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07 June 2018

Mr David McNamara
Director, Secretariat
Independent Planning Commission
Level 3, 201 Elizabeth Street
SYDNEY NSW 2000

Dear David,

EASTERN CREEK ENERGY FROM WASTE FACILITY (SSD 6236) - SUPPLEMENTARY INFORMATION

Reference is made to our letter dated 25 May 2018, in relation to the information provided in clarification for floc waste with regard to the State significant development application presently before the Independent Planning Commission (the Commission) for the Eastern Creek Energy from Waste Facility (SSD6236) (EfW Facility).

This letter provides supplementary information to the Commission to respond to key items raised at the public hearing on 14 May 2018 which had not previously been raised in relation to the proposal. This information generally seeks to respond to concerns surrounding emergency shut-down procedures and potential risk scenarios.

This information should be read in conjunction with the Urbis submission dated 25 May 2018 previously provided to the Commission and is supported by information provided from Hitachi Zozen Innova (HZI) as enclosed in this letter.

1. POTENTIAL RISK SCENARIOS

As described in the Amended EIS and the revised RTS Report, there are a number of possible scenarios which potentially could require an emergency shut-down event of the proposed EfW Facility. In these instances, there are a number of safeguards and procedures in place to ensure there is no increase in emissions during any shut-down event.

These scenarios are outlined below and are detailed in the attached advice from the facility technology supplier HZI.

1.1. FIRE IN THE FEEDSTOCK

There are two potential scenarios that could lead to a fire in the waste bunker:

1. Ignition by means of a source contained in the fuel; or
2. Spontaneous ignition of combustible gases due to anaerobic digestion in the waste pile.

These scenarios are unlikely to occur based on the following:

1.1.1. Homogenisation of Waste

All waste fuel will have been pre-processed at the existing Genesis MPC Facility and transferred to the EfW Facility by conveyor or truck. Any waste that contains oversized pieces or is not able to be processed will either have been removed or reduced in size to fit the specifications of the EfW Facility prior to delivery to the facility. The material supplied to the EfW Facility is expected to be homogenous in accordance with sorting procedures.

Notwithstanding, all loads will be inspected as they are tipped at the EfW Facility bunker, using the installed CCTV system or by visual observation of the crane operator. In addition, delivery trucks will be subject to inspection by the EfW Facility personnel prior to discharging their load into the waste bunker. As a consequence, of the pre-processing which has taken place no ignition sources are expected to be contained in the waste deliveries to TNG and it has been the case that no fires have occurred amongst the process material at Genesis since it began operating in June 2012.

1.1.2. Mixing of Waste

Waste will be continuously mixed within the waste bunker prior to feeding it to the boiler. This will ensure that waste will not sit undisturbed for lengthy periods of time. The limited components of organic matter in the residue fuel waste stream strongly minimise any risk of the occurrence of anaerobic digestion.

As a consequence of the above, conditions within the bunker will not be conducive to the commencement of a fire event. as. Notwithstanding this a sophisticated fire detection and extinguishing system will be installed to monitor the bunker surface at all times. This monitoring system scans the entire surface of the bunker and detects differences in temperature. If it detects areas of elevated temperatures it automatically alerts the operator who will then pick up the waste in that area, feed it to the boiler and/or mix it with other waste in the bunker.

Through the above methods, HZI has not experienced any bunker fires. This is true in particular of all EfW plants built by HZI in the UK such as Riverside, Ferrybridge, Newhaven, Tees Valley, Buckinghamshire, Hereford & Worcestershire and Severnside.

1.2. FAILURE OF THE MOVING GRATE

This scenario would arise from the mechanical blocking of the grate movement due to jamming of waste fuel components on the grate. Such a blockage is limited to one individual grate element (of a total of 24 elements which comprise the entire grate) where jamming could occur.

The jammed movement of one grate element will slow the movement of the fuel bed on that element. Notwithstanding, the movement of the adjacent elements will continue and provide for sufficient stoking of the fuel bed until the jammed grate element can be unblocked – this can generally be undertaken whilst the facility remains in operation.

Genesis sorting plant shreds all of the material into a nominal standard size and separates the material based on weight, size, length and composition. Both ferrous and non-ferrous metals are generally removed with a great degree of efficiency as these are of economic value. It is highly unlikely that metallic objects which could conceivably jam a moving grate could survive the process.

Should a situation arise where a serious jamming of the moving grate occurred this may require the facility to be shut-down in a normal manner in order to unblock the grate element. This would include the controlled shut-down of the boiler and this would not result in any uncontrolled emission releases to the environment.

1.3. CATASTROPHIC EVENT (EXPLOSION) INVOLVING THE BOILERS OR TURBINES

1.3.1. Boiler Event

An explosion inside the boiler can only occur if the waste fuel were to contain explosive materials. As the waste fuel received by the EfW Facility will be pre-processed (as described above and in the revised EIS and revised RTS Report) and is subject to inspection upon delivery to the facility, in addition to spot analysis by the operator, there are strict quality control processes in place to prevent any explosive devices forming part of the waste fuel. There have been no reported cases of explosive materials entering the Genesis sorting facility since operations commenced.

Despite this, the worst imaginable case scenario might be the explosion of a propane barbeque gas tank. The EfW Facility is designed to withstand such an explosion without any damage to the plant and without any impact on the environment. As such the robustness of the EfW Facility boiler allows the safe disposal of such material.

The high pressure elements of the steam boiler are protected by safety valves that are designed to relieve pressure in a controlled manner, should the pressure in the system exceed the designed level. As in any coal fired power plant, multiple safety valves provide redundancy to ensure the safe operation of the boiler at all times.

1.3.2. Turbine Event

The turbine used within the EfW Facility will be a condensing steam turbine as commonly used in other thermal power plant (e.g. coal fired, oil fired or gas fired power plants). Thousands of such turbines are in operation throughout the world today and provide a significant portion of electric energy consumed globally.

Modern turbine installations are continuously supervised by a wide array of instruments which monitor all the relevant aspects of this machine in operation (temperature, pressure, rotational speed, vibration, bearing positions, etc.). If any of these instruments were to detect a serious anomaly, the machine is designed to safely shut down immediately.

Steam turbines use steam as the driving force. As such, they cannot ‘explode’ since there is no explosive element involved (e.g. fuel, oil or natural gas).

The worst case scenario is a situation where a turbine blade was to break loose from the shaft. The turbine casing is designed to retain such broken parts within the machine and the vibration sensing instrumentation detects this situation immediately and shuts down the steam supply to the turbine, resulting in a controlled safe shut down. No such events have been known to occur at HZI plants.

1.4. FAILURE / SHUT-DOWN OF MAINS GRID

Under normal circumstances the EfW Facility will feed electric energy to the electric grid.

In the event that the grid was to shut-down and not be in a position to receive any input, the electric breaker of the EfW Facility would switch off and isolate the facility from the grid. The energy production system would then switch to 'island mode' and produce just enough electric energy to supply the facility with the power it consumes. Excess steam produced by the boiler is then routed to the bypass valve around the turbine and exhausted to the condensers.

Consistent with all facilities designed by HZI, the EfW Facility is designed to operate in this mode for extended periods of time until the grid becomes available. This is considered a normal operating mode – the transition from normal electric power export to island mode occurs in an automatic, manner and does not result in any uncontrolled release to the environment.

1.5. FAILURE OF A BAG FILTER

The bag filter of the EfW Facility consists of 14 compartments. Each compartment contains 12 rows with 16 bag filter elements each. Thus the bag filter contains a total of 2,688 bag filter elements. The 'failure of the bag filter' means that one of these 2,688 filter elements has incurred a hole or suffered the failure of a seam.

The continuous bag monitoring system at the exit of the filter will immediately detect such a failure due to a slight increase in particulate matter in the flue gas (broken bag indicator). The bag filter control logic links the received signal to the precise row of bags which was pulse-cleaned most recently and sends an alarm to the control room operator. The operator then isolates the affected filter compartment and instructs the maintenance crew to locate the affected filter bag within the compartment and replace it with a new one.

The bag replacement can occur while the plant remains online. As soon as the bag is replaced, the filter compartment can be put back into regular service. This system has been installed and commissioned in all recent EfW Facilities designed and built by HZI (e.g. Hereford & Worcestershire, Horgen and Dublin; Edinburgh, Ferrybridge II (not yet commissioned)). To date this system has not indicated a bag failure at these facilities.

2. AUTOMATIC SHUT-DOWN EVENT

The proposed EfW Facility is equipped with monitoring instructions that detect whether the facility is operating under normal conditions.

Any modern industrial facility (i.e. EfW Facility, coal fired power plant, chemical plant, or any manufacturing operation etc.) is equipped with redundant systems for critical processes. If any instruments indicate a malfunction or a deviation from normal operation of the EfW Facility, the control system will automatically shut down the affected sections of the plant or the entire boiler line – refer to 'Plant Operation Outline' in the enclosed for additional detail describing the safety interlock systems.

Automatic shut-down is a feature of normal plant design which is intended to protect the facility, personnel and the environment from damage and prevent uncontrolled releases from the facility. As an example, such automatic shut-downs for various reasons (e.g. elevated pressure in the furnace, boiler leakage) occur on average 1 to 2 times per year per boiler (example Riverside).

While such a shut-down is not necessarily desirable, it does constitute normal operation and does not involve any negative impact on human health or the environment.

3. EXISTING OPERATIONS

No facilities referenced by HZI have experienced a release to atmosphere or a breach of environmental regulations as a consequence of the scenarios listed above. This is true in particular of all EfW plants built by HZI in the UK such as Riverside, Ferrybridge (the comparison facility references in the amended EIS and amended RTS), Newhaven, Tees Valley, Buckinghamshire, Hereford & Worcestershire and Severnside.

4. NORTH LONDON HEAT AND POWER PROJECT – ISLINGTON COUNCIL

The Blacktown City Council's presentation to the IPC at the public meeting, included a comparison table between the projected emissions of the proposed EfW Facility and the North London Heat and Power Project – Islington Council, as detailed in Figure 1 below.

Figure 1 – Projected Emissions – Blacktown City Council

Pollutant	The Next Generation Easter Creek RTS Updated report	The Next Generation Eastern Creek Amended EIS	The Next Generation Eastern Creek Initial EIS	North London Heat and Power Project – Islington Council (Expected emissions under normal operation)
Solid particles /Dust/ Particulate Matter (mg/m³)	1	1	22	1
Nitrogen dioxide NO_2 (mg/m³)	120	188	286	10-25
TOC (mg/m³)	.015	.015	14	1
Dioxins and furans (ng/m³)	.01	.01	.01	.005-.01
Hydrogen Chloride HCL (mg/m³)	9	9	43	6
Cadmium Cd (mg/m³)	.009	.009	.04	.001
Mercury Hg (mg/m³)	.004	.004	.04	.008
Sulphur Dioxide SO_2 (mg/m³)	27	27	143	20
Hydrogen Fluoride HF (mg/m³)	.5	4	3	0.5
Carbon Monoxide CO (mg/m³)	23	23	71	10

ERM has reviewed the information presented in Blacktown City Council's submission and the original documentation from the North London Facility prepared by ARUP a copy of which is attached for ease of reference. In response to the comparison made and the conclusions reached we make the following observations and comments:

- The table does not relate to 'emissions' but rather to assumptions made around "in-stack" concentrations adopted for each facility as presented in ARUP's Environmental Assessment.
- While the two facilities do not appear to be comparable in terms of scale, technology provider, air pollution control or waste stream, the two facilities appear to have been designed to meet the same (IED) emission limits.
- The ARUP Environmental Assessment explains that the application for the North London Heat and Power Project has proposed lower NOx limits – it is anticipated that the reason for this is to satisfy a UK local air pollution control legislation that is not applicable to the Australian context.
- No information is provided within the ARUP Environmental Assessment as to the nature of the control technology used/proposed in the North London facility, how the reduced NOx will be achieved, and whether the NOx control technology meets Best Available Technology requirements.
- The proposed NOx control technology for the EfW Facility is Selective Non-Catalytic Reduction (SNCR), which represents Best Available Technology as defined within the European Best Available Techniques Reference (BREF) Document for Large Combustion Sources.
- The assumptions around NOx emission limits for the EfW Facility have been tested by ERM throughout the application process and it has been demonstrated that the proposed technology will satisfy ambient air quality standards for NOx as well as ozone formation.

As identified above, while ERM acknowledges that the two facilities are not comparable, it is important to also acknowledge that the two facilities have been designed to meet the same emission limits. Page 76 of the ARUP Environmental Assessment details that for stack emissions from the operation of the ERF facility it is concluded that:

> *'the magnitude of change for all pollutants would be small or imperceptible, and process results...would therefore be not significant.'*

Given that ARUP have reached this conclusion for this energy from waste project with similar emission limits to the proposed EfW Facility (irrespective of the waste stream), it is unclear how ARUP can also reach a position where it is considered that there are perceived uncertainties in relation to the air assessment undertaken for the proposed EfW Facility as expressed in the report.

5. SUMMARY

It is clear from the public meeting that concerns were raised in relation to catastrophic events and potential adverse impacts on the surrounding environment from an emergency shut-down of the proposed EfW Facility. The above information details clear safety procedures and mitigation measures part of the design and standard operations of the facility and are designed to ensure that there will not be an increase in emissions during shut-down events or possible risk scenarios and there will no adverse impact on the environment.

If you have any questions, please don't hesitate to contact me at on (02)8233 7678 or by email cbrown@urbis.com.au.

Kind regards,

Clare Brown
Director

Enc:
HZI – Plant Operation Outline
ARUP Environmental Assessment (North London Heat and Power Project)

Project No.	YE-3267
Project Name	

Eastern Creek

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Rev	Author (Name, Date, Signature)	Reviewer (Name, Date, Signature)	Approver (Name, Date, Signature)	Short description of change
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1.0				
2.0				
3.0				

Doc Type	OGE	HZI Doc No _ Rev	50042388-0.0
Contractor	HZI	Plant Operation Outline	

Table of Content

1 Introduction

The plant operation outline describes the plant regarding the conceptual setup of the control system, process monitoring and the automation degree.

This outline is held in a general form and is, in this form, valid for all projects and proposals. If necessary, it must be adapted to a specific project during the basic engineering (BE) phase.

It also describes the methods with regard to safety precautions realized within the distributed control system (DCS) and within the safety PLC.

The final version of the **PLANT OPERATION CONCEPT** consists of the **PLANT OPERATION OUTLINE** (this document) and the different **associated documents** listed in chapter 1.4 of this document.

1.1 Purpose

The primary purpose of this document is to give an overview of the degree of automation of the plant. It explains the different levels of automation, the various operation modes of the plant and its equipment.

Additionally this document should give a general overview of the plant operation. In an abbreviated manner the different operation statuses and transitions between the different statuses of the plant are described. Also included are the various steps to start and stop the entire plant. Emergency operations such as power failure or complete black-out are also addressed in this document.

In a further chapter a general overview on the structure and principles for personnel safety and plant protection is given.

1.2 Scope

This document is valid for all projects of Hitachi Zosen Inova AG, for all employees of Hitachi Zosen Inova AG, for members of a consortium and for suppliers.

1.3 Definitions and Abbreviations

Abbreviation	Explanation
2oo3	Two (**2**) **o**ut **o**f Three (**3**) Measurement
AIL	**A**sset **I**ntegrity **L**evel (Safety requirement related to assets and environmental aspects)
ACC	**A**ir **C**ooled **C**ondenser
ALM	Alarm Active
ACQ	Alarm Acknowledged
BE	**B**asic **E**ngineering
BoP	**B**alance **o**f **P**lant (Auxiliaries such as water supply, compressed air supply, fuel oil supply, etc.)
CAE	**C**omputer **A**ided **E**ngineering
CCR	**C**entral **C**ontrol **R**oom
CCS	**C**ombustion **C**ontrol **S**ystem
CCWS	**C**losed **C**ooling **W**ater **S**ystem
CEMS	**C**ontinuous **E**mission **M**onitoring **S**ystem

CPU	**C**entral **P**rocessing **U**nit
DCS	**D**istributed **C**ontrol **S**ystem
DE	**D**etail **E**ngineering
EBE	**E**xtended **B**asic **E**ngineering
EIC	**E**lectrical, **I**nstrumentation, **C**ontrol
EDG	**E**mergency **D**iesel **G**enerator
EPS	**E**mergency **P**ower **S**ystem
ESP	**E**lectro**s**tatic **P**recipitator
FDS	**F**unctional **D**esign **S**pecification
FG	**F**unction **G**roup
FGT	**F**lue **G**as **T**reatment
HAZOP	**Haz**ard and **Op**erability Study
HMI	**H**uman **M**achine **I**nterface
HP	**H**igh **P**ressure (Steam)
I/O	**I**nput / **O**utput
KKS	Reference and Designation System for Power Plants (**K**raftwerks-**K**ennzeichen-**S**ystem)
LOP	**L**ocal **O**perating **P**anel
LP	**L**ow **P**ressure (Steam)
MCB	**Mo**tor **C**ontrol **B**ox
MCC	**M**otor **C**ontrol **C**enter
MCR	**M**easure **C**ontrol **R**ecording
MFG	**M**ain **F**unction **G**roup
MIL	**M**ain **I**nterlock **L**ist
MP	**M**edium **P**ressure (Steam)
n/a	**n**ot **a**pplicable
O&M	**O**peration and **M**aintenance Manual
PID	**P**iping and **I**nstrumentation **D**iagram
PLC	**P**rogrammable **L**ogic **C**ontroller
PRDS	**P**ressure **R**educing **D**e**S**uperheating (valve)
PU	**P**ackage **U**nit
RTN	**R**eturn **to** **N**ormal Operation
SCC	**S**econdary **C**ombustion **C**hamber
SDE	**S**ingle **D**rive **E**quipment
SIL	**S**afety **I**ntegrity **L**evel (Safety requirement related to personnel safety)
SIS	**S**afety **I**nstrumented **S**ystem
SP	**S**et**P**oint

UPS	**U**n-interrupted **P**ower **S**upply
VFD	**V**ariable **F**requency **D**rive (of a motor)
WSC	**W**ater **S**team **C**ycle

1.4 Associated Documents

The following documents will be prepared for a specific project in order to finalize the overall plant operating concept during the engineering phase.

Title	Engineering Phase	Filing (HZI internal)	Document Description
Plant Operation Outline	**BE** Basic Engineering	**PIRS \14 \01**	This document.
Package Unit List	**BE** Basic Engineering	**PIRS \14 \03**	List of all package units within the plant containing a PLC or a similar logic controller.
Long Distance Data Transmittal Connection Concept	**BE** Basic Engineering	**PIRS \15 \04**	Document explaining the concept for external plant communication connections.
EU-, UV-, EM-Typicals	**BE** Basic Engineering	**PIRS \16 \25** (Comos)	Electrical typicals of all various drives used within the plant. Consists of a series of signals within the DCS.
Main Interlock Matrix EIC	**BE** Basic Engineering	**PIRS \14 \02**	Overview of the electrical interlocks between switchboards in the form of a table.
Electrical Power System Functional Description	**BE** Basic Engineering	**PIRS \14 \02**	Description of the operational control philosophy and interlocks for the electrical power network.
Function Group Table	**EBE** Extended Basic Engineering	**PIRS \14 \03**	Table on which every drive (SDE) is associated with its superior function group.
Main Interlock List	**EBE** Extended Basic Engineering	**PIRS \13 \08**	Overview of the most important interlocks between different systems in the form of a table.

EIC Emergency Stop List	**EBE** Extended Basic Engineering	**PIRS \14 \02**	List of all plant shut-down stops and emergency stops within the plant; the list consists of - Plant Shut-Down-Stops - Area Shut-Down-Stops - single drive E-Stops
Control System Operating Concept	**EBE** Extended Basic Engineering	**PIRS \14 \02**	Description of the general rules for instrumentation, equipment, process control system, and the user interface, which must be applied in their entirety to the HZI waste processing plant. The process control system forms the central operating, control, and data tracking entity for all the units and ancillary subsystems located in the plant.
Functional Design Specification (FDS) for all Systems	**DE** Detail Engineering	**PIRS \13 \09** (Comos)	Schematic and verbal description to define the functionality of a system. Contains an explanation of the function and a logic diagram.
FDS Plant Protection	**DE** Detail Engineering	**PIRS \13 \09** (Comos)	Schematic and verbal description to define the functionality of the safety PLC (refer also to sheet 1 of the main interlock list).
FDS General Interlocks	**DE** Detail Engineering	**PIRS \13 \09** (Comos)	Schematic and verbal description to define the functionality of interlocks between different systems (refer also to sheet 2 of the main interlock list).
EIC Emergency Power Start-Up and Safe Shut-Down Sequence	**DE** Detail Engineering	**PIRS \13 \09** (Comos)	Description of the emergency power start-up sequence which is launched at a plant black-out. The sequence defines the starting time after the generator start to equalize the load on the generator.
Start-Up and Shut-Down Table	**DE** Detail Engineering	**PIRS \14 \04**	Detailed description of the start-up and shut-down procedure. Is part of the operation and maintenance manual (O&M), will be finalized during commissioning.

2 Operation Modes

The system is divided into a hierarchy of different levels to sort components and drives in more or less independent process areas. This allows for a structured design and automation concept.

<u>**Hierarchical level**</u>	*Examples*
Ø **Line**	Line 1 / Line 2
Ø **Line Sections**	Grate Combustion / Flue Gas Treatment
Ø **Process Sections**	Bottom Ash Handling / Combustion Air Supply
Ø **Process Units**	Primary Air System / Hydraulic Station
Ø **Process Equipment**	Motors / Valves / Actuators – Single Drive Equipment

The plant operation is performed through Main Function Groups (MFG) and Function Groups (FG).

NOTE

The operating personnel starts and stops the equipment of the plant in semi-automatic way, using main function groups and function groups.

Main function groups and function groups act on <u>process units</u> and <u>process sections</u>. Process units or sections are the physical system in the field whereas MFG and FG reside only in the DCS.

START and STOP of complete <u>lines</u> is NOT provided.

<table>
<tr><td colspan="23">PLANT</td></tr>
<tr><td colspan="23">Line</td></tr>
<tr><td colspan="11">Line Section A</td><td colspan="12">Line Section B</td></tr>
<tr><td colspan="6">Process Section A-1</td><td colspan="5">Process Section A-2</td><td colspan="7">Process Section B-1</td><td colspan="5">Process Section B-2</td></tr>
<tr><td colspan="4">Process Unit A-1.1</td><td colspan="2">Process Unit A-1.2</td><td colspan="2">Process Unit A-2.1</td><td colspan="3">Process Unit A-2.2</td><td colspan="4">Process Unit B-1.1</td><td colspan="3">Process Unit B-1.2</td><td colspan="5">Process Unit B-2.1</td></tr>
<tr><td>Process Equipment A-1.1.1</td><td>Process Equipment A-1.1.2</td><td>Process Equipment A-1.1.3</td><td>Process Equipment A-1.1.4</td><td>Process Equipment A-1.2.1</td><td>Process Equipment A-1.2.2</td><td>Process Equipment A-2.1.1</td><td>Process Equipment A-2.1.2</td><td>Process Equipment A-2.2.1</td><td>Process Equipment A-2.2.2</td><td>Process Equipment A-2.2.3</td><td>Process Equipment B-1.1.1</td><td>Process Equipment B-1.1.2</td><td>Process Equipment B-1.1.3</td><td>Process Equipment B-1.1.4</td><td>Process Equipment B-1.2.1</td><td>Process Equipment B-1.2.2</td><td>Process Equipment B-1.2.3</td><td>Process Equipment B-2.1.1</td><td>Process Equipment B-2.1.2</td><td>Process Equipment B-2.1.3</td><td>Process Equipment B-2.1.4</td><td>Process Equipment B-2.1.5</td></tr>
</table>

2.1 Definition of Main Function Groups and Function Groups

Main Function Groups can be defined on the hierarchy level of a **Process Section** when multiple **Process Units** are tied together to form a common system.

Function Groups are defined on the hierarchy level of a **Process Unit** when at least one **Single Drive Equipment** (SDE) must be addressed.

In most of the cases each main function group (MFG) and each function group (FG) consist of both, a START sequence and a STOP sequence.

The START sequence can be executed if the PERMANENT CONDITIONS and the START RELEASE are fulfilled.

If the PERMANENT CONDITIONS are NOT fulfilled any more the STOP sequence is being executed.

The function group table is a table which shows the different hierarchical levels of the plant as well as defines the various MFG's and FG's. Additional information in the function group table are:

- on which hierarchical level a piece of equipment can be switched to MANUAL mode
- whether the control of the equipment is realized in the DCS or in a package unit
- lists the different locations from where a system can be operated

An example of a function group table can be found on the following pages.

2.1.1 Example of a Function Group Table

												Location of Control		Location of Operator Interface			
Line Section	Process Section	**MFG**	KKS No. … ED	Process Unit	**FG**	KKS No. ... EE	Automatic Operation (AutoOp)	Process Equipment	**SDE**	KKS No.	DCS / PU	DCS	PU	CCR	PU	LOP	MCB
Grate / Combustion	Waste Feed & Transport System			Feed Hopper		1 HFA00 EE001	Bridge Breaking Program	Hydraulic Valve Feed hopper Flap(s)	A/M	1 HHX70 AA310	DCS	X		X		X	
				Ram Feeder	M	1 HFY00 EE001		Control Cabinet Ram Feeder	A/M	1 HFY10 GH501	PU		X	X	X		
								Hydraulic Valves Ram Feeder	A/M	1 HHX81 /82 AA020			X		X		
				Grate	M	1 HHY00 EE001		Control Cabinet Grate	A/M	1 HFY10 GH501	PU		X	X	X		
								Hydraulic Valves Grate Elements	A	1 HHX11 /12/13/.. AA030			X		X		
	Combustion Air Supply			Primary Air System	M	1 HLA10 EE001	Flow Control	Fan / Motor	A/M	1 HLB10 AN001	DCS	X		X			
							Suction Switchover	Air Source Switch Damper	A/M	1 HLA10 AA300	DCS	X		X			
								Primary Air Dampers Zones 1 to 5	A/M	1 HLA10 /20/30.. AA400	DCS	X		X			
				Primary Air Preheater	M	1 LBG00 EE001	Temperature Control	Saturated Steam Control Valve	A/M	1 LBG20 AA400	DCS	X		X			
							Condensate Level Control	Condensate Control Valve	A/M	1 LCN30 AA410	DCS	X		X			

Line Section	Process Section	MFG	KKS No. … ED	Process Unit	FG	KKS No. ... EE	Automatic Operation (AutoOp)	Process Equipment	SDE	KKS No.	DCS / PU	Location of Control		Location of Operator Interface			
												DCS	PU	CCR	PU	LOP	MCB
				Secondary Air System	M	1 HLA20 EE001	Flow Control	Fan / Motor	A/M	1 HLB20 AN001	DCS	X		X			
	Combustion Control System (CCS)			Combustion Control System	M	1 HFY10 EE002			A/M		DCS	X		X			
	Start-up and Auxiliary Burners	M		Burner 1	A/M	1 HLY00 EE001		Control Cabinet	A/M	1 HJY10 GH501	PU	X		X	X		
								Combustion Air Fan	A	1 HJL10 AN001			X				
								Cooling Air Fan	A	1 HJQ10 AN001			X				
	Bottom Ash Extraction			Bottom Ash Extractor	M	1 HDA00 EE001		Extractor Motor	A/M	1 HDA10 AF001	DCS	X		X			X
							Auto Refill	Bottom Ash Water Valve	A/M	1 HDA10 AA300	DCS	X		X			
								Bottom Ash Water Pumps	A/M	1ETN11 /12 AP001	DCS	X		X			

Legend:

M	A	MFG	FG	SDE	DCS	PU	CCR	LOP	MCB
Manual Start	Auto Start	Main Function Group	Function Group	Single Drive Equipment	Distributed Control System	Package Unit	Central Control Room	Local Operating Panel	Motor Control Box

2.1.2 Main Function Group (MFG)

A process section is defined as a main function group if it has a certain degree of independence in control, maintenance, and operation. A main function group controls automatically its subordinate function groups.

A START command on a main function group level launches a sequence which starts the different function groups included in the main function group.

Examples for main function groups are:

- bottom ash handling
- residue discharge
- etc.

A main function group (MFG) can only be started when the PERMANENT CONDITIONS are satisfied and the START RELEASE is ACTIVE.

Included in the START RELEASE of the main function group is the requirement that ALL subordinated function groups are in AUTO mode.

A main function group can only be stopped when the STOP RELEASE is active.

The main function group is being started via a sequence (START sequence) and is also being stopped via a sequence (STOP sequence).

A soon as the PERMANENT CONDITIONS are not satisfied any more (also during the START sequence) the main function group will be stopped. The STOP sequence will be launched regardless of the STOP RELEASE and the main function group will be set to FAILURE.

If the START sequence winds up in a step (due to an exceedance of the step internal supervision time) the main function group will be set to FAILURE. At the same time the STOP sequence will be launched regardless of the STOP RELEASE.

For every MFG the PERMANENT CONDITIONS and the START (or STOP) RELEASES are displayed in the DCS. This allows a quick analysis of all the requirements involved in a system start.

Each step of the START and the STOP sequence is displayed in the DCS.

2.1.3 Function Group (FG)

A process unit is defined as a functional subgroup of a process section. A function group controls automatically its associated process equipment such as motors, drives, etc.

A START command on a function group level launches a sequence which starts the different single drives included in the function group.

Besides the «START» command each function group consists of an «ALL AUTO» command which switches all the single drive equipment contained in the respective function group into AUTO mode simultaneously. This allows to recover quickly when the unit or a part of the system has tripped.

Examples of function groups within the main function group "Residue Discharge" are:

- mechanical discharge semi dry
- pneumatic discharge semi dry
- etc.

A function group (FG) can only be started when the PERMANENT CONDITIONS are satisfied and the START RELEASE is active.

Except of redundant equipment all SDE in AUTO is part of the START RELEASE for the respective FG.

A function group can only be stopped when the STOP RELEASE is active.

For example there exists a STOP RELEASE for the FG Hydraulic Station: The FG Ram Feeder and the FG Grate must be stopped, before the FG Hydraulic Station can be stopped (this ensures, that the ram feeder and the grate are in their initial and safe position).

The function is being started via a sequence (START sequence) and is also being stopped via a sequence (STOP sequence).

A soon as the PERMANENT CONDITIONS are not satisfied any more (also during the START sequence) the function group will be stopped. The STOP sequence will be launched regardless of the STOP RELEASE and the function group will be set to FAILURE.

If the START sequence winds up in a step (due to an exceedance of the step internal supervision time) the function group will be set to FAILURE. At the same time the STOP sequence will be launched regardless of the STOP RELEASE.

Depending on the functionality and the tasks of the system the various function groups can react slightly different in the following two ways:

1. If a non-redundant drive is being set to FAILURE the associated function group will be set to FAILURE, <u>but remains in operation</u>. When there is a redundancy of drives, the stand-by drive will automatically be activated and the function group remains in operation.

OR

2. If a non-redundant drive is being set to FAILURE the associated function group will be set to FAILURE <u>and the STOP sequence will automatically be launched</u> (the function group will be stopped). When there is a redundancy of drives, the stand-by drive will automatically be activated and the function group remains in operation.

This is shown in the logic diagram of the respective system.

In case the FG is being started from a superior MFG, the FG must be set to AUTO mode.

In MANUAL mode the FG can be started at the FG itself, in AUTO mode the FG can receive START and STOP commands from the MFG.

For every FG the PERMANENT CONDITIONS and the START (or STOP) RELEASES are displayed in the DCS. This allows a quick analysis of all the requirements involved in a system start.

Each step of the START and the STOP sequence are displayed in the DCS.

2.1.4 Automatic Operation (AutoOp)

Automatic operations are considered to be periodic, automatic sequences or logic functions within a function group (e.g. 2-way level controls of a tank using two contacts or two thresholds from a continuous measurement).

Automatic operations are normally being started and stopped within the function group. They cannot be switched to manual mode but remain active as long as the FG is in operation.

2.1.5 Single Drive Equipment (SDE)

A process equipment is a physical unit consisting of a drive part and a mechanism.

Examples of process equipment of the function group "Feed Hopper Cooling System» are:

- feed hopper cooling pump
- feed valve in the feed hopper cooling circuit
- etc.

Every single drive within the plant may be individually switched to from AUTO to MANUAL mode and vice versa at any time.

A common command («ALL AUTO») on the FG level switches ALL single drive equipment in the respective function group to AUTO mode simultaneously.

The changeover of the operation mode of a single drive from AUTO to MANUAL **DOES NOT** change the operation status of the respective drive (e.g. when the drive is in operation, it remains in operation or when the drive is stopped it remains stopped).

When switching a single drive from MANUAL to AUTO the drive may be started. This depends on the status of the corresponding function group or the actual process requirements (e.g. when switching the cooling air fan of the hydraulic station from MANUAL to AUTO the fan starts immediately when the oil temperature is above the threshold).

Interlocks and start releases defined for the single drives remain active in MANUAL mode.

NOTE

In MANUAL mode the operator is responsible for the proper control of the process.

2.2 Definition of Operation Modes

2.2.1 Introduction

A distributed control system (DCS) assists the operator to run the entire plant according to the specifications and the design in a safe and secure manner in terms of personnel and equipment.

The DCS monitors and controls the process in real time. The human machine interface (HMI) makes all necessary information on the actual plant status available to the operator at any time.

In addition to the process related information the DCS also generates WARNINGS and ALARMS in case exceptional conditions develop. In the case process thresholds are reached or limits are passed over the DCS reacts and intervenes in order to correct the abnormal situation. As a backup of the DCS a Safety PLC reacts on critical equipment when the DCS is not reacting.

Besides the execution of monitoring and control tasks the DCS also serves as a data storage unit for measured process values (e.g. flow, pressure, temperature, etc.) as well as for all operator inputs (e.g. setpoint changes, start and/or stop of function groups, manual start and/or stop of equipment, etc.).

In normal operation all equipment is operated in AUTO - REMOTE - controlled from the DCS in the control room (see also chapter 2.2.2).

All individual equipment can be switched to MANUAL mode. In this mode the operator can actuate the equipment directly from the DCS in the control room (see also chapter 2.2.3). The switchover from AUTO to MANUAL (and vice versa) must be carried out by the operator in the DCS.

When a single drive (SDE) fails it will automatically be switched to MANUAL mode. This is also the case when a safety stop shuts the drive down. The SDE must be RESET, before it can be switched back to AUTO or before it can be STARTED in MANUAL mode.

Selected systems can be operated in LOCAL mode, either at the local control unit (package unit) or at the local operating panel (LOP).

Depending on the nature of the system, the following two ways to operate equipment locally are being used:

1. The equipment can be switched to LOCAL operation at the local control panel by means of a key switch. Local operation is then indicated in the DCS in the control room. The respective equipment is directly activated at the local control panel. No release from the DCS is necessary (e.g. Ram Feeder / Grate Control Cabinet, ash conveyors, etc.).

   LOCAL operation can be AUTO (on PU's) or MANUAL (on motors) (see also chapters 2.2.4 and 2.2.5).

OR

2. Before the equipment can be switched to LOCAL the operator in the control room must release local operation from the DCS. The local operator must request local operation. The control room operator acknowledges the request and thereby releases local operation (e.g. filling of silos or tanks, operation of hydraulically driven equipment, etc.).

   LOCAL operation is AUTO in this case (see also chapter 2.2.4).

REMOTE control from the DCS is disabled while equipment is operated in LOCAL mode. Switchback from LOCAL to AUTO operation is always released from the local control panel or package unit.

2.2.2 AUTO – REMOTE Mode

During normal operation, function groups are controlled from remote (from the control room) by the automation logic in the DCS and / or package units.

In normal operation the equipment is in AUTOMATIC mode. No alarms or failures are active. There is a normal signal exchange between the package units and the DCS.

In AUTO - REMOTE mode single drive equipment is actuated (e.g. started or stopped) automatically by a sequence or an automatic operation (AutoOp) without operator intervention.

2.2.3 MANUAL – REMOTE Mode

Process equipment is started and stopped manually in the DCS in the control room. All necessary information for changing the status of equipment is shown on the HMI.

Change from MANUAL to AUTO control mode and vice versa is made by the operator using a selector switch which is part of every drive control unit (motors, valves, dampers, heaters, etc.). When switching from AUTO to MANUAL mode and vice versa, the operation status (running, open, closed, etc.) of the equipment is not changed.

All automatic functions are disabled in MANUAL mode.

Safety devices (plant protection, equipment protection devices and mechanical safety guards) remain active.

The associated function group remains in operation but will show a FAILURE. The FAILURE disappears when the FG is back in normal operation (RESTART of the FG or equipment back in AUTO and running).

MANUAL operation requires an operator intervention.

Examples of interventions in MANUAL control mode:

- instrument tests (start a pump to check pressure downstream of pump)
- forced intervention (speed up filling of a tank by starting the redundant pump in parallel)
- manual control during sensor failure; safety devices remain active
- etc.

Interlocks, permanent conditions and start releases defined for the single drives remain active in manual mode.

NOTE

In MANUAL mode the operator is responsible for the proper control of the process.

2.2.4 AUTO – LOCAL Mode

Systems which are controlled by a local control cabinet (package units) can be operated locally in automatic mode. The operation from the DCS is then interrupted, e.g. setpoints are not transferred from the DCS to the package unit but the setpoint must be entered at the package unit itself. The automatic control of the process is realized within the package unit.

Process interlocks remain active; the signal exchange between the package unit and the DCS for information purposes remains active.

The associated function group remains in operation.

Examples of package units are:

- waste crane
- ram feeder / grate control cabinet
- start-up and auxiliary burners
- filter cleaning of ash silo
- water treatment plant
- main cooler of the closed cooling water system (CCWS)
- CEMS
- etc.

2.2.5 MANUAL – LOCAL Mode

Selected equipment can be controlled locally from a local operating panel (LOP) (e.g. forward and backward movement to unplug the bottom ash extractor). In this case local control must always be authorized in the DCS.

Local control is NOT normal operation.

NOTE

In MANUAL mode the operator is responsible for the proper control of the process.

In MANUAL – LOCAL mode process interlocks (e.g. interlocks between different mechanical transport devices, such as conveyors) are NOT ACTIVE.

Safety functions, such as e.g. pump dry run protections in the DCS (or hardwired to the MCC) remain active.

2.3 Local Operating Stations

2.3.1 Package Units (PU)

Package units are local control cabinets which contain a PLC (CPU). They are connected to the DCS either by BUS or via parallel connections. PU's can be operated locally at their own operator interface. They may receive setpoints and/or commands from the DCS but work completely independent. If the connection to the DCS fails their functionality is not jeopardized.

Examples for Package Units (PU) are:

- waste crane
- ram feeder / grate control cabinet
- start-up and auxiliary burners
- filter cleaning of ash silo
- water treatment plant
- main cooler of the closed cooling water system (CCWS)
- CEMS
- etc.

2.3.2 Local Operating Panels (LOP)

Local operating panels are operator interfaces without any intelligence. They consist mainly of switches, buttons and indication lights. These elements are I/O's from and to the DCS. The logic for these elements is programmed in the DCS. If the connection to the DCS fails, the local operator station cannot be operated any more.

Examples for Local Operating Panels (LOP) are:

- silos
- filling stations
- local operation of hydraulically driven equipment
- etc.

2.3.3 Motor Control Boxes (MCB)

Motor Control Boxes for selected motors are wired directly to the motor control center (MCC). This means that the respective START and STOP commands act directly on the motor. The signals are NOT routed via the DCS. If the connection to the DCS fails, the selected motors can be operated locally.

Examples for Motor Control Boxes are:

- bottom ash transporting devices
- through chain conveyors
- etc.

NOTE

When the respective motors are operated locally (from the MCB) NO interlocks from the DCS are active!

2.3.4 Emergency Stop Buttons

Emergency stop buttons are wired directly to the MCC. An additional contact is wired to the DCS to indicate the emergency stopping to the control room operator.

