distance of 64km has been calculated from the equivalent of 40 miles.

5. CARBON FOOTPRINT OF THE PROPOSED DEVELOPMENT

Carbon footprints have been calculated for the operational phase of the Proposed Development, taking into account scenarios with and without CHP. A breakdown is shown in Table 7 below.

Table 7 Carbon Footprint of the Proposed Development

Emissions Source	Annual carbon emissions by scope (tCO_2e)
Scope 1	
Process emissions from WDF combustion	108,151
Emissions from fossil fuel (natural gas) combustion	1,618
Scope 2	
Electricity imported from the National Grid	780
Scope 3	
Transport of Multi-fuel	4,161
Transport of raw materials (hydrated lime, ammonia and activated carbon)	383
Transport of waste materials (flue gas treatment residue and wet bottom ash)	1,625
Total annual carbon emissions (tCO_2e)	**116,718**
Carbon Intensity of generated electricity and heat with CHP all scopes (tCO_2e/GWh)	247
Carbon Intensity of generated electricity without CHP all scopes (tCO_2e/GWh)	324

Using the data described above the total annual carbon footprint of the Proposed Development is 116,718 tonnes CO2e. Assuming the Proposed Development includes CHP and exports 312,000 MWhe per year and 160,000 MWhth per year (based on 8,000 operating hours with net output of 39MWe[1], plus heat generation of 20MWth output CHP) this is equivalent to 247 tonnes CO_2e per GWh electricity generation.

Without CHP, the Proposed Development would export 360,000 MWhe per year (based on 8,000 operating hours with net output of 45MWe) with a carbon intensity of 324 tonnes CO2e per GWh electricity generation. This figure is based upon the CO_2 emissions arising from the plant operating without CHP, divided by the total GWh exported to give tCO_2e/GWh. It includes CO_2e emissions relating to transport, imported electricity when not generating and gas used as a combustion support fuel, which are derived from factors published by Defra (Section 4.3).

As Table 7 above shows, the majority of emissions will originate from the combustion of the WDF. Due to uncertainty surrounding the location of the source of WDF, Table 8 presents alternative figures to demonstrate the impact of doubling the distance the WDF is transported. Whilst the carbon footprint is greater with a longer transportation distance as expected, it is marginal, with an increase of just 3% overall.

Table 8 Transport of Multi-fuel Sensitivity Tests

Emissions Source	Annual carbon emissions by scope (tCO_2e)	
	Original Assumptions	Conservative Assumptions
Transport of WDF	4,161	8,321
Total annual carbon emissions (tCO_2e)	116,718	120,878

6. COMPARISON OF PROPOSED DEVELOPMENT CARBON FOOTPRINT

6.1 Electricity Generation

Table 9 presents the carbon intensity of the Proposed Development along with national averages for other existing power stations (Ref. 5). The carbon intensity figures have been taken from the Digest of United Kingdom energy statistics (2013) and present the provisional 2012 figures, which are the most up to date for this assessment. It should be noted that the intensity figures stated below comprise carbon intensity associated with the combustion of the primary fuel source (e.g. coal, natural gas, refuse derived fuel) i.e. Scope 1 emissions only, and do not include other elements of the carbon footprint such as transport of primary fuel electricity use on site. Therefore results are presented compared to the Scope 1 intensity of the Proposed Development only.

[1] Note – Whereas the net output without CHP is 45MWe (i.e. the 50MWe gross is reduced by 5MW of ancillary load), it may reduce to 39MWe if the full 20MWth is extracted in the form of steam. This is shown in *Appendix J-3: CHP Assessment* and represents the lowest net electrical output based on the design parameters.

Table 9 Comparison of Carbon Intensities for the Proposed Development with other Existing Power Stations

Nature of power station	Carbon intensity of electricity supplied (tCO_2e/GWh)
Average UK power station - coal	895
Average UK power station – fossil fuels only	700
Average UK power station – gas fired only	415
Average UK power station - all fuel types (including nuclear & renewable)	483
Proposed Development, Scope 1 only (with CHP)	**233**
Proposed Development, Scope 1 only (without CHP)	**305**

The Proposed Development will outperform the average existing power stations within the UK both with and without CHP.

Based on the average carbon intensity data provided in Table 9 above, the tonnes of CO_2e emitted from an average UK power station (all fuel types) with the same capacity as Slough would be 173,900 tonnes CO_2e (excluding Slough's CHP capacity) and 228,000 tonnes CO_2e (including Slough's CHP capacity). Hence, the results indicate that the generation of electricity by the Proposed Development using WDF represents annual carbon savings of 64,100 tonnes CO_2e without CHP, increasing to 118,200 tonnes CO_2e with CHP compared to the UK average power station for the generation of electricity alone from all fuel types. When compared to a UK average gas-fired power station, savings of 39,600 tonnes and 86,100 tonnes CO2e without and with CHP respectively are still possible.

Please note the above carbon savings include the emissions associated with the Scope 1 emissions only, i.e. the burning of the primary fuel source, and does not include a comparison of other elements of the carbon footprint such as transport of the primary fuel to site, electricity use on site etc.

6.2 Landfilling of Feedstock

A positive consequence of the Proposed Development will be the diversion of waste from landfill. The *Government Review of Waste Policy in England 2011* supports efficient energy recovery from residual waste to deliver environmental benefits and reduce carbon impacts, as well as reducing the amount of waste sent to landfill in support of targets set by the EU. In 2008 around 165 million tonnes of waste were generated by households, commercial and industrial businesses as well as the construction sector, with disposal via landfill sites the traditional approach in the UK (Ref. 6). Not only does this take up valuable landfill space but there are also associated greenhouse gas (methane) emissions to atmosphere generated from the breakdown of such material within the landfill. When biomass materials such as wood and paper are allowed to decay naturally, methane is released into the atmosphere. When biomass is burned efficiently and in a controlled manner (such as within the proposed multifuel plant) the complete combustion results in the emission of CO_2 rather than methane. Due to the lower global warming potential of CO_2 as compared to methane (1 tonne of methane is the equivalent of 21 tonnes of CO_2) combustion alone can lead to lower carbon equivalent emissions.

As discussed a WRATE assessment has been undertaken to compare the following two scenarios:

- The disposal of waste directly to landfill (the baseline); and
- The pre-treatment and combustion of WDF at the Proposed Development.

WRATE calculates the potential impacts arising from all processes in the waste management system including the collection, transportation, transfer, treatment, disposal and recycling of materials. The model takes into account the construction and operation of infrastructure and vehicles, and offsets this burden against the avoided burdens associated with materials and energy recovery. All inputs of waste, energy and materials, and outputs of energy, process residues, materials and emissions are accounted for. A built-in database is used to source information related to the electricity generation mix, energy generation efficiency, losses during electricity transport and marginal electricity production as well as the waste composition.

In this assessment two different baseline energy mixes were selected. The first marginal mix modelled is the mix forecast by WRATE (using Department of Energy and Climate Change [DECC] data). WRATE forecasts the marginal energy mix for 2020 in the UK to be 33.8% Coal, 4.2% Gas and 62.0% Gas – Combined Cycle Gas Turbine (CCGT). The second marginal mix modelled as a comparison is a ‘user defined’ mix set at 100% Gas CCGT.

The WRATE assessment has calculated a baseline scenario of landfilling a tonnage of 422,072 tonnes. This is the volume of waste equivalent to that which would be reasonably expected to produce the annual average volume of WDF throughput required for the Proposed Development (approximately 400,000 tonnes).

As shown in Table 10 below the WRATE model shows that the diversion of waste in the form of WDF to the Proposed Development presents significant carbon savings, of over 183 million kg CO_2-eq (183,000 tonnes CO_2-eq) in comparison to the baseline of disposal of waste directly to landfill when displacing the WRATE Default UK marginal mix for 2020. Carbon savings of over 137 million kgCO_2-eq (137,000 tonnes CO_2-eq) in comparison to the baseline are shown when the marginal energy mix is set to 100% Gas CCGT.

Table 10 Comparison of Waste Processing Emissions

Waste Process/Marginal Energy Mix	WRATE Default UK 2020 Energy Mix		100% Gas CCGT Energy Mix	
	Carbon impact of process (tonnes CO_2e)	Kg CO_2/T waste	Carbon impact of process (tonnes CO_2e)	Kg CO_2/T waste
Baseline – disposal of waste to landfill	65,983	156	81,142	192
Pre-treatment and combustion of WDF at SHP	-117,627	-278	-56,076	-133
Savings by use of waste as a WDF	**183,609**		**137,218**	

The primary purpose of this assessment is to assess the carbon impact of the Proposed Development. Climate change impact in WRATE is expressed in kg CO_2-equivalent (eq). It is important to note that where the model shows a minus value for the kg CO_2-eq this is not indicative of a process being a carbon 'sink' but of a process displacing conventional energy or electricity use.

The WRATE and Climate Change Assessment assess the 400,000 tonnes per year design case. The assessments demonstrate a beneficial effect, mainly through diverting waste from landfill. Therefore the impact of avoiding the landfilling of a further 20% of WDF i.e. 480,000 tonnes per year (the maximum capacity of the Proposed Development) would also be beneficial in comparison to the baseline scenario.

7. CARBON REDUCTION AND MITIGATION MEASURES

Chapter 16: Sustainability and Climate Change of this ES discusses further how the Proposed Development has been designed to reduce its environmental impact.

8. CONCLUSIONS

National planning policy (National Policy Statements) places value on the importance of a diverse mix of energy generating technologies, including energy from biomass and/or waste. The National Planning Policy Framework also encourages the move to a low carbon future, and planning new development to reduce greenhouse gas emissions. Based on the assumption that typical UK average municipal waste generated WDF is used on site, the Proposed Development will provide a secure energy supply to the national grid as well as heat to the local Slough Trading Estate network.

The key points of this assessment are as follows:

- The Proposed Development compares favourably with national averages, with annual carbon savings of 39,600 to 86,100 tonnes CO_2e for an equivalent UK average gas-fired power plant, depending on whether CHP is included in the assessment;

- The WRATE assessment shows that the diversion of waste in the form of WDF to the Proposed Development presents significant carbon savings, of over 183,000 tCO2**e** in comparison to a baseline of disposal of the equivalent waste directly to landfill when displacing the WRATE Default UK marginal mix for 2020. Carbon savings of over 137 million kgCO_2-eq (137,000 tonnes CO_2-eq) in comparison to the baseline are shown when the marginal energy mix is set to 100% Gas CCGT; and

- The vast majority of the emissions will originate from process emissions from the combustion of the WDF rather than the fuel and raw material transportation elements. This remains the same even when the transportation distance of the WDF is hypothetically doubled.

9. REFERENCES

Ref. 1 GHG Protocol for Project Accounting (2005) World Resources Institute and the World Business Council for Sustainable Development.

Ref. 2 Government conversion factors for company reporting. DEFRA [Online] Available From: [redacted]

Ref. 3 DEFRA (2006) Impact of Energy from Waste and Recycling Policy on UK Greenhouse Gas Emissions, January 2006

Ref. 4 European Commission (2004) Section 9 of 2004/156/EC: Commission Decision of 29 January 2004.

Ref. 5 DECC (2013) Electricity, chapter 5, Digest of United Kingdom energy statistics' (DUKES). Published by the Department of Energy & Climate Change, July 2013. Available online: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/279523/DUKES_2013_published_version.pdf (last accessed 17 July 2014)

Ref. 6 Government Review of Waste Policy in England 2011

Appendix J-3

Combined Heat and Power (CHP) Feasibility Assessment

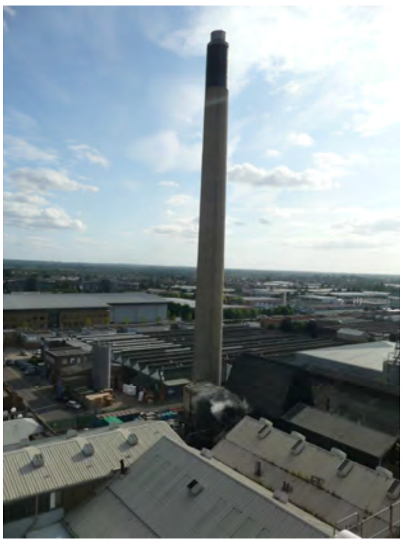
URS

Slough CHP Assessment

47066339

Prepared for:
SSE Generation Ltd

UNITED
KINGDOM &
IRELAND



REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Reviewed by**	**Approved by**
0	06/09/13	Draft for comment	Veronica Hamilton Senior Energy Engineer	Rob Boyer Principle Energy Engineer	Oliver Riley Technical Director
1	23/09/13	Draft for comment	Veronica Hamilton Senior Energy Engineer	Rob Boyer Principle Energy Engineer	Rob Boyer Principle Energy Engineer
2	13/12/13	Final	Veronica Hamilton Senior Energy Engineer	Oliver Riley Technical Director	Oliver Riley Technical Director

URS Infrastructure & Environment UK Limited
6-8 Greencoat Place
London
SW1P 1PL
United Kingdom

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Forecast cost estimates do not include such costs associated with any negotiations, appeals or other non-technical actions associated with the agreement on measures to meet the requirements of the authorities, nor are potential business loss and interruption costs considered that may be incurred as part of any technical measures.

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1 INTRODUCTION

URS has been commissioned by SSE Generation Ltd (the 'Applicant') to undertake a Combined Heat and Power (CHP) Feasibility Study for the proposed Slough Multifuel development (hereafter referred to as the Proposed Development). The Proposed Development Site (the Site) is located within the existing Slough Heat and Power (SHP) site on the Slough Trading Estate. This study evaluates the heat demand in the area of the Site, so that the potential for heat recovery from the Proposed Development can be assessed.

The Proposed Development will comprise of either a single or twin unit multifuel generating plant which will convert fuel derived from selected processed waste into electricity and heat. The Proposed Development site is located on the SHP site, which already provides heat and power to the existing trading estate buildings.

This document has been produced in accordance with the requirements of the national and regional planning policies.

1.1 Planning Context

Projects with an onshore generating capacity of 50 megawatts electrical (MW_e) or less are considered under the provision of the Town and Country Planning act 1990. Policies for Nationally Significant Infrastructure Projects (NSIP) (those with a generating capacity above 50 MW_e) are set out in the National Policy Statements (NPS). Considerations outlined by NPSs are likely to be a material consideration for applications that fall under the Town and Country Planning act 1990, though are considered on a case by case basis.

This assessment has been undertaken in line with the policies outlined in the NPS, in addition to local policies, in order to assist with the planning application. Those that are relevant to the CHP assessment are referenced below.

Overarching National Policy Statement for Energy, EN-1 (NPS EN-1)

Considerations for CHP are described in section 4.6 of NPS EN-1. This outlines the government's commitment to reducing carbon dioxide (CO_2) emissions through the promotion of good quality CHP (GQCHP) and provides the assessment criteria:

- Paragraph 4.6.5 states that in order for CHP to be considered as economically viable the plant needs to be closely located to consumers with heat demands, though this distance will vary with the nature of the demand. An example of a cost-effective distance on district heating networks is given as 200 megawatts thermal (MWth) of heat within 15 kilometres (km) as identified with an Department for Energy and Climate Change[1] (DECC) report;
- Paragraph 4.6.6 references Department of Trade and Industry (DTI) guidelines (see below) that applications must either include CHP or contain evidence that the possibilities have been fully explored. This should be through an audit trail of dialogue between the applicant and prospective customers;
- Paragraph 4.6.7 stresses the importance of liaising with potential heat consumers identified by the Applicant and also bodies such as the Homes and Communities Agency (HCA), Local Enterprise Partnerships (LEPs) and Local Authorities; and
- Paragraph 4.6.8 states that where the proposal is for thermal generation without CHP, the applicant should;
  - Explain why CHP is not economically or practically feasible;
  - Provide details of any potential future heat demands in the area; and

[1] The Potential and Costs of District Heating Networks, Pöyry and Faber Maunsell, April 2009

   - Detail provisions in the proposed scheme for exploiting any potential heat demand in the future.

National Policy Statement for Fossil Fuel Generation, EN-2 (NPS EN-2)

Considerations for CHP are described in section 2.3 of NPS EN-2. These are to be considered in conjunction with those outlined in NPS EN-1 and the guidance document crated by the DTI:

- Paragraph 2.3.2 refers to section 4.6 of EN-1 for requirements and states that evidence should be presented in the application that shows that the possibilities for CHP have been explored; and
- Paragraph 2.3.3 states that where there is reason to believe that future opportunities for CHP may arise, if a non-CHP solution is proposed, then developers are required to ensure that the station is 'CHP ready' to allow heat supply at a later date.

Guidance on background information to accompany notifications under Section 14(1) of the Energy Act 1976 and applications under Section 36 of the Electricity Act 1989

NPS EN-1 references the DTI guidelines as a source of advice for applications with an onshore generating capacity greater than 50 MW_e. In addition to those addressed above, this comprises the following key elements.

- Paragraph 11 provides details of the evidence and steps that need to be taken by the applicant in order to assess the viability of CHP. These are as follows:
  - An explanation of their choice of location, including the potential viability of the site for CHP;
  - A report on the exploration carried out to identify and consider the economic feasibility of local heat opportunities and how to maximise the benefits from CHP;
  - The results of the exploration;
  - A list of the organisations contacted
- Paragraph 14 identifies some of the largest and likely most economically viable prospective consumers to be considered. These are as follows:
  - Industrial sectors;
  - Commerce, including;
    - Hotels
    - Leisure centres
    - Large public buildings
  - Public services, including;
    - Hospitals
    - Universities/teaching institutions
    - Prisons
    - Defence installations
- Paragraph 16 provides the details of the elements that should be included in their applications:
  - Demonstrate that the DECC UK heat map has been consulted
  - Demonstrate that they have worked with regional and local planning bodies to identify opportunities;
  - Demonstrate that a number of different heat markets have been explored;

- Demonstrate that they have contacted Defra, Combined Heat and Power Quality Assurance (CHPAQ) programme administrator and Regional Development Agencies (RDAs were abolished in 2012);
- The following have been identified as possible sources for general information: Combined Heat and Power Association (CHPA), The Energy Savings Trust and the Carbon Trust.

Slough Local Development Framework Core Strategy 2006-2026, 2008

The Slough Core Strategy is Slough Borough Councils (SBC) overall approach for planning development in Slough.

- Core Policy 8 (Sustainability and the Environment), Implementation 7.157, describes SBC's expectations that all major developments will demonstrate that a range of renewable and low carbon technologies have been explored including CHP.