2.4 Process Redundancies

2.4.1 Redundant Pumps

For plant availability or operation safety reasons it may be necessary to have redundant pumps installed.

The operation of one single pump is sufficient to meet the process requirements. The second pump installed is on stand-by. It will be started automatically by the DCS whenever an electrical failure of the running pump occurs (motor failure or VFD failure) OR when a process condition (flow / pressure / etc.) is not met any more (broken pump shaft / worn out pump wheel / etc.).

The switch over to the stand-by pump in case of a process condition is performed in such a way that the actually running pump will be stopped first and the stand-by pump will be started immediately thereafter.

For special process conditions it might be necessary to overlap the start of the stand-by pump and the stop of the running pump (during the overlapping time). This will then be specified in the logic diagram.

Periodically the two redundant pumps are switched from stand-by to operation and vice versa. This functionality allows checking the availability of the stand-by equipment in case of a breakdown of the pump in operation. Two different time delays ensure an unequal wear and tear of the pumps. The two time delays can be set in the DCS.

Remark: When starting a pump the process criteria (flow / pressure / etc.) for a switch over and the respective alarm will be by-passed until the process has reached stable conditions.

During the periodical switch over of the pumps the process criteria (flow / pressure / etc.) for a switch over will be by-passed during the switch over time period.

The functionality of the periodical switch over to the stand-by pump can be turned off in the DCS. In this case the starting order of the two pumps must be selected in the DCS (e.g. Pp1 => Pp2 or Pp2 => Pp1).

Remark: In case a switch over of the pumps was initiated AND the process monitoring criteria (flow / pressure / etc.) is not fulfilled after a determined time period BOTH pumps will be stopped. Reason for this is as follows: When the process condition is not re-established within this time period an important leak might be the reason for the pump switch over and in such a case it makes no sense to operate the pump.

Remark: The "waiting time switchover criteria" is the time, during which the process criterion must be active before a switch-over takes place. The "stabilizing time switchover criteria" is the time, during which the process criterion is by-passed after a switch-over has taken place. The stabilizing time is longer than the waiting time.

In selected cases (hydraulic system) the stand-by pump of a system can be started IN ADDITION to the pump already in operation SIMULTANEOUS or PARALLEL operation of the two pumps).

2.4.2 Other Equipment (than Pumps)

When two identical pieces of equipment are installed for the same function (although a single unit is sufficient to meet the process requirements) the stand-by unit must be started manually when the operating unit fails.

2.4.3 Pre-Selections

For redundant equipment without automatic periodical switch-over the starting order (e.g. Pp1 => Pp2 or Pp2 => Pp1) must be selected in the DCS.

Other selections in the DCS may be

- Pre-selection of a silo to be emptied or be filled
- Pre-selection of the burner starting order
- Other

2.4.4 Redundant Measurements (DCS and Safety PLC)

Safety related measurements are carried out as 2 out of 3 measurements (abbreviated as “2oo3” on the PIDs). The treatment of the signals can either be carried out in the Safety PLC or in the DCS. If the signals are treated in the Safety PLC the average value is also transferred to the DCS where it can be further processed (e.g. thresholds or alarms are triggered from this value).

The number of measurements is THREE (3); when all inputs are error free, the output Q is the average value of the measured values (M1, M2, M3).

Faulty Inputs

When one input is faulty (M<4mA or M>20mA), then this value is ignored and the output Q equals the average of the two remaining measurements.

When TWO or MORE inputs are faulty, then the output Q equals the default value => an ALARM is triggered and the safety function is launched.

Deviations

When the deviations of one value (M1) compared to each of the other values (M2, M3) is higher than the «deviation warning» for a time period longer than the monitoring time then an alarm is triggered.

When the deviation is higher than the value «deviation action» for a time period longer than the monitoring time then this value is ignored and the output Q equals the average of the remaining inputs.

When the deviation between the remaining inputs is higher than the value «deviation action» for a time period longer than the monitoring time, then the output Q equals the default value => an ALARM is triggered and the safety function is launched.

Combination of Faults and Deviations

When one input is faulty and the deviation of the remaining inputs is higher than the value «deviation action» then the output Q equals the default value => an alarm is triggered and the safety function is launched.

When one input is ignored because of a deviation and one of the remaining inputs becomes faulty, then the output Q equals the default value => an alarm is triggered and the safety function is launched.

2.5 Human Machine Interface (HMI)

The HMI serves as the link between the distributed control system (DCS) and the operator. The following chapters describe the operability of this interface as well as some operational aspects that are implemented within the DCS.

2.5.1 DSC Screen Structure

In order to represent the entire plant on the DCS screens, there are multiple screens to monitor and operate the process.

The different screens are grouped in a hierarchical manner according to the respective plant sections and split (on a lower level) into individual process sections.

An individual screen is not limited to a single PID nor is it limited to a single function group.

The operator will be able to switch from one DCS screen to another in a "logical" way (e.g. in the "direction of flow" of the process). On every screen there is a button, allowing him to jump back to the last active screen. In addition there is a button to jump to the superior DCS screen.

The DCS screens display all the elements which are necessary to monitor and operate the plant (e.g. valve drives, motors, heaters, controllers, analogue process measurements, binary switches, etc.).

The status of each of these elements is displayed directly on the screen (e.g. motor IN OPERATION , STOPPED or TRIPPED, shut-off valve OPEN or CLOSED, controller in MANUAL, AUTO or CASCADE, equipment in AUTO or MANUAL and LOCAL or REMOTE, etc.). The status of the element can be displayed by different colours and/or by changing the elements shape.

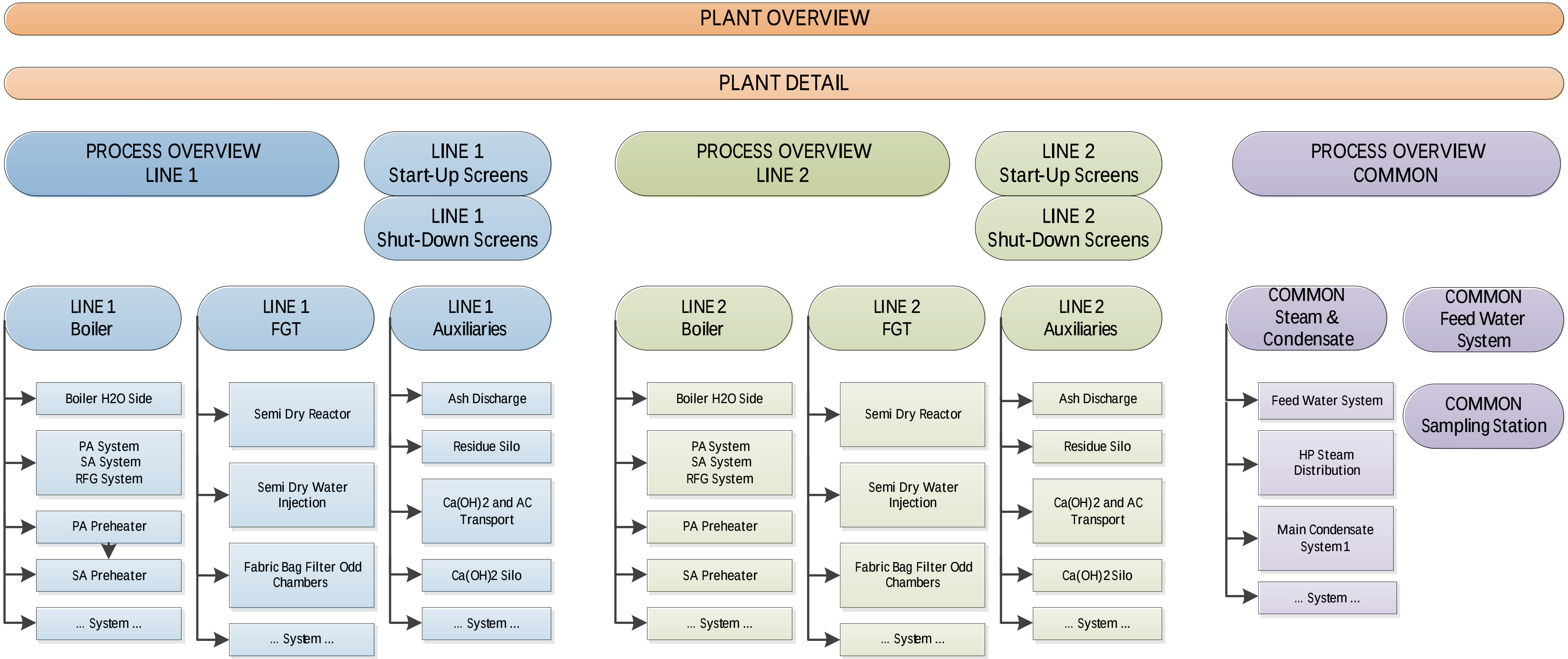
Some (for the process not immediately important) information will be displayed in "Pop-Up Windows".

Examples for such information are:

- controls of motors, valves or heaters
- the 3 individual values of a 2 out of 3 measurement
- controller parameters
- START and STOP buttons for a function group
- display of the START and STOP sequence of a function group
- motor current and/or power, etc.

On every DCS screen there is access to the subordinate displays (ALARM, TREND, EVENT, etc.) by a button in a standard command bar. This command bar is identical in all displays.

2.5.2 Example: DSC Screen Structure



2.5.3 DSC Access Levels

The DCS is split into different hierarchical levels giving different access to the corresponding level. For each access level except of the visitor / guest level a password is required to log into the system. Every login / logout of every user will be historicized.

Example of Hierarchy Levels in the DCS:

Access Level No.	Title	**Description of Activities**
1	Visitor / Guest	no right to change anything, right only to watch
2	Shift Operator	can start and stop equipment, can change setpoints
3	Shift Supervisor	can change thresholds, can force values
4	Engineer	can modify all parameters such as timers, config. values, etc.
5	Administrator	unlimited access to everything

2.5.4 Trends

Trends show time dependent variations of measured process values as curves. Multiple process variables can be combined in a single trend in order to compare their chronological behavior.

A number of standard trends will be pre-defined. Each operator can create his personal trends (user defined trends) using any measured (and stored) values of the plant or DCS internal values such as controller setpoints, etc.

Selected binary signals can also be trended.

2.5.5 Alarms and Messages

Different information is displayed in the DCS to inform the operator in real time about the process.

Examples for such information are:

- feedback from the process that a certain condition is being reached (e.g. the combustion control system CCS reports that the secondary air flow controller has reached its minimum output)
- an unexpected stop of a sequence (e.g. start and/or stop of a function group)
- discrepancies between the commanded valve position and actual valve position (e.g. the ammonia flow control valve is jammed)
- incoherence of signals (e.g. valve limit switch OPEN and CLOSED simultaneously)
- measured values outside of limits (exceedance of thresholds) (e.g. pressure LOW)
- DCS errors
- other

Three major types of messages can be distinguished, each type corresponding to one or more necessary measures which must be taken by the operator:

Level No.	Type	Display Color	Explanation / Example
1	ALARM ALM	red	Immediate operator intervention necessary OR automatic safety intervention by the DCS has already been triggered Example: Due to level TOO LOW in the tank, the pump protection (LS3L) has STOPPED the pump and has ,at the same time, triggered an ALARM (LA3L)
2	WARNING WAR	yellow	Operator intervention essential in a short time period (minutes) Pre-Alarm before an automatic safety intervention (and the associated ALARM) is triggered by the DCS Example: Warning: the water level in the tank has dropped to the LOW threshold (LALL); if the level keeps dropping, the pump will stop
3	MESSAGE MSG	green	Information for the operator, NO operator intervention necessary Example: OPEN (LSL) and CLOSE (LSH) the water supply valve to control the level in a tank

Depending on the type of message (MESSAGE / WARNING / ALARM) the event goes along with an audible signal in the control room to catch the operators attention.

Example of an ALARM List:

Date	Time	Description	TAG / KKS No.	Type	Status
11/04/24	19:23:35	Process Water Valve OPEN - GOH	1 HDB82 AA300	MSG	Coming
11/04/24	21:08:50	Fault ID fan - EAL	1 HNC10 AN001-M01	ALM	ACQ

2.5.6 Event / Log List

An event list / log list records **all** operator manipulation made in the DCS.

Examples of recorded actions are:

- changing a setpoint of a controller
- acknowledging an alarm
- starting / stopping a piece of equipment
- starting / stopping a function group
- switching a piece of equipment to MANUAL / AUTO mode
- etc.

Example of an Event List:

Date	Time	Description	TAG / KKS No.	Event	User
11/05/28	06:22:03	FG Feed Hopper Cooling System	1 HFK00 EE001	START FG	Joe
11/05/28	08:21:43	Main condensate pump 1	0 LCA11 AP001-M01	MANUAL	Bill
11/05/29	10:04:15	Boiler Outlet Temperature Controller	1 HBK50 DT901	SP = 189°C	Jack

2.5.7 Start-Up and Shut-Down Screens

In order to assist the operator in starting up or shutting down the plant a series of screens are provided by the DCS. These screens guide the operator through the proposed sequence for starting (and stopping) the different systems (function groups). The screens consist of tables, containing:

- the step number
- the name of the system concerned and a description of the action to be taken
- when applicable, a button to change over to the respective screen on which the action must be executed (e.g. to start the respective function group (FG))
- a feedback signal of the function group concerned (e.g. function group is IN OPERATION) or an acknowledge button to mark that the operator has carried out the respective actions

Each necessary step to start-up or shut-down the plant must be executed manually by the operator.

NOTE

There is NO common, automatic sequence to start-up or shut-down a unit or the plant.

The individual steps are NOT interlocked, however the start of individual function groups may be interlocked where process conditions require it.

The table shall serve as a guideline or recommendation; there are different ways to start-up a plant. It is not mandatory to start up the plant using the DCS Start-Up and Shut-Down Screens.

The proposed sequence will be finalized and optimized during the commissioning phase of the plant.

Example of the Start-Up Screen:

Step	Description / Action	KKS No.	Screen	Status
1	**Building Installation:** Start HVAC, Sanitary Installations, Illumination, Video System	-	-	
2	**Compressed Air System:** Start Compressed Air FG	0 QFA30 EE001	Compressed Air	
3	**Process Water System:** Start Process Water FG	0 GHA10 EE001	Process Water	
4	**Demineralized Water Plant:** Start Demineralized Water Plant FG	0 GCL10 EE001	Demineralized Water Plant	
5	**etc.**			

2.6 General Remarks

2.6.1 Acknowledgment of Alarms

Each operator screen has a common button to acknowledge all alarm associated with the respective function group. The button resets all alarms which are not active any more. Measurements that exceed thresholds or faulty conditions that generate alarms will <u>not</u> be reset; their alarm status will persist.

2.6.2 Suppression of Alarms

Process alarms such as «Pressure LOW» (PAL) or «Flow LOW» (FAL) which are associated with the operation status of a process equipment (e.g. pumps or fans) will be suppressed, when the respective drive is not in operation.

The alarm will be suppressed even in the case where the equipment fails => in such a case an alarm of the equipment failure is triggered.

NOTE

Despite the suppression of alarms there will be a series of alarms during the start-up and the shut-down phase of the plant (e.g. even with the burners in operation there will be a «Temperature LOW» (TAL) alarm in the secondary combustion chamber during the heat-up phase).

2.6.3 Threshold Hysteresis

When not otherwise specified, all thresholds on analogue measurements will have a hysteresis of 2% of the measurement range (e.g. a temperature measurement with the range of 0 to 150°C will have a hysteresis on its thresholds of 3°C).

2.6.4 Discrepancy Handling

Valves, dampers and control valves are being monitored for their actual position (if they are equipped with the respective position feedbacks) in respect to their DCS output command. A timer allows each device to reach the desired position before an alarm is triggered. Control valves must reach their position with a small tolerance within a defined time, otherwise an alarm is triggered.

The motor control centre must feedback a "RUNNING" signal to the DCS after the start command for the motor has been launched in a defined period of time, otherwise an alarm is triggered.

Each step of a sequence is monitored. If the next step is not reached within defined period of time an alarm is triggered.

2.6.5 Incoherence Testing

When a motor receives a RUNNING and a STOPPED feedback from the MCC at the same time, an incoherence alarm is triggered without time delay.

When a shut-off valve receives an OPEN and a CLOSED signal from its limit switches at the same time an incoherence alarm is triggered without time delay.

2.6.6 Starting and Stopping a Function Group

When starting or stopping a function group the actual status of the sequence as well as the necessary permanent conditions and associated releases are displayed in the DCS to inform the operator about the current situation.

The complete list of all conditions is displayed; green conditions are satisfied, red ones are not satisfied.

Every step of the starting / stopping sequence of a function group will be displayed in detail. When timers between individual steps are included, these count backwards in real time keeping the operator posted on all the details taking place in the respective function group.

This allows the operator to get complete overview of the function group in very short time.

2.6.7 Interlock Handling for Single Drive Equipment

In the DCS faceplate of every single drive equipment the interlock conditions are displayed (e.g. dry run protection for a pump or vibrations too high for a fan).

3 Plant Operation Status

In order to structure the operation of the plant, the functioning of the plant can be divided into different **Operation Statuses** and into **Transitions**.

Operation statuses describe the conditions of the various systems contained in the entire plant.

Transitions describe the steps necessary to get from one operation status to another.

The graph on the next page shows the structure of the plant operation and the transitions necessary between the different modes.

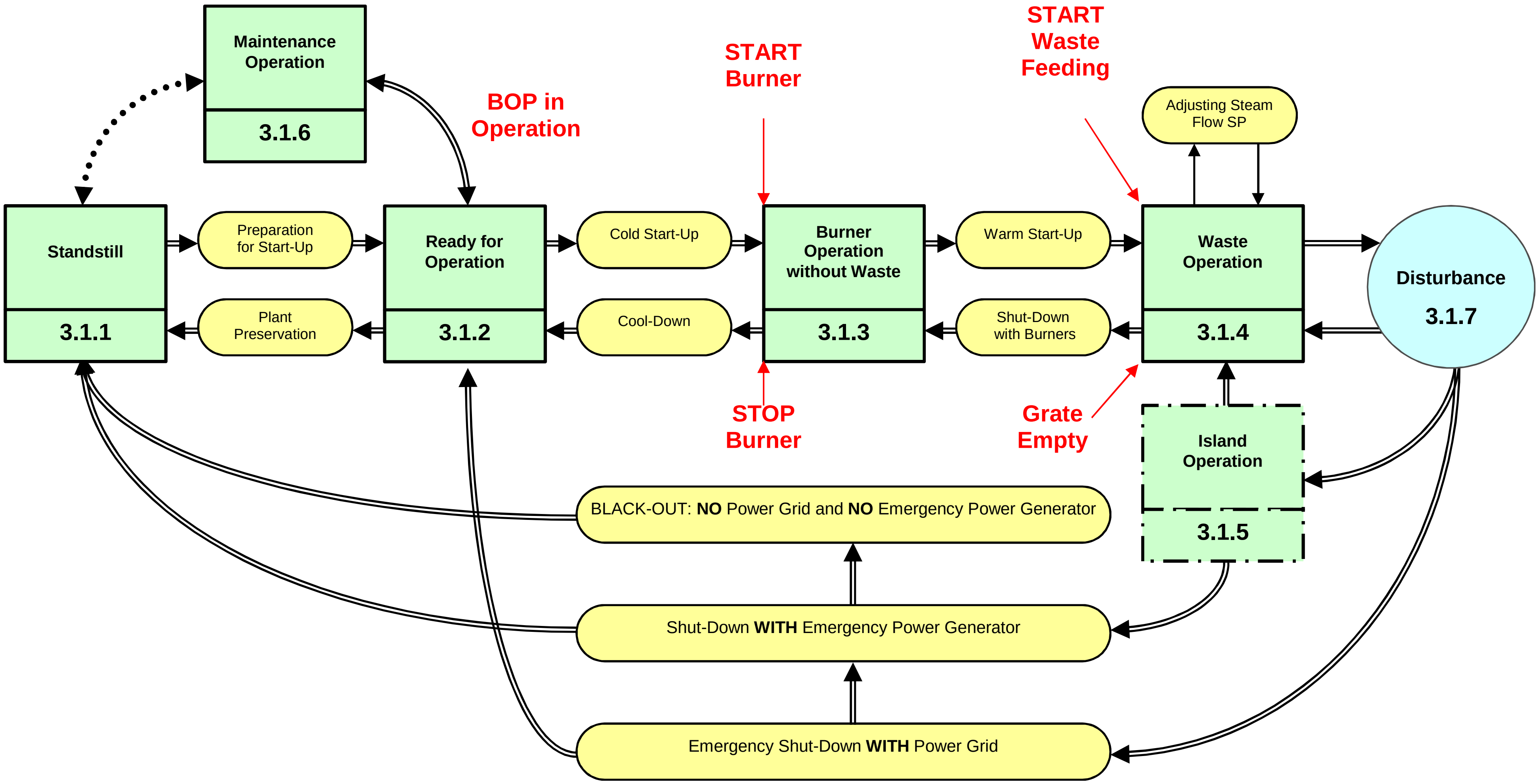
Because the combustion chamber temperature is (among others) one of the most important process variables, there is a clear relation between the combustion chamber temperature and the various operation statuses. This fact is depicted in the second graph.

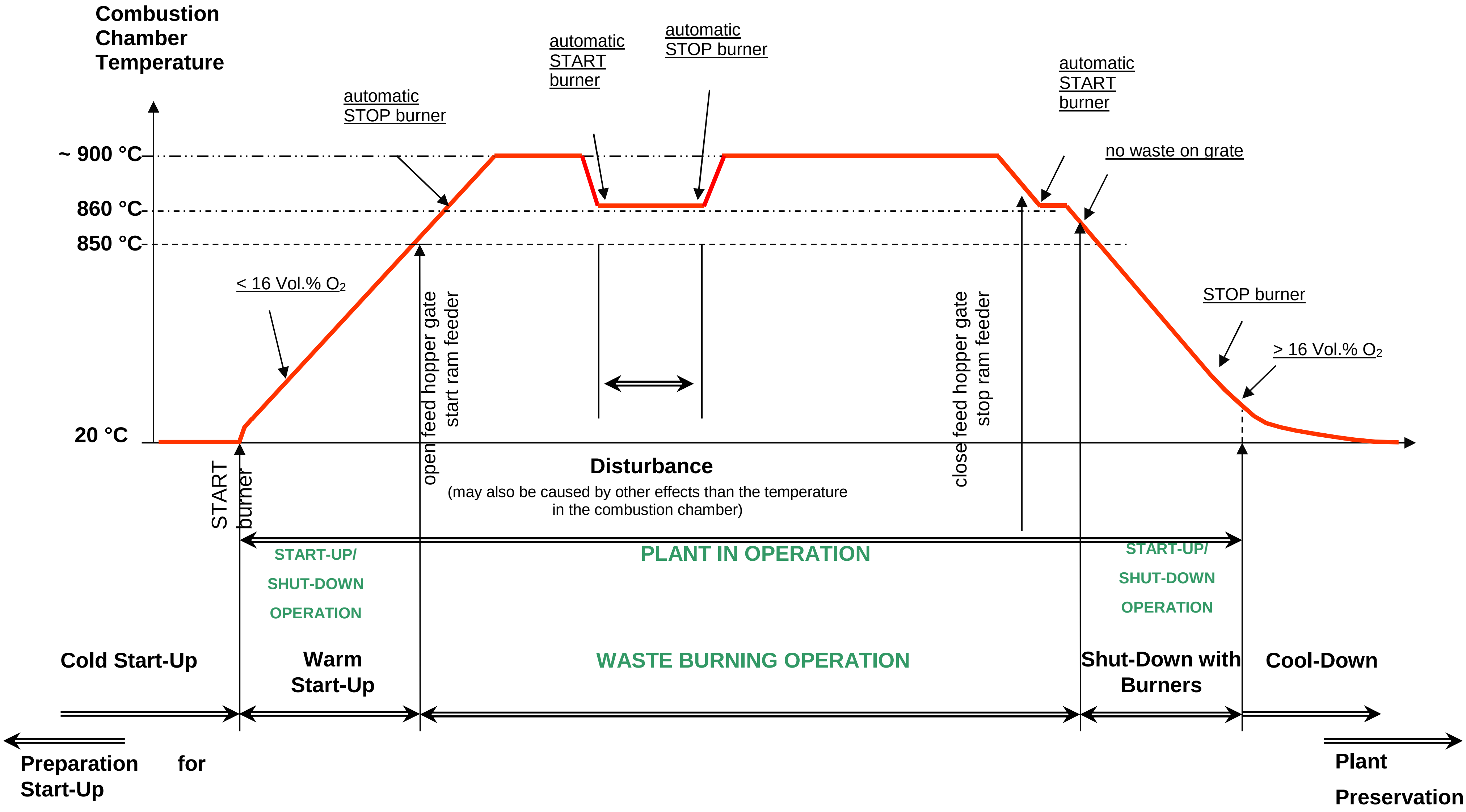
The general structure of the plant operation is developed mainly around burner operation and waste operation. The reason being the legal requirements (for temperature) before waste may be fed to the furnace.

Waste operation (within the boundaries of the load range diagram) is normal operation (the burners are NOT in operation at this point).

Several Transitions, starting with the preparation and start-up of all auxiliaries before a burner start may occur, are necessary to achieve normal operation. Vice versa burner operation is mandatory (as long as there is waste in the furnace) during the shut-down period of the plant.

Plant Operation Statuses and Transitions




Combustion Chamber Temperature
~ 900 °C
860 °C
850 °C
20 °C
automatic STOP burner
automatic START burner
automatic STOP burner
automatic START burner
no waste on grate
< 16 Vol.% O_2
open feed hopper gate
start ram feeder
close feed hopper gate
stop ram feeder
STOP burner
> 16 Vol.% O_2
START burner
Disturbance
(may also be caused by other effects than the temperature in the combustion chamber)
PLANT IN OPERATION
START-UP/ SHUT-DOWN OPERATION
START-UP/ SHUT-DOWN OPERATION
Cold Start-Up
Warm Start-Up
WASTE BURNING OPERATION
Shut-Down with Burners
Cool-Down
Preparation for Start-Up
Plant Preservation

3.1 Plant Operation Statuses

3.1.1 Standstill

The entire plant is shut-down and in a cold condition. Depending on the duration of the standstill, some systems may still be in operation (e.g. low voltage power supply, DCS, etc.).

In order to start-up the plant the various procedures to start each individual system (described in the O&M) must be followed.

- A thorough check of the entire plant is absolutely essential. On a final round every piece of equipment to be started must be checked and brought into the condition as described in the O&M.
- All doors, manholes and other access openings must be closed.
- All fluid and solids levels must be checked and adjusted according to the O&M.
- All manual valves must be set to the correct position according to the O&M.

3.1.2 Ready for Operation

All necessary common auxiliaries such as electrical power supply, water and fuel supplies, compressed air generation, adsorbent supplies, etc. are in operation or are ready to be started.

All common consumables such as water, fuel, different adsorbents for the flue gas treatment, etc. are available.

All necessary silos and tanks are filled.

Collecting and receiving vessels are drained to a point where they provide enough storage capacity for normal and emergency operation.

3.1.3 Burner Operation without Waste

The start-up and auxiliary burners are in operation, the furnace and the rest of the unit are slowly being warmed up respecting the appropriate heat-up curve.

At this point auxiliary systems not yet being used so far can be started up or can be prepared so their start is possible at any time when needed.

3.1.4 Waste Operation

The unit is operating with waste according to design and within the load range diagram.

The burners are in auxiliary mode (they are NOT RUNNING); ready to be started whenever the process conditions require it (e.g. when the flue gas temperature in the secondary chamber drops below 860°C).

3.1.5 Island Operation

The connection to the external power grid has failed and power cannot be fed to the public grid. The electrical power produced by the turbine/generator set is only as much as the plant is using as actual internal consumption.

Surplus HP steam which cannot be used in the turbine must be routed through the turbine bypass and will be condensed in the ACC.

The turbine/generator control system will immediately switch from power control to frequency control (50 Hz) and the turbine inlet control valve will close until the generated power equals the internal consumption. Simultaneously the pressure reducing desuperheating (PRDS) valve will be driven to a preset open position depending on the current steam flow, before modulating to maintain the operating pressure at the boiler.

Under certain conditions the unit load (live steam flow) must be reduced to partial load in order to avoid a turbine trip.

Depending on the construction of the turbine (e.g. due to insufficient cooling of the low pressure stage) Island Operation of the plant is possible only for a limited period of time.

When the public grid is revived the operator issues a synchronization command to the turbine/generator control system. The turbine/generator set will synchronize the frequency with the public grid and switches from frequency and voltage control back to pressure and power control.

3.1.6 Maintenance Operation

In maintenance operation the unit is shut-down. Individual equipment or entire systems may be in operation for **testing purposes** or for other reasons.

When the operation concerns a single drive equipment (SDE) the operation mode is MANUAL - REMOTE or MANUAL - LOCAL.

(see also chapters 2.2.3 and 2.2.5)

When the operation concerns an entire system (MFG or FG) the operation mode is AUTO - REMOTE or AUTO - LOCAL.

(see also chapters 2.2.2 and 2.2.4)

Maintenance operation is only of short duration and NOT considered to be normal operation.

3.1.7 Disturbance

A disturbance can be caused by a wide variety of causes. Depending on the nature and the severity of the disturbance different measures must be taken.

Examples:

- The disturbance is minor, repair or exchange of the damaged equipment is possible without interruption of normal waste operation.
  e.g. change of one transmitter within a "2 out of 3" measuring arrangement
- The disturbance requires to reduce the load (steam flow) of the unit, after the repair / exchange of the damaged equipment full load can be resumed.
  e.g. one of the fabric bag filter chambers must be shut-down because of high dust emissions resulting from a damaged filter bag.
- The disturbance requires to stop the waste feed to the system. The burners will start automatically when the combustion chamber temperature has dropped below the threshold. If the damaged equipment can be repaired in reasonable length of time burner operation can be continued. After repair normal waste operation can be resumed.
- The disturbance requires a shut-down of the respective unit, the time path is not critical, thus the unit can be stopped via the normal shut-down procedure.
  e.g. the boiler cleaning equipment is damaged, as a consequence the boiler outlet flue gas temperature is slowly rising
- The disturbance requires a sudden shut-down of the unit, an emergency shut-down must be initiated.(see also chapter 3.2.8)
  e.g. the ID-fan must be shut-down because of a motor failure or a damaged bearing
- A power failure requires a plant shut-down.
  (see also chapters 3.2.10 and 3.2.11)

See also chapter 4.3.

3.2 Transitions

The transition from one operation status to another takes place in several steps (see also chapter 3.1.) The execution of these steps takes place **manually** (with the exception of the transition to island mode, to

During the transition of operation statuses all necessary interlocks are still active for personnel safety and for the protection of the plant.

The following descriptions provide a **general overview** of actions and conditions needed for a change of the operation status (transition). The necessary steps to be taken described in this chapter are exemplary and are not necessarily complete. Depending on the configuration of the plant (single unit or multiple units) the order and number of steps may vary.

A detailed description of the start-up and shut-down procedures will be part of the operation and maintenance manual (O&M).

3.2.1 Preparation for Start-Up (exemplary listing)

The following steps need to be executed in order to prepare the plant before a / the unit can be started:

- make round trough plant, make sure all system are in the condition to be started
- start power supply from public grid
- check and make emergency power generator set available (if applicable)
- start high voltage power supply
- start medium voltage power supply
- start low voltage power supply
- start UPS supply
- start DCS
- start building supplies (illumination, HVAC, tap water supply, vacuum cleaning system (if applicable), eye wash stations and emergency showers, etc.)
- start compressed air generation and supply – open valves
- start plant water supplies – open valves
- start firefighting system
- start demineralized water plant
- fill all necessary water tanks – check levels
  (e.g. demineralized water tank / feedwater tank / etc.)
- fill all necessary consumable tanks and silos – check levels
  (e.g. fuel oil tank / NH_4OH supply / activated carbon silo / $Ca(OH)_2$ silo, etc.)
- fill all necessary operating supplements – check levels
  (e.g. hydraulic oil tank / etc.)
- empty residue silo / drain waste water tank – check levels
- start closed cooling water system
- start fuel oil and ignition gas supply

3.2.2 Cold Start-Up (exemplary listing)

The list below describes the necessary preparation steps that need to be made before the burners of the unit can be started.

- make round through unit - close all access doors, manholes, ports, nozzles, etc.
- set all manual valves to their correct position
- fill all unit systems with water where applicable – check levels
  (e.g. feed hopper cooling system, grate cooling system, bottom ash extractor, etc.)

- start heaters and heat tracing where applicable – respect preheating time (e.g. ESP, grate riddling removal system,
- start CEMS and raw gas measurements including O2-monitor at boiler outlet
- close all boiler drain valves and open all boiler vent valves – leave superheater drain valves OPEN
- open boiler start-up valve
- start feedwater tank level control system
- start feedwater pumps
- start auxiliary condensate system
- fill boiler drum with water – close feedwater control valve
- drain HP, MP and LP steam system – close drain valves
- start condensate system
- open main steam shut-off valve
- start ACC
- start HP steam bypass station
- start hydraulic system
- start ram feeder and grate
- start bottom ash extractor
- start grate riddling removal system
- start HP/LP reducing station
- start boiler ash discharge and boiler ash transport system
- start residue discharge
- start fabric bag filter
- start ID fan – pressure control in AUTO
- start primary and secondary air system – air flows are set to minimum
- start flue gas recirculation system
- start furnace purging program
- stop secondary air system
- stop flue gas recirculation system

3.2.3 Warm Start-Up (exemplary listing)

Before waste may be fed to the unit the post combustion chamber temperature must be above the threshold of 850°C in order to comply with the legal requirements (DIRECTIVE 2000/76/EC). Thus the start-up and auxiliary burners must be started to heat the furnace. Once the temperature is above 850°C the start release to open the feed hopper flap(s) is activated.

- start start-up and auxiliary burners
- ramp up secondary combustion chamber temperature following the refractory heat-up curve
- adjust boiler drum level – using feedwater control and drum emergency blow down valves
- close superheater drain valves when steam exits
- close all boiler vent valves when drum pressure is 3 bar(g)
- increase boiler pressure using boiler start-up valve – leave open at least 30% to cool superheaters
- start primary air preheating system
- start NH4OH supply
- start SNCR system
- start boiler rapping system
- start boiler sampling station
- start $Ca(OH)_2$ transport system
- start activated carbon transport system
- start HZI Semi Dry reactor
- start secondary air system
- start flue gas recirculation system

- burners switch automatically to auxiliary mode when target temperature 850°C is reached
- burners control 863°C secondary combustion chamber temperature
- when secondary combustion chamber temperature has reached 850°C
  - prepare waste to be fed to the feed hopper
  - open feed hopper flap(s)

- manually cover grate with waste
  - adjust ram feeder speed
  - adjust grate stroke frequency
  - adjust primary air flow to individual zones

- start high pressure water injection system to HZI Semi Dry reactor
- start fabric bag filter cleaning
- adjust boiler outlet O_2 content by adjusting secondary air flow
- increase thermal load of boiler to 60% of the nominal value
- start boiler attemperators / desuperheaters
- burners will stop automatically when thermal power of waste is sufficient
- start combustion control system
- start chemical dosing station of boiler
- start boiler blow down
- start flash tank level control
- adjust steam flow setpoint in the CCS

3.2.4 Adjusting the Steam Flow Setpoint

The targeted steam flow (thermal load) of the unit is set manually in the DCS. The combustion control system (CCS) adjusts the different mass flows (waste flow, air flows, ram feeder and grate movements, etc.) needed to achieve the respective load automatically.

The combustion control system (and the furnace, the flue gas treatment system, etc.) are designed to operate the unit within the limits of the load range diagram.

Outside these limits the plant is either not permitted to run (high end – excessive thermal load) or must be operated manually (low end – unstable combustion).

3.2.5 Shut-Down with Burners (exemplary listing)

As long as there is waste on the grate the secondary combustion chamber temperature must remain above 850 °C for regulatory reasons (DIRECTIVE 2000/76/EC). While the heat input from the waste is diminishing during shut-down the start-up and auxiliary burners must compensate for the missing load. The following steps are necessary to shut-down the plant (exemplary list):

- stop feeding waste
- close feed hopper flap(s)
- lower steam flow setpoint to 60% of the nominal value
- burners will start automatically when secondary combustion chamber temperature drops below 860°C – the burners will maintain 863°C
- stop the combustion control system when the steam flow reaches 60% of the nominal value
- shut-down turbine
- launch ram feeder clearing stroke
- adjust grate speed , primary air flow, secondary air flow and flue gas recirculation flow according to the fading combustion intensity

- once the grate is emptied, ramp down the secondary combustion chamber temperature following the refractory cool-down curve
- stop high pressure water injection system to HZI Semi Dry reactor
- stop HZI Semi Dry reactor
- start fabric bag filter intensive cleaning cycle
- stop primary air preheating system
- stop SNCR DyNOR system
- stop activated carbon transport system
- stop boiler attemperators / desuperheaters
- start continuous boiler rapping cycle during cool-down
- stop HP steam bypass station
- stop burners when they have reached minimum load
- stop ACC

3.2.6 Cool-Down (exemplary listing)

During the cool-down phase the unit is brought to a condition from where transitions either to maintenance operation or to complete standstill are possible. After shutting down the burners the remaining heat in the unit must be dissipated and the units system still in operation must be stopped. The plants auxiliary systems such as water supply, compressed air supply, power supply, etc. remain in operation.

- stop flue gas recirculation system
- stop $Ca(OH)_2$ transport system
- increase primary air flow to cool furnace
- stop boiler rapping system
- close boiler blow down valve
- adjust boiler drum level manually
- open superheater drain valves
- open boiler vent valves
- drain all boiler drain valves – re-close
- fill boiler drum to level HIGH mark
- close feedwater control valve
- close main steam shut-off valve
- stop NH_4OH supply
- stop primary air system
- stop ram feeder
- stop grate
- stop boiler ash transport system
- stop bottom ash extractor
- stop hydraulic station
- stop feed hopper cooling system
- stop boiler ash discharge
- stop grate riddling removal system
- stop residue transport system
- stop ID fan

3.2.7 Plant Preservation (exemplary listing)

Depending on the duration of the shut-down and the planned work further systems may be taken out of operation:

- stop CEMS
- stop fuel oil and ignition gas supply
- stop closed cooling water system
- stop demineralized water plant
- stop plant water supply / supplies
- stop compressed air generation and supply
- stop building supplies (illumination, HVAC, tap water supply, vacuum cleaning system, eye wash stations and emergency showers, etc.)
- stop DCS
- stop UPS supply
- stop low voltage power supply
- stop medium voltage power supply
- stop high voltage power supply
- stop power supply from public grid

NOTE

For an extended shut-down period every piece of equipment must be conserved according to the suppliers / manufacturer's instructions.

3.2.8 Shut-Down Scenarios

There are different scenarios to shut down the plant:

- Normal shut-down of one unit followed by the shut-down of the plant:
  see chapters 3.2.5 and 3.2.6)
- Emergency shut-down of a unit (the plant) with the public power grid in operation:
  (see chapter 3.2.9)
- Shut-down of the plant when it is isolated from the public power grid and island operation mode (the turbine generator is producing just as much electrical power as the plant is consuming; (surplus HP steam not being used in the turbine be routed through the turbine bypass and will be condensed in the ACC; see chapter 3.2.9).
  In such a case, power generated by the emergency diesel generator must be used to shut down the plant in a controlled manner: (see chapters 3.2.5 and 3.2.10)
- If, in an event as described above, the emergency diesel generator cannot be started due to any circumstances the plant must be shut down without any electrical power at all: (see chapter 3.2.11)

3.2.9 Emergency Shut-Down WITH Power Grid or Island Mode

Certain situations require an emergency shut-down of a unit or the plant. Such a situation could be:

- a serious failure of the ID fan (with NO possibility to start the auxiliary ID fan motor)
- a major boiler leak leading to an important water loss without the possibility to hold the level in the boiler drum
- failure of the compressed air supply system
- other serious events which require an immediate stop of the unit or the plant
- etc.