Slough Local Development Framework Site Allocations DPD, November 2010

The Core Strategy forms a key part of the portfolio of Local Development Framework planning documents. The key policy in relation to heat recovery is Site Reference SSA4. Though CHP is not mentioned specifically, it does refer to development of the site in relation to policies outlined in the core strategy.

1.2 Scope of Study

Based on the planning context described above the following scope for has been developed.

- To identify and assess the magnitude of the industrial and other significant heat demands which are within the vicinity of the Proposed Development;
- To comment on the projected economic and technical feasibility of connection to heat users identified in (1) above;
- Identify future potential loads; and
- To assess the good quality CHP implications of heat demand uptake scenarios representing a range of heat network extents.

1.3 General Methodology

In order to address the items above the following methodology has been utilised.

The viability of a potential heat load is dependent on both the size of the heat load and the distance it is located from the heat source. Therefore two search zones have been identified. A 15km radius search zone has been used to identify very large heat loads and a 5km radius has been used to identify smaller heat loads.

Initial heat load density and large heat load consumer searches for 15km and 5km search areas have been conducted through consulting with the following resources:

- The National Heat Map; and
- CHP Database and District Heating (DH) installation map.

Using the information gathered from these sources, areas to focus on in greater detail have been identified. Maps, satellite information and GIS data have then been used to estimate individual heat loads for particular sector types in the areas identified using benchmark heat demand data. The sector types focussed on in this study, as recommended by the DTI guidance document[2], are as follows:

- Hotels;
- Leisure centres;
- Large public buildings;
- Hospitals;
- Universities;
- Prisons; and
- Defence installations.

Following the identification of existing core potential heat loads the potential of future developments occurring in the area will be undertaken through gathering information from the following bodies:

- Planning application notifications; and
- Information available from local authorities.

Analysis of the available heat output from the plant, impact on electricity generation and potential to export to consumers is undertaken followed by a CHPQA calculation to understand if the heat and power generated can be classified as good quality.

2 SLOUGH HEAT AND POWER

2.1 The Development

The Proposed Development is located within the existing SHP site located in the Slough Trading Estate, approximately 2km northwest of Slough Town Centre.

The Proposed Development is to comprise of a multifuel generating plant that will convert fuel derived from selected processed waste into electricity and heat. The plant will have a maximum capacity of 480,000 tonnes per annum of Waste Derived Fuel (WDF) and a design capacity of 400,000 tonnes per annum. The maximum gross electrical output of the plant is 50MW$_e$, with a net output of 45 MW$_e$.

The Proposed Development will consist of an enclosed tipping hall and fuel bunker, grate and ash system, furnace with boiler passes (super-heater, evaporator and economisers), flue gas treatment plant, chimney and steam turbine. Electricity generated by the steam turbine will be exported to the grid. A steam or medium temperature hot water (MTHW) take-off from the turbine will provide the ability to export steam or MTWH to the existing network supplying heat to the Slough Trading Estate.

2.2 Slough Heat and Power

Heat and power has been provided to the Slough Trading Estate from a centralised source since the 1920's. Electricity generated is now exported directly to the grid.

[2] Guidance on background information to accompany notifications under Section 14(1) of the Energy Act 1976 and applications under Section 36 of the Electricity Act 1989

The heat is exported in the form of low pressure steam to a combination of buried and above ground network of pipes. Steam is supplied directly to a number of consumers on the Estate. A MTHW network provides hot water for space heating and Domestic Hot Water (DHW) to a number of other consumers on the Estate. The MTHW is generated by three calorifiers connected to the steam network.

Over the years the fuel sources supplying the Estate have evolved from fossil fuels such as coal, oil and gas to primarily biomass, with top-up and back-up provided by gas fired boiler plant. Steam to the network is currently provided from a combination of extraction from turbine 17, which is provided with steam generated from waste wood, and a gas fired boiler, which ensures resilience to the system as well as providing top up.

There is still a demand for heat on the Estate from the district heating network, however this demand has decreased over the years as business focus has shifted away from light industries requiring process heat loads to office based businesses requiring primarily for space heating or cooling for data centres. The Applicant has advised that the current peak demand is estimated to be in the region of 12MWth with an annual average load of approximately 6MWth, not including heat losses from the network. Currently, there are around 40 existing consumers connected to the network with one large process user.

In order to optimise the CHP potential of the site an investigation into potential additional heat consumers has been undertaken.

3 HEAT DENSITY ANALYSIS

3.1 The National Heat Map

The data of the National Heat Map[3] was designed by The Centre for Sustainable Energy and commissioned by the Department of Energy and Climate Change (DECC). This tool can be applied to support planning and deployment of local sustainable projects in England.

The viability of a heat connection to the district heating system is dependent on the size of the heat load and its proximity to the source of heat. As outlined above in the EN-1 guidance and scope, a search area of 15km has been used to identify very large heat loads. A smaller 5km search area has then been assessed in order to identify smaller heat loads which may be viable connections due to their closer proximity to the source of heat.

There are several high density heat demands of around 200-340 per kilowatt-hours per metre squared (kWh/m^2), which are in 1km and 3km proximity to the Proposed Development Site respectively. Towards the boundary of the 5km radius search area there are areas of low to medium density heat demands, ranging from 39- 98kWh/m^2.

Figure 1 and Figure 2 illustrate that the largest potential heat demand densities in this area are located on the Slough Trading Estate, a strip of commercial offices on the Bath Road to the south of the Slough Trading Estate, Wexham Park Hospital to the northeast and Tesco Extra located in the centre of Slough to the southeast of the Proposed Development Site.

[3] http://tools.decc.gov.uk/en/content/cms/heatmap/about_map/about_map.aspx

Figure 1: Spatial Heat Demand Density within 15 km Search Area

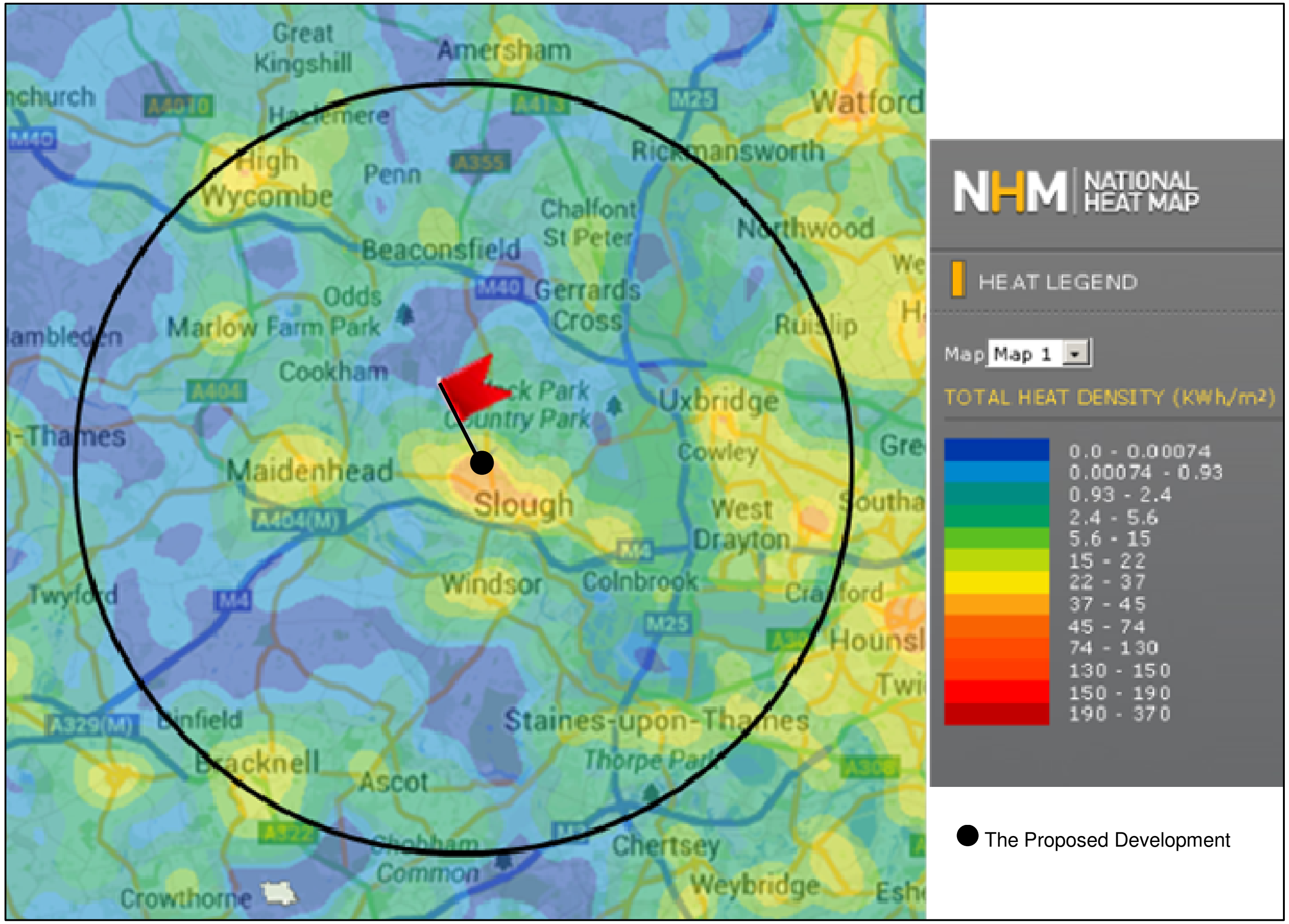
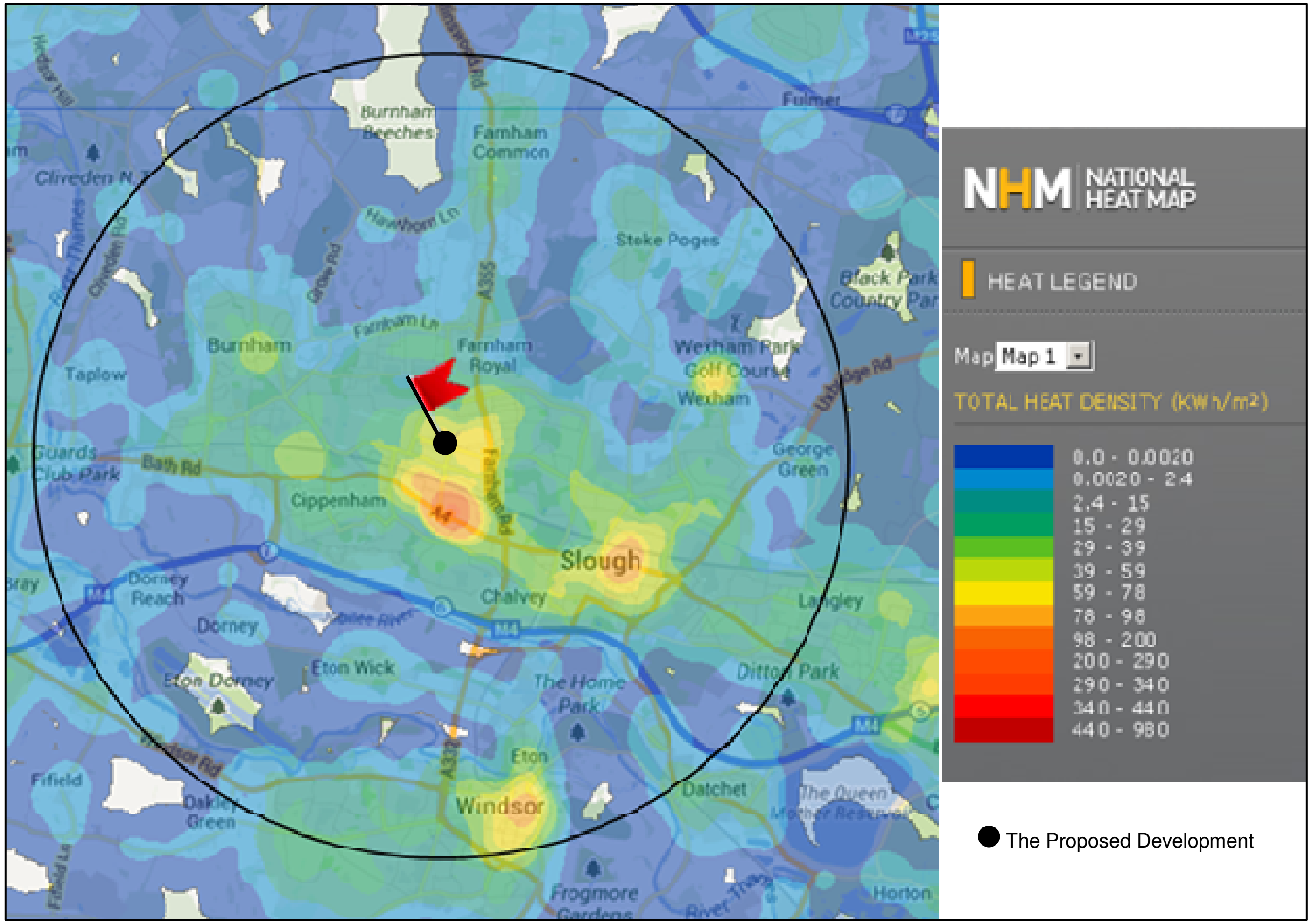


Figure 2: Spatial Heat Demand Density within 5 km Search Area



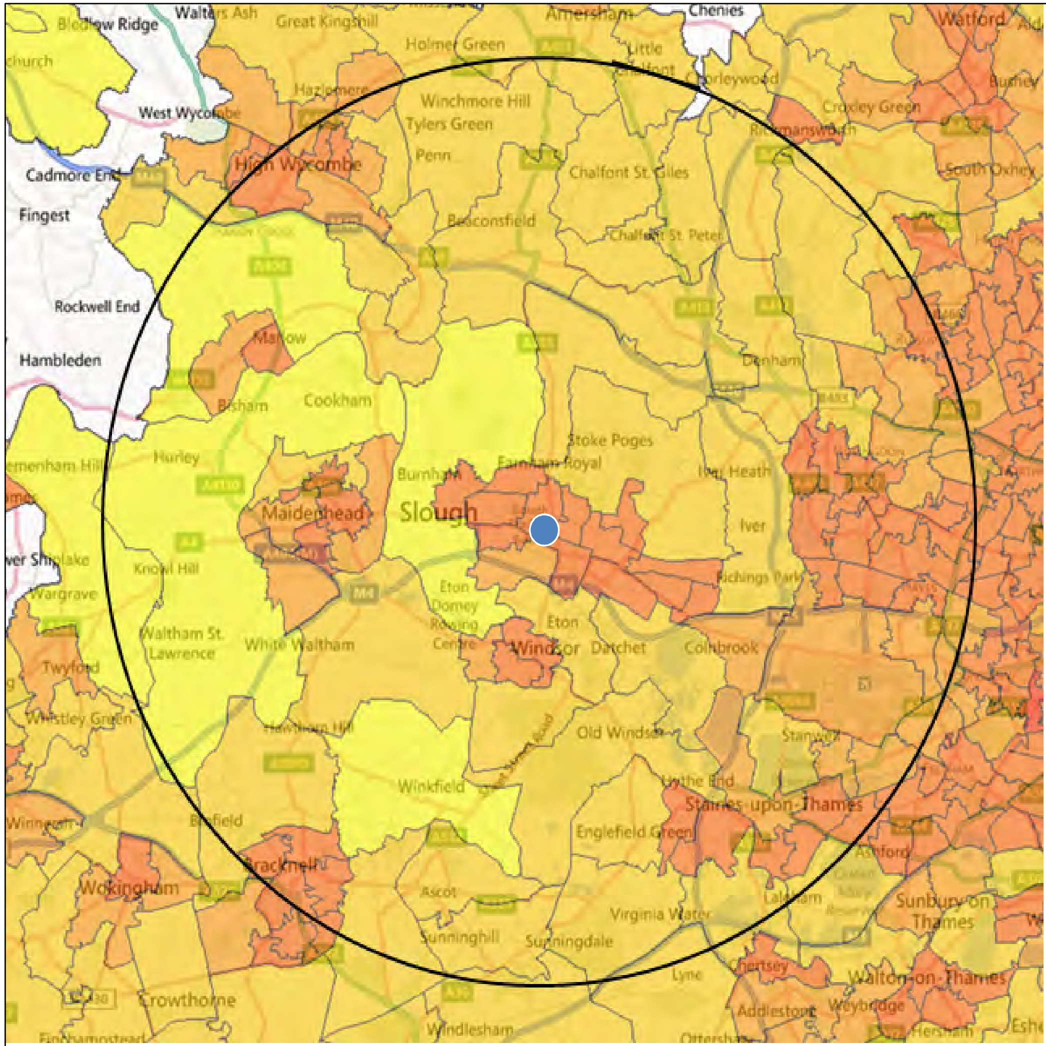
3.2 UK CHP Development Map

The UK CHP Development Map[4] has been created by DECC to support the development of CHP systems in the UK. Initially created to assist developments in the planning process the tool can be used to identify the size and location of existing CHP and District Heating systems and also areas of high heat demand for the development of new systems. Heat densities are expressed in peak demand format (kW/km^2) as opposed to annual heat consumption as described by the National Heat Map.

Similarly to the above a search area of 15km has been used to identify very large heat demands. A smaller 5km search area has then been assessed in order to identify smaller heat loads which may be viable connections due to their closer proximity to the source of heat.