WARNING

Avoid overheating of the boiler tubes !

1st PRIORITY: Maintain the water level in the boiler drum within normal operating limits in order to ensure cooling of the water walls and the evaporator bundles.

2nd PRIORITY: Maintain steam flow in the superheaters for cooling.

When there is a risk of a TOO LOW water level in the boiler drum (water level drops down to a level reaching the water walls)

THEN

Lower the flue gas temperature in the combustion chamber quickly as possible to a target value below 400°C in order to respect the allowable maximum material temperature of the possibly uncooled boiler tubes.

The fuel supply to the unit must be stopped immediately. Depending on the nature of the failure this is done either automatically by an interlock or must be done MANUALLY.

WARNING

The boiler drum level must be monitored carefully. If necessary, the feed water control valve must be operated MANUALLY.

WARNING

Due to a possible water loss in the water steam cycle:

Monitor the feedwater tank level carefully.

Make sure there is enough water in the system.

NOTE

Depending on the nature of the failure the number of necessary steps to be carried out and the duration of the emergency shut-down may vary.

The following table is only a rough guideline for an emergency shut-down.

The following steps must be performed in order to achieve this:

- if the nature of the failure allows NOT to discharge the steam via the turbine by-pass station (in MANUAL operation)

THEN

1. open boiler start-up valve approximately 10% (live steam pressure should be lower than the opening pressure of the live steam safety valve – make sure there is always steam flow to cool the superheater bundles)
2. close live steam main shut-off valve (isolate the unit from the steam system)
3. During the subsequent steps:
    - check the life steam flow in order to cool the superheaters

    - if the steam flow is too low for safe cooling of the superheaters then increase the opening position of the start-up valve provided, that the water level in the boiler drum is maintained within its safe limits
    - decrease the opening position of the start-up valve if the water level in the boiler drum is below the safe limit and the flue gas temperature in the secondary combustion chamber is above 400°C
- stop waste feed to the feed hopper
- stop ram feeder and grate
- stop burners (if in operation)
- stop primary air fan
- make sure all primary air zone dampers are closed
- stop combustion control system
- stop secondary air fan
- start grate in MANUAL – adjust grate speed allowing the bottom ash extractor to discharge the bottom ash / waste – make sure the bottom ash extractor system doesn't plug
- start the ram feeder in MANUAL at 5 to maximum 10% speed in order to slowly empty the feed hopper
- close the feed hopper flap(s) as soon as the waste level in the feed chute allows for it
- when the secondary combustion chamber temperature is below 400°C the procedures for normal shut-down may be followed and the start-up valve may be closed
- stop the flue gas treatment system

3.2.10 Shut-Down WITH Emergency Power Generator

In case the power supply from the public grid fails, the turbine/generator set will normally be switched to island operating mode (see also chapter 3.1.5).

In this mode the turbine/generator set is producing only the electrical power which is being consumed by the plant itself. Surplus HP steam not being used in the turbine must bypass the turbine and will be condensed in the ACC.

If the turbine/generator set trips or Island Operation mode cannot be established due to other reasons, the emergency power generator will supply certain systems of the plant so it can be shut down in a controlled and safe way.

NOTE

The plant can NOT be operated with the emergency power supply in service. The sole purpose of the emergency power supply is to shut the plant down in a controlled and safe way.

The emergency power generator starts and generates power within 30 seconds after a public grid failure when island operation cannot be established.

The systems supplied by emergency power are being connected automatically to the emergency power net in a predefined sequence so the emergency power generator is not being overloaded and risks to trip.

NOTE

Only equipment which has been in operation prior to the trip (and which is enabled to be supplied with emergency power) will be re-started during the emergency power launch sequence.

The following systems (exemplary listing) will be supplied automatically with emergency power so the plant can be shut down in a controlled manner:

Immediately after start-up of the emergency power generator

- emergency lighting
- one out of several feedwater pumps
- feedwater control valve
- one out of several condensate pumps
- ID fan auxiliary motor (the main motor is NOT supplied with emergency power)
- one out of several compressors
- the power supply of the UPS system
- turbine control cabinet

Within 60 seconds after start-up of the emergency power generator

- one out of several demineralized water pumps
- one out of several closed cooling water system pumps
- all closed cooling water system fans
- grate cooling system pumps
- the burner cooling air fans

Within 120 seconds after start-up of the emergency power generator

- the waste crane personnel rescue device (the crane grab will NOT be supplied with emergency power)
- process water pump

See also chapter 4.4.1.

All other consumers are NOT energized, unless they are connected to the UPS system (such as: all control cabinets, all instruments and all important shut-off and control valves).

The load sequence of the emergency power generator will be terminated in 3 to 4 minutes after the start of the emergency diesel.

With the above mentioned consumers supplied, the unit (plant) can be shut down in a controlled and safe way:

- when the FG ID Fan is in operation – the ID fan auxiliary motor will be started automatically when the ID fan speed has reached 500 to 450 rpm while winding down from its previous speed
- when the FG ID Fan is NOT in operation – the ID fan is winding down from its last speed towards standstill; when the ID fan speed reaches 500 to 450 rpm, the auxiliary motor must be started MANUALLY)
- one feedwater pump will start in order to supply the boiler with water
- steam is condensed in the ACC
- one condensate pump will start in order to supply condensate to the feedwater tank

WARNING

The boiler drum level must be monitored carefully. If necessary, the feed water control valve must be operated MANUALLY.

- the waste remains on the grate
- close the feed hopper flap(s) using the hydraulic pressure reservoir; if this is not possible, carefully monitor the feed hopper using the TV camera; if smoke exits the feed hopper consider using the sprinkler or the fire extinguishing system
- when the secondary combustion chamber temperature is below 400°C the procedures for normal shut-down may be followed as allowed by the limited supply of power

Note

When the power supply is re-established make a control round in the plant before re-starting any piece of equipment.

- check all hoppers and conveyors; empty if necessary
- re-fill all emergency water vessels if empty
- re-fill all other water vessels if empty

Note

Before re-starting the plant after an emergency shut-down (according to the steps described in chapters 3.2.2 (Cold Start-Up) and 3.2.3 (Warm Start-Up)) make sure the plant is ready and prepared according to the steps described in chapter 3.2.1 (Preparation for Start-Up).

3.2.11 BLACK-OUT: NO Power Grid and NO Emergency Power Generator

In case the power supply from the public grid fails AND Island Operation mode of the turbine/generator set cannot be established AND the diesel engine of the emergency power generator doesn't start the entire plant is not supplied with electrical power (with the exception of the UPS supplied systems).

Such a scenario is considered to be a BLACK-OUT scenario.

The turbine bypass station (PRDS valve) will CLOSE and steam will be discharged either through the boilers startup valve or its safety valve.

NOTE

The waste must remain on the grate until the hydraulic system can be re-started. When power is available again the waste must be discharged into the bottom ash extractor.

WARNING

Be careful not to block the bottom ash extractor with waste; operate the grate manually and frequently check the bottom ash extractor.

NOTE

Close the feed hopper flap(s) using the hydraulic pressure reservoir; if this is not possible, carefully monitor the feed hopper using the TV camera; if smoke exits the feed hopper consider using the sprinkler or the fire extinguishing system

WARNING

In case the boiler drum level has dropped below the visible and measurable range, make sure that no feedwater will be fed to the boiler until the furnace temperature has dropped below 300°C.

Fill the boiler carefully with a reduced feedwater flow (max. opening of the feedwater control valve $\leq$ 5%).

NOTE

When the power supply is re-established make a control round in the plant before re-starting any piece of equipment.

- check all hoppers and conveyors; empty if necessary
- re-fill all emergency water vessels if empty
- re-fill all other water vessels if empty

NOTE

Before re-starting the plant after an black out (according to the steps described in chapters 3.2.2 (Cold Start-Up) and 3.2.3 (Warm Start-Up)) make sure the plant is ready and prepared according to the steps described in chapter 3.2.1 (Preparation for Start-Up).

4 Personnel Safety and Plant Protection

It is important to eliminate all possible hazardous situations at the design stage of a plant as far as is possible. If it is not possible to eliminate a hazardous situation then additional protective measures are required. These measures include warning signs, control interlocks, direct mechanical guards, complex control system; and emergency stops.

A HAZOP study is conducted to evaluate the risks within a plant and determine where additional measures are required.

Emergency stops are used as the last and final measure to avoid injury to an operator or damage to equipment.

A safe design of the systems along with mechanical and electrical measures assure the safety of the operating personnel and protect critical parts of the plant.

The safety level for critical equipment will be evaluated in a HAZOP and the respective risk analysis.

The **first level** and most proven safety measures are mechanical protections such as safety valves, guards, rails, stops, etc.; e.g. all pressurized or potentially pressurized systems are equipped with mechanical safety valves allowing dangerous pressure build-ups to be vented to a safe place.

The **second level** of safety measures react on a process deviation which could lead to a potential dangerous situation. This level is implemented in a designated Safety-PLC (safety instrumented systems (SIS)). All critical measurements from which thresholds are derived are connected directly to the Safety-PLC. The logic used in the Safety-PLC is being programmed according to the Safety-PLC manufacturers specifications and cannot be accessed without permission.

Because of its limited access manipulation of parameters in the Safety-PLC is only possible with a special access code. Any change to the logic is being automatically recorded.

The Safety-PLC communicates with the DCS via a safe BUS connection. All information treated in the Safety-PLC will be transferred by this BUS and is available in the DCS.

The **third level** of safety measures is the normal way of reaction. Measuring instruments evaluate process parameters and react on thresholds. As a consequence systems are either SHUT-DOWN (e.g. burners), are CLOSED (e.g. ammonia water main shut-off valve(s)) or, in particular cases, are OPENED (e.g. quench emergency water valve) or are STARTED (e.g. cooling system pumps).

The evaluation of the process parameters and the command for action are executed in the DCS. Before any actions are executed WARNINGS and ALARMS are being triggered in the DCS to direct the operators attention to the changing process situation.

The **fourth level** of safety measures is the emergency power supply to selected consumers so the plant can be shut down in a controlled and safe way in case of a public grid failure.

4.1 Structure of the Safety Measures

The safety measures can be divided into four different levels of reaction when a fault or a malfunction emerges.

There are four different stages of reaction in case of a malfunction:

No.	Type of reaction	Description	MCR-Function (Example)
1	Mechanical safety of plant	Installation of redundancies where needed. Logic in the DCS will select the working equipment automatically (switch to the redundant pump, select the two corresponding measurements …), the operation of the plant is not affected. The operating staff must replace the damaged element as fast as possible.	n/a
2	WARNING and manual operator intervention	Interventions according to the operation and maintenance manual, if the failure can't be repaired within the required time. (e.g. partial load operation, use of staple capacity, shut-down, etc.).	LAH
3	ALARM and automatic DCS intervention	Disturbance and failure of critical systems are protected by main interlocks in the control and monitoring system (DCS). These main interlocks prevent critical situations and switch the system automatically to a safe operation (e. g. limited operation, if still possible).	LSHH LAHH
4	ALARM and automatic Safety PLC intervention	Critical situations regarding plant and personnel security are detected using special instruments interlocked in a hard-wired safety chain system, which initiates a safe STOP of the respective equipment (and as a consequence the associated equipment).	LZ3H LA3H
Alternative			
4	ALARM and hardwired connection to the MCC	Plant safety in regard to big (expensive) equipment using type-tested contacts wired directly to the MCC (e.g. level LOW in the feedwater tank to protect the feedwater pumps from running dry)	LZL LAL

4.2 Main Interlock List

The main interlock list gives a common understanding for personnel safety and plant safety issues related shut-downs or stops. It serves to document the interlocks between different systems and shows how the various systems respond to a failure of another system or when thresholds of critical process parameters are reached.

The main interlock list consists of two separate pages. The first page shows the interlocks that are processed in the Safety PLC, the second page serves to document the interlocks between different systems which are handled in the DCS.

Interlocks within single systems such as pump protections or the shut-down of sequenced mechanical transporting devices are NOT part of the main interlock list.

With the exception of a common unit emergency stop button or a plant shut-down emergency stop button in the control room, all other emergency stop buttons are NOT documented in the main interlock list.

The measurements of critical process parameters which must have a safe shut-down of process equipment (in the Safety PLC) as a consequence are either:

- 2 out of 3 measurements (2oo3) processed in the Safety PLC (see also chapter 2.3)

OR alternative

- type tested (German: baumustergeprüfte) binary contacts processed in the Safety PLC

4.2.1 Example: Safety Main Interlock List (Thermal Treatment)

Hitachi Zosen Inova AG

This document is NOT a guideline for the programming. For details regarding the programming refer to the logic diagrams and the function descriptions

Sheet No. 1
Safety Main Interlock List

Project:	NYC	Status:	01.03.2011
Project No.:	P - 9999	Revision No.:	04
Doc. No.:	XXXXXXXX		
Drawn :	Checked :	Approved :	

Implementation in the Safety - PLC

Hitachi Zosen INOVA

Part of plant	No.	PID No.	System	Deviation	Ref.	Function MCR	KKS Sensor	KKS Signal	Threshold Value	Timer	Waste Storage	Thermal Treatment												
System												Feed Hopper	Ram Feeders & Grate Drive		Primary Air		Secondary Air	Flue Gas Recirculation			Wall Air	Burners	Pneum. Ash Removal	Boiler Cleaning
Actuator											Crane	Damper	Ram Feeder	Grate	Fan (FC or motor)	Zone Dampers	Fan (FC or motor)	Fan (FC or motor)	Fresh Air Damper	Flue Gas Damper	Fan (FC or motor)	Burners 1 & 2	Pneum. Ash Removal	Boiler Cleaning
KKS Actuator											0EAF10 GH501	1 HHX70 AA310	1 HFY10 EA301	1 HHY10 EA301	1 HLB10 AN001	1 HHL10...50 AA400	1 HLB20 AN001	1 HNF10 AN001	1 HNG10 AA300	1 HNF10 AA300	1 HLB30 AN001	1 HJY10...20 EA001	1...	1...
PID No.												00044928	00050888	00050888	00044937	00044937	00044938	00044941	00044941	00044941	00044939	00044942 00044943 00044944 00044945	00044942 00044943 00044944 00044945	
Gen.	1		Unit EMERGENCY STOP	EMERGENCY STOP OPERATED		HZ		1 H[illegible]10 CH001	–	–	STOP 1)		STOP	STOP	STOP	[CLOSE]	STOP	STOP	CLOSE	CLOSE	STOP	STOP	STOP	STOP
Thermal Treatment	2	00044937	Primary Air Purging	Flow TOO LOW		FS	1 HLA10 CP001 1 HLA10 CT001	1 HLA10 CP5[illegible]	< ??000 m³/h START-UP	–												START LOCKED 2)		
	3	00044938	Secondary Air Purging	Flow TOO LOW		FSL	1 HLA22 CP001 1 HLA22 CT001	1 HLA22 CP501	< ??000 m³/h START-UP													START LOCKED 2)		
	4	00044941	Flue Gas Recirculation Purging	Flow TOO LOW		FSL	1 HNF10 CP001 1 HNF10 CT001	1 HNF10 CP5[illegible]	< ??000 m³/h START-UP	–												START LOCKED 2)		
	5	00044927	Secondary Combustion Chamber	Temperature MUCH TOO LOW		TZLLL	1 HBK10 CT011-013	1 HBK10 CT50[illegible]	< 650 °C													START LOCKED 2)		
	6	00044927	Secondary Combustion Chamber	Pressure MUCH TOO HIGH		PZHHH		1 HBK10 CP50[illegible]	>= 12.0 mbar	–	[STOP] 1)		[STOP]	[STOP]	STOP	[CLOSE]	STOP				STOP	STOP		
	7	00044927	Secondary Combustion Chamber	Pressure TOO LOW		PZLL		1 HBK10 CP50[illegible]	<= 12.0 mbar	–	[STOP] 1)		[STOP]	[STOP]	STOP	[CLOSE]	STOP	STOP	CLOSE	CLOSE	STOP	STOP		
	8	00044956	Boiler Drum	Level TOO LOW		LZLL		1 HAD10 CL30[illegible]	<= 100 mm	–	[STOP] 1)		[STOP]	[STOP]	STOP	[CLOSE]	STOP	STOP			STOP	STOP		
	9	00044956	Boiler Drum	Level TOO HIGH		LZHH		1 HAD10 CL302	>= [illegible]50 mm		[STOP] 1)													

4.3 Emergency Stop Concept

4.3.1 General

The requirements related to emergency stop devices and systems in EN ISO 13850 and EN 60947-5-5 are complied with.

Activating an emergency stop doesn't lead to a worse situation for neither personal nor material.

Categories

The classification defined in EN 60204 as stated below are as follows:

Emergency Stop Category 0

Uncontrolled emergency stop – power is immediately removed from the device or from a group of devices. The loss of power initiates all brakes and failsafe mechanical stopping devices as well as all operational and safety interlocks.

Emergency Stop Category 1

Controlled emergency stop - the power supply is only removed once the devices have stopped according to the defined emergency shutdown sequence.

Actions

Direct/immediate emergency stops are required when moving parts can collide with personal or plant structures (e.g. cranes and conveyors) or when personnel could be caught in moving parts. In this case the emergency stop pushbuttons are hardwired directly to the switchgear supplying power to the actuator.

Emergency stops can be either directly hardwired to the local control panel, to the local actuator, to the circuit breaker in the motor control centre (MCC) or, in exceptional circumstances, to the failsafe programmable logic controller (Failsafe-PLC).

To achieve a controlled stop, a safety system is required to perform the safe, sequential, shutdown of the plant or the faulty part of equipment, using hardwired control interfaces. Electronic cards, programmable logic controllers (PLC) or computer systems are not considered to be safety systems unless they comply with the requirements for a failsafe PLC as defined in EN 61508.

Refer to the document "TII 16.25 EU- UV- EM- Typicals" for the interfaces to the switchgear and the different drives.

Alarm messages

Every activation of any emergency stop device or button initiates an alarm in the DCS.

The emergency stop buttons have one dedicated contact for alarm purposes.

4.3.2 Local Emergency Stops

Local emergency stops are enclosed in separate casings and mounted in the vicinity of the device to be shut down immediately in case of an emergency.

The position of these emergency stops will be determined during detail engineering and in collaboration with the customers operating personal and/or the consultant.

4.3.3 Emergency Stop List

All process emergency stop devices and buttons are listed in the document "Emergency Stop List". The list will be generated during the extended basic engineering phase of the project (see also chapter 1.4).

On the PIDs these emergency stop devices are labelled with the KKS designation «HZ». They are different to the normal stop devices labelled with the KKS designation «HS».

4.4 Failures and Disturbances

The following chapters describe a selection of the most important disturbances and/or failures.

It is NOT a complete list of all failures and disturbances which can occur.

4.4.1 Electrical Power Supply Failure

In case of failure of the internal electrical power supply from the turbine generator as well as the external electrical power supply from the grid (failure of a transformer or BLACK-OUT), the emergency power generator starts automatically. The DCS starts the emergency operation sequence which allows to supply electrical energy to important plant equipment for a safe shut-down of the plant.

Until the emergency power generator is started the DCS is supplied from batteries via the uninterruptible power supply (UPS). The battery packs are designed for a power outage of approximately 60 min but are re-charged automatically after availability of the emergency power generator.

The emergency operation sequence is described in detail in chapter 3.2.10.

4.4.2 Water Supply Failure

If the plants water supply fails, several systems are affected and the plant must be shut down when reliable supply cannot be established. The main affected systems are

- the demineralized water plant
- the sampling station
- the bottom ash extractor
- the grate riddling removal system
- etc.

Storage capacities, tanks and vessels are sized in a way that a short disturbance in the system does not influence normal plant operation. However, if the problem cannot be solved within a reasonable time period the affected plant section or in the worst case the entire plant must be shut down.

4.4.3 Compressed Air Supply Failure

The plant is supplied with compressed air via two legs, instrument air and process air. There is no difference in the air quality, the system pressure and the air dew point are identical. The two legs each consist of a pressure reservoir each with enough storage capacity to shut the plant down in a safe manner. Actuators and instruments are being supplied with instrument air whereas viewports and atomizing nozzles are supplied with process air.

In case the pressure in the instrument air leg drops, the process air leg is automatically isolated from the instrument air leg and the remaining capacity of the process air reservoir can be used in the instrument air leg in order to shut the plant down.

4.4.4 LP Steam Supply Failure

During normal operation low pressure steam is extracted from the turbine. When the turbine is not in operation LP steam is produced in the HP/LP reducing station. This means that there is a virtual redundancy for this system.

Low pressure steam is supplied to various systems such as

- feedwater tank (pre-heating and removal of non-condensable gases)
- primary air pre-heater

- turbine gland steam system
- etc.

If low pressure steam cannot be supplied to the connected systems within a short period of time, the plant or the affected part of the plant must be shut down.

4.4.5 DCS Failure

The control system (DCS) is redundant (CPU's, servers and BUS). Not only the server but also the entire communication and data exchange system consists of a completely independent back-up unit. The DCS is powered via a redundant uninterruptible power supply (UPS) and ensures operability even in the case of a power failure. The two systems operate in parallel. One system is in operation and works as the master system, the redundant system serves as a slave system, ready to take over all the tasks in case of a system crash of the master system.

4.4.6 ID Fan Failure

In case of an ID fan failure the unit must be shut down. The ID fan is equipped with an auxiliary motor which will start in case the main motor of the fan or the frequency converter are defective or during a BLACK-OUT scenario. Since the auxiliary motor is not designed to start the fan, it can only be started while the fan rotor is turning in a range of 450 to 500 rpm. The task of the auxiliary motor is to ensure a minimum draft through the furnace and the flue gas cleaning system to avoid that flue gas can exit into the boiler hall.

The unit may NOT be operated with the auxiliary motor of the ID fan – it must be shut down. With a trip of the ID fan main motor the combustion air fans will also trip and thus the combustion intensity will be reduced drastically. This leads to an emergency shut-down.

4.4.7 General Equipment Failure

Failures of individual equipment or entire process units (systems) are indicated in the DCS in such a way that they are comprehensible for the operating personnel. The information is displayed in the DCS in different forms:

- list of alarms
- indication of the disturbance at the equipment
- indication of alarm values or thresholds (pressure, temperature, flow, quality etc.)
- collective alarms of function groups
- indication of missing start conditions or permanent conditions for an action to follow

The following table shows the effects of various system / unit failures on the plant / unit operation and actions to be initiated.

‘Normal shut-down’ means basically the shut-down procedure according to the shut-down procedure of the unit under consideration of the limitations from the process disturbance.

Depending on the configuration of the plant (single unit or multiple units) the effects of process disturbances and failures may vary.

4.4.8 Exemplary Table of Process Disturbances and Failures

Process Disturbance or Failure	Redundancy	Delay Time (*) [min]	Necessary Interventions (*) if no redundancy OR redundancy is not working	Emergency Shut-Down necessary ?
Thermal Treatment				
Failure of one waste crane	Yes	Depends on waste level in feed hopper	normal operation possible, when the damaged crane can be pushed into the service bay	No
Failure of feed hopper cooling system	No	0 120	emergency cooling with town/process water, then normal shut-down (depends on the level in the process water tank)	No
Failure of primary air system	No	0 60	stop of grate incineration, operation at reduced thermal load (steam flow) with start-up and auxiliary burners normal shut-down (discharge of remaining waste on the grate)	No
Failure of primary air pre-heater	No		operation at reduced thermal load (depending on the heat value of waste)	No
Failure of secondary air system	No	0 120	reduce thermal load (70%) at 70 %, then normal shut-down	No
Failure of flue gas recirculation system	No	0	reduce thermal load (70%); operation with secondary air only (manual operation)	No
Failure of first hydraulic station pump	Yes	60	reduce thermal load	No
Failure of second hydraulic station pump	Yes	15	Normal shut-down	No
Failure of ram feeder	No	0 60	reduce thermal load then normal shut-down	No
Failure of grate	No	0 60	reduce thermal load then normal shut-down	No

Process Disturbance or Failure	**Redundancy**	**Delay Time (*) [min]**	**Necessary Interventions** (*) if no redundancy OR redundancy is not working	**Emergency Shut-Down necessary ?**
Failure of start-up and auxiliary burner	No	- 0	continuous operation until furnace temperature < 850°C when temperature < 850°C, then normal shut-down	No
Creeping water loss in the boiler	n/a		normal shut-down	No
Cracked tube in the boiler	n/a	0	-	Yes
Failure of bottom ash extractor	No	0 120	stop of last grate zone normal shut-down	No
Failure of bottom ash water supply	Yes, using process water	0	continuous operation with process water possible	No
Failure of bottom ash water supply with Level < LSL	No	0 30	stop of bottom ash extractor and stop of last grate zone normal shut-down	No
Failure of bottom ash handling	No	0 120	stop of last grate zone normal shut-down	No
Failure boiler cleaning devices	No	several hours 0	reduction of thermal load depending on the boiler outlet temperature of the flue gas, then normal shut-down outlet temperature too high, then normal shut-down	No
Failure ash / bottom ash handling system	No	several hours 0	continuous reduction of thermal load depending on the outlet temperature of flue gas outlet temperature too high, then normal shut-down	No
Flue Gas Treatment				
Failure of NH_4OH injection unit	No	0	depending on national regulation for NO_X emission, then stop of feeding waste	No
Failure of water injection HZI Semi Dry (water injection pumps)	Yes	0 0	continuous operation normal shut-down if temperature at top of reactor is too high	No

Process Disturbance or Failure	Redundancy	Delay Time (*) [min]	Necessary Interventions (*) if no redundancy OR redundancy is not working	Emergency Shut-Down necessary ?
Failure of activated carbon and $Ca(OH)_2$ system	No	0 10	continuous operation with reduced load	No
Failure of flue gas reheating system for the fabric bag filter	No	-	only used during cold start-up of the unit	No
Loss of fabric bag filter (1 chamber)	Yes	0	continuous operation with possibly reduced thermal load (steam flow)	No
Loss of fabric bag filter (all chambers)	No	0 0	stop the activated carbon and $Ca(OH)_2$ supply then normal shut-down	No
Failure of residue transport below fabric bag filter	No	-	continuous operation possible until max. level LSH in fabric bag filter bunker is reached	No
Failure of ID fan frequency converter or main motor	No	0	auxiliary motor of ID fan starts at 500 to 450 rpm	Yes
Failure in the flue gas ducts	No	0	when the pressure is too low on the suction side of the ID fan	Yes
Heat Recovery				
Failure of de-mineralized water plant	No	Hours or days 0	depends on size of the storage tank and possibility of supply from an external source normal shut-down when level of tank gets too low	No
Failure of first feedwater pump	Yes	0	automatic switch-over to redundant pump	No
Failure of second feedwater pump	No	0	emergency shut-down	Yes
Failure of first condensate pump	Yes	0	automatic switch-over to redundant pump	No

Process Disturbance or Failure	**Redundancy**	**Delay Time (*)** [min]	**Necessary Interventions** (*) if no redundancy OR redundancy is not working	**Emergency Shut-Down necessary ?**
Failure of second condensate pump	No	2	emergency shut-down	Yes
Failure of air cooled condenser (ACC)	No	0		Yes
Failure of steam turbine	No	0	possible reduction of thermal load with external power supply and steam condensation via turbine bypass operation (ACC)	No
Failure of the closed cooling water system (CCWS) pump	Yes	0	normal shut-down	No

5 Revisions

Rev.	Date / Initial	Objects, Chapter	Modification
01	Halloween 2011 / Pst	all	Complete overhaul of the document
02	07.05.12 / Pst	1.4 2.1.3 3.2.9	Corrected and extended the list of associated documents added the description of the "ALL AUTO" command for MFG's and FG's Harmonized description of 2oo3 block with the respective description in Comos Corrected the description of the emergency shut-down scenario
03	22.04.14 / Pst	1.4 2.5.2 3.15 4.3	Corrections of the number and names of the associated documents in conjunction with GP 425 Added example of the DCS screen structure More precise description of the island mode New chapter: Emergency Stop Concept (incorporated the formerly associated document in the POO)
04			

NORTH LONDON WASTE AUTHORITY

NORTH LONDON HEAT AND POWER PROJECT

ENVIRONMENTAL STATEMENT: VOLUME 2

The Planning Act 2008 The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5 (2) (a)

AD06.02

Arup

Revision 0 | October 2015

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Glossary

See Project Glossary (AD01.05)

1 Introduction

1.1.1 This document is Volume 2 of the Environmental Statement (ES) for the North London Heat and Power Project (the 'Project'). This is the proposal for a new Energy Recovery Facility (ERF) in the London Borough (LB) of Enfield to replace the existing Energy from Waste (EfW) facility at Edmonton EcoPark.

1.1.2 The environmental topic assessments undertaken for the Project are presented in this volume and Volume 3. Within this volume, assessments for the following topics can be found:

a. Air Quality and Odour (Section 2)
b. Archaeology (Section 3)
c. Daylight, Sunlight and Overshadowing (Section 4)
d. Ecology (Section 5)
e. Environmental Wind (Section 6)
f. Ground Conditions and Contamination (Section 7)
g. Noise and Vibration (Section 8)
h. Socio-Economics (Section 9)
i. Transport (Section 10)
j. Water Resources and Flood Risk (Section 11)
k. Interactive Effects (Section 12).

1.1.3 Volume 3 contains the visual assessment.

1.1.4 All of the Project stages have been assessed within each of the topic assessments. They are:

a. Stage 1: this stage is split into four sub-stages:
    - 1a: Site preparation and enabling works
    - 1b: Construction of Resource Recovery Facility (RRF), EcoPark House and commence use of Temporary Laydown Area
    - 1c: Operation of RRF, EcoPark House and demolition/clearance of northern area
    - 1d: Construction of ERF.
b. Stage 2: Commissioning of ERF alongside operation of EfW facility, i.e. transition period.
c. Stage 3: Operation of ERF, RRF and EcoPark House, demolition of EfW facility.
d. Stage 4: Operation of ERF, RRF and EcoPark House, i.e. final operational situation.

1.1.5 In addition to this volume, the ES also consists of:

a. Volume 1: which provides a description of the existing site and surroundings, a description of the Project, a description of alternatives, a description of the environmental impact assessment (EIA) approach and methodology, a summary of the preliminary environmental assessment results and an outline of the next steps.

b. Volume 3: which contains the visual assessment.

c. Appendix – Figures: this provides the supporting figures (A3 format) to Volume 1 and Volume 2.

d. Appendix – Reports: this provides supporting reports and documents to Volumes 1, 2 and 3.

e. Non-Technical Summary: this provides a summary of the information provided in the ES in an easily accessible and understandable manner.

2 Air quality and odour

2.1 Introduction

2.1.1 This section describes the likely significant effects of the Project on air quality and odour.

2.1.2 Effects are assessed for four stages associated with the Project (as set out in Vol 1 Section 3 of the ES (AD06.02)):

a. construction (Stages 1-3 of the Project);

b. operation (Stages 1-4 of the Project);

c. decommissioning; and

d. effect of the Project in combination with other developments in the vicinity of the Application Site (i.e. cumulative effects).

2.1.3 Air quality studies are concerned with the presence of airborne pollutants in the atmosphere. In terms of construction and decommissioning impacts, the assessment examines the potential emissions of dust, particulates and odour from construction and demolition activities and exhaust emissions generated by plant and traffic associated with the Project.

2.1.4 For the operational impacts, traffic emissions and stack emissions from operation of the existing EfW facility and proposed ERF have been assessed. Fugitive emissions, operational dust, odour and human health are also considered. Plume visibility also been modelled and this has been considered in the visual assessment (Vol 3 of the ES (AD06.02)).

2.1.5 The Works Plans (based on which the air quality and odour assessment has been undertaken) are contained in the Book of Plans (AD02.01) which forms part of the DCO Application documents. Figures associated with the air quality and odour assessment are contained in the Appendix – Figures volume of the ES (AD06.02).

2.2 Engagement

2.2.1 There has been engagement with the environmental health officers at LB Enfield, LB Waltham Forest and LB Haringey to agree the methodology as set out in the ES (AD06.02). The officers agreed with the proposed methods and scope of the air quality assessment.

2.2.2 Details of this engagement along with comments received on the Scoping Opinion[1] relating to air quality and odour are contained Vol 2 Appendix 2.1 of the ES (AD06.02). The key issues relating to air quality raised in the Scoping Opinion[1] comments included the importance of assessing worst-case options for the Project, engaging with the EA and use of London specific guidance. Each of these issues is addressed within the assessment.

[1] The Planning Inspectorate (2014) Scoping Opinion Proposed North London Heat and Power Project, November 2014

2.2.3 During Phase Two Consultation, responses on the air quality assessment contained in the Preliminary Environmental Information Report[2] (PEIR) were received from LB Enfield and the Greater London Authority (GLA). LB Enfield noted that the methods proposed for the assessment were acceptable, and suggested that construction/demolition dust impact is considered using the GLA supplementary planning guidance (SPG)[3]. The method outlined in the GLA guidance is the same as that in the Institute of Air Quality Management (IAQM) guidance[4], and so it is considered that the same approach has been followed in the assessment. Where any additional mitigation is recommended, this is included in the Code of Construction Practice (CoCP) (Vol 1 Appendix 3.1).

2.2.4 With regard to the air quality traffic assessment, the GLA noted that the affected road network should be assessed using a 5 per cent threshold of change in Average Annual Daily Traffic (AADT), with roads with an AADT of over 10,000. This appears to be taken from the previous Environmental Protection UK (EPUK) guidance[5], which has been revised since the GLA made their comments. As such, the new guidance[6] has now been followed in the ES (AD06.02), which has more stringent assessment criteria.

2.2.5 With regard to odour, the GLA recommended that odour modelling is carried out. A qualitative assessment of odour has been undertaken, which concludes that the Project would be equivalent to, or lead to an improvement in background odour in comparison to the existing EfW facility and in-vessel composting (IVC), and therefore the effect would be considered to be not significant. It is not considered that there would be a significant odour impact, and therefore modelling is not required.

2.2.6 The GLA also noted that the Project should address the requirements of London Plan policies and guidance relating to non-road mobile machinery (NRMM), both of which have been taken into account in the assessment.

2.2.7 A permit to operate the plant would be applied for from the EA who would need to be satisfied that the air quality impacts are acceptable. Ongoing discussions are being held with the EA with the permit application expected to be submitted in autumn 2015.

2.3 Methodology

2.3.1 This section provides an overview of the methodology for assessing the likely significant effects of the Project on air quality and odour during construction, operation and decommissioning. Full details of the topic methodology are provided in Vol 2 Appendix 2.1 including relevant air quality standard, limit values or environmental assessment levels.

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[2] North London Waste Authority (2015) Preliminary Environmental Information Report Issue for Consultation, May 2015

[3] Greater London Authority (2014) The control of dust and emissions during construction and demolition Supplementary Planning Guidance, July 2014.

[4] Available from the IAQM website: http://iaqm.co.uk/guidance/

[5] Environmental Projection UK (2010) Development Control: Planning For Air Quality (2010 Update)

[6] Moorcroft and Barrowcliffe. et al, (2015) Land-Use Planning & Development Control: Planning for Air Quality, Institute of Air Quality Management, London

Construction

Dust assessment

2.3.2 The construction dust assessment has been carried out for each Project stage containing construction/demolition works in terms of the type of works taking place, the sensitivity of the surrounding area and determines the risk of impacts.

2.3.3 The aspects of each Project development stage most relevant to the air quality assessment for construction are outlined in Vol 2 Table 2.1.

Vol 2 Table 2.1: Aspects of each Project stage relevant to the air quality assessment – construction

Stage	Relevant aspects
Stage 1a: site preparation and enabling works Stage 1b: construction of RRF, EcoPark House and commence use of Temporary Laydown Area Stage 1c: operation of RRF, EcoPark House and demolition/clearance of northern area Stage 1d: construction of ERF	• Potential to generate dust from earthworks, trackout and construction/demolition activities associated with the construction of the RRF, EcoPark House and ERF. • Emissions from construction equipment and vehicles. • Potential odour emissions from in-vessel composting (IVC) removal.
Stage 2: commissioning of ERF alongside operation of EfW facility, i.e. transition period	• Does not involve any major construction work, has low potential for dust generation. • Emissions from construction equipment and vehicles.
Stage 3: operation of ERF, RRF and EcoPark House, demolition of EfW facility	• Demolition of EfW facility has the potential for generation of dust emissions. • Emissions from construction equipment and vehicles.
Stage 4: operation of ERF, RRF and EcoPark House, i.e. final operational situation	This stage does not involve any further construction/demolition works, therefore has not been assesfsed in terms of construction effects.

2.3.4 The construction effects have been assessed using a qualitative approach based on latest guidance from the IAQM[7] and GLA3 for Project Stages 1-3 when construction impacts would be experienced. This follows the recommendation of the Secretary of State in the Scoping Opinion[1]. The guidance methodology has been followed, and provides the basis for the determination of significance for the construction dust assessment. It is considered that where the overall construction dust significance is deemed to be medium or high risk, the overall construction dust impacts of the Project would be significant.

2.3.5 The Application Site and the Temporary Laydown Area have been assessed as a whole for the construction assessment. This is a

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

precautionary assumption as it assumes dust impacts can occur across the whole Application Site. This ensures any mitigation identified would be sufficient to effectively manage any potential dust emissions.

2.3.6 Following a review of the works in each stage, there may be the potential for odour in Stage 1, when the IVC is removed. No significant odour emissions are anticipated during any other stage.

Traffic emissions – construction and operation

2.3.7 The Project has the potential to impact on air quality as a result of road traffic exhaust emissions during all stages. These emissions include nitrogen dioxide (NO_2) and fine particulate matter (PM_{10}), and are associated with light goods vehicles and heavy goods vehicles (HGVs) travelling to and from the Application Site. A screening assessment has been undertaken using the criteria contained within the EPUK/IAQM guidance[6] document and the Design Manual for Roads and Bridges (DMRB) Air Quality Chapter[8] to determine the required level of detail for the assessment.

2.3.8 Total traffic flows for each of the stages (Stages 1-4) are assessed with construction and operation traffic assessed together for all stages. Construction and operations would occur concurrently in some of these stages and hence emissions from traffic associated with both have been considered together.

2.3.9 Where further assessment is required, a more detailed screening assessment using the DMRB screening tool has been undertaken and significance determined through the methodology in the EPUK/IAQM guidance6. If no further assessment is required (i.e. screening criteria are not met) then impacts are considered to be negligible and not significant.

Operation

2.3.10 To assess air quality impacts during operation, the following have been undertaken:

a. assessment of the combustion source emissions from the stack, diesel generators and other fugitive sources on local air quality;

b. assessment of plume visibility;

c. assessment of odour; and

d. assessment of the potential impacts on human health.

2.3.11 Operational effects have been assessed for all stages, although Stages 3 and 4 are identical in terms of ERF emissions, as the existing EfW facility would no longer be operational by this time.

2.3.12 The aspects of each stage most relevant to the air quality assessment for operation are outlined in Vol 2 Table 2.2.

[8] Highways Agency (2007) Design Manual for Roads and Bridges: Air Quality Advice Note HA 207/07.