[4] http://chp.decc.gov.uk/developmentmap/

Figure 3: CHP Development Map and heat demand within 15 km search area



Map Values

The legend for heat loads (kW/Km^2) is shown below:

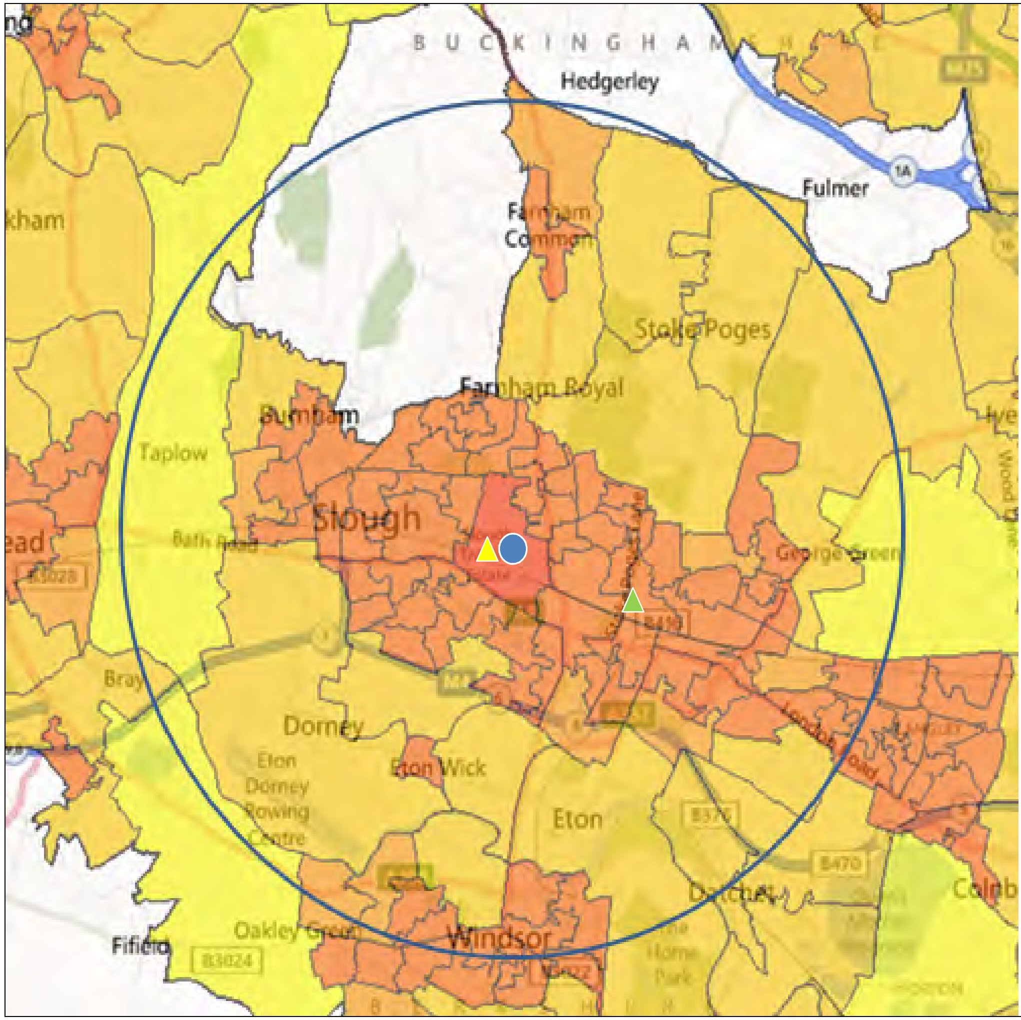
- 500 - 1,000
- 1,000 - 5,000
- 5,000 - 10,000
- 10,000 - 50,000
- 50,000 - 100,000
- > 100,000

Please note the colouring on the map is for illustrative purposes only

● : Proposed Development

Sector Name	Share	Total KW
Communications and Transport	4.13%	147,147 KW
Commerical Offices	4.2%	149,662 KW
Domestic	67.23%	2,397,003 KW
Education	1.51%	53,703 KW
Government Buildings	1.06%	37,868 KW
Hotels	3.13%	111,757 KW
Large Industrial	0.37%	13,036 KW
Health	0.43%	15,496 KW
Other	1.43%	51,009 KW
Small Industrial	4.53%	161,341 KW
Prisons	0.02%	687 KW
Retail	2.66%	94,807 KW
Sport and Leisure	1.08%	38,668 KW
Warehouses	7.29%	259,800 KW
District Heating	0.93%	33,308 KW
Total heat load in Area		**3,565,292 KW**

Figure 4: CHP Development Map and heat demand within 5 km search area



Map Values

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- 500 - 1,000
- 1,000 - 5,000
- 5,000 - 10,000
- 10,000 - 50,000
- 50,000 - 100,000
- > 100,000

Please note the colouring on the map is for illustrative purposes only

● : Proposed Development

▲ : Smithkline Beecham

▲ : Slough Heat and Power Limited

Sector Name	Share	Total KW
Communications and Transport	0.36%	2,367 KW
Commerical Offices	3.75%	24,800 KW
Domestic	63.93%	423,085 KW
Education	1.72%	11,395 KW
Government Buildings	0.9%	5,962 KW
Hotels	2.61%	17,301 KW
Large Industrial	1.08%	7,164 KW
Health	0.57%	3,759 KW
Other	1.32%	8,707 KW
Small Industrial	8.29%	54,842 KW
Prisons	0.03%	174 KW
Retail	2.74%	18,135 KW
Sport and Leisure	0.98%	6,501 KW
Warehouses	6.69%	44,255 KW
District Heating	5.03%	33,308 KW
Total heat load in Area		**661,755 KW**

The CHP development Map identified total heat loads of around 656MW within the 5km radius and 3,519MW within the 15km radius. The Slough Trading Estate is identified as one of the areas with the highest net load density within the search criteria.

By sector the largest heat demand has been found to be from domestic consumers, accounting for 64% of the heat demand in the 5 km radius search area. Though this sector may represent the greatest heat demand the heat load density considered is too low to enable viable heat delivery from a district heating system in the majority of cases. This is due to the large amount of distribution network that would be required to enable the connections, which in turn corresponds to high heat losses and capital cost of installation, notwithstanding the logistical and commercial complexity of connecting numerous existing low rise residential properties.

Other sectors with high heat demands have been found to be Commercial Offices (4%), Small Industrial (8%), Hotels (3%) and Retail (3%). These sectors, in addition to those suggested in the DTI guidance document, will be used to inform a more detailed search for specific heat consumers.

In addition to identifying the heat load density of the area the UK CHP Development Map provides information on specific large heat consumers, the proportion of the existing heat requirements that are fulfilled by CHP technology and if there are existing district heat networks that the system could feed into.

Table 1 provides details of the largest heat loads identified in the area and Figure 5 shows their l

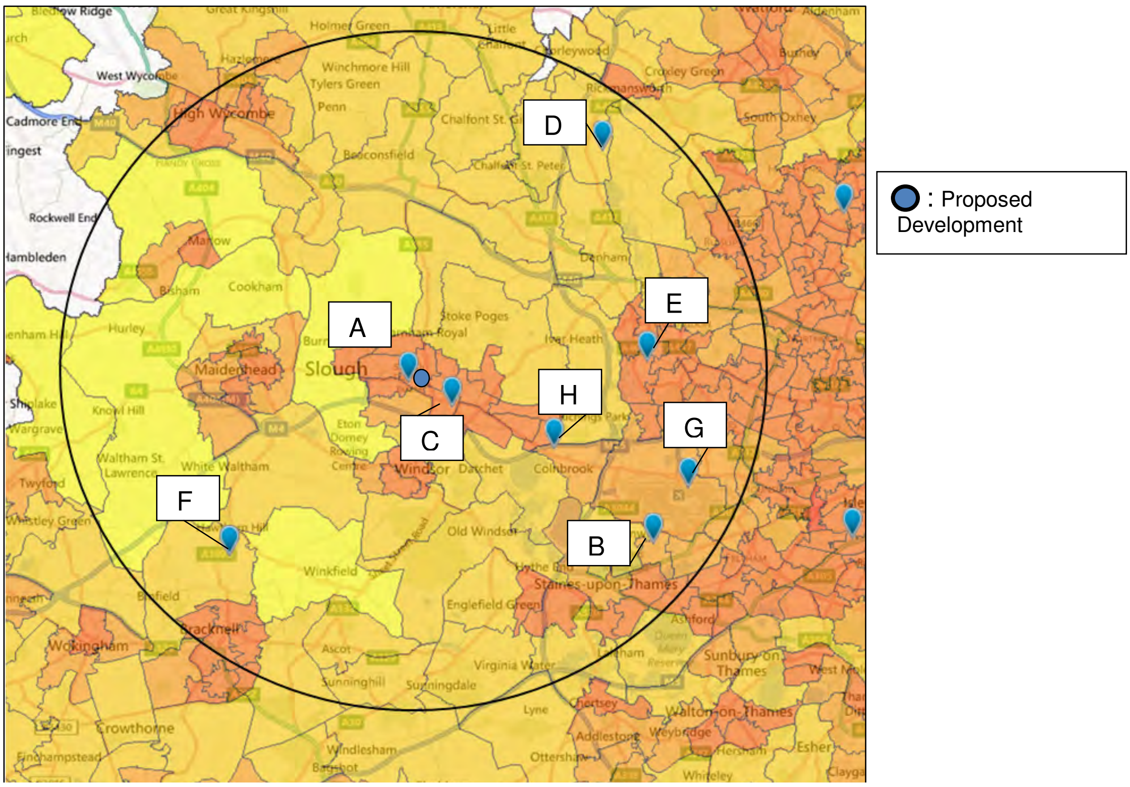
Map Ref.	Large Heat User	Approx. Distance (km)	Total Heat Load (kW)	Taken by CHP (kW)	Total Remaining (kW)
A	Existing Slough Heat and Power District Heat Network – Slough Trading Estate	0-1	c. 6,000	c. 6,000	-
B	Thames Valley Power Ltd	13	29,885	29,885	-
C	GSK Horlicks	2	7,164	-	7,164
D	Maple Lodge Sewage Treatment Works	13	5,872	5,818	55
E	Brunel University	10	8,480	-	8,480
F	Syngenta	12	13,415	-	13,415
G	Heathrow Airport Ltd and British Airways plc	13	65,871	-	65,871
H	Royal Mail Heathrow, Worldwide Distribution Centre	7	6,497	6,497	-

t
o the Proposed Development.

Table 1: List of major heat users and their heat demands within a 15km radius

Map Ref.	Large Heat User	Approx. Distance (km)	Total Heat Load (kW)	Taken by CHP (kW)	Total Remaining (kW)
A	Existing Slough Heat and Power District Heat Network – Slough Trading Estate	0-1	c. 6,000	c. 6,000	-
B	Thames Valley Power Ltd	13	29,885	29,885	-
C	GSK Horlicks	2	7,164	-	7,164
D	Maple Lodge Sewage Treatment Works	13	5,872	5,818	55
E	Brunel University	10	8,480	-	8,480
F	Syngenta	12	13,415	-	13,415
G	Heathrow Airport Ltd and British Airways plc	13	65,871	-	65,871
H	Royal Mail Heathrow, Worldwide Distribution Centre	7	6,497	6,497	-

Figure 5: Largest heat loads identified within a 15 km search area



Of the large heat loads identified within the search area the GSK Horlicks site represents the greatest opportunity as a potential new heat consumer from a district heating network. It is within 2km of the Site and none of the current 7MW heat demand is supplied from CHP. The site is on the same side of the railway line, which simplifies the connection.

3.3 Future Developments

Slough Trading Estate – IQ development

Slough Trading Estate is one of the largest industrial estates in the UK under single ownership, with over 400 different companies on the estate. It is owned and managed by SEGRO.

There are around 40 consumers of varying sizes connected to the existing SHP network, with consumer demand steadily decreasing over the years. However, a master plan has been developed for the redevelopment of an area of the Slough Industrial Estate stretching from Bath Road gateway entrance, along Leigh Road and into the centre of the Estate. The redevelopment is envisaged to happen over a period of 20 years. In 2010, SEGRO was granted planning consent for the development of 150,000m^2 of office, leisure and amenity space[5].

The proximity to the heat generating source, density of heat load and opportunities represented by new build developments for integrating into district heating provide a good opportunity for connection to the system and are likely to be some of the most cost effective options.

Heart of Slough Regeneration Project

The Heart of Slough project aims to regenerate a 29 acre site in the centre of Slough. The project has been developed in partnership with the Homes and Communities Agency, Slough Borough Council and Development Securities[6].

The first two phases to create a new bus station and improve infrastructure links to the town centre have been completed. There are further plans to create a learning and cultural centre in 2015 with a floor area of 4,447m^2 and three new office spaces with a combined floor area of 34,651m^2 on Wellington Street.

The Applicant has stated that a limited amount of pipework has already been installed in the centre of Slough as future proofing to enable connection to a district network as and when a central network evolves and a connection becomes viable without the need to excavate the main A4 Bath Road.

Redevelopment of the Queensmere Observatory Shopping Centre

Criterion Capital and Slough Shopping Centres are developing proposals for the redevelopment of Queensmere Observatory Shopping Centre. These include 911 new residential units, a new landmark development in the centre of Slough and retail and restaurants[7]. The developers are currently in consultation on the proposals.

3.4 GIS Mapping and Heat Benchmarking

Building on the information from above, GIS mapping and satellite information of the search area has been used to conduct a more refined search to identify specific consumers and those

5 [redacted]

with a lower heat load that are within closer proximity. This approach also enables clusters of heat loads to be identified in greater detail. A number of consumers with a moderate heat demand may, when considered together, provide opportunities for district heating network development.

As outlined in the DTI guidance document searches for heat loads such as hotels, leisure centres, large public buildings, hospitals, universities/teaching institutions, prisons and defence installations have been undertaken. These categories represent buildings that are likely to have significant heat loads and existing centralised plant systems, which simplifies connection to a district heating network.

Sites with an area greater than 2,000m^2 were used as an initial measure for buildings which may have relatively large heat consumption. A full list of the buildings found in these categories is included in Annex A: Identified Heat Loads.

Following this initial identification process a heat benchmarking exercise was undertaken to understand the size of the heat load. The approximate area of the buildings was calculated based on URS's in house GIS tool and satellite information. CIBSE Guide F and CIBSE TM46 typical practice bench marks were used to identify the approximate heat demand. The table below details the benchmarks assumed.

Table 2: Heat demand benchmarks

Type of building	Heat benchmark (MWh/m^2.per annum)
Schools – Primary/ Secondary	0.15
Retail / Supermarket	0.26
Retail / distribution warehouses	0.16
Retail / DIY store	0.19
Major retail/ Department stores	0.25
Leisure Pool Centre	1.321
Combined Centre	0.59
Light Manufacturing	0.26

The heat users within the region of interest were categorised into three groups based on their annual estimated heat consumption, in order to determine those with the greatest potential and eliminate those with the lowest. **Table 3** illustrates these three bands of heat demand and their limiting values.

Table 3: Categories of heat users

Category	Heat consumption
High potential	above 5000 MWh
Medium potential	1000-5000 MWh
Low potential	below 1000 MWh

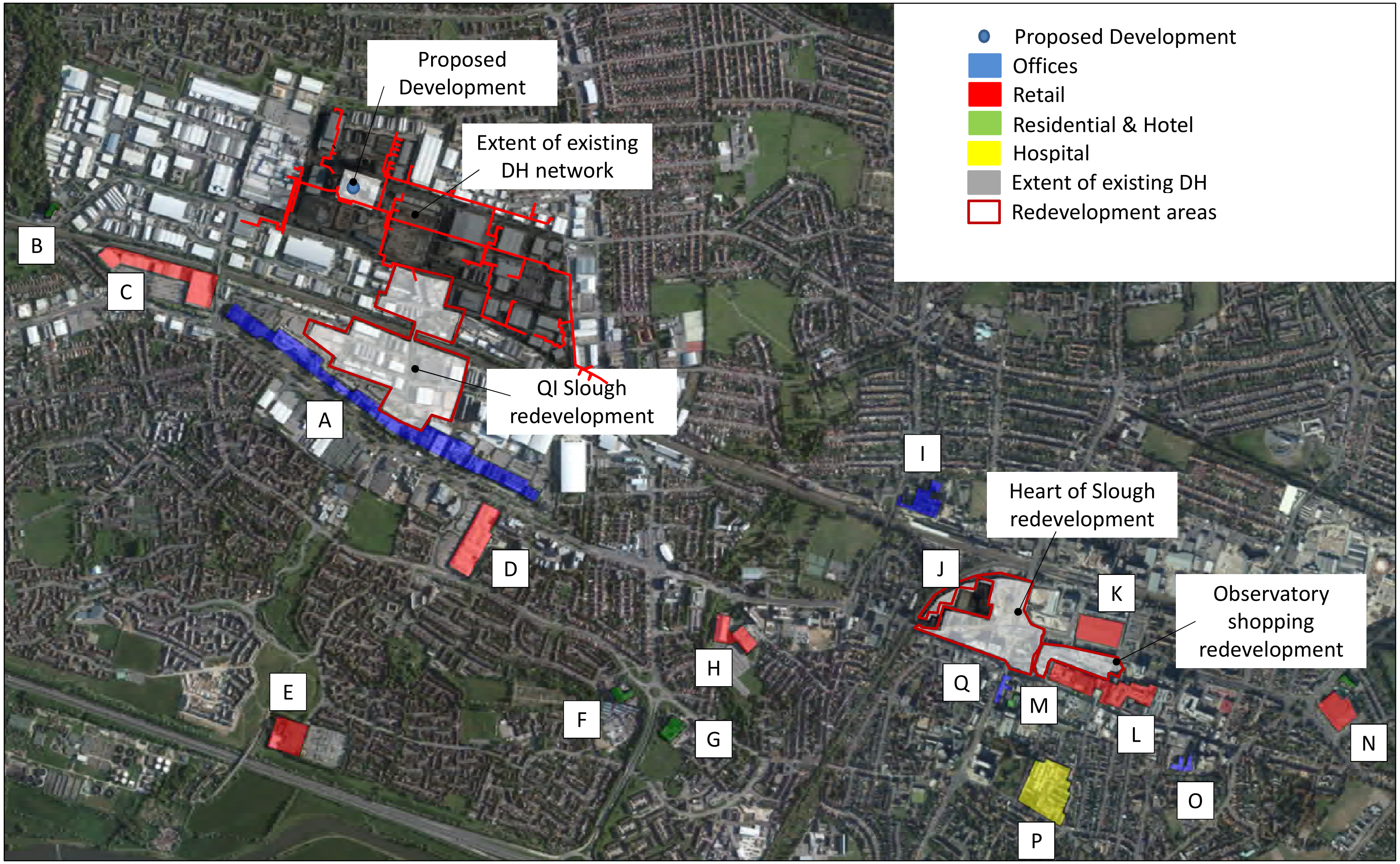
This process removed the majority of the teaching establishments and a large number of the offices initially identified. The remaining heat loads were then further refined to take into account their proximity to the Proposed Development and if there were any particular areas of clusters which could provide opportunities for the development of district heating networks. The results of this are shown in the map below and the following table.