Vol 2 Table 2.2: Aspects of each Project stage relevant to the air quality assessment – operation

Stage	Relevant aspect
Stage 1a: site preparation and enabling works Stage 1b: construction of RRF, EcoPark House and commence use of Temporary Laydown Area Stage 1c: operation of RRF, EcoPark House and demolition/clearance of northern area Stage 1d: construction of ERF	• Existing EfW facility stack emissions. • Emissions from operational vehicles associated with the existing EfW facility and other ongoing operations (it is noted that the operational traffic emissions are assessed with construction traffic to ensure that all traffic associated with site activity is assessed). • Risk of odour emissions. • Risk of fugitive emissions and dust.
Stage 2: commissioning of ERF alongside operation of EfW faciliity, i.e. transition period	• Stack emissions from the EfW facility and ERF. • Emissions from diesel generators. • Emissions from operational vehicles associated with the EfW facility and ERF and other ongoing operations (it is noted that the operational traffic emissions are assessed with construction traffic to ensure that all traffic associated with site activity is assessed). • Risk of odour emissions. • Risk of fugitive emissions and dust.
Stage 3: operation of ERF, RRF and EcoPark House, demolition of EfW facility	• ERF stack emissions. • Emissions from diesel generators. • Emissions from operational vehicles associated with the ERF and other ongoing operations (it is noted that the operational traffic emissions are assessed with construction traffic to ensure that all traffic associated with site activity is assessed). • Risk of odour emissions. • Risk of fugitive emissions and dust.
Stage 4: operation of ERF, RRF and EcoPark House, i.e. final operational situation	• Stack emissions from the ERF would be the same as in Stage 3. • Emissions from diesel generators would be the same as in Stage 3. • Emissions from operational vehicles associated with the ERF and other ongoing operations. • Risk of odour emissions. • Risk of fugitive emissions and dust.

Combustion source emissions

2.3.13 The main significant sources of atmospheric emissions in the operational stages are from the stack of the proposed ERF, the stack of the existing EfW facility and from diesel generators to a lesser extent.

2.3.14 There a number of pollutants associated with the operation this type of facility, which are included in the Industrial Emissions Directive (IED)[9]. These have emission limit values set by the EA that control the quantities of pollutants emitted from the plant, and there are also air quality standards for concentrations of these pollutants in the atmosphere. The relevant pollutants (which are considered in the assessment) are listed below:

a. Oxides of nitrogen (NO_x) and NO_2;

b. Carbon monoxide (CO);

c. Volatile Organic Carbons (VOCs): benzene (C_6H_6);

d. Sulphur dioxide (SO_2);

e. PM_{10};

f. Very fine particulate matter ($PM_{2.5}$);

g. Hydrogen fluoride (HF) and hydrogen chloride (HCl);

h. Ammonia (NH_3);

i. Polychlorinated dibenzodioxins and polychlorinated dibenzofurans (dioxins and furans);

j. Trace metals: lead (Pb), arsenic (As), cadmium (Cd), nickel (Ni); and

k. Benzo(a)pyrene (as a polycyclic aromatic hydrocarbon (PAH) marker).

2.3.15 The effects of these emissions have been assessed using the ADMS 5 atmospheric dispersion model, which is a widely used model in the UK, and the assessment follows the methodology set out in the H1 guidance[10] released by the EA.

2.3.16 The H1 and EPUK/IAQM6 guidance have been followed in the air quality assessment. The H1 guidance sets criteria for where the air quality impacts would be insignificant. However, if these criteria are exceeded then this does not necessarily mean the impacts are significant. The level of significance is determined by using the approach developed by EPUK/IAQM. Therefore the EPUK/IAQM guidance provides the basis for determination of significance for the operational assessment.

2.3.17 Pollutant concentrations have been predicted at selected discrete receptor locations (described in Paragraphs 2.5.76-2.5.78 and shown on Vol 2 Figure 2.7), and over a wider 10km by 10km gridded area (shown on Vol 2 Figure 2.8). This is based on the screening distance for nature conservation sites required in the EA's H1 guidance[10].

2.3.18 Fugitive emissions[11] from the Project have been considered by qualitatively analysing the sources and activities within the Application Site which may give rise to fugitive emissions along with analysis of wind direction and location of sensitive receptors. Significance of potential fugitive emissions

[9] Directive 2010/75/EU of 24 November 2010 on industrial emissions (integrated pollution prevention and control).
[10] Environment Agency (2011) H1 Annex F – Air Emissions.
[11] Fugitive emissions are uncontrolled releases of gases or dust to the atmosphere, for example wind blow dust from stock piles or surface dust or leaks.

is based on the risk of these emissions creating either a nuisance or elevated pollutant concentrations at relevant receptor locations.

Cooling tower emissions

2.3.19 Cooling towers do not emit any harmful pollutants and no air quality assessment of plumes from the cooling technology is required as the proposed technology is an enclosed system (Air Cooled Condenser).

Plume visibility

2.3.20 A visible plume is formed when the temperature of the ambient air mixed with the cleaned flue gas, is lower than the saturation temperature of the water vapour emitted with flue gas. Plume visibility has been modelled and quantified using the ADMS 5 dispersion model for both the proposed ERF stack and the existing EfW facility stack. There are no standards for visible plume lengths; for this study, the frequency of the predicted plume (by number of hours per year) at various increments of plume length has been examined. The plume is assessed for significance in visual terms in Vol 3 of the ES (AD06.02).

Odour

2.3.21 Odour has been qualitatively assessed using the FIDOR method, as outlined in the IAQM[12] and H4 guidance[13]. FIDOR relates to 'Frequency, Intensity, Duration, Offensiveness and Receptor sensitivity'.

2.3.22 A low risk of odour nuisance is considered to be not significant. Anything higher is considered as significant.

Human health

2.3.23 The human health risk assessment (HHRA) (Vol 2 Appendix 2.3 of the ES (AD02.06)) process for dioxins/furans, dioxin-like polychlorinated biphenyls (PCBs) and metals is based on the application of the US Environmental Protection Agency (EPA) HHRA Protocol, as there is no equivalent methodology available in the UK. The approach seeks to quantify the hazard faced by the receptor, the exposure of the receptor to the substances identified as being a potential hazard and then to assess the risk of the exposure.

2.3.24 Significance for human health impacts has been determined in a similar manner as that outlined in the EPUK/IAQM guidance for air quality:

a. The Hazard Index (HI) or carcinogenic risk that is <1 per cent of the relevant criteria (i.e. HI less than 0.01, lifetime risk less than 7×10^{-7}) is described as negligible and assessed as not significant;

b. HI or carcinogenic risk that is between 2 per cent and 5 per cent of the relevant criteria is described as a slight impact and assessed as not significant;

[12] Institute of Air Quality Management (2014) Guidance on the assessment of odour for planning.

[13] Environment Agency (2011) H4 – Odour Management How to comply with your environmental permit

c. HI or carcinogenic risk that is between 6 per cent and 10 per cent of the relevant criteria is described as a moderate impact and assessed as significant; and

d. HI or carcinogenic risk that is greater than 10 per cent of the relevant criteria is described as a substantial impact criteria (i.e. HI greater than 0.1, lifetime risk greater than 7×10^{-6}) and a substantial impact and assessed as significant.

2.3.25 For comparison with the Committee of Toxicity (COT) Tolerable Daily Intake (TDI), a similar approach is taken for air quality with the contribution of the facility to total intake determined as follows:

a. predicted incremental intake due to emissions from the ERF;

b. average daily background intake (i.e. that arising from other sources), referred to as the mean daily intake (MDI), and is derived from data provided by the EA;

c. the total intake (i.e. the sum of the predicted incremental intake and the MDI);

d. a comparison of the total intake with the COT TDI for dioxin/furans.

2.3.26 The impact can then be described according to the guidance provided by EPUK/IAQM in relation to the change in dose relative to the COT TDI and the total exposure relative to the COT TDI (see Vol 2 Appendix 2.1 Table 29).

2.3.27 The impacts identified according to EPUK/IAQM guidance are then assessed using professional judgement to determine the significance of effects. This application of professional judgement takes account of the following:

a. the existing and future exposure in the absence of the development;

b. the extent of current and future population exposure to impacts;

c. the worst-case assumptions adopted when undertaking the prediction of exposure; and

d. the extent to which the proposed development has adopted best practice to eliminate and minimise emissions (e.g. adequate stack height).

2.3.28 Where the overall risk is determined to be negligible or slight, the significance of the Project would be likely to be not significant. Where the significance is deemed to be moderate or substantial the overall significance would likely be significant.

Decommissioning

2.3.29 It is considered that any decommissioning effects would be of a similar nature or less, to those identified in the construction assessment, as such the outcomes of the construction assessment are considered applicable to the decommissioning of the ERF.

2.4 Assumptions and limitations

Assumptions

2.4.1 It has been assumed that wind conditions measured at London City Airport in 2014 are representative of wind conditions at the Application Site. This is the nearest station where the required meteorological data for predicting air quality impacts of the Project are measured on a routine basis. Sensitivity analysis has been carried out which showed London City Airport in 2014 to be the worst-case (i.e. highest concentrations at receptors) for a full year of meteorological data. Further details can be found in the methodology in Vol 2 Appendix 2.1 of the ES (AD06.02).

2.4.2 The works plans (in Book of Plans (AD02.01)) show a minimum stack height of 100m but with a tolerance of an additional 5m. For the purposes of the modelling a stack height of 100m has been assumed.

2.4.3 A 100m stack is considered appropriate for the purposes of the modelling study, as dispersion increases with stack height and so a 105m stack would likely lead to slightly better dispersion and therefore marginally lower concentrations at ground level. With a 105m stack height, the location of the point of maximum impact at ground level may vary slightly; however the concentration itself would not be any greater.

2.4.4 In terms of baseline data gathering, selected background concentrations are considered to be representative of concentrations at the Application Site and receptors where no monitoring is undertaken at the Application Site itself.

Limitations

2.4.5 There are a number of limitations and uncertainties associated with modelling predictions. The model is required to simplify real world conditions based upon a series of algorithms and is dependent on input data. IED limit values have been used for the future operation scenarios (Stages 2, 3 and 4) as a worst-case assessment.

2.4.6 The buildings included in the model have to be simplified to cuboid shapes and do not exactly represent the actual building dimensions.

2.4.7 Also, small sources of atmospheric emissions have not been included in the dispersion modelling as they are not considered to be significant. However as the dispersion modelling results are likely to overestimate concentrations due to use of the IED emission limits, the assessment can be considered robust and remains worst-case.

2.5 Baseline

2.5.1 This section sets out the baseline conditions for air quality and odour in and around the Application Site. Future baseline conditions are also described.

Current baseline

2.5.2 This section looks at the most recent available monitoring results from local air quality monitoring sites in the vicinity of the Application Site.

2.5.3 The section includes data from relevant monitoring studies carried out as part of the local air quality management regime, and data from national monitoring or modelling studies, by pollutant, in the following order:

a. NOx and NO_2;

b. PM_{10} and $PM_{2.5}$;

c. carbon monoxide (CO);

d. VOCs: benzene

e. SO_2;

f. HF and HCl;

g. NH_3;

h. dioxins and furans;

i. trace metals: Pb, arsenic (As), cadmium (Cd), nickel (Ni), thallium (Ti), mercury (Hg), antimony (Sb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn) and vanadium (V); and

j. benzo(a)pyrene (as a polycyclic aromatic hydrocarbon (PAH) marker).

2.5.4 Dust is not included in the air quality standards, and so no monitoring is undertaken of dust itself. PM_{10} and $PM_{2.5}$ are constituent parts of dust that are of concern with regard to human health impacts, and baseline PM_{10} and $PM_{2.5}$ data is included in this section.

2.5.5 The section then looks at estimated background pollutant concentrations for NO_x, NO_2, PM_{10}, SO_2, CO and benzene, from the Defra background maps, and includes a summary of the monitoring study undertaken in 2013.

2.5.6 This is followed by identification of industrial processes in the vicinity of the Project, a compilation of baseline odour information, and a summary of baseline ecological levels and loads at ecological sites within 10km of the Application Site, as required by EA H1 guidance[10]. Local monitoring

2.5.7 Local authorities are required to review and assess air quality in their local areas. Where air quality has been found to exceed the national air quality standards, local authorities must declare an air quality management area (AQMA).

2.5.8 LB Enfield, LB Waltham Forest and LB Haringey have declared their whole boroughs as AQMAs in 2001 for exceedences of the annual mean NO_2 standard and 24-hour mean PM_{10} standard. The extent of the AQMAs is shown in Vol 2 Figure 2.1 of the ES (AD06.02).

2.5.9 A review of air quality monitoring sites within 10km of the Application Site boundary has been undertaken. Vol 2 Figure 2.2 of the ES (AD06.02) shows the air quality monitoring sites, and Vol 2 Table 2.3 presents details of the air quality monitors located within 10km of the Application Site. The type of each monitoring site (automatic or diffusion tube, and urban background/ roadside/ industrial/kerbside) is shown in Vol 2 Table 2.3.

Vol 2 Table 2.3: Monitoring locations within 10km of the Application Site in LB Enfield, LB Waltham Forest and LB Haringey

Site	Type	Local authority	OS grid ref		Distance (direction) from Application Site boundary
			X	Y	
Bush Hill Park (1)	Auto – UB	LB Enfield	533881	195832	3.6km (NW)
Derby Road (2)	Auto – R	LB Enfield	535056	192470	600m (W)
Bowes Road (3)	Auto – R	LB Enfield	529893	192224	5.8km (W)
Prince of Wales School	Auto – UB	LB Enfield	536879	198505	6.0km (N)
Enfield 1 Sterling Way	DT – UB	LB Enfield	533659	192376	2.1km (W)
Enfield 2 Centenary Road	DT – I	LB Enfield	536634	196356	3.8km (NE)
Enfield 3 Agricola Place	DT – UB	LB Enfield	533881	195832	3.6km (NW)
Enfield 4 Conway Road	DT – UB	LB Enfield	530349	193283	5.5km (W)
Enfield 5 Glynn Road	DT – UB	LB Enfield	535126	196295	3.7km (N)
Enfield 7 Bullsmoor Lane	DT – R	LB Enfield	535460	199849	7.2km (N)
Enfield 8 Derby Road	DT – R	LB Enfield	535056	192470	800m (W)
Enfield 9 Bowes Road	DT – R	LB Enfield	529893	192224	5.9km (W)
WL1 - Dawlish Road	Auto – UB	LB Waltham Forest	538380	186717	6.5km (SE)
WL4 - Crooked Billet	Auto – K	LB Waltham Forest	537468	191071	2.2km (S)
WL5 - Ruckholt Close	Auto – R	LB Waltham Forest	537804	186025	7.0km (S)
Chingford	DT – UB	LB Waltham Forest	538705	194452	3.4km (E)
Dawlish Rd	DT – UB	LB Waltham Forest	538380	186717	6.5km (S)
Leyton Library	DT – R	LB Waltham Forest	538245	186285	6.9km (S)
Connaught	DT – R	LB Waltham Forest	539025	186945	6.6km (S)
HGY1 High Road	Auto – R	LB Haringey	533890	190710	2.7km (SW)

Site	Type	Local authority	OS grid ref		Distance (direction) from Application Site boundary
			X	Y	
HR06 Archway Road	DT – R	LB Haringey	528940	187660	8.5km (SW)
HR07 Park View Road	DT – UB	LB Haringey	534400	190160	2.9km (SW)
HR08 Myddelton Road	DT – UB	LB Haringey	530440	189450	6.3km (SW)
HR14 High Road	DT – R	LB Haringey	533890	190710	2.9km (SW)
HR19 Archway Road	DT – R	LB Haringey	527897	188558	8.8km (SW)
HR20 North Hill	DT – R	LB Haringey	527974	188329	8.8km (SW)
HR21 Lordship Lane	DT – R	LB Haringey	532010	190549	4.3km (SW)
HR22 Seven Sisters	DT – R	LB Haringey	533612	188841	4.4km (SW)
HR23 Tottenham Hale	DT – R	LB Haringey	533720	189471	3.8km (SW)
HR24 Lordship Lane	DT – R	LB Haringey	532155	190517	4.1km (SW)
HR25 White Hart Lane	DT – R	LB Haringey	532554	191383	3.4km (W)
HR26 Coppetts Wood	DT – R	LB Haringey	527800	191800	8.2km (W)
HR27 Green Lanes	DT – R	LB Haringey	531758	188872	5.5km (SW)

DT = diffusion tube, Auto= automatic monitor, UB = urban background, R = roadside, I = industrial and K = kerbside

Oxides of nitrogen and nitrogen dioxide

2.5.10 Vol 2 Table 2.4 shows the monitoring results for NO_2 in LB Enfield, LB Waltham Forest and LB Haringey for the years 2012 to 2014. Exceedences of the annual mean 40 micrograms per cubic metre (µg/m^3) air quality standard are highlighted in bold.

Vol 2 Table 2.4: Annual mean NO_2 concentrations in LB Enfield, LB Waltham Forest and LB Haringey

Site	Type	NO_2 concentration (µg/m^3)		
		2012	2013	2014
Bush Hill Park (1)	Auto – UB	38.0	29.8	34.3

Site		Type	NO_2 concentration (µg/m^3)		
			2012	2013	2014
Derby Road (2)		Auto – R	**41.0**	**44.3**	**44.5**
Bowes Road (3)		Auto – R	**46.0**	**46.0**	-*
Prince of Wales School		Auto – UB	31.0	27.5	24.1
Enfield 1	Sterling Way	DT – UB	**44.2**	**43.0**	32
Enfield 2	Centenary Road	DT – I	36.9	34.6	29.9
Enfield 3	Agricola Place	DT – UB	23.9	28.3	27.9
Enfield 4	Conway Road	DT – UB	21.9	26.4	21.5
Enfield 5	Glynn Road	DT – UB	30.1	35.4	36.6
Enfield 7	Bullsmoor Lane	DT – R	31.1	38.1	32.4
Enfield 8	Derby Road	DT – R	**40.3**	**48.9**	37.8
Enfield 9	Bowes Road	DT – R	**44.5**	**54.6**	43.1
WL1 - Dawlish Road		Auto – UB	37.0	36.0	27.9
WL4 - Crooked Billet		Auto – K	**73.0**	**68.0**	**73.9**
WL5 - Ruckholt Close		Auto – R	24.0	28.0	36.4
Chingford		DT – UB	26.9	26.3	32.8
Dawlish Rd		DT – UB	31.4	28.4	33.8
Leyton Library		DT – R	**52**	**52.4**	**57.2**
Connaught		DT – R	**41.2**	**41.5**	**47.6**
HGY1	High Road	Auto – R	**42.0**	**43.0**	**47.9****
HR06	Archway Road	DT – R	**69.2**	**56.3**	42.4
HR07	Park View Road	DT – UB	31.9	29.3	24.7
HR08	Myddelton Road	DT – UB	31.8	30.0	24.9
HR14	High Road	DT – R	**46.1**	38.8	36.7
HR19	Archway Road	DT – R	**45.9**	**40.6**	34.1
HR20	North Hill	DT – R	36.8	31.5	29.1
HR21	Lordship Lane	DT – R	33.0	34.8	29.5
HR22	Seven Sisters	DT – R	**48.4**	**42.0**	37.3
HR23	Tottenham Hale	DT – R	37.3	**40.5**	30.2
HR24	Lordship Lane	DT – R	**41.6**	**41.5**	33.1
HR25	White Hart Lane	DT – R	36.6	34.0	27.1
HR26	Coppetts Wood	DT – R	**49.0**	-*	-*
HR27	Green Lanes	DT – R	**44.2**	**40.4**	32.4
Air quality standard			40		

*no data available; **data capture less than 70 per cent; DT = diffusion tube, Auto= automatic monitor, UB = urban background, R = roadside, I = industrial and K = kerbside; Exceedences of the air quality standard are shown in **bold**.

2.5.11 Vol 2 Table 2.4 shows that concentrations of NO_2 exceeded the 40µg/m^3 air quality standard at a number of sites in the years 2012 to 2014 at mostly roadside and kerbside monitoring locations (except Sterling Way), where higher concentrations would be expected. Therefore, they are not directly comparable with predicted concentrations at the Application Site.

2.5.12 Vol 2 Table 2.5 shows the automatic monitoring results in LB Enfield, LB Waltham Forest and LB Haringey for annual mean NO_x concentrations and hourly mean NO_2 concentrations, for the automatic monitoring sites within 10km of the Application site.

2.5.13 The air quality standard for ecosystems of annual mean NO_x concentration of 30µg/m^3 was exceeded at all monitoring sites in all years, although none are located within a relevant area where the standard would apply.

2.5.14 For maximum hourly mean NO_2 concentrations, the only site to exceed the hourly mean standard of 200µg/m^3 (not to be exceeded more than 18 times a year) in 2014 was the LB Waltham Forest Crooked Billet site, a kerbside site close to the A406. All other sites complied with the standard.

Vol 2 Table 2.5: Automatic monitoring concentrations in LB Enfield, LB Waltham Forest and LB Haringey

Site	**Type**	**Annual mean NO_x concentration (µg/m^3)**			**Hourly maximum NO_2 concentration (µg/m^3) (number of exceedences)**
		2012	**2013**	**2014**	**2014**
Bush Hill Park (1)	Auto – UB	-*	**47.4**	**52.6**	177
Derby Road (2)	Auto – R	**94.2**	**100.8**	**95.6**	148
Prince of Wales School	Auto – UB	-*	**48.0**	**48.9**	101
WL1 - Dawlish Road	Auto – UB	**66.0**	-*	**47.3**	208 (1)
WL4 - Crooked Billet	Auto – K	**197.0**	-*	**180.0**	**360 (116)**
WL5 - Ruckholt Close	Auto – R	**66.0**	**70.0**	**74.3**	254 (7)
HGY1 - High Road	Auto – R	-*	**97.5**	**112.3*****	183***
Air quality standard		**30****			**200 (not to be exceeded more than 18 times a year)**

*No data available; **designated for the protection of ecosystems; ***data capture less than 70 per cent; DT = diffusion tube, Auto= automatic monitor, UB = urban background, R = roadside, I = industrial and K = kerbside; Exceedences of the air quality standard are shown in **bold**.

Particulate matter (PM_{10} and $PM_{2.5}$)

2.5.15 Vol 2 Table 2.6 shows the measured PM_{10} concentrations for the automatic monitoring sites within 10km of the Application Site that monitor PM_{10} Automatic monitoring data for the Enfield Derby Road site had not been fully ratified[14] for 2014 at the time of writing, and so final ratified concentrations could differ slightly.

2.5.16 Concentrations of PM_{10} exceeded the 40µg/m^3 annual mean air quality standard at the WL4 Crooked Billet automatic monitoring site in 2014 which is a kerbside site so higher concentrations are expected. Concentrations of PM_{10} at all other monitoring sites were below the relevant air quality standards.

Vol 2 Table 2.6: Annual and 24-hour mean PM_{10} concentrations in LB Enfield, LB Waltham Forest and LB Haringey

Site	**Type**	**Annual mean concentration (µg/m^3)**			**Number of exceedences of daily mean standard**		
		2012	**2013**	**2014**	**2012**	**2013**	**2014**
Derby Road	Auto – R	27	31	31*	15	4	-*
Bowes Road	Auto – R	24	22	-	16	28	
HGY1 High Road	Auto – R	23	25	-**	11	13	-**
WL1 - Dawlish Road	Auto – UB	18	21	19	0	3	1
WL4 - Crooked Billet	Auto – K	32	31	**40**	21	22	**59**
WL5 - Ruckholt Close	Auto – R	19	21	20	13	8	8
Air quality standard		**40**			**50**		

*Data not ratified at time of writing; **no or insufficient valid results available for this year; DT = diffusion tube, Auto= automatic monitor, UB = urban background, R = roadside, I = industrial and K = kerbside; Exceedences of the air quality standard are shown in **bold**.

Carbon monoxide

2.5.17 No monitoring for carbon monoxide (CO) is undertaken in LB Enfield, LB Waltham Forest or LB Haringey; the nearest monitoring sites are located beyond 10km as shown in Vol 2 Figure 2.3. Concentrations for the monitoring sites closest to the Application Site with an annual data capture rate greater than 75 per cent are shown in Vol 2 Table 2.7.

2.5.18 Concentrations at all monitoring sites are well below the air quality standard for CO.

[14] The calibration and ratification process for automatic gas analysers corrects the raw dataset for ‘drift’ in the zero baselines and the upper range of the instrument, and a linear scaling factor is applied to the data. Following application of the scaling factor and adjustment of the baseline, data is further screened and validated, often by visual inspection.

Vol 2 Table 2.7: 8-hour mean CO concentrations

Site	Type	Distance from Application Site boundary	8 Hour running mean CO concentration (mg/m^3)		
			2012	2013	2014
London Bexley	Auto - Suburban Background	22.4km	0.2	*	*
London N. Kensington	Auto - Urban Background	15.6km	0.3	0.2	0.2
London Marylebone Road	Auto - Urban Traffic	12.7km	0.6	0.5	0.5
Air quality standard			**10**		

*no or insufficient valid results available for this year; DT = diffusion tube, Auto= automatic monitor.

VOCs: benzene

2.5.19 LB Haringey and LB Waltham Forest identified no exceedences of the benzene standard in the first round of review and assessment. This pollutant is therefore not monitored in either borough. LB Enfield stopped monitoring benzene in 2010.

2.5.20 Benzene is monitored in London using both automatic and non-automatic monitoring methods. Concentrations for the monitoring sites closest to the Application Site, with annual data capture rates greater than 75 per cent are shown in Vol 2 Table 2.8 (see Vol 2 Figure 2.3 for locations).

2.5.21 Concentrations at all monitoring sites are well below the air quality standard for benzene.

Vol 2 Table 2.8: Annual mean benzene concentrations

Site	Type	Distance from Application Site boundary	Annual mean benzene concentration ($\mu g/m^3$)		
			2012	2013	2014
London Eltham	Auto - Suburban Background	19.4km	0.6	0.6	0.6
London Marylebone Road	Auto - Urban Traffic	12.7km	1.4	1.1	1.2
Camden Kerbside	Non-Auto - Urban Traffic	12.0km	1.1	1.2	1.3
London Bloomsbury	Non-Auto - Urban Background	11.6km	0.7	0.9	0.8
Air quality standard			**5**		

*no or insufficient valid results available for this year; Auto = automatic monitor, Non-Auto = non-automatic monitor.

Sulphur dioxide

2.5.22 LB Waltham Forest stopped monitoring for SO_2 in 2008 (having been monitoring for SO_2 since 1999), and LB Haringey stopped the end of the monitoring year in December 2010 (having been monitoring since 2000), as no exceedences were recorded for this pollutant in either borough.

2.5.23 There is one roadside site, Derby Road, in LB Enfield which monitors SO_2, and a number of other sites in London which monitor SO_2. Annual mean concentrations for 2012 to 2014 are shown in Vol 2 Table 2.9 (see Vol 2 Figure 2.3 of the ES (AD06.02) for locations). Results show that concentrations at all monitoring locations are below the annual mean standard.

Vol 2 Table 2.9: Annual mean SO_2 concentrations

Site	**Type**	**Distance from Application Site boundary**	**Annual mean SO_2 concentration (μg/m^3)**		
			2012	**2013**	**2014**
Enfield – Derby Road	Auto - Roadside	0.6km	2.6	3.1	3.8*
London Bexley	Auto - Suburban Background	22.4km	3.8	4.8	4.7
London Bloomsbury	Auto - Urban Background	11.6km	2.9	4.0	2.1
London Westminster	Auto - Urban Background	14.5km	3.2	-	-
London N. Kensington	Auto - Urban Background	15.6km	2.0	2.0	2.4
London Marylebone Road	Auto - Urban Traffic	12.7km	8.1	6.0	9.0
Air quality standard			**20**		

*Data not fully ratified at time of writing; Auto = automatic monitor.

2.5.24 Data for all sites has also been reviewed and compared to the 15-min mean standard (266μg/m^3 not to be exceeded more than 35 times a year), hourly mean standard (350μg/m^3 not to be exceeded more than 24 times a year) and 24-hour mean standard (125μg/m^3 not to be exceeded more than 3 times a year). Results show that there have not been any exceedences of any of the standards, at any sites in 2012, 2013 or 2014.

Hydrogen chloride and hydrogen fluoride

2.5.25 No monitoring for hydrogen chloride (HCl) or hydrogen fluoride (HF) is undertaken in LB Enfield, LB Waltham Forest or LB Haringey, and no monitoring is undertaken on behalf of Defra for HF in the UK.

2.5.26 Non-automatic monitoring for HCl is undertaken at one site in London, Cromwell Road in the Royal Borough of Kensington and Chelsea, which is closest to the Application Site, and concentrations for 2012 to 2014 are shown in Vol 2 Table 2.10 (see Vol 2 Figure 2.3 of the EA (AD06.02) for locations).

2.5.27 There is no annual mean standard for HCl, however concentrations are considered to be low, as a 2006 report by the Expert Panel of Air Quality Standards[15] proposed an hourly mean guideline value of 750µg/m^3, which the concentrations at Cromwell Road are well below.

Vol 2 Table 2.10: Annual mean HCl concentrations

Site	Type	Distance from Application Site boundary	Annual mean HCl concentration (µg/m^3)		
			2012	2013	2014
Cromwell Road	Non-Auto - Roadside	16.1km	0.4	0.4	0.3

Non-Auto = non-automatic monitor.

Ammonia

2.5.28 No monitoring for ammonia (NH_3) is undertaken in LB Enfield, LB Waltham Forest or LB Haringey.

2.5.29 Non-automatic monitoring for NH_3 is undertaken at one site in London, which is closest to Application Site, and concentrations for 2012 to 2014 are shown in Vol 2 Table 2.11.

2.5.30 There are no UK or European air quality standards for NH_3. The EA H1 guidance has suggested an Environmental Assessment Levels for ammonia of 180µg/m^3 for long-term exposure. Concentrations of NH_3 at Cromwell Road are well below this level.

Vol 2 Table 2.11: Annual mean NH_3 concentrations

Site	Type	Distance from Application Site boundary	Annual mean NH_3 concentration (µg/m^3)		
			2012	2013	2014
Cromwell Road	Non-Auto - Roadside	16.1km	3.1	2.8	3.5
Environmental assessment level			**180**		

Non-Auto = non-automatic monitor.

Dioxins and furans

2.5.31 No monitoring for dioxins (polychlorinated dibenzo-p-dioxins) and furans (polychlorinated dibenzofurans) is undertaken in LB Enfield, LB Waltham Forest or LB Haringey.

2.5.32 Non-automatic monitoring for dioxins and furans is undertaken at one site in London, Nobel House in Westminster, which is the closest monitoring

[15] Expert Panel of Air Quality Standards (2006) Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects, February 2006.

site to the Application Site. Data was not available for this site after 2010, and so concentrations for 2008 to 2010 are shown in Vol 2 Table 2.12.

2.5.33 There are no UK or European air quality standards for dioxins and furans. A 2009 report on dioxin and furan concentrations in the UK[16] noted that concentrations were highest at the London Nobel House site in the UK.

Vol 2 Table 2.12: Annual mean dioxin and furan concentrations

Site	Type	Distance from Application Site boundary	Annual dioxin and furan concentration (fgTEQ/m^3)		
			2008	2009	2010
London Nobel House	Non-Auto – Urban Background	14.3km	11.0	41.5	48.7

Non-Auto = non-automatic monitor.

Trace metals

2.5.34 No monitoring for trace metals is undertaken in LB Enfield, LB Waltham Forest or LB Haringey.

2.5.35 The closest trace metals monitoring sites to the Application Site are Cromwell Road in London (which is 16.1km from the Application Site boundary) and Detling in Kent (which is 55km from the Application Site boundary).

2.5.36 Concentrations of trace metals for 2012 to 2014 are shown in Vol 2 Table 2.13 (see Vol 2 Figure 2.3 for monitoring site locations). There is no monitoring undertaken for Tl in the UK.

2.5.37 Concentrations for all trace metals at both monitoring sites are below the relevant air quality standards or determined assessment criteria.

Vol 2 Table 2.13: Annual mean trace metals concentrations

Year	Annual mean concentration (ng/m^3)										
	As	Cd	Co	Cr	Cu	Hg	Mn	Ni	Pb	Sb	V
Cromwell Road											
2012	0.7	0.1	0.2	5.3	36.0	2.0	8.5	1.6	9.1	*	1.5
2013	0.9	0.1	0.1	3.6	35.4	2.9	8.7	1.8	8.8	*	1.5
2014	*	*	*	*	*	*	*	*	*	*	*
Detling											
2012	0.8	0.1	0.1	0.2	4.4	0.8	2.5	1.0	7.2	1.2	1.4

[16] Department for the Environment Food and Rural Affairs (2009) Annual Report for 2009 on the UK Toxic Organic Micro-pollutants (TOMPs) Air Monitoring and Analysis Network

Year	Annual mean concentration (ng/m^3)										
	As	Cd	Co	Cr	Cu	Hg	Mn	Ni	Pb	Sb	V
2013	0.8	0.3	0.1	1.2	4.3	0.7	3.5	1.4	8.4	1.3	1.7
2014	0.8	0.2	0.1	1.0	4.2	*	2.9	1.5	6.8	0.7	1.7
AQS	**3**	**5**	**1000**	**5000**	**10000**	**250**	**150**	**20**	**250**	**5000**	**5000**

*no or insufficient valid results available for this year; AQS = air quality standard or assessment criteria.

PAHs: Benzo(a)pyrene

2.5.38 No monitoring for polycyclic aromatic hydrocarbons (PAHs) is undertaken in LB Enfield, LB Waltham Forest or LB Haringey.

2.5.39 Benzo(a)pyrene or B(a)P is considered to be a marker for all PAHs, and non-automatic monitoring for this is undertaken at four sites in London (see Vol 2 Figure 2.3 for monitoring site locations).

2.5.40 Concentrations of B(a)P for 2012 to 2014 are shown in Vol 2 Table 2.14. Concentrations at all monitoring sites are below the air quality standard for PAHs.

Vol 2 Table 2.14: Annual mean benzo(a)pyrene concentrations

Site	Type	Distance from Application Site boundary	Annual mean B(a)P concentration (ng/m^3)		
			2012	2013	2014
London Brent	Non-Auto - Urban Traffic	16.4km	0.20	0.17	0.15
London Crystal Palace Parade	Non-Auto - Urban Traffic	21.0km	0.23	0.20	0.17
London Nobel House	Non-Auto - Urban Background	14.3km	*	0.07	*
London Marylebone Road	Non-Auto - Urban Traffic	12.7km	0.23	0.22	0.23
Air quality standard			**0.25**		

*no or insufficient valid results available for this year; Non-Auto = non-automatic monitor.

Estimated background concentrations

2.5.41 In addition to using monitoring data to determine background baseline pollutant concentrations, Defra has produced estimated background air pollution data for certain pollutants for each 1x1km OS grid square for each local authority area[17]. Background maps are available for 2010 and

[17] Department for the Environment, Food and Rural Affairs, Background mapping data for local authorities http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011 (Accessed July 2015).

projected through to 2030. Years 2013 to 2015 have been selected for review, to give an overview of baseline conditions over recent years.

2.5.42 Estimated pollutant concentrations in the OS grid square where the Application Site is located are presented in Vol 2 Table 2.15. The annual mean background concentrations for NO_2 and PM_{10} are predicted to be below the air quality standard of 40µg/m^3, designated for the protection of human health. The annual mean background concentrations for NO_x are predicted to be above the air quality standard of 30µg/m^3, designated for the protection of ecosystems, although the standard does not apply in this location.

Vol 2 Table 2.15: Estimated NO_x, NO_2 and PM_{10} background pollutant concentrations

Year	**OS grid square**		**Annual mean concentration (µg/m^3)**		
	x	**y**	**NO_x**	**NO_2**	**PM_{10}**
2013	535500	192500	54.4	32.8	23.9
2014			52.4	31.9	23.4
2015			50.5	30.9	23.0
Air quality standard			**30***	**40**	**40**

* Designated for the protection of ecosystems only.

2.5.43 The Defra background maps for SO_2, CO and benzene were last updated in 2001. Estimated pollutant concentrations in the OS grid square where the Application Site is located are presented in Vol 2 Table 2.16. The 2001 CO and benzene concentrations have been factored up to 2013, 2014 and 2015 concentrations based on the 'year adjustment factors' provided by Defra[18]. 2014 has been selected as the year for baseline conditions at the Application Site.

2.5.44 For SO_2, Defra recommends that the year adjustment factors are not applied, as away from specific locations near industrial sources or areas of high domestic coal burning, SO_2 background levels would change very little[18]. Annual mean background concentrations for SO_2 are predicted to be below the relevant air quality standard designated for human health.

2.5.45 The annual mean background concentrations for benzene are predicted to be below the relevant air quality standard designated for human health.

2.5.46 The air quality standard for CO of 10mg/m^3 is strictly for a running 8 hour mean, however as the annual mean concentrations are predicted to be very low, it is unlikely this would be exceeded, as there are no reported exceedences of this standard in the UK.

Vol 2 Table 2.16: Estimated SO_2, CO and benzene background pollutant concentrations

Year	**OS grid square**		**Annual mean concentration**		
	x	**y**	**SO_2 (µg/m^3)**	**Benzene (µg/m^3)**	**CO (mg/m^3)**
2001	535500	192500	6.7	1.0	0.5

[18] Department for the Environment, Food and Rural Affairs, year adjustment factors http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html (accessed July 2015)

Year	OS grid square		Annual mean concentration		
	x	y	SO_2 (µg/m³)	Benzene (µg/m³)	CO (mg/m³)
2013			6.7	0.6	0.2
2014			6.7	0.6	0.2
2015			6.7	0.6	0.2
Air quality standard			**20**	**5**	**10**

Monitoring survey

2.5.47 A monitoring survey was undertaken over six months where impacts were expected the vicinity of Edmonton EcoPark to complement the baseline assessment of existing air quality conditions in the area. This comprised continuous and diffusion tube air quality monitoring.

2.5.48 Continuous monitoring involves the use of instruments which continuously draw air through the instrument, and provide data on short averaging periods such as 15 minutes. Diffusion tubes are a non-automatic monitoring method, and provide fortnightly or monthly average data.

2.5.49 Continuous monitoring of NO_x and PM_{10} was undertaken between 19 April 2013 and 8 October 2013. The continuous monitor was located at King's Road household waste recycling centre (ID 5 – refer to Vol 2 Figure 2.4 of the ES (AD06.02)). The site was chosen as a location representative of sensitive receptors.

2.5.50 Monitored data from this location is presented in Vol 2 Table 2.17 and Vol 2 Table 2.18.

2.5.51 No exceedences of the hourly mean NO_2 standard (18 hourly exceedences of 200µg/m^3) or daily mean PM_{10} standard (35 days where concentrations exceed 50µg/m^3) were recorded at this location during the monitoring survey. Average concentrations are also well below the annual mean NO_2 and PM_{10} standards.

Vol 2 Table 2.17: Monitored NO_2 concentrations throughout the monitoring period

Parameter	15-minute average NO_2 (µg/m³)
Minimum	0.3
Average	16.9
Median	14.8
Maximum	90.0
Data capture (per cent)	92.6
Exceedences of the NO_2 hourly standard (200µg/m³)	0 hours

Vol 2 Table 2.18: Monitored PM_{10} concentrations throughout the monitoring period

Parameter	24-hour average PM_{10} (µg/m³)
Minimum	5.4
Average	16.1

Parameter	24-hour average PM_{10} (µg/m^3)
Median	13.8
Maximum	50.2
Data capture (per cent)	95.4
Exceedences of the PM_{10} 24 hour mean standard (50µg/m^3)	1 day

2.5.52 Monitoring using diffusion tubes for NO_2, SO_2 and VOCs was carried out at eleven locations, including those representative of the likely worst-case exposure of emissions from the Project, such as locations to the north and west, which would be downwind of the prevailing south-westerly wind direction.

2.5.53 In order to compare the results with applicable air quality standards, they have been annualised[19] and bias adjusted as required in the methodology set out in LAQM TG(09)[20]. No continuous monitoring of VOCs is available within the vicinity of the monitoring locations therefore annualisation of the data could not be undertaken, however, monitored results show that pollutant concentrations are very low (highest benzene concentration recorded was 1.1µg/m^3, which is well below the 5µg/m^3 air quality standard) and results are considered highly unlikely to exceed the annual mean standards.