Table 4: Identified Heat Loads

Map Ref	Building	Type of Use	Estimated. Heat load (MWhp.a)	Heat User Category	Proximity to Site	Proximity to a Cluster	Overall Potential
A	Bath Road Offices	Offices	17,712	High	High	High	High
B	Priory Heights	Residential	1,872	Medium	High	Medium	Medium
C	Bath Road Retail Park	Retail	2,527	Medium	High	High	High
D	Slough Retail Park	Retail	1,933	Medium	High	High	High
E	Asda	Retail	1,714	Medium	Low	Low	Low
F	Copthorne Hotel	Hotel	4,224	Medium	Medium	Low	Medium
G	Holiday Inn	Hotel	3,654	Medium	Medium	Low	Medium
H	Slough Leisure Centre	Leisure Centre	2,605	Medium	Medium	Low	Medium
I	GlaxoSmithKline	Office/Light Industry	8,112	High	Medium	High	High
J	Thames Valley University	Education	4,992	Medium	Medium	High	Medium
K	Tesco Extra	Retail	1,673	Medium	Medium	High	Medium

L	Queensmere Observatory Shopping Centre	Retail	3,128	Medium	Medium	High	Medium
M	Premier Inn	Hotel	1,373	Medium	Low	Low	Low
N	Sainsbury's	Retail	1,224	Medium	Low	Low	Low
O	Thames Central	Office	2,074	Medium	Low	Low	Low
P	Upton Hospital	Hospital	8,400	High	Medium	High	High
Q	Travelodge	Hotel	1,848	Medium	Medium	High	Medium

Figure 6: Identified Heat Consumer locations



4 CHP ANALYSIS

An Energy from Waste plant such as the Proposed Development can be entitled to fiscal and other incentives such as Renewable Obligation Certificates (ROCs), the Renewable Heat Incentive (RHI) and Climate Change Levy Exemption Certificates (LECs) for Renewables.

At present Energy from Waste facilities with CHP may be able to claim ROCs and RHI. There is also a 0.5 ROC uplift available for systems that are registered as good quality CHP (GQCHP), however if the ROC uplift is claimed then RHI cannot be in addition and this would also remove the ability to claim Enhanced Capital Allowance (ECA) support. DECC summarises the two options as follows:

- Register as GQCHP and claim ROCs, including the 0.5 ROC uplift, and ECA, or
- Claim RHI and ROCs excluding the ROC uplift and ECAs[8]

There is currently a review underway that may remove the GQCHP uplift available for new stations accredited after the 1st April 2015. ROCs are also in the process of being phased out to be replaced by the Contract for Difference (CfD) feed in tariff scheme in 2017, with a transitional period from 2014 to 2017 where new generators can choose between the two systems. CfD is expected to provide a similar level of support as the current ROC system.

Similarly, LECs are dependent on the plant being operated as an accredited CHP installation and the level of incentives received will be influenced by the level of qualifying generation achieved under the good quality CHP programme.

The following investigates the potential of the Proposed Development to achieve a Good Quality CHP rating. In assessing qualification as a GQCHP, there are a number of key criteria involved; in order for the power outputs under annual operation to be fully eligible for LECs and ROCs, the ‘quality index’ of its performance must be greater than 100. The guidance note GN-10, available from “quality assurance for CHP schemes”, provides the calculation methodology for the Quality Index (QI). The formula below is abstracted from GN-10, Table GN10-2, and is applicable for the calculation of QI for new plants using alternative fuels.

Fuel: Biomass/ solid waste fuel
Formula: $QI = (220 \times \eta_{power}) + (120 \times \eta_{heat})$

(where the installed capacity range is greater than 25MWe)
η_{power} = Electrical efficiency
η_{heat} = Thermal efficiency (based on useful heat supplied)

The amount of power and heat generated by the plant will depend on its mode of operation. The table below summarises several different modes of operation and the amount of electricity and heat generated that would be expected for each.

[8] http://chp.decc.gov.uk/cms/interaction-between-the-rhi-and-renewables-obligation/

Table 5: Heat and Power Generation

Scenario	Fuel In MW	Heat Extracted MWth	Steam Extract	MTHW Extract
			Gross Electrical Output MWe	Gross Electrical Output MWe
Scenario 1	160	0	50	50
Scenario 2	160	5	48	49
Scenario 3	160	10	47	48
Scenario 4	160	20	44	47

The figures in Table 5 have been provided by the Applicant and are based on outline Contractor submissions. The stated figures are estimated values and may be subject to change during actual operation.

Table 6 below summarises notional CHPQA performance of the different operational modes listed above. This assumes the system operates at these outputs all year round with all heat extracted used usefully for heat supply to consumers, and with no other heat source, or fuel source, providing top-up to the system. This is the most optimistic operation of the district heating system.

Table 6: CHPQA Calculation

Scenario	Max Annual Useful Heat Generated	Thermal Eff %	Steam Extract			MTHW Extract		
			Elec Eff %	Total Eff %	CHPQA	Elec Eff %	Total Eff %	CHP QA
Scenario 1	-	0%	31%	31%	N/A	31%	31%	N/A
Scenario 2	43,800	3%	30%	33%	70	31%	34%	71
Scenario 3	87,600	6%	29%	36%	72	30%	36%	74
Scenario 4	175,200	13%	28%	40%	76	29%	42%	80

Table 6 indicates that even under this most optimistic situation the plant would fail to achieve a QI rating that would allow its full outputs to qualify for fiscal incentives. However, partial qualification under this scheme is also possible as per the CHPQI guidelines (Guidance Note 27), and detailed economic analysis taking account of customer heat sales, the capital cost of heat distribution infrastructure, the ROC/LEC benefit of higher QI performance and the loss in electrical generation revenue should be undertaken when potential heat users have been identified for the scheme.

At this stage of design development URS has not identified the potential benefit from partial qualification, as more detailed analysis on the operation of the system would be required. It is understood that the qualifying element of power from CHP operation of the plant could benefit from attracting single ROCs per MWh_e output. Analysis to determine the most beneficial incentive, either ROC, RHI or a combination would also be recommended.

5 TECHNICAL AND COMMERCIAL CONSIDERATIONS

The following provides technical and commercial considerations for the development of a CHP based district heating system based around the Proposed Development. These are not exhaustive but do outline some key high-level considerations.

District heating network considerations

- **Network route:** The route and sizing of the network need to be carefully considered so that suitable provision for current and future connections are allowed for whilst minimising the length of pipe network installed in order to reduce installation costs and heat losses. The congested nature of existing utilities in the highway has been highlighted as a potential constraint/limitation on the district heating network routing which could influence the viability of a network if long lengths are required to route round certain areas or if the pipework needs to be buried to such a depth that it becomes impractical to install.
- **Physical constraints:** In terms of physical constraints for installing a district heating network the railway line is the most significant obstacle. If the new Leigh Road rail crossing does not prove to be viable, another route would need to be found which may impact on the viability of supply to the identified heat consumers if this is excessively long.

Heat supply considerations

- **Grade of heat supply:** The form of heat that is exported by the Proposed Development to a district heating network, whether this is steam, MTHW or LTHW, is an important consideration for maximising efficiencies and compatibility with the existing network. If steam is exported this has the advantage of being compatible with the existing export to the SHP network and the potential to combine the systems is maintained. However, a steam off-take reduces the overall efficiency of the turbine to a greater extent than a MTHW off-take would, heat losses from steam networks are higher than MTHW and the majority of potential consumers identified are likely to require MTHW or LTHW rather than steam.
- **System resilience:** District heating systems can either provide the entire heating demands of the consumer or just a proportion. If the entire heat demands are provided this system is dependent on sufficient resilience being provided from the central heat generating source, typically in the form of top-up and back-up boilers in addition to the heat off-take from the turbine. This is generally a more attractive solution to potential consumers, to provide space and cost savings from operating only one system, but this does require additional plant to maintain resilience to the system as a whole, with associated space to be provided, by the district heating supplier. This is the current system utilised for the existing SHP network, and in general provides a more efficient district heating system that can benefit from greater economies of scale and simpler control by centralising all of the heat generating plant. If the entire heat demands of the consumer are not provided they would need to maintain their own top-up and back-up facilities to meet peak demands, with the Proposed Development providing base load only.
- **Absorption cooling:** Heat could also be supplied via the district heating network to enable cooling to be generated by absorption chillers on the consumer's site. This would provide an additional heat source for the system, which could optimise the use of heat particularly during summer when there are only typically Domestic Hot Water (DHW) demands. A key consideration for this heat supply would be the need to install absorption chillers, and

associated heat rejection equipment, on the consumer's site, with the associated costs and space provisions. This has not been considered in detail at this stage of the project.

- **Contamination issues:** The heat supplied by the system is to be provided by a MTHW or steam off-take from the turbine. If a steam system is selected this will be in the form of a flow pipe providing steam and a return pipe with condensate. To ensure that the condensate is clean and does not contain any contaminates which would negatively impact the operation of the turbine suitable detection equipment should be utilised.

Retrofit of existing buildings considerations

- **Plant lifecycle:** Where existing developments have heat generating plant (e.g a boiler system) that has remaining life, motivation to connect to the system on day one may not be high. This could reduce the number of viable consumers at least in the short term.
- **System design:** Compatibility of consumer secondary side systems to a district heating system may influence the viability of a connection. If the potential consumer's existing heating systems are electric based there would be considerable retrofitting work required on the consumer side of the system, which may make a connection unviable. If the existing system is a wet system there may be considerations for conversion from a three port constant volume system to two port variable volume system, though this would likely not be prohibitively onerous.
- **Compatibility of systems:** Pressure and temperature compatibilities are important considerations. Generally if the operating pressures and temperatures of the network are higher than that required by the consumer then a heat exchanger can relatively simply provide a hydraulic break and temperature reduction in the appropriate range. If the temperatures of the network are lower than that required by the consumer, the heat may not be useable or may only provide a partial solution to the consumer as pre-heat, which would then require the consumer to maintain their own plant in addition to the district heating supply.