2.5.54 This is also the case for SO_2 where the majority of monitored results were below the limit of detection of the laboratory, with the highest concentration recorded being 1.7µg/m^3. Therefore it is highly unlikely that there would be an exceedence of the annual mean standard of 20µg/m^3 for SO_2. Vol 2 Table 2.19 presents the adjusted annual mean NO_2 concentrations for comparison with the annual mean NO_2 air quality standard of 40µg/m^3. Once the data was annualised and bias adjusted, no exceedences of the annual mean NO_2 standard are recorded. Two locations (Sites 1 and 6) are at risk of exceeding the annual mean NO_2 standard, with concentrations greater than 40µg/m$^{3;}$ these locations are within the vicinity of major roads and therefore is it expected that concentrations may be elevated.

Vol 2 Table 2.19: Adjusted annual mean NO_2 concentrations

ID	Name	Period mean (19/03/2013 – 12/09/2013)	Annual mean	Local bias adjusted annual mean
		NO_2 (µg/m^3)		
1	Claremont Road	35.1	**44.6**	36.8
		37.6	**47.7**	39.4
2	Brookfield Road	28.2	35.8	29.6
		26.7	34.0	28.0
3	Woodlands Road	26.4	33.5	27.7
		25.9	32.9	27.2

[19] Annualisation is a correction applied to monitoring results when a full calendar year of data is not available.
[20] Department for the Environment, Food, and Rural Affairs (2009) Local Air Quality Management Technical Guidance LAQM.TG(09).

ID	Name	Period mean (19/03/2013 – 12/09/2013)	Annual mean	Local bias adjusted annual mean
		NO_2 (µg/m³)		
4	Sedcote Road	26.0	33.1	27.3
		26.0	33.1	27.3
5	King's Road household waste recycling centre	19.7	25.0	20.6
		19.0	24.1	19.9
		19.8	25.1	20.7
6	Old Church Road	34.6	**43.9**	36.2
		36.1	**45.9**	37.9
9	Lower Hall Lane	24.3	30.9	25.5
		25.8	32.8	27.1
10	Waverley Avenue	27.6	35.0	28.9
		26.8	34.0	28.1
11	Durban Road	24.7	31.3	25.9
		25.2	32.0	26.4

Exceedences of the annual mean NO_2 standard value are highlighted in **bold.**

2.5.55 It is concluded that as NO_2 and PM_{10} concentrations monitored in the vicinity of the Application Site are below the predicted Defra modelled concentrations for the Application Site, the Defra modelled concentrations have been used as the background for the modelling study, as a precautionary assumption.

Background summary

2.5.56 A summary of the background concentrations by pollutant is shown in Vol 2 Table 2.20. This shows the selected background concentrations for the Application Site for each pollutant (for use in the air quality modelling as reported in Section 2.8), and the reasoning behind their choice.

2.5.57 The use of Defra background map concentrations are considered to be representative of concentrations at the Application Site where no monitoring is undertaken at the Application Site itself.

Vol 2 Table 2.20: Summary of background concentrations by pollutant

Pollutant	Source	Year	Reasoning	Annual mean concen-tration
NO_x	Defra Background Maps	2014	Concentrations are considered to be representative of concentrations at the Application Site.	52.4 µg/m³
NO_2	Defra Background Maps	2014	Concentrations are considered to be representative of concentrations at the Application Site.	31.9 µg/m³
PM_{10}	Defra Background Maps	2014	Concentrations are considered to be representative of concentrations at the Application Site.	23.4 µg/m³

Pollutant	Source	Year	Reasoning	Annual mean concen-tration
$PM_{2.5}$	Defra Background Maps	2014	Concentrations are considered to be representative of concentrations at the Application Site.	16.0 µg/m^3
CO	Defra Background Maps	2014	Results from monitoring sites have been reviewed, however concentrations from the background maps are higher, and have therefore been used as a precautionary assumption.	0.60 µg/m^3
Benzene	Defra Background Maps	2014	Results from monitoring sites have been reviewed, and concentrations from the background maps are the same as monitored concentrations.	0.20 µg/m^3
SO_2	Defra Background Maps	2014	Results from monitoring sites have been reviewed, however concentrations from the background maps are higher, and have therefore been used as a precautionary assumption.	6.7 µg/m^3
HF and HCl	HCl – London Cromwell Road HF – No available monitoring data	2012-2014	Average HCl results from closest monitoring site to the Application Site for latest available years have been used.	0.38 µg/m^3
NH_3	London Cromwell Road	2012-2014	Average results from closest monitoring site to the Application Site for latest available years have been used.	3.1 µg/m^3
Dioxins and furans	London Nobel House	2008-2010	Average results from closest monitoring site to the Application Site for latest available years have been used. Also, the London site has the highest concentrations in the UK.	33.7 fgTEQ/m^3
As	Detling	2012-2014	Annual average monitored concentrations for period from 2012-2014 were higher than at Cromwell Road, and have therefore been used as a precautionary assumption.	0.79 ng/m^3
Cd	Detling	2012-2014	Annual average monitored concentrations for period from 2012-2014 were higher than at Cromwell Road, and have therefore been used as a precautionary assumption.	0.21 ng/m^3
Ni	London Cromwell Road	2012-2013	Average results from closest monitoring site to the Application	1.7 ng/m^3

Pollutant	Source	Year	Reasoning	Annual mean concen-tration
			Site for latest available years have been used as a precautionary assumption.	
Ti	No available monitoring data	-	-	-
Hg	London Cromwell Road	2012-2013	Average results from closest monitoring site to the Application Site for latest available years have been used.	2.4 ng/m^3
Pb	London Cromwell Road	2012-2013	Average results from closest monitoring site to Application Site for latest available years have been used.	9.0 ng/m^3
Sb	Detling	2012-2014	No monitoring for antimony is undertaken at Cromwell Road, and therefore results from Detling have been used.	1.1 ng/m^3
Cr	London Cromwell Road	2012-2013	Average results from closest monitoring site to the Application Site for latest available years have been used.	4.4 ng/m^3
Co	London Cromwell Road	2012-2013	Average results from closest monitoring site to the Application Site for latest available years have been used.	0.14 ng/m^3
Cu	London Cromwell Road	2012-2013	Average results from closest monitoring site to the Application Site for latest available years have been used.	35.7 ng/m^3
Mn	London Cromwell Road	2012-2013	Average results from closest monitoring site to the Application Site for latest available years have been used.	8.6 ng/m^3
V	Detling	2012-2014	Annual average monitored concentrations for period from 2012-2014 were higher than at Cromwell Road, and have therefore been used as a precautionary assumption.	1.6 ng/m^3
B(a)P	London Brent	2012-2014	As the closest urban background monitoring site, concentrations are considered to be representative of the Application Site.	0.18 ng/m^3

Note: For the operational air quality modelling study the Defra Background Map data for the grid squares within the 10 by 10km modelled grid or the grid square in which a discrete receptor is located have been used to determine the background pollutant concentration.

Industrial processes

2.5.58 Industrial air pollution sources are regulated through a system of operating permits or authorisations, requiring stringent emission limits to be met and ensuring that any releases to the environment are minimised or rendered harmless. Regulated (or prescribed) industrial processes are classified as Part A or Part B processes, regulated through the Pollution Prevention and Control system[21, 22]. The larger more polluting processes (Part A) are regulated by the EA and the smaller less polluting ones (Part B) by the local authorities. Local authorities tend also to regulate only for emissions to air whereas the EA regulates emissions to air, water and land.

2.5.59 There are eleven Part A processes within 10km of the Application Site, which all lie within 5km of the Edmonton EcoPark and one of these processes is the existing Edmonton facility. Details of these processes and their proximity to the Application Site are given in Vol 2 Table 2.21. Pollutant concentrations from these works are included within the background concentrations for the area and as such, do not require specific inclusion within the model.

Vol 2 Table 2.21: Part A processes within 10km of the Application Site

Company	Process	OS grid square		Distance from Application Site boundary (direction)
		x	y	
Arla Foods Ltd	Animal, Vegetable and Food	532100	192350	3.5km (W)
North Middlesex University Hospital Trust	Radioactive Substances	533430	192280	2.2km (W)
Coca Cola Enterprises	Food	535400	192500	300m (W)
LondonWaste Ltd	Waste Processes	535760	192640	On Site
Thames Water Utilities Ltd	Water	535660	193710	750m (N)
Aesica Pharmaceuticals Ltd	Pharmaceuticals	536090	195340	2.4km (N)
G R Wright and Sons Ltd	Animal, Vegetable and Food	536230	195580	2.6km (N)
Rimex Metals UK (Ltd)	Metal Production	536290	196210	3.3km (N)
dJohnson Matthey PLC	Metal Production	536620	196620	3.7km (N)
UOP Ltd	Inorganic Chemicals	536550	196650	3.7km (N)
EON UK PLC	Combustion	536800	197700	4.8km (N)

Odour

2.5.60 Engagement with LB Enfield indicated that there were 83 odour complaints received by the council between 18 November 2005 and 17 June 2014. LB

[21] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

[22] The Environmental Permitting (England and Wales) (Amendment) Regulations 2013, SI 2013/390

Enfield advised that the odour complaints *"will all be based around the composting at the EcoPark"*. One abatement notice was served regarding the odour on 3 August 2006; no breaches of the notice have been observed.

2.5.61 The location of the complaints range through postcodes N18 and N9. The roads identified in Vol 2 Figure 2.5 give an indication of the addresses from which the odour complaints originate.

2.5.62 Based on the complaints recorded, it is considered that there is the potential for odour in the vicinity of the Application Site from the existing operations (IVC).

Ecological critical levels and loads

2.5.63 Ecological sites within 10km are listed in Vol 2 Table 2.22; each site has a separate critical load, details for which have been taken from the Air Pollution Information System online resource[23].

Vol 2 Table 2.22: Ecological sites within 10km of the Application Site[24]

Designated site	Average background deposition (kgN/ha/yr)*	Critical load - nitrogen deposition (kgN/ha/yr)*	Closest distance to stack (km)
Chingford Reservoirs Site of Special Scientific Interest (SSSI)	19.78	20-30	0.5
Epping Forest SSSI	17.41	8-15	3
Epping Forest SAC	17.31	10-20	3
Walthamstow Reservoir SSSI	19.13	20-30	1.9
Lee Valley Special Protection Area (SPA)/Ramsar	18.41	15-30	1.9

*kilograms of nitrogen per hectare per year

Future baseline

2.5.64 The estimated background air pollution data for each 1x1km OS grid square produced by Defra predicts concentrations projected through to 2030 for NO_2 and PM_{10}.

2.5.65 Estimated pollutant concentrations in the OS grid square where the Application Site is located, for the starting year of each of the development stages are presented in Vol 2 Table 2.23. The annual mean background concentrations in each of the years for NO_2 and PM_{10} are predicted to be below the air quality standard of 40µg/m^3 designated for the protection of human health. Annual mean NO_x concentrations for all years are predicted to be above the air quality standard of 30µg/m^3 designated for the protection of ecosystems. However, the standard does not strictly apply at the Application Site as it is not an area of ecological sensitivity.

2.5.66 The starting year (as indicated in Vol 2 Table 2.23) for each Project stage has been selected as a precautionary assumption, as air pollutant concentrations are expected to improve with time.

[23] Air Pollution Information System online resource http://www.apis.ac.uk/srcl (Accessed July 2015).

Vol 2 Table 2.23: Estimated NO_x, NO_2 and PM_{10} future background pollutant concentrations

Stage	Starting year	OS grid square		Annual mean concentration ($\mu g/m^3$)		
		x	y	NO_x	NO_2	PM_{10}
Stage 1	2019	535500	192500	40.4	25.6	22.3
Stage 2	2025			32.3	21.2	21.7
Stage 3	2026			32.1	21.0	21.7
Stage 4	2028			31.6	20.7	21.8
Air quality standard				**30***	**40**	**40**

*designated for the protection of ecosystems

2.5.67 Predicted future baseline concentrations for Stages 1 to 4 (2019 to 2028) are available for NO_x, NO_2 and PM_{10}. Data for SO_2, CO and benzene are only available for 2001, but can be factored forward. Defra provide adjustment factors for the period 2001 to 2025[18], and as such predicted future concentrations for Stages 1 and 2 (stages expected to be undertaken by 2025) are shown in Vol 2 Table 2.24. Annual mean background concentrations for SO_2 and benzene are predicted to be below the relevant air quality standard designated for human health in 2019 and 2025.

2.5.68 The air quality standard for CO of 10mg/m^3 is strictly for a running 8 hour mean, however as the future annual mean concentrations are predicted to be very low, it is unlikely this would be exceeded.

Vol 2 Table 2.24: Estimated SO_2, CO and benzene background pollutant concentrations

Stage	Starting year	OS grid square		Annual mean concentration		
		x	y	SO_2 ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	CO (mg/m^3)
Stage 1	2019	535500	192500	6.7	0.7	0.2
Stage 2	2025			6.7	0.7	0.2
Air quality standard				**20**	**5**	**10**

2.5.69 Pollutant emissions and background concentrations are expected to improve in the future, however, to ensure a worst-case approach is taken, data for 2014 has been used in the air quality assessment for all pollutants and for all future years. As such, the future baseline is included for information for these pollutants, but has not been specifically used in the operational air quality assessment which uses background concentrations detailed in Vol 2 Table 2.20 for all modelled scenarios.

Receptor identification and sensitivity

2.5.70 Sensitive receptors are defined as those residential properties/schools/ hospitals that are likely to experience a change in pollutant concentrations and/or dust nuisance due to the construction and operation of the Project.

2.5.71 Designated ecological sites such as Special Areas of Conservation (SACs), SPAs, SSSIs and Ramsar sites are also included in the assessment as sensitive receptors.

Construction

2.5.72 Sensitive receptors have been identified for the construction assessment, and are applicable to all stages of construction.

2.5.73 Vol 2 Figure 2.6 of the ES (AD06.02) identifies the receptors within 350m of the Application Site boundary.

2.5.74 The closest residential receptors to the Application Site are:

a. Badma Close approximately 60m to the west

b. Zambezie Drive, approximately 125m to the west

c. Lower Hall Lane, approximately 150m to the east

d. Proposed residential receptors at Meridian Water to the south (assumed to be within 300m of the Application Site boundary) and Pumping Station House 110m to the east of the Temporary Laydown Area Application Site boundary.

2.5.75 The closest ecological receptors are William Girling Reservoir (approximately 300m to the north-east), which along with the King George's Reservoir, is designated as a SSSI.

Operation

2.5.76 Sensitive receptors have been identified within 10km of the centre of the Application Site for the operational stages of the Project and represent appropriate receptors for the assessment of combustion source emissions and human health. These receptors cover a wider area than for the construction assessment, due to the wider impact area of stack emissions compared to construction emissions, and are shown in Vol 2 Figure 2.7 of the ES (AD06.02) and in Vol 2 Table 2.25.

2.5.77 Residential properties and other sensitive locations such as schools close to the Application Site, have been selected as receptors. In addition to the discrete receptor locations, a 10km by 10km grid has also been modelled to ensure coverage of all possible receptor locations in the vicinity of the Project. This is shown in Vol 2 Figure 2.8 of the ES (AD06.02).

2.5.78 The consideration of receptors within 10km of the Application Site is recommended for the screening of nature conservation sites by the EA[10]. For consistency this distance has been applied for the operational effects of the Project for both human health and ecology.

2.5.79 Ecological receptors locations are shown in Vol 2 Figure 2.9 of the ES (AD06.02). These are locations around William Girling Reservoir.

Vol 2 Table 2.25: Operational assessment receptor locations

Receptor ID	OS grid reference		Height (m)	Distance from stack (m)		Direction
	X	Y		Existing EfW facility	ERF	
Human receptors						
1	536326	192465	1.5	627	802	To E of Application Site
2	536390	192542	1.5	676	819	To E of Application Site

Receptor ID	OS grid reference		Height (m)	Distance from stack (m)		Direction
	X	Y		Existing EfW facility	ERF	
3	536478	192261	1.5	839	1,044	To E of Application Site
4	536431	192162	1.5	847	1,073	To E of Application Site
5	536531	192719	1.5	819	896	To E of Application Site
6	536681	192949	1.5	1,019	1,028	To E of Application Site
7	536789	192022	1.5	1,226	1,436	To E of Application Site
8	536789	192251	1.5	1,132	1,309	To E of Application Site
9	536800	192666	1.5	1,083	1,170	To E of Application Site
10	536925	192994	1.5	1,264	1,274	To E of Application Site
11	536821	193220	1.5	1,257	1,210	To NE of Application Site
12	536908	193495	1.5	1,478	1,387	To NE of Application Site
13	537217	193203	1.5	1,549	1,541	To NE of Application Site
14	534923	191311	1.5	1,530	1,751	To SW of Application Site
15	536880	192494	1.5	1,169	1,292	To NE of Application Site
16	534904	192337	1.5	861	939	To W of Application Site
17	534958	192523	1.5	766	792	To W of Application Site
18	535101	192578	1.5	618	641	To W of Application Site
19	535116	192710	1.5	609	572	To W of Application Site
20	535084	192863	1.5	680	571	To W of Application Site
21	535069	192998	1.5	752	593	To W of Application Site
22	534702	192985	1.5	1,081	956	To W of Application Site
23	534494	192820	1.5	1,241	1,163	To W of Application Site
24	534463	192404	1.5	1,273	1,290	To W of Application Site
25	535137	193250	1.5	858	623	To W of Application Site
26	535440	193285	1.5	722	438	To W of Application Site
27	535483	193418	1.5	834	544	To W of Application Site
28	535532	193615	1.5	1,014	723	To NW of Application Site
29	534672	193307	1.5	1,253	1,062	To W of Application Site
30	534848	193615	1.5	1,323	1,076	To W of Application Site
31	535109	193782	1.5	1,314	1,035	To NW of Application Site
32	535348	193899	1.5	1,334	1,043	To NW of Application Site
33	535289	193329	1.5	830	562	To W of Application Site
34	535774	193917	1.5	1,300	1,022	To N of Application Site
35	535975	193888	1.5	1,296	1,037	To N of Application Site
36	535048	192151	1.5	816	965	To SW of Application Site
37	535108	192015	1.5	858	1,042	To SW of Application Site
38	535499	191989	1.5	666	926	To S of Application Site
39	535673	191965	1.5	655	937	To S of Application Site
40	535743	191924	1.5	695	982	To S of Application Site
41	535866	191864	1.5	768	1,059	To S of Application Site
42	535954	191647	1.5	999	1,290	To S of Application Site
43	534991	192230	1.5	824	944	To SW of Application Site
44	534883	192033	1.5	1,019	1,162	To SW of Application Site
45	534799	191902	1.5	1,166	1,316	To SW of Application Site
46	534813	191648	1.5	1,326	1,510	To SW of Application Site

Receptor ID	OS grid reference		Height (m)	Distance from stack (m)		Direction
	X	Y		Existing EfW facility	ERF	
47	534820	191439	1.5	1,483	1,685	To SW of Application Site
48	534785	191044	1.5	1,830	2,051	To SW of Application Site
49	535877	191031	1.5	1,595	1,884	To SE of Application Site
50	535781	190813	1.5	1,806	2,093	To SW of Application Site
51	536190	191057	1.5	1,631	1,922	To SW of Application Site
52	536543	191108	1.5	1,721	2,002	To SW of Application Site
53	535964	190902	1.5	1,733	2,024	To SW of Application Site
54	535731	194625	1.5	2,007	1,725	To N of Application Site
55	534858	194334	1.5	1,920	1,639	To NW of Application Site
56	534050	193710	1.5	1,993	1,796	To W of Application Site
57	533242	192667	1.5	2,476	2,423	To W of Application Site
58	532942	193649	1.5	2,961	2,813	To W of Application Site
59	533487	194593	1.5	2,980	2,749	To NW of Application Site
60	534092	195241	1.5	3,086	2,812	To NW of Application Site
61	535712	195583	1.5	2,965	2,682	To N of Application Site
62	537328	194146	1.5	2,220	2,086	To NE of Application Site
63	537769	193667	1.5	2,304	2,250	To NE of Application Site
64	537887	193127	1.5	2,228	2,244	To NE of Application Site
65	537868	192357	1.5	2,166	2,280	To E of Application Site
66	537868	194945	1.5	3,168	3,012	To NE of Application Site
67	538234	194470	1.5	3,125	3,020	To NE of Application Site
68	538582	193743	1.5	3,077	3,046	To NE of Application Site
69	538859	192695	1.5	3,142	3,212	To E of Application Site
70	537746	192000	1.5	2,120	2,278	To E of Application Site
71	537563	191423	1.5	2,198	2,415	To SE of Application Site
72	537290	190671	1.5	2,502	2,767	To SE of Application Site
73	536027	190164	1.5	2,473	2,763	To S of Application Site
74	536938	189896	1.5	2,983	3,268	To SE of Application Site
75	535938	189488	1.5	3,138	3,426	To S of Application Site
76	537962	190521	1.5	3,071	3,316	To SE of Application Site
77	538352	191263	1.5	2,962	3,157	To SE of Application Site
78	538685	192418	1.5	2,974	3,070	To E of Application Site
79	534675	190549	1.5	2,317	2,549	To S of Application Site
80	533951	191028	1.5	2,377	2,532	To SW of Application Site
81	533895	191855	1.5	1,976	2,047	To SW of Application Site
82	533843	192259	1.5	1,909	1,922	To S of Application Site
83	533017	192315	1.5	2,718	2,702	To W of Application Site
84	532801	191780	1.5	3,035	3,066	To SW of Application Site
85	533336	191385	1.5	2,682	2,770	To SW of Application Site
86	533458	190512	1.5	3,089	3,246	To SW of Application Site
87	534238	190267	1.5	2,778	2,991	To SW of Application Site
88	533980	189845	1.5	3,273	3,486	To SW of Application Site
89	537511	192655	1.5	1,793	1,873	To E of Application Site
90	534361	194275	1.5	2,141	1,885	To NW of Application Site

Receptor ID	OS grid reference		Height (m)	Distance from stack (m)		Direction
	X	Y		Existing EfW facility	ERF	
91	535048	194871	1.5	2,350	2,060	To NW of Application Site
92	535557	191578	1.5	1,052	1,327	To S of Application Site
93	534953	191953	1.5	1,014	1,180	To SW of Application Site
Ecological receptors						
E1	536126	193021	0	573	487	Chingford Reservoir
E2	536179	193231	0	767	619	Chingford Reservoir
E3	536273	193493	0	1,037	856	Chingford Reservoir
E4	536284	192905	0	634	630	Chingford Reservoir
E5	536462	192863	0	784	809	Chingford Reservoir
E6	538006	194754	0	3,130	2,994	Epping Forest
E7	538132	195584	0	3,824	3,651	Epping Forest
E8	539540	194628	0	4,318	4,252	Epping Forest
E9	539498	193756	0	3,947	3,938	Epping Forest
E10	539099	192622	0	3,381	3,456	Epping Forest
E11	538700	190899	0	3,442	3,645	Epping Forest
E12	535433	190794	0	1,846	2,120	Lee Valley Ramsar and Walthamstow Reservoirs
Notes: The height of receptors has been based on professional judgement. Ecological receptors are taken to be ground level where nitrogen deposition occurs and vegetation are located in the main. Human receptors are located at 1.5m, deemed to be an average height of a person[20]. N = north, S = south, E = east, W = west, NE = north-east, NW = north-west, SE = south-east, SW = south-west.						

2.5.80 For the assessment of fugitive emissions and odour, the closest sensitive receptors are considered.

Human health

2.5.81 For the ERF, residential exposure within the immediate vicinity is limited by the industrial nature of the Application Site. The nearest residential areas are to the east at Chingford, Higham Hill to the south-east and Upper Edmonton to the west. In addition, there are residential areas located within Chingford Green, Lower Edmonton, Ponders End and Tottenham. Therefore, seven areas where residential exposure may occur have been defined based on these locations. There are a large number of allotments within the urban area and these are not necessarily located within residential areas. Therefore, an allotment receptor has been identified based on the maximum exposure for these allotments assuming that the resident lives on or close to the allotment and consumes all of his or her vegetables from the allotment.

2.5.82 The urban nature of the land use around the Application Site means that areas used for farming are very limited and the only area identified is located to the north-west beyond Chingford Green. Therefore, farmer receptors have been selected based on this area.

2.5.83 For each type of receptor, up to nine locations are selected based on the maximum predicted airborne concentration, maximum predicted wet deposition rate and maximum dry deposition rate for gas, particle and particle bound phases. These maxima are often co-located, however, and each receptor type could have between one and nine identified receptor locations per defined area.

2.5.84 For the proposed ERF, 17 residential allotment receptors, two farmer receptors and 11 residential receptors have been assessed. For all of the receptor types, adult and child receptors have been considered. The locations of the allotment, resident and farmer receptors are presented in Vol 2 Table 2.26 and Vol 2 Figure 2.10 of the ES (AD06.02). At other locations not specifically considered in the assessment, the predicted hazards and risks would be lower than predicted for the discrete receptors considered.

Vol 2 Table 2.26: Human health assessment receptor locations

Receptor name	Code	Grid reference X	Grid reference Y
Allotment A01	A01	537818	195318
Allotment A02	A02	537718	193118
Allotment A03	A03	537018	191918
Allotment A04	A04	537318	191518
Allotment A05	A05	536118	190218
Allotment A06	A06	536518	190218
Allotment A07	A07	538618	190618
Allotment A08	A08	535718	190718
Allotment A09	A09	535118	190918
Allotment A10	A10	534818	193318
Allotment A11	A11	535718	195218
Allotment A12	A12	535018	195018
Allotment A13a	A13a	533618	194318
Allotment A13b	A13b	533518	194218
Allotment A14	A14	533218	192418
Allotment A15	A15	532818	191618
Allotment A16	A16	533318	191218
Farmer North 1	FN1	538318	195318
Farmer North 2	FN2	537718	196118
Resident Chingford	CF	536818	193318
Resident Chingford Green 1	CFG1	538618	194418
Resident Chingford Green 2	CFG2	537518	195018
Resident Higham Hill 1	HH1	536018	191018

Receptor name	Code	Grid reference X	Grid reference Y
Resident Higham Hill 2	HH2	536218	191018
Resident Higham Hill 3	HH3	536318	191018
Resident Lower Edmonton	REL	534218	193018
Resident Ponders End	RPE	535618	194018
Resident Tottenham	RTH	534818	191618
Resident Upper Edmonton 1	RUE1	535018	192918
Resident Upper Edmonton 2	RUE2	535418	193318

2.6 Potential effects and good environmental design management

2.6.1 The Project is described in Volume 1 of the ES (AD06.02). The elements of the Project relevant to air quality and odour are set out below.

Construction

2.6.2 During construction, the Project has the potential to impact air quality through emissions from construction and demolition activities and traffic emissions from construction vehicles travelling to/from the Application Site. This may cause dust deposition or elevated PM_{10} concentrations.

2.6.3 Dust and PM_{10} concentrations within the Application Site would be managed using best practicable means and would be monitored using appropriate methods to show that the mitigation used is effective and appropriate.

2.6.4 Appropriate mitigation measures are outlined in the CoCP (Vol 1 Appendix 3.1) which includes specific measures in relation to vehicles, plant and equipment, transport storage and handling, conveyors, demolition, excavations and earthworks, processing, crushing, cutting and grinding activities, monitoring procedures and odour (including complaints procedures).

2.6.5 During Stage 1 of the Project, the IVC facility would be removed. This has the potential to improve odour conditions in the vicinity of the Application Site.

Operation

2.6.6 Combustion source emissions are related to the operation of the EfW facility, the ERF and the diesel generators.

2.6.7 Two flue gas treatment (FGT) mitigation technology options are proposed for the ERF; wet and combined. Emissions for both systems are the same and the wet scenario has been modelled, and can be considered representative of both technology options.

2.6.8 If the wet option is used, then reheating can be also used to raise the temperature of the flue gases, which would increase the buoyancy of the emitted gases and improve dispersion. It would also reduce the incidence of visible plumes, and as such, two wet FGT scenarios have been considered for the operational assessment (Stages 3/4); 'wet' without reheat, and 'wet with reheat'.

2.6.9 Both options (wet and combined) would be used with Selective Catalytic Reduction (SCR) to reduce NO_x emissions and manufacturers are likely to guarantee a NO_x emission level of 80mg/Nm^3, compared to the IED main mean emission limit value of 200 mg/Nm^3. Actual NO_x emissions are likely to be lower than 80mg/Nm^3.

2.6.10 The Applicant has therefore proposed a NO_x emission limit of 80mg/Nm^3, which has been used as the basis for a worst-case assessment.

2.6.11 In addition to the operation of the ERF at Stages 3/4, there would be a transition stage (Stage 2) between the existing EfW facility and the proposed ERF. The transition stage is expected to last for around six months, however it has been assessed for a full year as a worst-case assessment. The transition stage has also been included in this assessment for the two ERF FGT scenarios; wet and wet with reheat.

2.6.12 The operation of the Project also has the potential to impact fugitive emission levels[11], plume visibility, odour and human health, all of which are considered in the operational air quality assessment (Section 2.8).

2.7 Assessment – construction

Sensitive receptors

2.7.1 Sensitive receptors have been identified for the construction assessment, and are applicable to all stages of construction, as a worst-case assessment. This is considered to be a precautionary assumption, as construction would take place in different areas of the Application Site and at different times. Details are included in Section 2.4.

2.7.2 Transient receptors, such as users of access roads, local footpaths and other public rights of way, are not considered to be of high sensitivity as they are not exposed to emissions continuously or for extended periods.

2.7.3 A map is shown in Vol 2 Figure 2.6 of the ES (AD06.02), which identifies the sensitive receptors within 20m, 50m, 100m and 350m of the Application Site boundary, as per the IAQM guidance7.

2.7.4 The closest residential receptors to the Application Site are located on Badma Close, approximately 60m to the west, Zambezie Drive approximately 125m to the west and on Lower Hall Lane approximately 150m to the east of the Application Site boundary (Temporary Laydown Area), and approximately 470m from the operational site boundary.

2.7.5 There are also proposed residential receptors located at the Meridian Water proposed development to the south assumed to be within 300m of the Application Site boundary, and the Pumping Station House approximately 110m to the east of the Application Site boundary. These are shown on Vol 1 Figure 5.1 of the ES (AD06.02).

2.7.6 The closest ecological receptor is the William Girling Reservoir (approximately 300m from the Application Site boundary), which along with the King George's Reservoir (known collectively as the Chingford Reservoirs) is designated as a SSSI.

Construction dust

Need for assessment

2.7.7 The area surrounding the Application Site is generally industrial and commercial in nature. However, there are residential dwellings (receptors) located within 350m of the Application Site boundary. As such, their sensitivity to dust soiling and PM_{10} exposure has been classified as high according to the IAQM guidance and therefore further assessment is required.

2.7.8 There are no ecological receptors within 50m of the Application Site, however for a conservative assessment, these have also been classified as *high* according to the IAQM guidance.

Sensitivity of the area

2.7.9 The sensitivity of the area surrounding the Application Site to dust soiling has been assigned as low in accordance with the IAQM guidance7, due to there being fewer than 100 sensitive receptors within 100m of any potential dust generating activity.

2.7.10 The sensitivity of the area to human health impacts has also been assigned as *low*, due to projected 2014 background PM_{10} concentrations in the 1km by 1km grid square where the Application Site is located being less than $24\mu g/m^3$, and no receptors being located within 20m of any potential dust generating activity (assumed for the purposes of the site assessment to be undertaken up to the Application Site boundary).

2.7.11 The sensitivity of the area to ecological impacts has been assigned as low, due to no statutory ecological receptors being located within 50m of the Application Site boundary. The overall sensitivity has been summarised as shown in Vol 2 Table 2.27.

Vol 2 Table 2.27: Sensitivity of the surrounding area, for all stages

Activity	Sensitivity of the surrounding area			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	Low	Low	Low	Low
Human health	Low	Low	Low	Low
Ecological	Low	Low	Low	Low

Stage 1

Dust emission magnitude

2.7.12 For Stage 1, each dust-generating activity has been assigned a dust emission magnitude, based on the anticipated works in each stage, as shown in Vol 2 Table 2.28.

Vol 2 Table 2.28: Dust emission magnitude for Stage 1 construction activities

Activity	Dust emission magnitude	Reasoning
Demolition	Large	Stage 1a: Clinical waste building and maintenance workshop to be demolished (approximately 1,300m^3 of concrete), demolition of EcoPark House construction zone and RRF construction zone. Stage 1c: Demolition of the fuel preparation plant, Incinerator Bottom Ash (IBA) reprocessing plant, bulky waste recycling facility and IVC plant.
Earthworks	Large	Stage 1a: Site preparation and stripping of topsoil. Stages 1b and 1d: Piling, excavation and foundation works.
Construction	Large	Stage 1a: Construct widened southern entrance and new security gatehouse, and establishment of Temporary Laydown Area. Stage 1b: Construction of RRF and EcoPark House buildings, and attenuation tank and associated drainage of the RRF sub-catchment. Stage 1c: None. Stage 1d: Construction of attenuation tank and associated drainage of the ERF sub-catchment, and construction of the ERF.
Trackout	Large	Maximum number of daily vehicle trips (one-way) associated with construction/demolition is 284, during Stage 1d.

Risk of impacts

2.7.13 Taking into consideration the determined dust emission magnitudes and the sensitivity of the area, the Application Site has been classified as medium risk for all activities in Stage 1 as a precautionary assumption, as shown in Vol 2 Table 2.29.

Vol 2 Table 2.29: Summary dust risk table prior to mitigation for Stage 1

Activity	Dust emission magnitude	Dust soiling	Human health risk	Ecological
Demolition	Large	Medium risk	Medium risk	Medium risk
Earthworks	Large	Low risk	Low risk	Low risk
Construction	Large	Low risk	Low risk	Low risk
Trackout	Large	Low risk	Low risk	Low risk

Significance

2.7.14 Based on the dust risk summary, it is considered that the potential impact of the Project is significant during Stage 1, due to the risk of dust impacts from demolition, without the application of mitigation. It is recommended that appropriate mitigation for a medium risk site be applied to the whole Application Site as a precautionary process. Appropriate mitigation measures are included in the CoCP (Vol 1 Appendix 3.1) (see Paragraph 2.6.3).

2.7.15 With the application of the appropriate mitigation measures the impact would be **not significant**.

Stage 2

Dust emission magnitude

2.7.16 For Stage 2, each dust-generating activity has been assigned a dust emission magnitude, based on the anticipated works, as shown in Vol 2 Table 2.30.

Vol 2 Table 2.30: Dust emission magnitude for Stage 2 construction activities

Activity	Dust emission magnitude	Reasoning
Demolition	-	None anticipated.
Earthworks	-	None anticipated.
Construction	Small	Installation of ERF weighbridges and minor construction works.
Trackout	Small	No construction related traffic.

Risk of impacts

2.7.17 Taking into consideration the determined dust emission magnitudes and the sensitivity of the area, the Application Site has been classified as negligible for all activities in Stage 2, as shown in Vol 2 Table 2.31.

Vol 2 Table 2.31: Summary dust risk table prior to mitigation for Stage 2

Activity	Dust emission magnitude	Dust soiling	Human health risk	Ecological
Construction	Small	Negligible	Negligible	Negligible
Trackout	Small	Negligible	Negligible	Negligible

Significance

2.7.18 Based on the negligible dust risk summary, it is considered that the significance of the Project is not significant during Stage 2. It is recommended that appropriate mitigation for be applied to the whole Application Site during this stage, as best practice. Appropriate mitigation measures are included in the CoCP (Vol 1 Appendix 3.1).

2.7.19 The impact of Stage 2 would be **not significant**.

Stage 3

Dust emission magnitude

2.7.20 For Stage 3, each dust-generating activity has been assigned a dust emission magnitude, based on the anticipated works, as shown in Vol 2 Table 2.32.

Vol 2 Table 2.32: Dust emission magnitude for Stage 3 construction activities

Activity	Dust emission magnitude	Reasoning
Demolition	Large	Demolition of main EfW facility building, and pumping station.
Earthworks	Large	Clearance of northern half of existing EfW facility and excavation of bunker.
Construction	Medium	Completion of staff car parks and attenuation tanks.
Trackout	Large	Maximum number of daily vehicle trips (one-way) is 92.

Risk of impacts

2.7.21 Taking into consideration the determined dust emission magnitudes and the sensitivity of the area, the Application Site has been classified as medium risk for all activities in Stage 3, as shown in Vol 2 Table 2.33.

Vol 2 Table 2.33: Summary dust risk table prior to mitigation for Stage 3

Activity	Dust emission magnitude	Dust soiling	Human health risk	Ecological
Demolition	Large	Medium risk	Medium risk	Medium risk
Earthworks	Large	Low risk	Low risk	Low risk
Construction	Medium	Low risk	Low risk	Low risk
Trackout	Large	Low risk	Low risk	Low risk

Significance

2.7.22 Based on the dust risk summary, it is considered that the significance of the Project is significant during Stage 3, due to the risk of dust impacts from demolition, without the application of mitigation. It is recommended that appropriate mitigation for a medium risk site be applied to the whole Application Site as a precautionary process. Appropriate mitigation measures are included in the CoCP (Vol 1 Appendix 3.1).

2.7.23 With the application of the appropriate mitigation measures the residual impact would be **not significant**.

Odour

2.7.24 During Stage 1 of the Project, the IVC facility would be removed.

2.7.25 Using professional judgement, the FIDOR method assessment has been used to qualitatively determine the degree of odour pollution for Stage 1, as outlined in Vol 2 Table 2.34.

2.7.26 The removal of the IVC facility may result in unpleasant odour, however the removal would be a one-off event and short in duration, therefore it is considered to be low risk.

Vol 2 Table 2.34: Assessment of the level of odour pollution (FIDOR) - construction

FIDOR	Discussion	Odour nuisance risk
Frequency of detection	Infrequent as removal of the IVC is a one off event.	Low
Intensity as perceived	Could be strong, but more likely that the composting odour would be reduced, as the amount of compost has decreased in preparation for IVC removal, which is no different from normal operation.	Low
Duration of exposure	Residential properties likely to be exposed for a short duration whilst IVC is removed.	Low
Offensiveness	Likely to be unpleasant and offensive.	Medium
Receptor sensitivity	Residential receptors considered to have high sensitivity, however they are located more than 100m from the Application Site boundary.	Low

Significance

2.7.27 The removal of the IVC facility would be a one-off event and short in duration, therefore it is considered to be low risk and **not significant**.

Traffic emissions – construction and operation

2.7.28 Any additional vehicle movements associated with the construction and operation of the Application Site would generate exhaust emissions, including NO_2 and PM_{10}, on the local and regional road networks.

2.7.29 A review of the traffic data in Vol 2 Section 10 of the ES (AD06.02) (Transport) for each stage was carried out.

2.7.30 A screening assessment has been undertaken using the criteria contained within the DMRB8 and EPUK/IAQM6 guidance documents to determine the potential for vehicle trips generated by the development to affect local air quality.

2.7.31 Vol 2 Table 2.35 to Vol 2 Table 2.38 show the criteria for identifying whether an air quality assessment is considered necessary; they evaluate the potential impacts of the Application Site during each stage and conclude whether a detailed air quality assessment is required as per the criteria.

2.7.32 For Stage 1, the highest (worst-case) traffic levels are considered for each of Stages 1a, 1b, 1c and 1d.

2.7.33 The construction and operational traffic in each stage have been assessed together, as a precautionary assumption, and professional judgement has been applied to the assessment of each criteria.

2.7.34 The traffic screening assessment for air quality shows that the DMRB thresholds that would require a detailed assessment were not met for any of the stages, although using the EPUK/IAQM screening criteria, further assessment is required.

Vol 2 Table 2.35: Significance of Project traffic with reference to the screening criteria identified by DMRB and EPUK/IAQM – Stage 1

Criteria	Evaluation	Further assessment required?
DMRB		
• Road alignment will change by 5m or more. • Daily traffic flows will change by 1,000 annual average daily traffic (AADT) or more. • Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more. • Daily average speed will change by 10km/hr or more; or peak hour speed will change by 20km/hr or more.	• No roads to be moved, have a change in AADT of more than 1,000, or a change in speed. The highest increase in AADT is on Lee Park Way, which is predicted to experience an increase of 929 AADT in Stages 1c and 1d, and which has zero flow under baseline conditions. • No roads have a change in HDV AADT of more than 200. The highest increase is predicted to be 104 HDVs on Advent Way east of Edmonton EcoPark entrance in Stage 1c.	No
EPUK/IAQM		
• A change of LDV flows of more than 100 in Annual Average Traffic Daily (AADT). • A change of HDV flows of more than 25 AADT. • A change in road alignment of more than 5m. • Introduction of a new junction that causes a significant change in vehicle acceleration/ deceleration. • Introduction or change of a bus station. • Have an underground car park with extraction system.	• Some roads are predicted to experience an increase in AADT greater than 100 LDVs and/or greater than 25 HGVs. • No new junctions, bus stations or underground car parking.	Yes

Vol 2 Table 2.36: Significance of Project traffic with reference to the screening criteria identified by DMRB and EPUK/IAQM – Stage 2

Criteria	Evaluation	Further assessment required?
DMRB		
• Road alignment will change by 5m or more. • Daily traffic flows will change by 1,000 annual average daily traffic (AADT) or more.	• No roads to be moved, have a change in AADT of more than 1,000, or a change in speed. The highest increase in AADT is on Lee Park Way, which is predicted to experience an increase of 583 AADT, and	No

Criteria	Evaluation	Further assessment required?
• Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more. • Daily average speed will change by 10km/hr or more; or peak hour speed will change by 20km/hr or more.	which has zero flow under baseline conditions. • One road is predicted to experience a change in HDV AADT of more than 200, this is Advent Way east of Edmonton EcoPark entrance. However, this is predominantly an industrial area and the road has less than 10,000 AADT.	
EPUK/IAQM		
• A change of LDV flows of more than 100 in Annual Average Traffic Daily (AADT). • A change of HDV flows of more than 25 AADT. • A change in road alignment of more than 5m. • Introduction of a new junction that causes a significant change in vehicle acceleration/ deceleration. • Introduction or change of a bus station. • Have an underground car park with extraction system.	• Some roads are predicted to experience an increase in AADT greater than 100 LDVs and/or greater than 25 HGVs. • No new junctions, bus stations or underground car parking.	Yes

Vol 2 Table 2.37: Significance of Project traffic with reference to the screening criteria identified by DMRB and EPUK/IAQM – Stage 3

Criteria	Evaluation	Further assessment required?
DMRB		
• Road alignment will change by 5m or more. • Daily traffic flows will change by 1,000 annual average daily traffic (AADT) or more. • Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more. • Daily average speed will change by 10km/hr or more; or peak hour speed will change by 20km/hr or more.	• No roads to be moved, have a change in AADT of more than 1,000, or a change in speed. The highest increase in AADT is on Lee Park Way, which is predicted to experience an increase of 737 AADT and which has zero flow under baseline conditions. • One road is predicted to experience a change in HDV AADT of more than 200, this is Advent Way east of Edmonton EcoPark entrance. However, this is predominantly an industrial area and the road has less than 10,000 AADT.	No

Criteria	Evaluation	Further assessment required?
EPUK/IAQM		
• A change of LDV flows of more than 100 in Annual Average Traffic Daily (AADT). • A change of HDV flows of more than 25 AADT. • A change in road alignment of more than 5m. • Introduction of a new junction that causes a significant change in vehicle acceleration/ deceleration. • Introduction or change of a bus station. • Have an underground car park with extraction system.	• Some roads are predicted to experience an increase in AADT greater than 100 LDVs and/or greater than 25 HGVs. • No new junctions, bus stations or underground car parking.	Yes

Vol 2 Table 2.38: Significance of Project traffic with reference to the screening criteria identified by DMRB and EPUK/IAQM – Stage 4

Criteria	Evaluation	Further assessment required?
DMRB		
• Road alignment will change by 5m or more. • Daily traffic flows will change by 1,000 annual average daily traffic (AADT) or more. • Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more. • Daily average speed will change by 10km/hr or more; or peak hour speed will change by 20km/hr or more.	• No roads to be moved, have a change in AADT of more than 1000, or a change in speed. The highest increase in AADT is on Lee Park Way, which is predicted to experience an increase of 737 AADT, and which has zero flow under baseline conditions. • No roads are predicted to experience a change in HDV of more than 200, with the greatest increase being 23 HDV AADT on Advent Way west of Eley Road.	No
EPUK/IAQM		
• A change of LDV flows of more than 100 in Annual Average Traffic Daily (AADT). • A change of HDV flows of more than 25 AADT. • A change in road alignment of more than 5m. • Introduction of a new junction that causes a significant	• Some roads are predicted to experience an increase in AADT greater than 100 LDVs and/or greater than 25 HGVs. • No new junctions, bus stations or underground car parking.	Yes

Criteria	Evaluation	Further assessment required?
change in vehicle acceleration/ deceleration. • Introduction or change of a bus station. • Have an underground car park with extraction system.		

2.7.35 As the EPUK/IAQM criteria were not being met for some roads in all Project stages, further assessment was required.

2.7.36 This assessment has been undertaken using the DMRB screening spreadsheet for the worst-case roads and worst-case Project stages, for roads with nearby receptors. These were identified as follows:

a. Highest increase in LDVs: A406 west of Cooks Ferry Roundabout during Stage 1d. With nearest receptors at Aberdeen Parade, to the north of the A406.

b. Highest increase in HGVs: A406 west of Montagu Road during Stage 3. With nearest receptors at Aberdeen Parade, to the north of the A406.

2.7.37 The inputs to the DMRB screening spreadsheet included the AADT flows for all vehicles, percentage of HGVs, speed and background pollutant concentrations for NO_2 and PM_{10}.

2.7.38 A comparison between the baseline and the relevant Project stages was undertaken and concentrations of annual mean NO_2 and PM_{10} have been predicted at the relevant receptors, for the worst-case Project stages. The worst-case project stages have been selected to represent all Project stages, as a conservative assessment. The change in pollutant concentrations at the relevant receptors as a percentage of the relevant air quality standard has then been determined and compared to EPUK/IAQM benchmarks[24]. This shows that:

a. For the highest increase in LDVs: A406 west of Cooks Ferry Roundabout during Stage 1d. The percentage change in annual mean NO_2 and PM_{10} concentrations in relation to the air quality standard would be an improvement of 0.16 and 0.02 per cent respectively, showing that there would be a negligible impact from the Project during Stage 1d. This slight improvement is due to the predicted reduction in the number HGVs on this road during this stage compared to the baseline.

b. For the highest increase in HGVs: A406 west of Montagu Road during Stage 3. The percentage change in annual mean NO_2 and PM_{10} concentrations in relation to the air quality standard would be a deterioration of 0.25 and 0.05 per cent respectively. Following

[24] Percentage change in concentration relative to Air Quality Assessment Level, as per EPUK/IAQM (2015): Large: >10 per cent, Medium: 6-10 per cent, Small: 2-5 per cent, Imperceptible: 1 per cent, Negligible: <0.5 per cent

EPUK/IAQM guidance this would be considered a negligible impact from the Project during Stage 3.

2.7.39 Based on the further screening assessment, potential air quality impacts from road traffic associated with all stages are predicted to be negligible and **not significant** and can be scoped out from further detailed assessment.

2.8 Assessment – operation

Combustion source emissions

2.8.1 The largest source of emissions associated with the Project is from the combustion stack associated with the proposed ERF (and the existing EfW facility while operational). Emissions would leave the stack and subsequently disperse into the atmosphere.

2.8.2 Long-term average NO_2 process contributions of the ERF have been assessed following the H1 guidance, and this concluded that a detailed dispersion modelling study was required (see Vol 2 Appendix 2.1, Section 1.3 and Table 1).

2.8.3 Dispersion modelling has been carried out to determine the likely impact of the EfW facility and ERF stack emissions at ground level for the following stages:

a. Stage 1 - existing EfW facility stack emissions.

b. Stage 2 - transition period between the EfW facility and ERF, assessed in terms of stack emissions from the EfW facility, the ERF and diesel generators.

c. Stage 3 - operation of the ERF, and has been assessed for ERF stack emissions and diesel generator emissions.

d. Stage 4 - ongoing operation of the ERF, and emissions would be the same as those assessed for Stage 3.

2.8.4 For the ERF, two FGT options have been assessed; wet and wet with reheat. All results are presented in Vol 2 Appendix 2.2. For reporting purposes, the worst-case FGT results are presented and discussed in this section.

2.8.5 A summary of the model inputs are as follows:

a. representative hourly sequential meteorological data from London City Airport station in 2014 (see Vol 2 Figure 2.11);

b. latitude of 51.6°;

c. minimum Monin-Obukhov length[25] of 30m (see Vol 2 Figure 2.12);

d. existing and proposed buildings;

e. surface roughness of 1m to represent a city location;

[25] The Monin-Obukhov length allows for turbulence caused by minimum heat production in cities which is not represented in the meteorological data.

f. discrete human and ecological receptors;

g. a 10km by 10km gridded area; and

h. predicted background concentrations, for the relevant 1km by 1km grid squares in which the receptor is located.

2.8.6 Process contributions have been predicted for the ERF, existing EfW facility and diesel generators at all discrete receptor locations and over the 10km by 10km gridded area.

2.8.7 A review of the existing EfW facility's actual measured emissions shows that the plant is operating well below the emission limit values. The modelling study for the proposed ERF has assumed that it would operate at the emission limits for all pollutants, other than NO_x, as a worst-case assessment. The Applicant has proposed a lower NO_x emission limit and this has been used in the air quality assessment. It can be expected that the ERF emission levels would be the same or better than the existing facility which is currently operating well below the required emission limits. Therefore this assessment is considered to be worst-case and conservative.

Results - discrete receptors

2.8.8 Long- and short-term concentrations of all pollutants have been predicted at each discrete receptor location for the existing EfW facility (Stage 1), the transition stage (Stage 2) and the ERF (Stages 3 and 4). The results are presented in Vol 2 Appendix 2.2 of the ES (AD06.02).

2.8.9 Based on the modelling using emission limits, the predicted ground-level concentrations for all pollutants for the proposed ERF are similar to the existing EfW facility, during the transition and operational stages. For example, for predicted annual mean NO_2 concentrations the percentage change in concentrations between the existing EfW facility and the worst-case ERF scenario (Stage 2 with wet FGT) is an increase of 0.6 per cent, which is an imperceptible change.

2.8.10 The results show that concentrations of NO_2, CO, benzene, PM_{10}, SO_2, B(a)P, Cd and Tl, Hg, Pb, Sb, Cr, Co, Cu, Mn and V at all discrete receptor locations under all scenarios and all stages would be below the relevant air quality standards, and have either a slight adverse or negligible impact.

2.8.11 The impacts for NH_3, As and Ni are predicted to be adverse at some receptor locations for Stages 2, 3 and 4. The maximum point of impact of these pollutants has therefore been further investigated using the 10km by 10km grid results below.

Results - 10km grid

2.8.12 The process contributions for each pollutant have been predicted for the ERF for Stages 2, 3 and 4 over the 10km by 10km gridded area for the worst-case wet FGT scenario, which has been determined to be the wet without reheat FGT.

2.8.13 The process contributions of all pollutants at the maximum point of impact of the 10km by 10km gridded area have been compared with the applicable air quality standard or assessment criterion and are shown in the Vol 2 Table 2.39 and Vol 2 Table 2.40.

2.8.14 The modelling study has been based on worst-case IED emission limits for all pollutants, and in the case of Pb, As, Ni, Sb, Cr, Co, Cu, Mn and V has been based on an emission limit for a sum of nine metals. To determine the percentage of the emission limit for each metal, the measured metal emission data in the EA guidance[26] has been used.

2.8.15 For the transition stage (Stage 2), results show that the magnitude of change for all pollutants has been determined to be small or imperceptible, apart from hourly mean NO_2, which has been determined to be medium.

2.8.16 Further assessment has been undertaken for hourly mean NO_2 to predict the likely realistic worst-case concentrations which would result from the maximum process contributions during the transition stage. The maximum predicted process contribution of 16.1µg/m^3 during the transition stage has been added to the maximum hourly mean NO_2 concentration at the nearest monitoring site to the Application Site, Derby Road, which is located around 600m to the west of the Application Site. This gives a maximum predicted hourly concentration of 159µg/m^3, which is well below the hourly mean objective of 200µg/m^3. This is considered to be a worst-case assessment, as these maximum concentrations are likely to occur under different meteorological conditions, and would be unlikely to occur at the same time. Therefore the impact is considered to be small.

2.8.17 During ERF operation (Stages 3/4), results for all pollutants show that the magnitude of change has been determined to be small or imperceptible.

2.8.18 It is noted that there are no air quality standards for dioxins and furans and so the change in concentrations compared to background concentrations has been used as an indicative assessment criteria.

2.8.19 To further consider the trace metals, dioxins and furans, a human health assessment has been carried out, the results of which are discussed in Paragraph 2.8.50 onwards.

2.8.20 Contour plots for the 10km gridded area, for long-term NO_2 and PM_{10} process contributions for both FGT options and for both Project stages are presented as figures:

a. Vol 2 Figure 2.13 and Vol 2 Figure 2.14 of the ES (AD06.02) show the long-term NO_2 and PM_{10} process contributions for the existing EfW facility.

b. Vol 2 Figure 2.15 to Vol 2 Figure 2.18 of the ES (AD06.02) show the long-term NO_2 and PM_{10} process contributions by FGT model scenario for the transition stage (Stage 2)

c. Vol 2 Figure 2.19 to Vol 2 Figure 2.22 of the ES (AD06.02) show the long-term NO_2 and PM_{10} process contributions by FGT model scenario for Stages 3/4.

[26] Environment Agency (2012) Releases from municipal waste incinerators: Guidance to applicants on impact assessment for group 3 metals stack

Vol 2 Table 2.39: ERF contribution to airborne concentrations at the point of maximum impact

Pollutant	Averaging period	Air quality standard ($\mu g/m^3$)	Stage 2			Stages 3/4		
			EfW facility/ERF contribution ($\mu g/m^3$)	Contribution/ Air quality standard (per cent)	Magnitude of change[24]	ERF contribution ($\mu g/m^3$)	ERF contribution/ Air quality standard (per cent)	Magnitude of change[24]
NO_2	Max 1-hour mean	200	16.2	8.1	Medium*	8.6	4.3	Small
	Annual mean	40	0.92	2.3	Small	0.67	1.7	Small
CO	Max 8-hour running mean	10000	12.4	0.1	Imperceptible	10.7	0.1	Imperceptible
VOCs: Benzene (C_6H_6)	Annual mean	5	0.05	1.0	Imperceptible	0.079	1.6	Small
SO_2	Max 15-minute mean	266	11.3	4.2	Small	14.6	5	Small
	Max 1-hour mean	350	9.8	2.8	Small	12.6	3.6	Small
	Max 24-hour mean	125	3.7	3.0	Small	4.8	3.8	Small
	Annual mean	20	0.27	1.4	Small	0.40	2.0	Small
PM_{10}	Max 24-hour mean	50	0.25	0.5	Imperceptible	0.31	0.6	Imperceptible
	Annual mean	40	0.057	0.1	Imperceptible	0.079	0.2	Imperceptible
$PM_{2.5}$	Annual mean	25	0.057	0.2	Imperceptible	0.079	0.3	Imperceptible
HF	Max 1-hour mean	160	0.0052	0.003	Imperceptible	0.0079	0.005	Imperceptible
HCl	Max 1-hour mean	750	0.072	0.010	Imperceptible	0.079	0.011	Imperceptible

Pollutant	Averaging period	Air quality standard ($\mu g/m^3$)	Stage 2			Stages 3/4		
			EfW facility/ERF contribution ($\mu g/m^3$)	Contribution/ Air quality standard (per cent)	Magnitude of change[24]	ERF contribution ($\mu g/m^3$)	ERF contribution/ Air quality standard (per cent)	Magnitude of change[24]
NH_3	Max 1-hour mean	2500	0.035	0.001	Imperceptible	0.007	0.000	Imperceptible
	Annual mean	180	0.037	0.020	Imperceptible	0.008	0.004	Imperceptible
PAH: Benzo(a)pyrene	Annual mean	0.005	0.000014	0.288	Imperceptible	0.0000082	0.164	Imperceptible
*Impact is considered to be not significant following further assessment.								

Vol 2 Table 2.40: ERF contribution to airborne concentrations at the point of maximum impact – dioxins, furans and trace metals

Pollutant	Averaging period	Assessment criteria ($\mu g/m^3$)	Percentage of WID Group 3 (metals)[26]	Stage 2			Stage 3/4		
				EfW facility/ERF contribution ($\mu g/m^3$)	Contribution/ Assessment criteria (per cent)	Magnitude of change[24]	ERF contribution	ERF contribution/ Assessment criteria (per cent)	Magnitude of change[24]
Dioxins and furans	Annual mean	None*	-	0.00000000052	1.6	Small	0.0000000007 9	2.4	Small
Arsenic (As)	Annual mean	0.003	0.14	0.000004	0.13	Imperceptible	0.000006	0.18	Imperceptible
Cadmium (Cd)	Annual mean	0.005	**	0.00013	2.6	Small	0.00020	4.0	Small
Lead (Pb)	Annual mean	0.25	3.2	0.00009	0.036	Imperceptible	0.00013	0.05	Imperceptible

Pollutant	Averaging period	Assessment criteria (µg/m³)	Percentage of WID Group 3 (metals)[26]	Stage 2			Stage 3/4		
				EfW facility/ERF contribution (µg/m³)	Contribution/ Assessment criteria (per cent)	Magnitude of change[24]	ERF contribution	ERF contribution/ Assessment criteria (per cent)	Magnitude of change[24]
Nickel (Ni)	Annual mean	0.02	4.4	0.00012	0.62	Imperceptible	0.00017	0.87	Imperceptible
Thallium (Ti),	Annual mean	1	**	0.00013	0.013	Imperceptible	0.00020	0.02	Imperceptible
Mercury (Hg)	Annual mean	0.25	-	0.00025	0.10	Imperceptible	0.00040	0.16	Imperceptible
Antimony (Sb)	Annual mean	5	0.7	0.000020	0.0004	Imperceptible	0.00003	0.001	Imperceptible
Chromium (Cr) II and III	Annual mean	5	2.2	0.000062	0.001	Imperceptible	0.00009	0.002	Imperceptible
Chromium (Cr) VI	Annual mean	0.0002	2.2	0.0000004	0.22	Imperceptible	0.000001	0.31	Imperceptible
Cobalt (Co)	Annual mean	1	0.07	0.0000020	0.0002	Imperceptible	0.000003	0.0003	Imperceptible
Copper (Cu)	Annual mean	10	1.5	0.000042	0.0004	Imperceptible	0.00006	0.0006	Imperceptible
Manganese (Mn)	Annual mean	150	3.4	0.000095	0.0001	Imperceptible	0.0001	0.00009	Imperceptible
Vanadium (V)	Annual mean	5	0.06	0.0000017	0.00003	Imperceptible	0.000002	0.00005	Imperceptible
'-' Not applicable. *No Assessment Criteria for dioxins or furans, change from background concentrations has been used as an indicative assessment criteria. **Emissions of cadmium and thallium have been taken as half the IED emission limit for cadmium and thallium and compounds.									

Combustion source significance

Concentrations at human receptors

2.8.21 For the predicted concentrations at discrete receptors, the following points are noted:

a. The overall magnitude of impact according to EPUK/IAQM guidance is slight adverse or negligible for NO_2, CO, benzene, PM_{10}, SO_2, B(a)P, Cd and Tl, Hg, Pb, Sb, Cr, Co, Cu, Mn and V at all discrete receptor locations, under both FGT for all Project stages.

b. The impacts for NH_3, As and Ni are predicted to be adverse at some receptor locations and the maximum point of impact was therefore further investigated, the findings from which are discussed in Paragraph 2.8.23 below.

c. Predicted pollutant concentrations are below the relevant air quality standards for all pollutants at all discrete receptors and during all assessed stages.

d. Conservative assumptions have been made throughout the assessment.

2.8.22 Based on this, the significance of the air quality impacts from the Project for NO_2, CO, benzene, PM_{10}, SO_2, B(a)P, Cd and Tl, Hg, Pb, Sb, Cr, Co, Cu, Mn and V concentrations is concluded to be **not significant**.

Process contributions

2.8.23 For the process contributions during Stages 2, 3 and 4, the magnitude of change for all pollutants has been determined to be small or imperceptible, and process results are therefore considered to be **not significant**.

Ecological receptors

2.8.24 The effect of the stack emissions on sensitive ecological sites within 10km of the Application Site has been assessed. The emissions have been assessed against the critical levels for NO_2 and SO_2 and also the site-specific critical loads.

2.8.25 The process contributions from the existing EfW facility and proposed ERF have been compared with the critical level for NO_2 (30µg/m^3) which indicates the process contribution at Chingford Reservoir would be up to 4 per cent of the critical level (Vol 2 Appendix 2.2 Table 12). This is above the 1 per cent test for insignificance. For the existing EfW facility, the maximum impact is 1.2µg/m^3 with a total process environmental contribution (PEC) (process plus background) of 50.3µg/m^3 which is above the critical level. The background NO_2 in the area is above 30µg/m^3. The process contribution reduces at sensitive ecosystems with the Project for the transition (Stage 2) and operational (Stages 3/4) stages. Only receptors located at Chingford Reservoirs SSSI experience a process contribution of greater than 1 per cent of the critical level. The significance of the process contribution on ecology at Chingford Reservoir SSSI is determined in the ecology assessment (Vol 2 Section 5). Process contributions at all other sensitive ecological sites within 10km would be **not significant** as the process contribution is less than 1 per cent of the critical level.

2.8.26 The process contributions from the existing EfW facility and proposed ERF have been compared with the critical level for SO_2 (20µg/m^3) which shows that all sites are well below the 1 per cent screening test for insignificance. Therefore impacts upon sensitive ecosystems from emissions of SO_2 have been assessed as **not significant.**

2.8.27 The critical loads at each of the sensitive ecological sites have been compared to the total acidity deposition for both the process contribution and the PEC (graphs provided in Vol 2 Appendix 2.2 Plates 6 to 25). At all sites the process contribution critical loads were below the maximum impact line. The PEC was between the minimum and maximum lines on the graphs for all sensitive ecological sites. The significance of air quality on sensitive ecological sites is determined in the ecology assessment (Vol 2 Section 5 of the ES (AD06.02)).

Fugitive emissions and dust

2.8.28 As part of the embedded mitigation measures included in the design, there are a number of steps that would be implemented to minimise the risk of fugitive emissions and dust, and monitor for any potential emissions. These measures will be set out in a written scheme for the management and mitigation of dust emissions as specified in the Environmental Commitments and Mitigation (ECM) document (AD06.03).

2.8.29 There are potentially dusty activities proposed for the northern area of the Application Site, however with the application of appropriate mitigation measures the risk of a significant effect for operational dust is considered to be **not significant**.

2.8.30 The closest residential properties to the operational site are over 50m from any potential source, and the predominant wind direction for the area is from the south-west, away from the majority of residential properties.

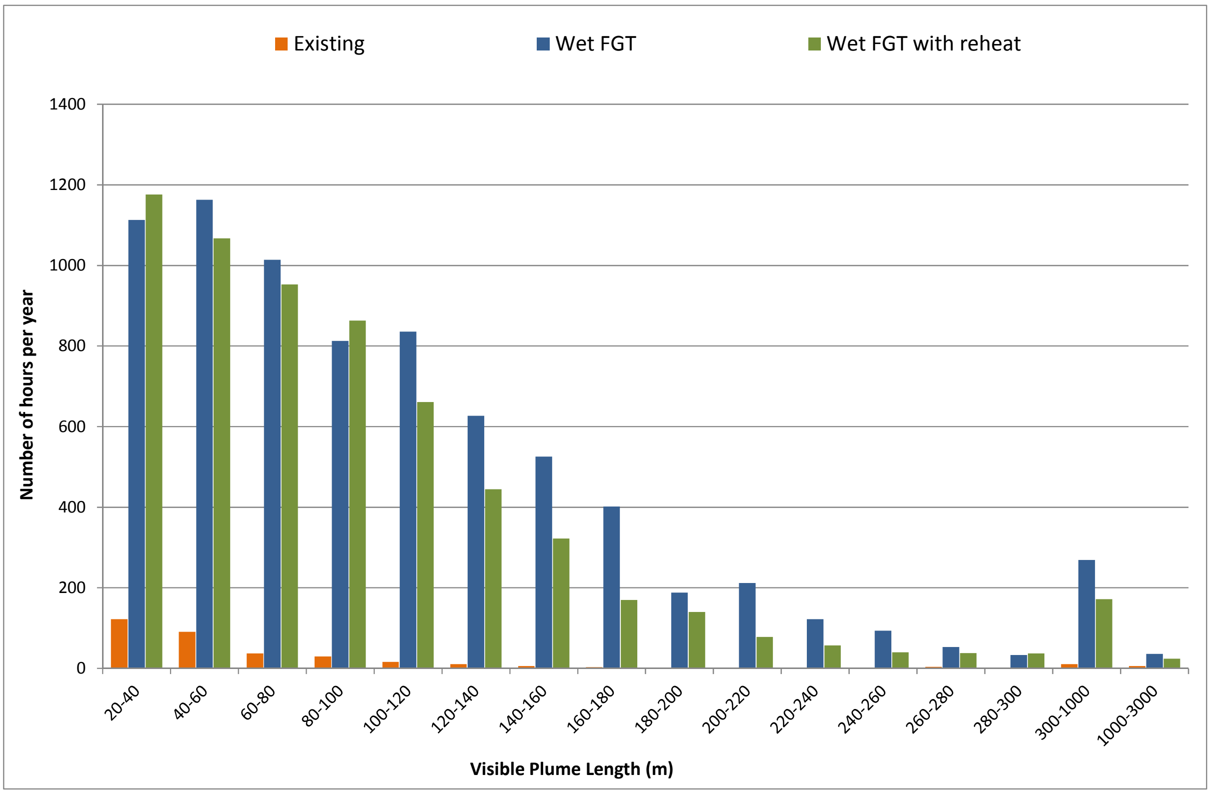
2.8.31 This coupled with the short-term nature of any unexpected fugitive emissions release and the limited chance of winds blowing towards sensitive receptors means that the risk of a significant effect for all fugitive emissions is considered to be low risk and therefore **not significant**.

Plume visibility

2.8.32 The two FGT options being considered result in some differences in the emission conditions of the emitted gases from the stack. Water in the emitted gas can condense and form a visible plume. The ADMS model has been used to predict the length of visible plume for each hour of the year.

2.8.33 The predicted plume lengths are shown in Vol 2 Plate 2.1 of the ES (AD06.02) for the existing EfW facility and the wet FGT options. The chart shows the frequency of predicted plume lengths for various ranges in plume length. The water content of the wet FGT options is greater than the existing EfW facility stack and consequently the predicted visible plume lengths are longer. The visual impacts of the plume are considered in ES Volume 3.

2.8.34 Cooling towers do not emit any harmful pollutants and consequently no further assessment is required in the air quality assessment.



Vol 2 Plate 2.1: Visible plume length by number of hours per year

Odour

2.8.35 The IVC facility would be removed as part of the Project, and green and food waste would be bulked up in the RRF for onward transport, therefore it can be expected that there would be an improvement in odour conditions in the future.

2.8.36 Using professional judgement, the FIDOR method assessment has been used to qualitatively determine the degree of odour pollution for the existing situation and future operation of the Application Site, as outlined in Vol 2 Table 2.41.

2.8.37 This shows that there would be no change or an expected improvement in odour, predominantly from the removal of the existing IVC facility, and that the predicted impact of the ERF and RRF would be low.

2.8.38 The ERF would receive waste in an enclosed reception area which would operate under negative pressure. Air extracted from this area would be used in the combustion plant which would destroy any odorous compounds. No significant sources of odour are located outside of the ERF or RRF.

2.8.39 The ERF and RRF would have design controls in place to control odour, such as the tipping hall being under negative pressure, and installation of proposed odour control plant such as carbon filters and fast acting door shutter doors. These measures will be set out in a written scheme for the management and mitigation of odour emissions as specified in the ECM document (AD06.03). On this basis it is considered that the Project would be equivalent to, or lead to an improvement in background odour in comparison to the existing EfW facility and IVC facility, and therefore the effect would be considered to be **not significant**.

Vol 2 Table 2.41: Assessment of the level of odour pollution (FIDOR) - operation

FIDOR	**Existing**		**Future**	
	Discussion	**Odour nuisance risk**	**Discussion**	**Odour nuisance risk**
Frequency of detection	Few number of complaints received. Likely to be short in duration as waste is moved to, on or around the Application Site.	Low	No change - short in duration as waste is moved to, on or around the Application Site.	Low
Intensity as perceived	Likely to be strong, as complaints were generated.	Medium	Expected improvement – offensive composting odour would be eliminated, as the IVC would be removed.	Low
Duration of exposure	Residential properties likely to be	Low	No change - residential properties	Low

FIDOR	Existing		Future	
	Discussion	Odour nuisance risk	Discussion	Odour nuisance risk
	exposed intermittently.		could be exposed intermittently.	
Offensiveness	Likely to be unpleasant and offensive, as it is waste and composting.	Medium	Expected improvement - likely waste odours could be considered unpleasant and offensive, however the offensive composting odour would be eliminated, as the IVC would be removed.	Low
Receptor sensitivity	Residential receptors considered to have high sensitivity, however they are located more than 100m from the Application Site boundary.	Low	No change - residential receptors with high sensitivity located more than 100m from Application Site boundary.	Low

Human health

2.8.40 The HHRA considers the effects of human exposure from emissions to air of trace metals, dioxins, furans and dioxin-like polychlorinated biphenyls (PCBs), from the proposed ERF during operation (Stages 2 and 3/4). The Stage 2 (transition stage) assessment takes account of emissions from the existing EfW facility and proposed ERF when operating at the same time for a period of up to a year while the ERF is commissioned. Additionally, a cumulative scenario has been used to assess the operation of the ERF alongside the historic operation of the existing EfW facility. This was required as the existing EfW facility has operated for over 40 years and as a consequence will have operated prior to the introduction in 1996 of stricter controls on emissions from municipal waste incinerators. Therefore it is necessary to consider historical exposure to dioxins and furans in combination with the exposure from the proposed ERF. The full HHRA report is contained in Vol 2 Appendix 2.3.

2.8.41 Health effects could occur through exposure routes other than purely inhalation. As such, an assessment needs to be made of the overall human exposure to the substances by the local population and then the risk that this exposure causes. The principal focus of the HHRA is to assess risks to health from alternative exposure routes other than inhalation (direct as well as indirect).

2.8.42 The assessment considers the impact of certain substances released by the ERF on the health of the local population at the point of maximum exposure. These substances are those that are 'persistent' in the environment and have several pathways from the point of release to the human receptor. These are substances that can accumulate in soil and other media and which have potentially chronic (long-term) health effects. Other substances for which health effects arise from direct inhalation exposure (e.g. NO_2, SO_2, PM_{10}, $PM_{2.5}$ etc) have been considered in the air quality assessment by comparison with air quality standards and standards set for the protection of human health. Therefore, the substances considered for the HHRA are essentially dioxins/furans, dioxin-like PCBs and metals.

2.8.43 Unlike substances such as NO_2, which have potential short-term, acute effects on the respiratory system, dioxins/furans, dioxin-like PCBs and trace metals have the potential to cause effects through long-term, cumulative exposure. A lifetime is the conventional period over which such effects are evaluated, and is taken to be 70 years.

2.8.44 The exposure scenarios used represent a highly unrealistic situation in which all exposure assumptions are chosen to represent a worst-case and should be treated as an extreme view of the risks to health. While individual high end exposure estimates may represent actual exposure possibilities (albeit at very low frequency), the possibility of all high end exposure assumptions accumulating in one individual is, for practical purposes, never realised. Therefore, intakes presented should be regarded as an extreme upper estimate of the actual exposure that would be experienced by the real population[27] in the locality.

Summary of non-carcinogenic effects

2.8.45 The Hazard Index (HI) calculated by the Industrial Risk Assessment Program (IRAP) for emissions from the proposed ERF (Stages 3/4) for each of the fourteen receptors (adult and child) is presented in Vol 2 Table 2.42. For the allotment

[27] Real population are the typical exposure scenarios rather than the assumed worst-case. This is the resident or farmer that lives at the location of highest concentration and consumes locally grown produce. Actual exposures are likely to vary between 0 per cent to 100 per cent consumption of locally grown produce but will depend on the resident.

receptors, the maximum HI is presented which was predicted at Allotment 10.

Vol 2 Table 2.42: Hazard index for allotment, farmer and resident receptors

Receptor name	**Hazard Index**	
	Adult	**Child**
Allotment A10	**0.00098**	**0.0018**
Farmer North 1	**0.0037**	**0.0049**
Farmer North 2	0.0035	0.0046
Resident Chingford	**0.0021**	**0.0035**
Resident Chingford Green 1	0.00084	0.0014
Resident Chingford Green 2	0.00080	0.0014
Resident Higham Hill 1	0.00036	0.00065
Resident Higham Hill 2	0.00036	0.00066
Resident Higham Hill 3	0.00036	0.00066
Resident Lower Edmonton	0.0011	0.0019
Resident Ponders End	0.00096	0.0020
Resident Tottenham	0.00038	0.00071
Resident Upper Edmonton 1	0.0019	0.0034
Resident Upper Edmonton 2	0.0017	0.0033
Criterion	**1.0**	

Note: The highest HI for each receptor type are presented in **bold**.

2.8.46 The HIs are well below unity[28] (i.e. less than 1.0) and so it is highly unlikely that emissions of compounds of potential concern (CoPCs) from the proposed ERF would cause an adverse non carcinogenic health risk. The highest HI is predicted for the Farmer North 1 Child and is a factor of around 200 less than unity. The maximum residential HI is 0.0035 for Resident Chingford (child) and is a factor of 286 less than unity. The highest allotment HI occurs at A10, approximately 950m to the west-northwest of the proposed ERF. This is a factor of 556 less than unity. For all receptors, the impact would be described as negligible.

2.8.47 Predicted HIs for farmers are generally higher than for residential receptors due to the assumed consumption of home-reared animal products.

[28] Should the maximum daily intake for the ERF be equal to the RfD, then the HQ would be equal to 1.0 and this would indicate the potential for a health effect. A hazard quotient of less than unity (1.0) implies that such an exposure would not create an adverse non carcinogenic health effect.

Summary of carcinogenic risks

2.8.48 The total lifetime risk calculated by IRAP for typical emissions from the proposed ERF (Stages 3/4) for each of the receptors (adult and child) is presented in Vol 2 Table 2.43.

Vol 2 Table 2.43: Total lifetime risk for allotment, farmer and resident receptors

Receptor name	Lifetime risk	
	Adult	Child
Allotment A10	**1.0×10^{-7}**	**5.4×10^{-8}**
Farmer North 1	**2.3×10^{-6}**	**5.0×10^{-7}**
Farmer North 2	2.2×10^{-6}	4.7×10^{-7}
Resident Chingford	**2.0×10^{-7}**	**1.0×10^{-7}**
Resident Chingford Green 1	8.0×10^{-8}	4.0×10^{-8}
Resident Chingford Green 2	8.5×10^{-8}	4.4×10^{-8}
Resident Higham Hill 1	3.8×10^{-8}	2.0×10^{-8}
Resident Higham Hill 2	3.8×10^{-8}	2.0×10^{-8}
Resident Higham Hill 3	3.8×10^{-8}	2.0×10^{-8}
Resident Lower Edmonton	1.1×10^{-7}	5.6×10^{-8}
Resident Ponders End	1.2×10^{-7}	6.4×10^{-8}
Resident Tottenham	4.2×10^{-8}	2.2×10^{-8}
Resident Upper Edmonton 1	2.0×10^{-7}	1.0×10^{-7}
Resident Upper Edmonton 2	1.9×10^{-7}	1.0×10^{-7}
Criterion	**7×10^{-5}**	

Note: The highest HI for each receptor type are presented in bold

2.8.49 For the ERF, the highest carcinogenic risk is predicted for Farmer North 1 (adult) and Resident Chingford (adult). The additional, total, lifetime risks to these receptors are 2.3×10^{-6}, (1 in 434,800) and 2.0×10^{-7} (1 in 5,000,000), respectively. Expressed as an annual risk, these risk estimates (risk of causing an adverse carcinogenic health impact) become 1 in 30,436,000 for Farmer North 1 and 1 in 350,000,000 for Resident Chingford, assuming a lifetime of 70 years. Such risks are well within an annual risk of 1×10^{-6} (1 in 1 million), conventionally considered to be acceptable for industrial regulation in the UK. For the Allotment A10 (adult), the lifetime risk is 1.0×10^{-7} (1 in 10,000,000) which is equivalent to an annual risk of 1 in 700,000,000.

2.8.50 Except for the adult farmers, the carcinogenic risk would be described as negligible. For the adult farmers, the impact would be described as slight adverse.

Comparison of dioxin/furan exposure with UK and WHO Tolerable Daily Intakes

2.8.51 The average (lifetime) daily intake of dioxins/furans and dioxin-like PCBs for the receptors considered is presented in Vol 2 Table 2.44 associated with the operation of the proposed ERF (Stages 3/4).

2.8.52 These are also presented as a percentage of the COT TDI[29] of 2pg I-TEQ kg-BW^{-1} d^{-1} in Vol 2 Plate 2.2.

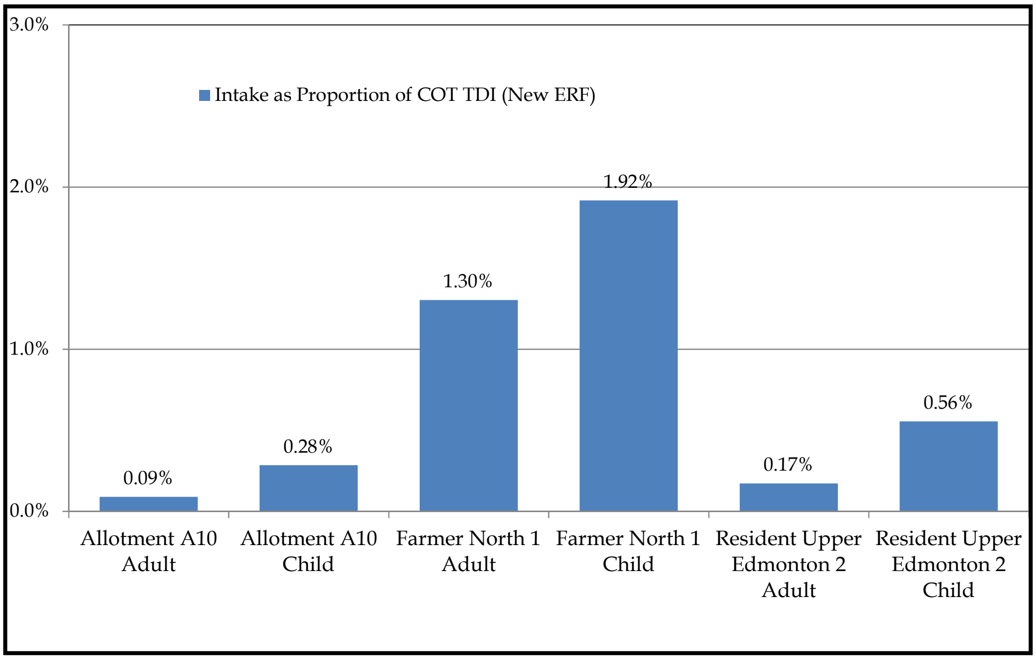
Vol 2 Table 2.44: Comparison of average daily intakes with the UK and WHO's TDI for dioxins/furans and dioxin-like PCBs

Receptor name	**Average Daily Intake**	
	Adult	**Child**
Allotment A10	**0.0018**	**0.0057**
Farmer North 1	**0.026**	**0.038**
Farmer North 2	0.025	0.036
Resident Chingford	0.0032	0.010
Resident Chingford Green 1	0.0013	0.0040
Resident Chingford Green 2	0.0014	0.0046
Resident Higham Hill 1	0.00064	0.0021
Resident Higham Hill 2	0.00065	0.0021
Resident Higham Hill 3	0.00065	0.0021
Resident Lower Edmonton	0.0018	0.0057
Resident Ponders End	0.0022	0.0070
Resident Tottenham	0.00073	0.0023
Resident Upper Edmonton 1	0.0033	0.011
Resident Upper Edmonton 2	**0.0035**	**0.011**
WHO TDI	**1 to 4 pg I-TEQ kg-BW^{-1} d^{-1}**	
COT TDI	**2 pg I-TEQ kg-BW^{-1} d^{-1}**	

Note: The highest intake for each receptor type are presented in bold

2.8.53 For the ERF, the contribution of the Project to the COT TDI is less than 2.0 per cent for the farmer receptors, 0.3 per cent for the allotment receptors and less than 0.6 per cent for the residential receptors.