Considerations for connection to new build developments

- **System design:** Connections to new developments will typically provide a simpler district heating connection in technical terms compared to retrofit. This is due to the greater ability to influence the design of the consumer side systems to optimise the connection to the particular district heating system, which a retrofit scenario will not typically offer to the same extent.

Commercial considerations

- **Heat price and connection charge:** Suitable mechanisms for an appropriate heat price and potential connection charge for consumers would need to be established which provide the consumer with an equivalent or better than whole life cost against appropriate alternative systems, while providing sufficient revenues to enable a viable district heating system to be operated.
- **Heat supply agreements**: The length of heat supply agreement that a consumer can enter in to is to be considered. District heating system heat supply agreements are often long term in nature in order to ensure a revenue stream against the investment made in constructing the network and installing the CHP plant. Commercial properties may be on short-term leases that could deter potential consumers from connecting to the district heating network. To an extent this can be managed with by ensuring that the heat supply agreement is of a similar length of time to the life of the alternative plant system.

- **Number of consumers:** In order to ensure that the district heating system is viable it is necessary to establish sufficient numbers of commitments from consumers to connect, particularly at the early stages of a project. This can frequently be difficult to achieve, given resistance to change and generally a conservative approach of organisations to technologies that might appear to have a high level of risk.

6 CONCLUSIONS

This study has identified, via a variety of sources, a selection of the most promising heat demand users in the vicinity of the Proposed Multifuel Development located on the Slough Trading Estate. URS has based its estimates of heat demand upon floor areas, estimated from GIS data and satellite information, and benchmark energy consumption figures derived from recognised publications. This methodology has limitations, as actual energy use for a given site has the potential to deviate considerably from the norm that is represented by benchmarks. Nevertheless, given the combination of sources for identifying significant heat loads in the area, this study provides reasonable confidence that there is no single very significant users (e.g. >20MW_{th}) of heat within the primary 5km radius of the study, and that the local heat loads available vary considerably in magnitude, heat profile and proximity from the proposed site.

The most striking potential opportunities identified are around two core clusters, one centred around the Bath road developments, to the south of the Slough Trading Estate, and the other centred around the town centre of Slough. Individually the heat loads which make up these clusters are unlikely to provide sufficient demand to enable the viable development of a district heating network. However when the heat loads within the clusters are considered as a whole the heat density of these areas, together with their proximity to the heat source, may provide sufficient heat demand. The Applicant has already installed a short length of heat pipe in the centre of Slough to future proof these potential connections, as well as investigating the potential of installing pipework in a new rail crossing at Leigh Road to enable options for providing heat south of the railway line, as and when these connections become viable. It is therefore a recommendation of this report that further investigation into these two areas is undertaken, to gain more clarity on the actual heat demands, and whether these organisations would have a commercial interest in the uptake of heat from the Proposed Development.

However, with the exception of the these two clusters, there are predominantly only light industrial and retail facilities in reasonable proximity to the Proposed Development site, and URS would not consider these sites individually or collectively to offer great viability to become customers of a successful DH network. This is a combined function of both their relatively diffuse locations, low anticipated heat demands, and the transaction costs associated with DH commercial agreements.

ANNEX A – IDENTIFIED HEAT LOADS

Table 7: Identified significant new developments within a 5km area

Significant New Developments	Type	Approx. Distance (km)
Slough Trading Estate IQ Development	Office Space	<1
Heart of Slough Regeneration Development	Bus Station, Cultural centre, Office space	3
Redevelopment of Queensmere Observatory Shopping Centre	Retail, restaurants, residential	3
Britwell regeneration project	Residential, Retail	1

Table 8: Identified hotels within a 5km area

Name of the Hotel	Approx Distance (km)	Postcode	Name of the Hotel	Approx Distance (km)	Postcode
Copthorne Hotel	2	SL1 2YE	Datchet Mead Hotel	4	SL3 9AE
Baylis House Hotel	2	SL1 3PB	Sir Christopher Wren Hotel & Spa	4	SL4 1PX
Stoke Park	2	SL2 4PG	The Oakley Court	5	SL4 5UR
Holiday Inn	2	SL1 2NH	Skyways Hotel	5	SL3 7RL
Stoke Place	3	SL2 4PG	The pinewood Hotel	5	SL3 6AP
Holiday Inn Express	3	SL2 5DD	Norfolk House Hotel	5	SL6 0AP
Burnham Beeches Hotel	3	SL1 8DP	The Thames Riviera Hotel	5	SL6 8DW
Premier Inn Slough	3	SL1 1SU	The Thames Hotel	5	SL6 8NR
Travelodge Slough	3	SL1 1PG	Cliveden	6	SL6 0JF
Grovefield House Hotel	4	SL1 8LR			

Table 9: Identified sports and leisure centres within a 5km area

Sports/Leisure Centres	Approx Distance (km)	Postcode	Sports/Leisure Centres	Approx Distance (km)	Postcode
LA Fitness	1	SL1 4JB	Synergy Health and Fitness	2	SL1 2QG
Absolutely Fitness	1	SL1 4QZ	Eton College Swimming Pool	3	SL4 6DW
Herschel Sports Centre	1	SL1 3BW	Windsor Maidenhead Sauna Pool and Spa	5	SL4 5UB
Slough Community Leisure Ltd, Montern Leisure Centre	2	SL1 2QG			

Table 10: Identified retail within a 5km area

Retailer/Office	Approx Distance (km)	Postcode	Retailer/Office	Approx Distance (km)	Postcode
Bath Road Retail Park – 10 units. B&Q warehouse, Next, Outfit, Furniture Village, Mothercare, Carpetright, Argos, McDonalds	1	SL1 4DX	Slough Retail Park – 7 units. Homebase, Galiform, Harveys, Wickes, DFS, Carpetright	2	SL1 5PS
Westgate Retail Park – 3 units. Currys, PC World, Brantano	1	SL1 5PS	Queensmere Observatory Shopping Centre. Approx 100 units	3	SL1 1LN

Table 11: Identified supermarkets within a 5km area

Supermarket	Approx Distance (km)	Postcode	Supermarket	Approx Distance (km)	Postcode
Iceland Foods Ltd	1	SL1 4XT	Casco Stores	2	SL1 6EA
Marks & Spencer	1	SL1 5PR	Tesco Slough Wellington Extra	3	SL1 1XW
Sainsbury's Superstore	1	SL1 4XP	Sainsbury's	3	SL6 0QH
Wentworth Supermarket	1	SL2 2DS	Sainsbury's Local	4	SL2 3PQ
Grover Superstore	1	SL2 1EQ	Windsor Superstore	5	SL4 4JT
Asda Superstore	2	SL1 9LA	Royal Thai Supermarket	5	SL4 5AN

Table 12: Identified hospitals and medical centres within a 5km area

Hospitals	Approx Distance (km)	Postcode	Hospitals	Approx Distance (km)	Postcode
Manor Park Medical Centre	2	SL1 3XU	Wexham Park Hospital	4	SL2 4HL
Spire Thomas Valley Hospital	3	SL3 6NH	Cippenham Medical Centre	2	SL1 5PP
The Huntercombe Hospital – Maiden Head	2	SL6 0PQ	The Village Medical Centre	2	SL1 5NP
Burnham Health Centre	3	SL1 7DE	Jesus Hospital	5	SL6 2AN

Table 13: Identified Universities and Teaching Institutions within a 5km area

Name of School	Approx Distance (km)	Postcode	Name of School	Approx Distance (km)	Postcode
Herschel Grammar School	1	SL1 3BW	St Peters Church of England School	3	SL1 7DE
Kitch Craft Haybrook College	1	SL1 4LP	Saint Joseph's Catholic High School	3	SL2 5HW
Priory School	1	SL1 6HE	Slough and Eton Church of England Business and Enterprise College	3	SL1 2PU
Lynch Hill Primary Academy	1	SL2 2AN	London College of Finance & Accounting Trinity College	3	SL1 2EE
Godolphin Junior School	1	SL1 3HS	Cranbrook Business School	3	SL1 1PN
Bayliss Court School	1	SL1 3AH	Saint Nichola' Church of England Combined School	4	SL6 0ET
Springboard at Haybrook College	2	SL1 6LZ	Farnham Common Junior School	4	SL2 3TZ
Our Lady of Peace Junior School	2	SL1 6HW	The Stoke Poges School	4	SL2 4LN
Our Lady of Peace Infant & Nursery School	2	SL1 6HW	Seftom Park School	4	SL2 4QA
Lent Rise Combined School	2	SL1 7NP	Wexham Court Primary School	4	SL3 6LU
Burnham Grammar School	2	SL1 7HG	Teikyo School UK International School of Creative Arts	5	SL2 4QS
Eton College	2	SL4 6DW			

Table 14: Identified office and light industry within a 5km area

Name of School	Approx Distance (km)	Postcode	Name of School	Approx Distance (km)	Postcode
Bath Road Office Developments	1	SL1 4DX	AkzoNobel Offices	3	SL2 5DS
GSK Horlicks	2	SL1 3NU	Fujitsu	3	SL1 2EY
Cornwall House	2	SL1 1DZ	Edinburgh House	3	SL1 2HL
Thames Central	2	SL1 1QE	Charter Court	3	SL1 2EJ