[29] This is the Committee of Toxicity (COT) Tolerable Daily Intake (TDI) where TEQ is the toxic equivalence, which is used to report the toxicity information of mixtures of dioxins and furans. Toxic equivalency of a mixture is calculated by summing the concentration of the individual compounds and multiplying this by the relative toxicity of the compound.



Vol 2 Plate 2.2: Predicted intake of dioxins/furans and dioxin-like PCBs as a percentage of the Committee on Toxicity Tolerable Daily Intake

Total intake of dioxins, furans and dioxin-like PCBs

2.8.54 For all receptors, the total intakes are presented in Vol 2 Table 2.45. Results are presented for both adult and child receptors. Due to the assumptions made regarding the body weight of the child, the mean daily intake (MDI)[30] exceeds the TDI without the contribution from the ERF.

Vol 2 Table 2.45: Comparison of total intake with the COT TDI

Receptor	Total Intake from the Facility (pg I-TEQ kg^{-1} d^{-1})	Total Intake Facility + MDI (pg I-TEQ kg^{-1} d^{-1})	Facility as percentage of TDI	Total Intake as percentage of TDI
Adult receptors				
Allotment A10	0.0018	0.70	0	35
Farmer North 1	0.026	0.73	1	36
Farmer North 2	0.025	0.72	1	36
Resident Chingford	0.0032	0.70	0	35
Resident Chingford Green 1	0.0013	0.70	0	35

[30] The mean daily intake is the average daily background intake (i.e. that arising from other sources).

Receptor	Total Intake from the Facility (pg I-TEQ kg^{-1} d^{-1})	Total Intake Facility + MDI (pg I-TEQ kg^{-1} d^{-1})	Facility as percentage of TDI	Total Intake as percentage of TDI
Resident Chingford Green 2	0.0014	0.70	0	35
Resident Higham Hill 1	0.00064	0.70	0	35
Resident Higham Hill 2	0.00065	0.70	0	35
Resident Higham Hill 3	0.00065	0.70	0	35
Resident Lower Edmonton	0.0018	0.70	0	35
Resident Ponders End	0.0022	0.70	0	35
Resident Tottenham	0.00073	0.70	0	35
Resident Upper Edmonton 1	0.0033	0.70	0	35
Resident Upper Edmonton 2	0.0035	0.70	0	35
Child receptors				
Allotment A10	0.0057	2.11	0	105
Farmer North 1	0.038	2.14	2	107
Farmer North 2	0.036	2.14	2	107
Resident Chingford	0.010	2.11	1	106
Resident Chingford Green 1	0.0040	2.10	0	105
Resident Chingford Green 2	0.0046	2.10	0	105
Resident Higham Hill 1	0.0021	2.10	0	105
Resident Higham Hill 2	0.0021	2.10	0	105
Resident Higham Hill 3	0.0021	2.10	0	105
Resident Lower Edmonton	0.0057	2.11	0	105

Receptor	Total Intake from the Facility (pg I-TEQ kg^{-1} d^{-1})	Total Intake Facility + MDI (pg I-TEQ kg^{-1} d^{-1})	Facility as percentage of TDI	Total Intake as percentage of TDI
Resident Ponders End	0.0070	2.11	0	105
Resident Tottenham	0.0023	2.10	0	105
Resident Upper Edmonton 1	0.011	2.11	1	106
Resident Upper Edmonton 2	0.011	2.11	1	106
COT TDI	**2**	**2**	**-**	**-**

2.8.55 For inhalation and oral intake of dioxins/furans for adults, total intake is well below the TDI. Background exposure represents approximately 35 per cent of total exposure. At worst, the ERF contributes 1.3 per cent to the TDI for adults. The impact of emissions from the ERF would be negligible for all adult receptors in accordance with the EPUK/IAQM guidance.

2.8.56 For inhalation and oral intake of dioxins/furans by children, the background intake is in excess of the TDI. At worst the additional contribution from the facility for a child is 0.038pg TEQ kg^1 d^1 (2 per cent of the COT TDI). For the Farmer North child receptors and the Resident Chingford and Resident Upper Edmonton child receptors, the impact would be moderate adverse due mainly to the elevated background exposure. However, the exposure duration for children is limited, whereas the COT TDI is set for lifetime exposure.

2.8.57 For the allotment receptors (adults and children), the impact of emissions from the ERF would be negligible in accordance with the EPUK/IAQM guidance.

Cumulative impacts with the existing EfW facility

2.8.58 Contaminants from the operation of the existing EfW facility will remain in soils for some period following decommissioning of the facility and the level of contamination will be dependent on the persistence of the COPC within soils. Therefore, a cumulative assessment of the impact of the existing EfW facility and proposed ERF has been carried out for the operation of the ERF accounting for the previous operation of the existing EfW facility (as described in Paragraph 2.8.40).

2.8.59 For the cumulative assessment, it is assumed that the existing EfW facility operates for the next 20 years alongside the proposed ERF rather than the past 20 years. Therefore, no account has been taken of the removal of the existing EfW facility contaminants in soil via degradation, leaching and other processes, as such, the cumulative assessment is considered to represent worst-case conditions. The HIs for combined exposure to the existing EfW facility and proposed ERF are well below unity (1.0) and so it is highly unlikely that emissions of CoPCs from the two facilities would cause an adverse non-carcinogenic health risk when cumulative impacts are considered. For the combined exposure, the highest HI is predicted for the Farmer North 1 Child and is a factor of around 100 less than unity. For all receptors, the impact would be described as negligible.

2.8.60 The highest carcinogenic risk for combined exposure to the existing EfW facility and proposed ERF is predicted for Farmer North 1 (adult) and Resident Chingford (adult). The additional, total, lifetime risks to these receptors are 3.8×10^{-6}, (1 in 263,200) and 3.1×10^{-7} (1 in 3,225,800), respectively. Expressed as an *annual* risk, these risk estimates become 1 in 18,424,000 for Farmer North 1 and 1 in 225,800,000 for Resident Chingford, assuming a lifetime of 70 years. Such risks are well within an annual risk of 1×10^{-6} (1 in 1 million). Except for the adult farmers, the carcinogenic risk would be described as negligible. For the adult farmers, the impact would be described as slight adverse.

2.8.61 For the combined exposure to the existing EfW facility and proposed ERF, the contribution to the COT TDI is 3 per cent for the farmer receptors, 0 per cent for the allotment receptors and at most 1 per cent for the residential receptors. For the farmer receptor, this is approximately 50 per cent higher than for the proposed ERF operating alone. For adults the impact would be described as negligible. For the child receptors, the impact would be moderate adverse for the farmer receptors and some of the resident receptors (Resident Chingford, Resident Ponders End and Resident Upper Edmonton) due mainly to the elevated background exposure and therefore significant adverse. However, it should be noted that exposure duration for children is limited, whereas the COT TDI is set for lifetime exposure. For the allotment receptors and the majority of residential receptors the impact would be described as negligible.

Stage 2 (transition stage)

2.8.62 For the transition stage it is assumed that the existing EfW facility has operated at 100 per cent capacity for 20 years and with the same worst-case emissions as assumed for the cumulative assessment. The proposed ERF is assumed to operate for one year with emissions reflecting operation at 70 per cent capacity.The HIs for the transitional scenario are well below unity (1.0) and so it is highly unlikely that emissions of CoPCs from the facility would cause an adverse non-carcinogenic health risk when cumulative impacts are considered. The highest HI is predicted for the Farmer North 1 Child and is a factor of around 145 less than unity. For all receptors, the impact would be described as negligible.

2.8.63 The highest carcinogenic risk for the transitional scenario is predicted for Farmer North 1 (adult) and Resident Chingford (adult). The additional, total, lifetime risks to these receptors are 2.9 x 10^{-6}, (1 in 344,800) and 2.0 x 10^{-7} (1 in 5,000,000), respectively. Expressed as an annual risk, these risk estimates become 1 in 24,136,000 for Farmer North 1 and 1 in 350,000,000 for Resident Chingford, assuming a lifetime of 70 years. Such risks are well within an annual risk of 1 x 10^{-6} (1 in 1 million). Except for the adult farmers, the carcinogenic risk would be described as negligible. For the adult farmers, the impact would be described as slight adverse.

2.8.64 For the transition scenario, the contribution to the COT TDI is less than 2.2 per cent for the farmer receptors, 0.2 per cent for the allotment receptors and less than 0.3 per cent for the residential receptors. For the farmer receptor, this is approximately 10 per cent higher than for the proposed ERF operating alone. For all adult receptors and allotment and resident children, the impact would be described as negligible. For child farmers the impact would be described as moderate adverse due mainly to the elevated background exposure. However, it should be noted that exposure duration for children is limited, whereas the COT TDI is set for lifetime exposure.

Assessment of significance – Stages 2, 3 and 4

2.8.65 For non-carcinogenic risks and carcinogenic risk for allotment receptors and residential receptors, the impact of emissions from the ERF during Stages 3/4 and for the combined operation of EfW facility and ERF during Stage 2 and in the cumulative assessment are described as negligible. For adult farmers, the carcinogen risk is described as slight adverse but this is based on worst-case assumptions that the adult is located within the area of highest concentration for the farming area and consumes locally grown and locally reared vegetables, dairy products and meat products.

2.8.66 For the total exposure to dioxins/furans and dioxin-like PCBs, the impact at the majority of receptors has been assessed as negligible for Stages 2 and 3/4. The impact on children of farmers has been assessed as moderate adverse based on worst-case assumptions. Furthermore, it should be noted that the TDI for dioxins/furans is set for the purposes of assessing lifetime exposure and the elevated background exposures for children are therefore not representative of long-term exposure. Therefore, when considering lifetime exposure it is considered that the impact should be described as negligible to slight adverse for all receptors.

2.8.67 It is concluded that the impact of the emissions from the ERF during Stages 3/4 and for the combined operation of EfW facility and ERF during Stage 2 and in the cumulative assessment are **not significant**.

2.9 Assessment – decommissioning of the Project

2.9.1 It is considered that any decommissioning effects would be of a similar nature or less, to those identified in the construction assessment, as such the outcomes of the construction assessment in Section 2.7 are applicable to ERF decommissioning and effects would be **not significant**.

2.10 Supplementary mitigation

Construction

2.10.1 Appropriate mitigation measures have been included within the CoCP (Vol 1 Appendix 3.1) with resultant effects being not significant. No further mitigation measures are therefore required.

Operation

2.10.2 No significant effects are predicted with regard to operational air quality and odour effects and therefore no mitigation is required.

Decommissioning

2.10.3 As for the construction stages, with the embedded mitigation it is considered that there would be no significant effect from the decommissioning stage and no supplementary mitigation is required.

2.11 Residual effects

2.11.1 As no supplementary mitigation measures are proposed, the residual construction/operational/decommissioning effects remain as described in Section 2.7, 2.7.35 and 2.9. All residual effects are presented in Section 2.14.

2.12 Sensitivity test for programme delay

2.12.1 For the assessment of air quality and odour effects, a change to the programme of plus or minus 12 months would not be likely to materially change the assessment findings reported in Section 3.11.

2.12.2 Based on the Cumulative Development Schedule (Vol 1 Appendix 5.2 of the ES (AD06.02)), there would be no new receptors requiring assessment as a result of the programme change. This is because there are no new developments identified on the Cumulative Development Schedule (Vol 1

Appendix 5.2 of the ES (AD06.02)) that would need to be considered in the assessment, in addition to those already considered.

2.12.3 Background air quality concentrations have been reviewed for a change to the programme of plus or minus 12 months, and the difference in concentrations would be unlikely to change the outcome of the assessment for either the construction or operation of the Project.

2.13 Cumulative effects

Traffic emissions

2.13.1 A screening assessment has been undertaken using the criteria contained within the DMRB and EPUK/IAQM guidance documents to determine the potential for cumulative vehicle trips generated by the Project and other nearby developments to affect local air quality.

2.13.2 Vol 2 Table 2.46 shows the criteria for identifying whether an air quality assessment is considered necessary, it evaluates the potential impacts of the Application Site with cumulative traffic, during each of the Project stages, and concludes whether a detailed air quality assessment is required as per the criteria.

2.13.3 The construction and operational traffic in each stage have been assessed together, and professional judgement has been applied to the assessment of each criteria.

Vol 2 Table 2.46: Significance of construction traffic with reference to the criteria identified by DMRB and EPUK – Cumulative

Criteria	Evaluation	Further assessment required?
DMRB		
• Road alignment will change by 5m or more. • Daily traffic flows will change by 1,000 annual average daily traffic (AADT) or more. • Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more. • Daily average speed will change by 10km/hr or more; or peak hour speed will change by 20km/hr or more.	• No roads to be moved, have a change in speed or a change in AADT of more than 1000 in any stage. • One road is predicted to experience a change in HDV AADT of more than 200, this is Advent Way east of Edmonton EcoPark entrance, during Stages 2 and 3. However, this is predominantly an industrial area and the road has less than 10,000 AADT.	No
EPUK		
• A change of LDV flows of more than 100 in Annual	• Some roads are predicted to experience an increase in	Yes

Criteria	Evaluation	Further assessment required?
Average Traffic Daily (AADT). • A change of HDV flows of more than 25 AADT. • A change in road alignment of more than 5m. • Introduction of a new junction that causes a significant change in vehicle acceleration/ deceleration. • Introduction or change of a bus station. • Have an underground car park with extraction system.	AADT greater than 100 LDVs and/or greater than 25 HGVs. • No new junctions, bus stations or underground car parking.	

2.13.4 The traffic screening assessment shows that evaluating with the EPUK/IAQM screening criteria shows that further assessment is required.

2.13.5 A study using the DMRB screening spreadsheet for the worst-case roads and worst-case Project stages, for roads with nearby receptors has therefore been undertaken. The same roads and stages have the largest change in vehicles as those assessed for the core assessment in Paragraph 2.7.38 (Stage 1d for the largest change in LDVs and Stage 3 for the largest change in HGVs). This concluded that potential air quality impacts from road traffic associated with all stages are predicted to be negligible.

2.13.6 As such, the cumulative assessment shows that a detailed air quality assessment is not required and therefore cumulative traffic emissions can be considered to be **not significant.**

Construction dust assessment

2.13.7 For construction, the assessment of cumulative effects has been taken into account through the location of sensitive receptors and during the defining of the dust emission magnitudes.

2.13.8 A review of cumulative developments within 350m of the Application Site has been undertaken. It is considered that the demolition taking place at the Pegamoid Works, the building at the Pumping Station House, construction works at 8 Eley Road, and the construction of Meridian Water (see Vol 1 Figure 5.1 for location of developments) have the potential to generate dust. However, it is considered that all developments, except for Meridian Water, will have completed their construction activities by the time Stage 1 of the Project commences.

2.13.9 Any construction sites in operation at the same time as the Project will be operating under permission from the relevant planning authorities. As such the approved level of dust mitigation should already be applied for these sites.

2.13.10 With the application of appropriate embedded control measures included in the CoCP (Vol 1 Appendix 3.1), and at any developments in operation at the same time as the Project, the cumulative impact is considered to be **not significant** for construction.

Operational combustion sources

2.13.11 A review has been undertaken, and there is one proposed combustion source development identified within the 10km of the Application Site, which could lead to increased emissions in the vicinity of the Project. This is the proposed Kedco Waste Wood Biomass Plant, proposed to be located approximately 330m to the west of the Application Site boundary. The air quality assessment for the Kedco Waste Wood Biomass Plant[31] noted that peak annual average NO_2 impacts at a limited number of relevant receptor locations was predicted to be 5µg/m^3.

2.13.12 Cumulative concentrations for NO_2 including the Kedco Waste Wood Biomass Plant have been predicted at discrete receptors for the existing EfW facility and the wet and wet with reheat ERF FGT options. The results are presented in Vol 2 Appendix 2.2 of the ES (AD06.02).

2.13.13 Results for the cumulative assessment including predicted maximum NO_2 concentrations from the proposed Kedco Waste Wood plant show that long-term (annual mean) NO_2 concentrations at all receptor locations and under all FGT scenarios would be below the annual mean NO_2 40µg/m^3 standard concentration.

Cumulative combustion source significance

2.13.14 Considering the significance of the air quality impacts according to the criteria set out in the EPUK guidance, the following points are noted:

a. The overall magnitude of impact is negligible for NO_2 concentrations at all discrete receptor locations;

b. Pollutant concentrations are below the air quality standards for NO_2 at all receptors; and

c. Pessimistic assumptions have been made throughout the assessment.

[31] Gibbs Road CHP Facility (Planning application TP/09/1862) (2010) Further Air Quality Information

2.13.15 Based on this, air quality is judged to be a low priority consideration in the planning process for cumulative NO_2, and therefore the cumulative impacts of NO_2 are considered to be **not significant**.

2.14 Assessment summary

Construction

Vol 2 Table 2.47: Assessment summary – construction

Air Quality and Odour			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 1			
Dust emissions	With the application of the appropriate embedded mitigation measures outlined in the CoCP, the impact would be **not significant**.	None required	Effect unchanged **Not significant.**
Traffic emissions	Potential air quality impacts from construction and operational traffic emissions are predicted to be negligible, and so **not significant**.	None required	Effect unchanged **Not significant.**
Odour	The removal of the IVC may result in unpleasant odour, however this would be a one-off event and short in duration, therefore the effect would be low risk and **not significant**.	None required	Effect unchanged **Not significant.**
Stage 2			
Dust emissions	Based on the negligible risk summary and best practice mitigation measures contained in the CoCP, these effects would be **not significant**.	None required	Effect unchanged **Not significant.**
Traffic emissions	Potential air quality impacts from construction and operational traffic emissions are predicted to be negligible, and so **not significant**.	None required	Effect unchanged **Not significant.**

Air Quality and Odour			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 3			
Dust emissions	With the application of the appropriate embedded mitigation measures outlined in the CoCP, the impact would be **not significant**.	None required	Effect unchanged **Not significant.**
Traffic emissions	Potential air quality impacts from construction and operational traffic emissions are predicted to be negligible, and so **not significant**.	None required	Effect unchanged **Not significant.**

Operation

Vol 2 Table 2.48: Assessment summary – operation

Air Quality and Odour			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 1			
Existing stack emissions	Emissions from the EfW facility – no assessment required.	None required	No assessment required
Stage 2			
Stack emissions from transition stage operation of the EfW facility and ERF	For process contributions, the magnitude of change for all pollutants would be small or imperceptible, and process results in Stage 2 would therefore be **not significant.**	None required	Effect unchanged **Not significant.**
Human health	For both non-carcinogenic and carcinogenic risks for allotment receptors and residential receptors, the impact of emissions in Stage 2 would be negligible. For adult farmers, the	None required	Effect unchanged **Not significant.**

Air Quality and Odour			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
	carcinogen risk would be slight adverse, based on worst-case assumptions. For the total exposure to dioxins/furans and dioxin-like PCBs, the impact at the majority of receptors would be negligible. The impact on children of farmers would be moderate adverse, based on worst-case assumptions. The overall impact of the emissions from Stage 2 would be **not significant.**		
Stage 3			
Stack emissions from operation of ERF	For process contributions, the magnitude of change for all pollutants would be small or imperceptible, and process results in Stage 3 would therefore be **not significant.**	None required	Effect unchanged **Not significant.**
Odour	The ERF would be designed to minimise odour. Therefore the Project would lead to an improvement in background odour, and the impact would be **not significant.**	None required	Effect unchanged **Not significant.**
Fugitive emissions and dust	With appropriate mitigation measures the risk of a significant effect for operational dust would be **not significant**, and the risk of a significant effect for all fugitive emissions and dust would be low risk and therefore **not significant**.	None required	Effect unchanged **Not significant.**
Human health	For non-carcinogenic risks and carcinogenic risk for allotment receptors and residential receptors, the impact of emissions from the ERF would be negligible. For adult farmers, the carcinogen risk would be slight adverse, based on worst-case assumptions.	None required	Effect unchanged **Not significant.**

Air Quality and Odour			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
	For the total exposure to dioxins/furans and dioxin-like PCBs, the impact at the majority of receptors would be negligible. The impact on children of farmers would be moderate adverse, based on worst-case assumptions. The impact of the emissions from the operation of the proposed ERF are **not significant.**		
Stage 4			
As Stage 3: Stack emissions from operation of ERF	For process contributions, the magnitude of change for all pollutants would be small or imperceptible, and process results in Stage 4 can would be **not significant.**	None required	Effect unchanged **Not significant.**
As Stage 3: Odour	The ERF would be designed to minimise odour. Therefore the Project would lead to an improvement in background odour, and the impact would **not significant.**	None required	Effect unchanged **Not significant.**
As Stage 3: Human health	For non-carcinogenic risks and carcinogenic risk for allotment receptors and residential receptors, the impact of emissions from the ERF would be negligible. For adult farmers, the carcinogen risk would be slight adverse, based on worst-case assumptions. For the total exposure to dioxins/furans and dioxin-like PCBs, the impact at the majority of receptors would be negligible. The impact on children of farmers would be moderate adverse, based on worst-case assumptions. It is concluded that the impact of the emissions from the operation of the proposed ERF would be **not significant.**	None required	Effect unchanged **Not significant.**

Air Quality and Odour			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Traffic emissions	Potential air quality impacts operational traffic emissions are predicted to be negligible and so **not significant**.	None required	Effect unchanged **Not significant.**

Decommissioning of the Project

Vol 2 Table 2.49: Assessment summary – decommissioning of the Project

Air quality and odour			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Dust emissions	The impact would be similar to the construction stages, due to the risk of dust from demolition. With appropriate embedded mitigation measures, the impact would be **not significant**.	None required	Effect unchanged **Not significant.**
Traffic emissions	Potential air quality impacts from road traffic associated with construction stages are predicted to be negligible, and are similar or less to those experienced during decommissioning, and would therefore be **not significant**.	None required	Effect unchanged **Not significant.**

3 Archaeology

3.1 Introduction

3.1.1 This section presents an assessment of the likely significant effects of the Project on below ground archaeological remains. The Project sits within the floodplain of the River Lee, historically a regularly inundated area, suggesting a potential for archaeological remains as the associated anaerobic conditions favour perseveration of archaeological materials. Although abundant or past settlement remains are unlikely, the possibilities of past water-based activities are higher and the alluvial deposits (common in floodplains) have the potential to yield palaeoenvironmental evidence.

3.1.2 This assessment considers the effects on archaeological resources during the construction phase of the Project and decommissioning of the Project.

3.1.3 Built heritage is scoped out of the EIA as no potentially significant effects on built heritage assets have been identified during desk-based assessment within the Application Site or wider study area. This has been agreed with Historic England (HE).

3.1.4 The works plans (based on which this assessment has been undertaken) are contained in the Book of Plans (AD02.01) which forms part of the DCO Application documents.

3.2 Engagement

3.2.1 A full description of the engagement undertaken and stakeholder comments received in relation to archaeology for the Project is provided in Vol 2 Appendix 3.1.The following provides a brief chronological summary of the engagement undertaken with consultees.

3.2.2 An archaeological desk-based assessment was originally undertaken as recommended by the Greater London Archaeological Advisory Service (GLAAS) which was included in the EIA Scoping Report. The desk-based assessment highlighted low potential of archaeological remains and it was therefore intended for this to be scoped out of the assessment. The Planning Inspectorate agreed with this approach subject to the agreement with HE; however this approach was not supported by HE who required further information to be gathered through geoarchaeological research. HE also asked for a setting assessment of Chingford Mill to be carried out in the visual assessment.

3.2.3 Further engagement was then undertaken with HE in February 2015 during which it was discussed that both the ERF and RRF buildings would require extensive below ground works (more so than had been assumed at the time the Scoping Report was prepared) which may extend into the layer of potential archaeology. HE requested further geoarchaeological assessments be carried out.

3.2.4 This geoarchaeological deposit modelling was undertaken, along with consideration of effects on the setting of the Grade II listed Chingford Mill, both of which were reported in the Preliminary Environmental Information

Report[2] (PEIR) that formed part of the Phase Two Consultation documents. Following this and further engagement with HE, it was agreed that some potential impacts to archaeology may exist that require further assessment as part of the EIA process. Archaeology is therefore included as a topic in the EIA, the assessment for which is contained in this section.

3.2.5 On the basis that there would be a negligible change to the setting of Chingford Mill Pumping Station, HE agreed that this could remain scoped out of the ES.

3.3 Methodology

3.3.1 This section provides an overview of the methodology for assessing the likely significant effects of the Project on archaeology. Full details are set out in Vol 2 Appendix 3.1, which details the legislation, policy and guidance used to derive methodology for this assessment.

3.3.2 The Project is divided into four stages, of which Stage 1 and Stage 3 are construction related activities which may affect archaeology, while Stage 2 and Stage 4 do not involve significant groundwork. Archaeological assets would be affected only where intrusive ground works are undertaken, i.e. during construction. The operation of the Project would not affect archaeology and therefore no assessment of effects from operations is undertaken. An assessment of the decommissioning of the Project has been undertaken using the same methodology as used for the assessment of construction effects.

3.3.3 The assessment has been undertaken using professional judgement, with reference to a number of guidance documents:

a. Chartered Institute for Archaeologists, Standard and Guidance for Archaeological Desk Based Assessments[32];

b. Highways Agency, Design Manual for Roads and Bridges [33]; and

c. English Heritage, The Setting of Heritage Assets[34];

d. Historic England, *Piling and Archaeology Guidelines and Best Practice*[35];

e. GLAAS, *Standards for Archaeological Wor*k[36] and;

f. GLAAS, *Guidelines for Archaeological Projects in Greater London.*[37]

3.3.4 Heritage assets within 1km of the centre of the Application Site have been examined and detailed within the assessment.

3.3.5 Archaeological effects are determined by considering the convergence of areas of likely archaeological deposits (based on the results of the desk-

[32] Chartered Institute for Archaeologists (2012*) Standard and Guidance for Archaeological Desk Based Assessments*
[33] Highways Agency (2009) *Design Manual for Roads and Bridges*, Volume 11, Section 3, Part 2
[34] English Heritage (2011) *The Setting of Heritage Assets*
[35] Historic England (June 2015) *Piling and Archaeology Guidelines and Best Practice*
[36] Greater London Archaeological Advisory Service (2009) *Standards for Archaeological Work*
[37] Greater London Archaeological Advisory Service (April 2015) *Guidelines For Archaeological Projects in Greater London*

based assessment and geoarchaeological deposit modelling) with the areas to be disturbed by intrusive development associated with the Project.

3.3.6 The effects are established based on the type of intrusion occurring from the construction/decommission. For the Project, this includes:

a. excavation of foundations;

b. slab construction; and

c. piling foundations.

3.3.7 Archaeological assets have been assessed to determine their potential survival and heritage value and the significance of effects upon them. Significance of effects is determined by two variables; the value of the asset and the magnitude of change upon the asset. This takes into account the severity of impact of the Project, together with the vulnerability of the asset to change. Effects have been determined to be beneficial for example through improvements to the management or setting of an asset or adverse for example through truncation of an asset.

3.4 Assumptions and limitations

Assumptions

3.4.1 It is assumed that in Stage 3 and decommissioning stages, demolition of buildings and foundations would not disturb further areas of below ground materials. For example, removal of a pile would not impact the surrounding ground based on the assumption that a clean removal of the pile would occur.

Limitations

3.4.2 Data used to compile the desk-based assessment (Vol 2 Appendix 3.2) consists of secondary information derived from a variety of sources, predominately the Greater London Historic Environmental Record (GLHER). The GLHER documents known archaeological and historic assets. It is not an exhaustive record of all surviving historic assets and does not preclude the existence of further assets which are unknown at present.

3.5 Baseline

3.5.1 This section describes the baseline conditions for archaeology in and around the Application Site. Further details of the archaeological and historical background of the Application Site are provided in the desk-based assessment (Vol 2 Appendix 3.2) and Geoarchaeological Deposit Model (Appendix E of Vol 2 Appendix 3.2).

Historical characteristics of the Application Site

3.5.2 The Application Site and its environs were essentially rural prior to the turn of the 20th century. The first elements of industrialisation began to emerge around the same time as the Great Eastern Railway and the Tottenham and

Edmonton gas works (see Ordnance Survey map regression in Volume 2 Appendix 3.2).

3.5.3 Industrialisation of the surrounding area continued well into the 20th century although the Application Site remained undeveloped until the southward expansion of Deephams Sewage Treatment Works (STW) in the 1970s. This expansion consisted of sludge lagoons being constructed on the northern part of the Application Site and the Energy from Waste facility on the central part of the Application Site. The sludge lagoons situated at the north part of the Application Site, were replaced by buildings between 1999 and 2010.

Topography

3.5.4 The British Geological Society (BGS) Solid and Drift Sheet 256 (North London) shows that the Application Site is positioned on a broad swathe of alluvial deposits accumulated within the floodplain. Ground levels in general, slope gently southward from 12m to 11m AOD on average, but reach a maximum of 14.5m and a minimum of 10.9m AOD in localised areas[38].

Geology

3.5.5 The geology of the Application Site comprises Made Ground, Alluvium (floodplain deposits) and Gravels – which contain Artic Bed deposits (categorised as ‘Quaternary’) lying on a bed of Eocene London Clay (‘Pre-Quaternary’), which pre–dates the evolution of hominin groups[39].

Designated heritage assets in the assessment area

3.5.6 There are no scheduled monuments, listed buildings, local listed buildings, battlefields, World Heritage Sites or registered parks and gardens within the Application Site.

3.5.7 Within the 1km assessment area, there are three designated heritage assets:

a. Chingford Mill Pumping Station (Grade II listed)

b. Chingford Mill Pumping Station Turbine Hall (Grade II listed); and

c. Railings at Chingford Mill Pumping Station (Grade II listed).

3.5.8 As built heritage has been scoped out on the basis of no significant impacts, the effect of the Project on these assets is not considered further.

Potential archaeological assets

3.5.9 This section summarises the archaeology baseline of the assessment area. Further details are provided in Vol 2 Appendix 3.2 including a full list of

[38] MOLA (2015) NLHPP Geoarchaeological Deposit Model – see Appendix E of Vol 2 Appendix 3.2, section 3.3, p9.
[39] MOLA (2015) NLHPP Geoarchaeological Deposit Model – see Appendix E of Vol 2 Appendix 3.2, section 3.4-3.5, p9-12.

archaeological and heritage assets located within the 1km assessment area.

3.5.10 The desk-based assessment indicates that there is moderate potential for prehistoric archaeology with high potential for palaeoenvironmental evidence. It notes a low potential for archaeological remains from other periods.

3.5.11 Twenty-four archaeological investigations have taken place in the assessment area. Six of these have taken place at Deephams STW between 2001 and 2010. This has identified some drainage features associated with the medieval and later Deephams Manor Farm and significant levels of truncation in the western part of the Deephams STW site, but survival of alluvium and peat in the south-eastern part adjacent to the Application Site.

3.5.12 South of the Application Site, at Ravenside Retail Park, a geoarchaeological borehole survey indicated good survival of deposits with potential to contain archaeological remains. Geoarchaeological assessment at Advent Way to the south-west of the Application Site identified surviving Bronze Age peat; however subsequent trial excavations failed to encounter any archaeological remains.

3.5.13 Excavations at a number of sites at Montagu Road in 1999 and 2000 produced evidence of Bronze Age and Iron Age ditches and enclosures.

3.5.14 The geoarchaeological deposit model (Appendix E of Vol 2 Appendix 3.2) identified three landscape zones (LZs) each with varying levels of archaeological and palaeoenvironmental potential (see Vol 2 Plate 3.1: Landscape Zones).

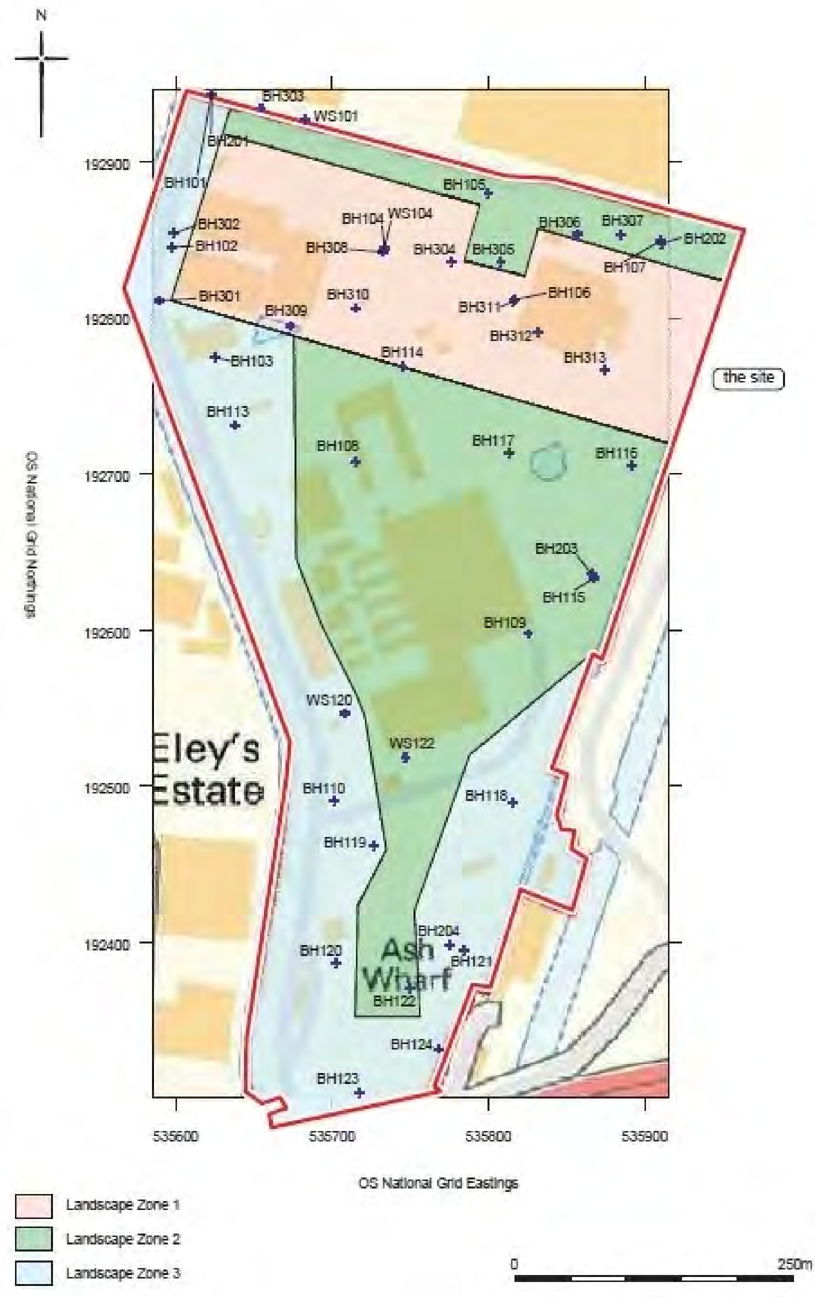
3.5.15 LZ 1 is situated on the northern part of the Application Site within the vicinity of the proposed ERF. This zone has low archaeological potential but moderate to high palaeoenvironmental potential including organic deposits within the basal gravel known as the Lea Valley Arctic Beds.

3.5.16 LZ 2 is located predominately on the northern and central area of the Application Site and extends as far south as the proposed RRF. The zone has moderate palaeoenvironmental potential and low to moderate archaeological potential.

3.5.17 LZ 3 is located on the western, south-eastern and southern areas of the Application Site. Parts of the RRF fall within this zone. This zone has the highest palaeoenvironmental potential across the Application Site as a whole and moderate archaeological potential.

3.5.18 Although settlement evidence is unlikely, there is good potential to encounter deposits capable of yielding palaeoenvironmental data. In LZ 1 the basal floodplain gravels may contain organic deposits that are known as the Lea Valley Arctic Beds. These relate to a cold period nearing the last glacial maximum and may preserve flora and fauna from 26,000 to 21,000 years ago. These deposits have the potential to contribute to national and regional research objectives such as P1, P2, and P3 of the Research

Framework outlined by the Museum of London[40]. These research objectives facilitate better focused archaeological research for the city of London highlighting key areas/assets necessary for investigation.



Vol 2 Plate 3.1: Landscape Zones

3.5.19 In LZ 2 the alluvial sequence is dominated by approximately 1 to 2m of late prehistoric/historic silty clay deposits that represent channel deposits of the River Lee as it meandered across the Application Site. The alluvial sequence is sealed by approximately 2 to 3m of Made Ground. In places the alluvial sequence has been entirely truncated. The zone has a moderate potential to contain palaeoenvironmental remains within the silts and clays that could be utilised to reconstruct river hydrology. These deposits have potential to address regional research objectives set out in the research

[40] Museum of London (2002) *A research framework for London* archaeology; p12-16

frame work for London; Infrastucture relating to 'Understanding the development of London's Docklands and Waterways'[41].

3.5.20 In LZ 3 undulations in the gravel topography suggest that the zone represents ecotonal channel marginal areas and deeper incised channels. The gravels are overlain by a peat and alluvial sequence that in places exceeds approximately 2m in thickness. Deposits within this zone appear to have suffered less truncation than those elsewhere on the Application Site because there has been less invasive groundwork, and therefore has the highest palaeoenvironmental potential.

3.5.21 Vol 2 Table 3.3.1 summarises the archaeological assets and their environmental value.

Vol 2 Table 3.3.1: Archaeological and geoarchaeological assets identified by the archaeological investigations and geoarchaeological deposit model

Description	Environmental value
Arctic bed deposits	High
Modern Made Ground	Negligible
Truncated floodplain deposits	Low
Upper floodplain deposits	Medium
Floodplain deposits (which includes any upper and lower floodplains)	Medium

3.6 Potential effects and good environmental design management

3.6.1 The following aspects of construction and demolition/decommissioning are particularly relevant to the archaeology assessment:

a. excavations for slab formation (RRF and EcoPark House) and storage bunker (ERF);

b. slab construction;

c. piling for foundations; and

d. demolition of existing structures and removal of slabs and foundations.

3.6.2 The CoCP (Vol 1 Appendix 3.1) would ensure that any archaeology discovered is appropriately handled and recorded. A programme of investigation would be developed in conjunction with GLAAS and would be likely to comprise some or all of the following:

a. watching brief during excavations for storage bunker; and

[41] Museum of London (2002) *A research framework for London* archaeology; p78

b. watching brief during site preparation for construction of RRF and EcoPark House.

3.6.3 In the event that archaeological materials are found on the Application Site, a Written Scheme of Investigation would be prepared for submission to LB Enfield prior to site preparation and construction, in consultation with HE. As set out in the CoCP, the Written Scheme of Investigation would detail the generic principles, standards, methods and techniques to be employed for archaeological works.

3.7 Assessment – construction

RRF and EcoPark House excavation and slab construction (Stage 1b)

3.7.1 The formation of new slabs and foundations for the RRF and EcoPark House would have a minor magnitude of change on the footprint of the building in the upper floodplain sequence due to their depth (approximately 9.70-10.70m AOD). With deposits in this layer being of medium environmental value, the effect would be slight adverse and therefore **not significant**.

Piling for RRF and EcoPark House (Stage 1b)

3.7.2 Piling for foundations for the RRF and EcoPark House would produce a localised impact[35] on the deeper part of the alluvial sequence although buried remains are unlikely to be present, due to the wet conditions unlikely to support anthropogenic settlement or use. Such localised impacts would be negligible due to the low volume of ground it would disrupt and the low number of piles required. With a medium environmental value, the resultant effect would be slight adverse and therefore **not significant**.

Excavation of ERF storage bunker (Stage 1d)

3.7.3 Construction of the proposed ERF storage bunker comprises five reinforced concrete boxes and would require excavation to a depth of 14m below ground level. This is sufficiently deep to encounter the palaeoenvironmental material (gravel layer) potentially containing arctic bed deposits. Although the construction would only result in a minor magnitude of change (i.e. not greatly altering the ability to understand and appreciate the resource and its historical context and setting), the arctic beds are of high environmental value due to their potential to store palaeoenvironmental data. With the geoarchaeological watching brief on the excavations for the bunker, as set out in the CoCP (Vol 1 Appendix 3.1), it is considered that the significance of effect would be slight adverse and therefore **not significant**.

Piling for ERF (Stage 1d)

3.7.4 The magnitude of change caused by the installation of the ERF piles is determined as minor on the basis that each pile is of a small volume, the piles are low in density and if artic bed deposits or archaeological remains in the alluvial floodplain are encountered, the CoCP (Vol 1 Appendix 3.1) measures would document the artic deposit information. Given the arctic bed and floodplain deposits are of high and medium environmental value respectively, the resultant significance of effect is slight adverse and therefore **not significant**.

ERF slab construction (Stage 1d)

3.7.5 The depth of the ERF slab construction would not reach the depth of, and thus impact, the underlying alluvial deposit. Impacting modern Made Ground, the magnitude of change is negligible with the resultant effect being neutral and **not significant**.

Demolition of existing structures and removal of slabs and foundations (Stage 3)

3.7.6 Covering the majority of the central part of the Application Site, the decommissioning and demolition of the EfW facility would have very little impact on archaeology. The value of the assets it would impact are low. Assuming cropping and back-filling of structures is carried out as proposed, the magnitude of change would be negligible. The resultant effect is neutral and therefore **not significant**.

3.8 Assessment – operation

3.8.1 As described in Paragraph 3.1.3, there are not anticipated to be significant effects once the Project is built and operational. This has therefore been scoped out of the assessment and is not considered further.

3.9 Assessment – decommissioning of the Project

3.9.1 It is expected that decommissioning and demolition of the ERF would continue for up to around 18 months using conventional methods, similar to those anticipated for the EfW facility. Other structures to be decommissioned include the ERF storage bunker (most likely method of removal is using a reverse open-cut excavation method, with a waterproofing layer to provide a low permeability barrier to groundwater resources, followed by compacted backfill and finally top backfill of granular material and topsoil up to ground level), the RRF and RRC buildings and EcoPark House.

3.9.2 The latest archaeological measures and guidance would be reviewed at that time. It is expected that they would be similar to those set out in the CoCP (Vol 1 Appendix 3.1) and adherence with those measures would prevent any significant effects occurring.

3.10 Supplementary mitigation

3.10.1 There is no requirement for supplementary mitigation as no significant adverse effects have been identified.

3.11 Residual effects

3.11.1 As no mitigation measures are proposed, the residual construction and decommissioning effects remain as described in Sections 3.7 and 3.8.

3.12 Sensitivity test for programme delay

3.12.1 A change to the programme of plus or minus 12 months would not materially change the assessment findings reported in Sections 3.7 and 3.8.

3.13 Cumulative effects

3.13.1 Using the Cumulative Development Schedule (Vol 1 Appendix 5.2), the following proposed projects have been considered based on each development's proximity, size and possibility of groundwork involved, as well as the characteristics of any archaeological asset impacted:

a. The North London (Electricity Line) Reinforcement (DCO);

b. Meridian Water;

c. Pegamoid Works;

d. Stonehill Estate; and

e. Lee Valley Heat Network and Energy Centre.

3.13.2 Assuming compliance with the NPPF, each development must make reasonable efforts to ensure that no significant adverse effects on archaeology would occur. Therefore, cumulatively, there would be **no significant** adverse effects.

3.14 Assessment summary

Construction

Vol 2 Table 3.3.2: Assessment summary – construction

Archaeology			
Aspect of the Project	**Description of effect and significance**	**Proposed mitigation**	**Residual effects summary**
Sub-stage 1b			
RRF/EcoPark House excavation and slab construction	With the implementation of CoCP measures, the excavation and slab construction is unlikely to disturb upper floodplain deposits, therefore the effect would be **not significant.**	None required	Effect unchanged **Not significant.**
RRF/EcoPark House piled foundations	With the implementation of CoCP measures and low density and volume of piling, the piled foundations are unlikely to disturb any archaeology that may be in deeper part of the alluvial floodplain, therefore the effect would be **not significant.**	None required	Effect unchanged **Not significant.**
Sub-stage 1d			
Excavation of ERF storage bunker	With the implementation of CoCP measures, the effect of truncating the gravel layer, and the potential to come into contact with artic bed deposits would be **not significant**.	None required	Effect unchanged **Not significant.**
ERF slab construction	With the implementation of CoCP measures, the potential to disturb archaeology is very low, therefore the effect would be **not significant.**	None required	Effect unchanged **Not significant.**
ERF piled foundations	With the implementation of CoCP measures and low density and volume of piling, the potential to disturb the floodplain (which could contain	None required	Effect unchanged **Not significant.**

Archaeology			
Aspect of the Project	**Description of effect and significance**	**Proposed mitigation**	**Residual effects summary**
	archaeological remains) and the gravel layer would be **not significant.**		
Stage 3			
Demolition of existing structures and removal of slabs and foundations	With the implementation of CoCP measures, the potential to disturb surrounding ground work of existing structures would be **not significant.**	None required	Effect unchanged **Not significant.**

Decommissioning of the Project

Vol 2 Table 3.3.3: Assessment summary – decommissioning of the Project

Archaeology			
Aspect of the Project	**Description of effect and significance**	**Proposed mitigation**	**Residual effects summary**
Decommissioning and demolition of structures	With the implementation of standard control measures, the potential to disturb ground around decommissioned facilities would be **not significant.**	None required	Effect unchanged **Not significant.**

4 Daylight, sunlight and overshadowing

4.1 Introduction

4.1.1 This section describes the likely significant effects of the Project on sunlight and daylight availability and overshadowing to properties on and surrounding the Application Site.

4.1.2 Sunlight and daylight availability and shadow guidance has been considered for the proposed development in order to:

a. assess the effects on the surrounding existing properties; and

b. assess the effects on the surrounding amenity areas.

4.1.3 Effects from artificial lighting on ecological receptors have been considered in the ecology assessment. In summary, controls within the CoCP (Vol 1 Appendix 3.1) and the lighting principles (contained in the Design Code Principles (AD02.02)) for the Project would ensure that significant effects on designated sites would not occur. Further details can be found in Vol 2 Section 5 (Ecology) and the No Significant Effects Report (AD05.17).

4.1.4 Construction and decommissioning activities generally do not in themselves give rise to daylight, sunlight and overshadowing effects. Rather, it is the physical form (massing) of development that has the potential to give rise to effects. Construction and decommissioning activities have therefore not been assessed.

4.1.5 The works plans (based on which the daylight, sunlight and overshadowing assessment has been undertaken) are contained in the Book of Plans (AD02.01) which forms part of the DCO Application documents.

4.2 Engagement

4.2.1 The Scoping Report recommended that Daylight, Sunlight and Overshadowing be scoped out from the assessment.

4.2.2 However, the Scoping Opinion[1] states that:

> *"As described in the Environmental Wind section above, the proposals involve a significant reconfiguration of the existing buildings on the site. As the details of these changes have not yet been established it is not possible to be certain that they would not result in significant effects on daylight, sunlight and overshadowing at neighbouring properties. The proposals also include artificial lighting and the Scoping Report acknowledges the potential for effects on ecological resources as part of the Habitats Regulations Assessment."*

4.2.3 Based on the Scoping Opinion, a precautionary approach has been taken to scope in the daylight, sunlight and overshadowing assessment.

4.2.4 No comments were received during Phase Two Consultation regarding the Daylight, Sunlight and Overshadowing assessment contained in the PEIR.

4.3 Methodology

4.3.1 This section describes the methodology for assessing the likely significant effects of the Project on daylight, sunlight and overshadowing.

4.3.2 The assessment criteria are based on the recommendations set out in guidance provided by Site Layout Planning for Daylight and Sunlight – A guide for good practice (2011)[42] (BRE 209). This is the de facto standard for planning and daylight and sunlight availability. It provides guidelines and targets and describes a methodology to assess daylight and sunlight availability for buildings and overshadowing of amenity areas.

4.3.3 The types of receptors considered in this assessment have been selected based on guidance provided in BRE 209: *"The guidelines given here are intended for use for rooms in adjoining dwellings where daylight is required, including living rooms, kitchen and bedrooms […] The guidelines may also be applied to any existing non-domestic building where the occupants have a reasonable expectation of daylight; this would normally include schools, hospitals, hotels and hostels, small workshops and some offices."*

4.3.4 BRE 209 sets out a preliminary criterion to determine whether buildings may be significantly affected or whether they would receive adequate levels of daylight and sunlight. It sets a minimum guideline value for the amount of daylight and sunlight that a building should receive. This is defined as follows:

> *"The guideline is met if the distance of each part of the new development from the existing windows is 3 or more times its height above the centre of the existing window, including that obstruction within 90° of due north of assessed windows need not to be analysed".*

4.3.5 In addition, BRE 209 requires that amenity areas, including parks, playing fields and playgrounds, are assessed. Amenity areas in the vicinity of the Application Site have therefore been identified and assessed. The criterion described in Paragraph 4.3.4 has also been applied to amenity areas.

4.3.6 Mapping analysis was undertaken to determine the area of influence as defined by this criterion. This was used to identify receptors where it could be concluded that there would not be significant effects in terms of daylight, sunlight or overshadowing. For those receptors, no further assessment has then been undertaken.

4.3.7 For receptors falling within the area of influence, obstruction angles and orientation have been used to determine whether they are exposed sufficiently to sunlight and daylight. For example when a development has unobstructed exposure to sun and sky, the availability of sunlight and daylight will be satisfactory and no significant effects would occur.

4.3.8 BRE 209 provides methodology for assessing daylight availability using a value known as the 'vertical skylight component'. For receptors with expectations of reasonable daylight, BRE 209 states that a vertical skylight component value of 27 per cent or more represents adequate daylight

[42] BRE 209 (2011) Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice – Second Edition.

availability. This corresponds to an obstruction angle of around 25°. For receptors falling within the area of influence of the Project, a 3D computer model has been interrogated to determine whether any would have obstruction angles greater than 25°. If the obstruction angle is less than 25°, it has been concluded that a significant effect would not occur.

4.3.9 In accordance with BRE 209, if the vertical skylight component is between 15 per cent and 27 per cent, there is likely to be adequate daylight availability although it is recommended that internal room layouts and window sizes are given consideration at the detailed design stage.

4.3.10 Stages 2 and 4 are assessed as these are the stages with static massing configurations. Stage 2 is considered to be the scenario with the potential for the greatest magnitude of effects as both the existing EfW facility and the proposed ERF would be present on the Application Site and would therefore have the greatest massing. Effects during Stage 4, which is the final operation configuration, are compared to effects identified for Stage 2.

4.4 Assumptions and limitations

Assumptions

4.4.1 For the purposes of this assessment, it has been assumed that the buildings that form the Project would be built out to the maximum extents identified in the works plans in the Book of Plans (AD02.01). This provides a worst-case assessment.

Limitations

4.4.2 In the course of undertaking this assessment, no limitations to the assessment process were encountered.

4.5 Baseline

4.5.1 This section sets out the current and future baseline conditions for daylight, sunlight and overshadowing in and around the Application Site. It describes the current massing on the Application Site and identifies receptors in the vicinity.

Current baseline

4.5.2 The existing EfW facility dominates the centre of the Application Site. The existing building height is 35m above ground, which makes it the tallest building on the Application Site. Only the existing stack is taller, at 100m above ground.

4.5.3 At the northern end of the Application Site there is an in-vessel composting (IVC) facility, incinerator bottom ash reprocessing plant, bulky waste recycling facility and fuel preparation plant. These facilities are approximately 20m in height.

4.5.4 South of the EfW facility are some ancillary buildings with a maximum height of 5-6m, open landscaped areas, a security gate and the southern weighbridge.

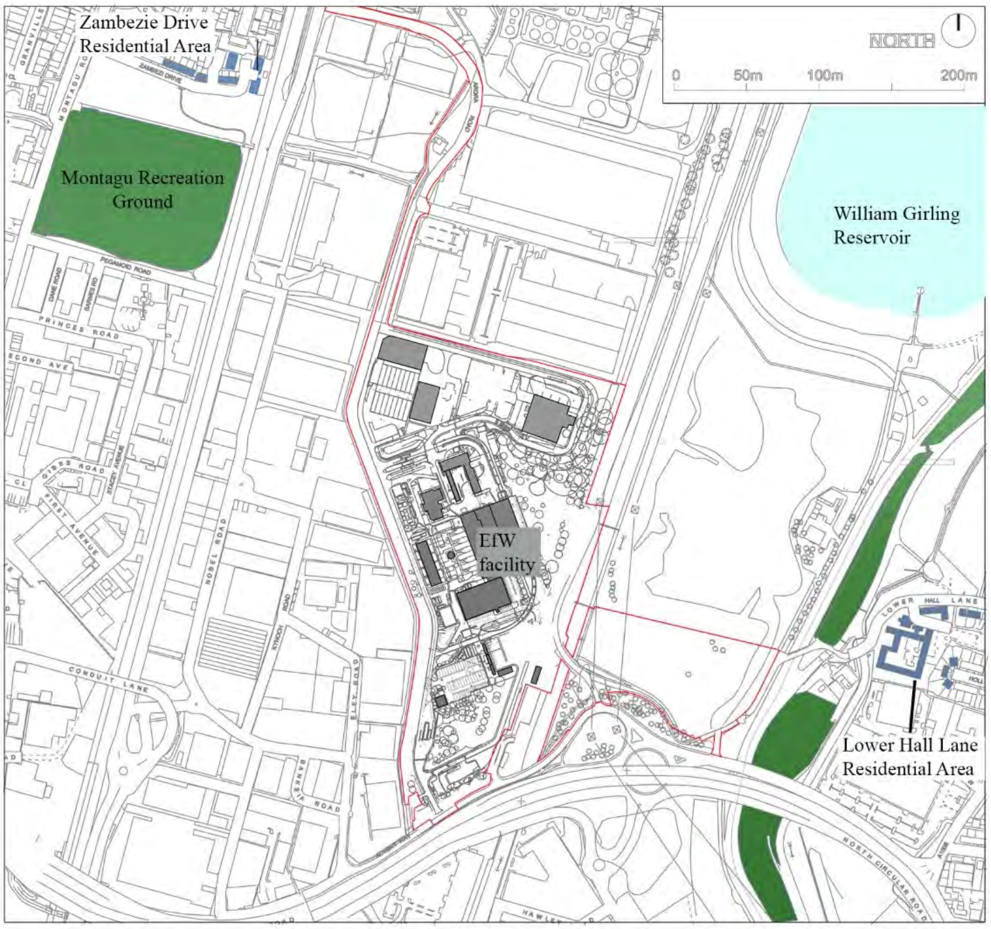
4.5.5 The following receptors in the vicinity of the Application Site have a reasonable expectation of daylight and sunlight and have therefore been considered:

a. The closest residential properties are located 60m to the west of the Application Site boundary on Badma Close. However this area is in proximity to the proposed northern access (Ardra Road) rather than any built development of interest to daylight, sunlight and overshadowing assessment. Zambezie Drive is the closest residential area to the Application Site boundary, located approximately 310m north-west of the Edmonton EcoPark.

c. To the east, the closest residential properties are located approximately 470m east of the Edmonton EcoPark on Lower Hall Lane. Lower Hall Lane is on the eastern side of the Lee Valley Regional Park (LVRP).

d. Amenity areas assessed comprise the green areas between Lower Hall Lane residential areas and River Lea and Montagu Recreation Ground to the north-west of the Application Site.

4.5.6 A plan of the receptors assessed is included as Vol 2 Plate 4.1.



Vol 2 Plate 4.1: Plan view showing the receptors assessed

Future baseline

4.5.7 Future baseline receptors and cumulative developments outside the Application Site have been identified and described in Vol 1 Appendix 5.2.

Of these, none has either a reasonable expectation for daylight or is close enough to the Application Site that it may affect the daylight and sunlight baseline.

4.6 Potential effects and good environmental design management

4.6.1 The elements of the Project relevant to daylight, sunlight and overshadowing are set out below.

4.6.2 Potential effects during operation include reduction in daylight and sunlight at receptors and overshadowing of amenity areas due to the massing of the proposed buildings. As noted in Paragraph 4.3.10 Stage 2 is the scenario with the greatest massing on the Application Site and hence with greatest potential for adverse effects. The existing stack would also remain on the Application Site until Stage 3. The heights of the existing structures are described in Paragraph 4.5.2. The proposed ERF would be up to 56.5m in height. The proposed stack would be up to 105m above ground. The works plans included in the Book of Plans (AD02.01) set out the proposed massing of the new facilities.

4.6.3 The Project includes a facility that would have reasonable expectation of daylight and sunlight due to its use as a visitor and education centre, offices and a base for the Edmonton Sea Cadets. This is EcoPark House, located on the south-east of the Application Site.

4.7 Assessment

Stage 2

Receptors on the Application Site

4.7.1 Daylight availability at EcoPark House would be good on all unobstructed elevations. On the west side, where the building faces the RRF, the obstruction angle would be at its greatest – 35°. This corresponds to a vertical sky component of 21.5 per cent. While this falls below the guideline value of 27 per cent provided by BRE 209, it is significantly above 15 per cent and therefore there is likely to be adequate daylight availability and the effect is considered to be not significant. However, it is recommended in accordance with BRE 209 guidance that internal room layouts and window sizes are considered at detailed design to ensure optimum daylight conditions.

4.7.2 EcoPark House would receive adequate levels of sunlight since more than one main window wall would face within 90° of due south and would be unobstructed.

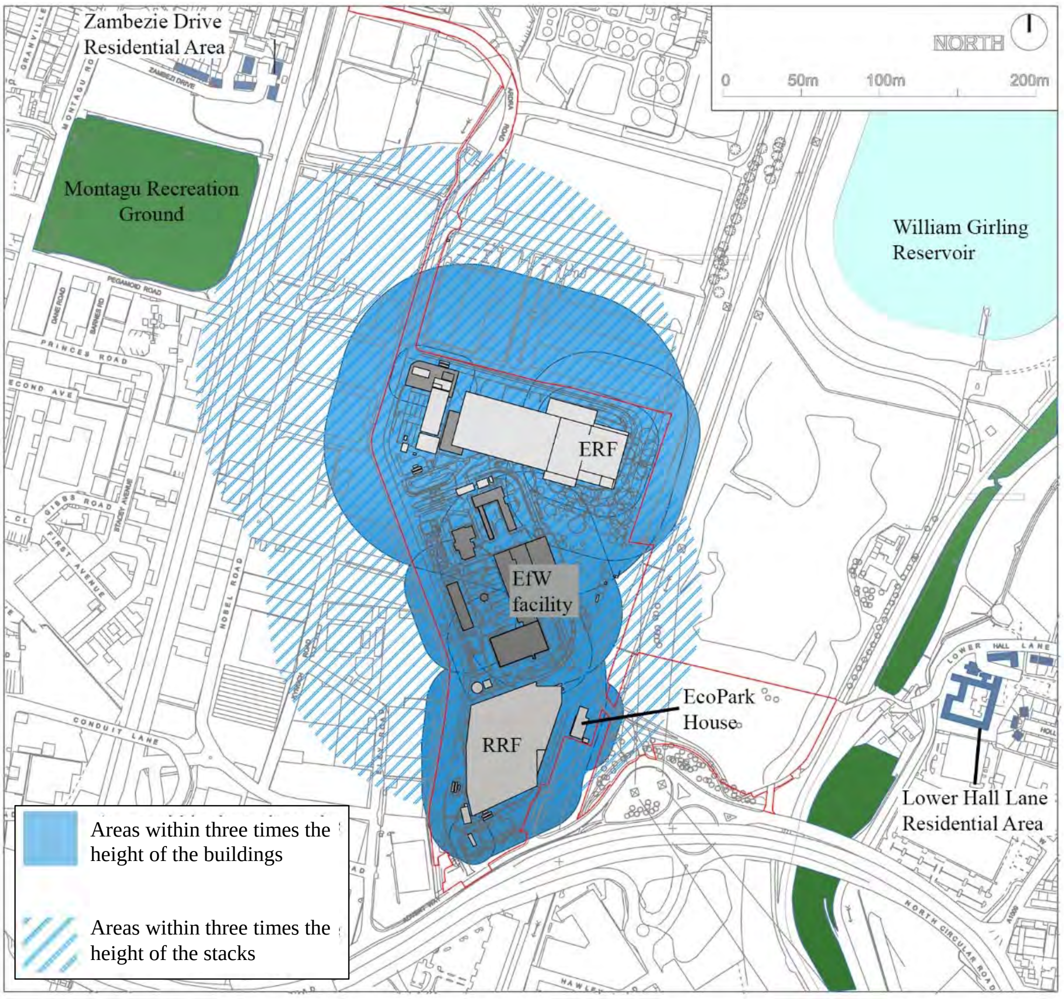
4.7.3 Therefore the effects on the daylight and sunlight availability for EcoPark House are **not significant**.

Surrounding properties and amenity areas

4.7.4 Vol 2 Plate 4.2 shows a plan view of the Application Site where a colour code is used to demonstrate the extent of the area of influence of the massing corresponding to Stage 2 of the Project on daylight and sunlight availability. This represents the area in which sensitive receptors, if present, may be affected. Receptors outside this area would not be significantly affected.

4.7.5 Areas that are within three times the height of the assessed massing are shown in blue. These include a solid blue pattern, which corresponds to the area within three times the height of the buildings at the Application Site and a blue hatch which indicates the areas within three times the height of the stacks.

4.7.6 All surrounding residential properties and amenity areas fall outside the area of influence. Therefore the effects of the Project on daylight and sunlight availability and overshadowing are **not significant**.



Vol 2 Plate 4.2: Plan view of Stage 2 of the Project showing the area of influence on sunlight and daylight availability

Stage 4

4.7.7 Stage 4 massing is reduced from Stage 2 as the EfW facility is removed. The reduction in massing reduces the effects of the proposed configuration on daylight and sunlight availability in surrounding areas compared to Stage 2.

4.7.8 Since Stage 2 has no significant adverse effects, effects during Stage 4 are also **not significant**.

4.8 Supplementary mitigation

4.8.1 As there are no significant adverse effects, no mitigation measures are required with respect to effects from the Project. However as stated in Paragraph 4.7.1 it is suggested that internal room layouts and window sizes are considered at detailed design to ensure optimum daylight conditions at EcoPark House.

4.9 Residual effects

As no mitigation measures are proposed, the residual effects remain as set out in Section 4.7.

4.10 Sensitivity test for programme delay

4.10.1 For the assessment of daylight, sunlight and overshadowing, a change to the programme of plus or minus 12 months would not be likely to materially change the assessment findings reported in Section 4.7.

4.10.2 Based on the Cumulative Development Schedule (Vol 1 Appendix 5.2), there would be no new receptors requiring assessment as a result of the programme change.

4.10.3 This is because there are no developments identified on the Cumulative Development Schedule (Vol 1 Appendix 5.2) that would fall into the future baseline as a result of the programme change and therefore the future baseline would remain as described in Section 4.5.

4.11 Cumulative effects

4.11.1 Based on a review of the Cumulative Development Schedule (Vol 1 Appendix 5.2), other developments in the vicinity of the Application Site are not close enough to EcoPark House to affect daylight and sunlight availability.

4.11.2 Furthermore, as the identified receptors fall outside the area of influence of the Project, there would be no cumulative effects.

4.12 Assessment summary

Operation

Vol 2 Table 4.1: Assessment summary – operation

Daylight, Sunlight and Overshadowing			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 2			
Massing of proposed ERF building and existing EfW facility.	For daylight and sunlight availability and overshadowing, the effects are **not significant**.	None required.	Effects unchanged. **Not significant.**
Stage 4			
Massing of proposed ERF building	For daylight and sunlight availability and overshadowing, the effects are **not significant**.	None required.	Effects unchanged. **Not significant.**

5 Ecology

5.1 Introduction

5.1.1 During the scoping phase of the Project, it was considered that there would be no significant ecological effects from the Project and this topic was proposed to be scoped out. Extensive ecological surveys at the Application Site have indicated that there is limited potential for significant effects arising from the Project. However, the Scoping Opinion[1] required that ecology be included as the Scoping Report did not provide adequate details in terms of the survey findings or proposed mitigation to justify this and considering the proximity of the Application Site to national and European sites. In response to the Scoping Opinion, ecology has been included in the ES.

5.1.2 There are ecological sites designated under the Conservation of Habitats and Species Regulations 2010[43] (as amended) ('European sites') near to the Application Site and therefore screening for Habitats Regulations Assessment (HRA) is also required. The criteria used in this Ecological Impact Assessment (EcIA) and the No Significant Effects Report (NSER) (Vol 2 Appendix 5.2) are different, whereby EcIA considers the evaluation of all ecological features and the likely significance of effects upon these and HRA focuses on the effects of the Project on the specific qualifying features and conservation objectives of European sites. Where a project subject to EIA would also be likely to have significant effects on a European site, the appropriate assessment under the Habitats Regulations must be carried out as well as undertaking the EIA.

5.1.3 This EcIA considers the effects on the ecological resources during the demolition, construction, operational and decommissioning of the Project.

5.1.4 The assessment comprises:

a. a review of consultation undertaken and how the responses have influenced the assessment;

b. a description of the baseline conditions and an assessment of the Application Site's ecological importance with regards to specific ecological features;

c. a summary of the survey and assessment methodologies, with full details provided in Vol 2 Appendix 5.1;

d. a review of the limitations and assumptions;

e. a review of embedded ecology measures that have been incorporated into the design of the Project;

f. an assessment of the potential effects on ecological features and any supplementary mitigation and enhancement measures; and

g. an assessment of residual and cumulative effects on ecological features.

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[43] Her Majesty's Stationary Office (HMSO) (2010); The Conservation of Habitats and Species Regulations 2010.

5.1.5 This section should be read in conjunction with related topic assessments, specifically Air Quality and Odour (Section 2), Noise and Vibration (Section 9) and Water Resources and Flood Risk (Section 11).

5.1.6 The works plans (based on which the ecology assessment has been undertaken) are contained in the Book of Plans (AD02.01) which forms part of the DCO Application documents.

5.2 Engagement

5.2.1 The following provides a summary of engagement with consultees. Full details of all comments and responses are provided in Vol 2 Appendix 5.1.

5.2.2 Natural England – A meeting was held with Natural England on 16 June 2014 to review the proposed development and ecological baseline conditions at the Application Site, identify opportunities and constraints and discuss the scope of the NSER (Vol 2 Appendix 5.2). It was concluded that an ecological walkover survey should be undertaken to update the results of previous Phase One, bat scoping, badger *Meles meles*, otter *Lutra lutra* and water vole *Arvicola amphibius* surveys. This updated survey was undertaken on 8 September 2014.

5.2.3 Natural England – A response to the Scoping Report was provided on 28 November 2014, which states that Natural England is satisfied that the Project would "… *not have a significant effect on The Lee Valley Ramsar*[44]*, either individually or in combination with other plans or projects*." The response also states that "…*the proposed operations are unlikely to damage any of the interest features of the Walthamstow and Chingford Reservoirs SSSIs*[45]*, which are also component part of the Lee Valley Ramsar*." Natural England was satisfied that the "… *approach and methodology of the EIA scoping report is sufficient to assist in developing the Habitat Regulations Assessment*."

5.2.4 EA – The EA recommended (11 November 2014) the use of green roofs and improvements to Enfield Ditch, which are both included in the landscape proposals for the Project. In their scoping response, the EA also stressed the need to ensure that opportunities are taken with regard to the protection and enhancement of biodiversity at the Application Site, including the restoration or rehabilitation of the channel back to more natural conditions.

5.2.5 NHS – Scoping response regarding habitat maintenance or improvement, especially for birds.

5.2.6 LB Enfield – Scoping response stating that ecology should be scoped into the EIA.

5.2.7 The following summarises scoping comments received from the Secretary of State in November 2014. For full comments and responses refer to Vol 2 Appendix 5.1:

[44] Sites designated under the Convention on Wetlands 1971 (the Ramsar Convention)
[45] Sites of Special Scientific Interest designated under the Wildlife and Countryside Act 1981 (as amended)

a. The use of assessment terminology – the Scoping Report proposed the use of 'impact' used as per the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines[46] rather than 'effect' as used for EIA Regulations[47]. The Secretary of State advocates consistency in the ES, therefore the term 'effect' is used instead of 'impact'.

b. The selection of a 2km radius search area during the desk study and need for justification of this distance. A 2km buffer for other designated sites was considered appropriate on account of the scale and nature of the Project, as well as the urban location of the Application Site. However, this was extended to 10km with respect to European sites, in line with guidance from Natural England.

c. The importance of liaising with other stakeholders, such as Natural England, regarding the preparation of the CoCP and inclusion of a draft copy with the ES. The CoCP (Vol 1 Appendix 3.1) has been developed alongside the design of the Project. In this way, relevant measures have been incorporated to alleviate any potential adverse effects and ensure a net gain in biodiversity.

d. The need to assess potential airborne pollutant emissions effects on sites in the vicinity of the Project, which are designated for nature value. The NSER (Vol 2 Appendix 5.2) considers the proximity of the Application Site to Epping Forest SAC and Lee Valley SPA and Ramsar site (Vol 2 Appendix 5.2). This assessment also considers effects of airborne pollutant emissions on all designated sites.

e. The need to consider interrelationships with other disciplines such as air quality and water resources. Information on interrelationships between topics are provided within each topic assessment with appropriate cross-references provided. Interactive effects are also presented in Section 12 which includes consideration of multiple effects from the Project on receptors.

5.2.8 The following summarises Phase Two Consultation responses received in June and July 2015. For full comments and responses refer to Vol 2 Appendix 5.1:

a. Lee Valley Regional Park Authority – Further detail was requested regarding the green area adjacent to the existing EfW facility within Edmonton EcoPark, in terms of whether it would be possible to include additional planting. This area would be landscaped, including a meadow and scattered trees. Concerns were also raised regarding the effects of the Project on the Lea Valley SMINC, particularly in terms of maintaining connectivity along the River Lee Navigation. Ecological enhancements have been proposed, including native planting and erection of bat and bird boxes within the Application Site. In addition, sensitive lighting is proposed along Lee Park Way to maintain a dark corridor along the River Lee Navigation and therefore minimise disturbance to foraging

[46] Institute of Ecology and Environmental Management (2006); Guidelines for Ecological Impact Assessment

[47] HMSO (2009); Infrastructure Planning (Environmental Impact Assessment) Regulations 2009.

and commuting bats. Clarification was also sought concerning the proposals within the area of the existing EfW facility post-demolition, which is due to be covered with hardstanding, which could include gravel, as it is being safeguarded for future other waste related development.

b. LB Enfield – The importance of creating habitat enhancements was emphasised, given that the Application Site overlaps Lea Valley SMINC. This has been taken into account through the landscape strategy (described in the Design and Access Statement), especially through enhancements along Lee Park Way.

c. Greater London Authority (GLA) – The GLA supports provision of green and brown roofs and creation of a visual buffer along the canal. Reference has been made to a dark corridor along the canal. Sensitive lighting is proposed along Lee Park Way.

d. Environment Agency – Improvements to Salmon's Brook are recommended, including measures to naturalise the banks. Improvements to Enfield Ditch are proposed.

e. Natural England – Concerning the Interim Screening Statement to Inform a Habitats Regulations Assessment (NSER (Vol 2 Appendix 5.2)), the conclusions were deemed appropriate, in that the Project would have no likely significant effects on European sites. Natural England is also satisfied that the Project is not likely to damage interest features of Chingford Reservoirs, Walthamstow Reservoirs and Epping Forest SSSIs. Concerning the PEIR, Natural England confirmed that the methodology for undertaking the surveys and assessment are satisfactory. Natural England also welcomes the inclusion of appropriate habitat enhancements. Ongoing monitoring of construction works by an ecologist is recommended. Although this is not proposed, the Contractor would monitor the effectiveness of mitigation measures.

f. Canal and River Trust – The Trust would like the towpath that is within the Application Site to be landscaped, which is proposed as part of the Project.

g. Secretary of State – Comments have been received concerning the Interim Screening Statement to Inform a Habitats Regulations Assessment (NSER (Vol 2 Appendix 5.2)), including taking account of the latest guidelines[48]. These comments have been taken into account in the NSER, including further detail in the in-combination assessment to consider effects associated with sulphur deposition.

5.3 Methodology

5.3.1 The same assessment methodology applies to all stages of the Project. The effects of construction and demolition are assessed separately to the operation of the Project and the decommissioning of the Project.

[48] The Planning Inspectorate (2015) Habitats Regulations Assessment. Advice note ten: Habitat Regulation Assessment relevant to nationally significant infrastructure projects. Available at: http://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/06/Advice-note-. Accessed July 2015.

5.3.2 This section provides an overview of the methodology for assessing the likely significant effects of the Project on ecology. Full details of the topic methodology are provided in Vol 2 Appendix 5.1.

5.3.3 The standard approach applied in the UK to EcIA is that developed by CIEEM[46]. This method has been used to evaluate existing features and to assess the significance of the ecological effects on these features that may arise as a result of the construction, operation and decommissioning of the Project.

5.3.4 Ecological features are valued according to the following criteria:

a. international;

b. national;

c. regional;

d. county;

e. district;

f. parish (ward);

g. site; and

h. negligible.

Determination of significant effects

5.3.5 An effect is considered to be significant if it is: "*An impact [effect] (either adverse or beneficial) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area.*"[46] As features of less than parish importance would not be a material consideration for the Project, only features of parish or higher importance have been considered in the assessment.

5.3.6 An effect is considered 'beneficial' if it helps to deliver conservation policy, or 'adverse' if it is contrary to conservation policy.

Residual and cumulative effects

5.3.7 The assessment is repeated taking into account the implementation of any required mitigation measures to determine the residual effects. This assessment considers the likely success of the mitigation, given knowledge of the tolerance or adaptability of the resource or feature to environmental change.

5.3.8 A cumulative assessment has also been undertaken, which considers whether any of the cumulative developments described in Vol 1 Appendix 5.2 have a potential to alter the significance of residual effects as a result of the Project. A qualitative assessment has been undertaken to identify any cumulative effects on ecological features associated with the Project.

5.4 Assumptions and limitations

Assumptions

5.4.1 It is assumed that the landscape proposals and embedded ecological measures would be implemented as described in Section 5.6.

Limitations

5.4.2 Ecological surveys have been undertaken at the Application Site from 2012 to 2015. During this time, the boundary of the Application Site has changed to include additional areas of land. Consequently, mapping shown in the less recent survey reports indicates a smaller red line boundary than the current Application Site. However, Phase One surveys have been undertaken and the reports updated with the addition of each new area of land. For each change in boundary, the Phase One work has included surveys for the potential presence of protected species. Where potential for protected species has been identified during this process (e.g. the potential for reptiles within the Temporary Laydown Area), this has been addressed by undertaking further surveys.

5.4.3 The automated bat detector located along the Deephams STW outflow channel malfunctioned during the September 2013 survey. However, this is not considered to adversely affect the results, as fifteen nights of data were still recorded from June and August. It is considered that adequate survey data was obtained to assess the importance of the main operational site to bats.

5.4.4 During the ecological walkover survey in 2014, contractors were removing Himalayan balsam from Deephams STW outflow channel. It is likely that invasive plants were under-recorded and may re-establish in the same or different locations than those indicated.

5.4.5 An area of plantation woodland consisting of young trees is located in the north-east corner of the Application Site. Although this area was inaccessible during surveys and could not be assessed for the potential to support roosting bats, inspections from accessible areas on the Application Site were carried out. These inspections concluded that the trees are too young to provide roosting habitat. Therefore this is not considered to pose a significant limitation.

5.4.6 All bat surveys have been undertaken in suitable weather conditions during the appropriate survey window (May to September inclusive) when bats are most active. While the September 2014 survey was conducted towards the end of the survey window, this is not considered to pose a constraint on account of the low level of bat potential attributed to the surveyed buildings and low level of bat activity recorded during the survey and also during previous surveys.

5.4.7 It is likely that floodlighting on Building B3 (refer to Figure 1 within the Phase One and Bat Survey Report in Vol 2 Appendix 5.3) deters bats from foraging in this part of the Application Site. Since this lighting was turned off for the purpose of the September 2014 survey, it is likely that this affected the results, in terms of indicating higher levels of bat activity than would otherwise occur. This indicates the potential value of the River Lee Navigation when light levels are reduced, further justifying the measures described in Section 5.6.

5.4.8 No account can be made for the presence or absence of species during the survey periods, since fauna may change their spatial distribution at various scales over time. Species may also return to, or colonise new areas at any future time, particularly if there is a change in the habitat structure. However, the surveys adhered to appropriate current best practice guidance and the judgement of experienced surveyors to provide an assessment of likely presence/absence of protected species. The data collected provides a robust scoping basis for the assessment of the ecological baseline of the Application Site.

5.5 Baseline

5.5.1 This section sets out the baseline conditions for ecology in and around the Application Site. Although the Application Site was extended after the Scoping Report was produced (and now also includes a Temporary Laydown Area to the east of River Lee Navigation and part of Deephams Farm Road/Ardra Road), the change to the Application Site boundary has been fully considered in terms of the surveys and assessment undertaken. Future baseline conditions are also described. Values have been attributed to the ecological features in accordance with Vol 2 Appendix 5.1 Table 5.

5.5.2 Baseline ecological information for the Application Site has been obtained through a combination of desk-based study and a series of field surveys.

5.5.3 Full details regarding the results of the surveys that were used to inform the following are contained in Vol 2 Appendix 5.3 (2015 Phase One Update and Bat Survey Report), Vol 2 Appendix 5.4 (2012 Protected Species Survey Report), Vol 2 Appendix 5.5 (2013 Phase One Habitat Survey Report), Vol 2 Appendix 5.6 (2013 Bat Survey Report), Vol 2 Appendix 5.7 (2013 Breeding Bird Survey Report), Vol 2 Appendix 5.8 (2015 Temporary Laydown Area Reptile Survey Report), Vol 2 Appendix 5.9 (2015 Incidental Bird Records Filenote) and Vol 2 Appendix 5.10 (2015 Lee Park Way Bat Report)

Current baseline

5.5.4 A data search for designated sites located within 2km of the Application Site was commissioned from Greenspace Information for Greater London (GiGL)[49] in 2013. The 2km radius was defined from the centre of the Application Site This 2km radius was extended to include a review of European designated sites within 10km of the Application Site using the MAGIC website[50].

5.5.5 The 2km radius for non-statutory sites was considered adequate for the Application Site due to its urban setting and scale and nature of the Project. The 10km radius was used for assessment of potential impacts on

[49] Greenspace Information for Greater London (2013) An Ecological Data Search for London Waste Eco Park Edmonton.
[50] Natural England (2013) ‘MAGIC’. Available at: http://magic.defra.gov.uk/ (Accessed July 2015)

European sites due to the potential for effects associated with the deposition of nitrogen (N) compounds and related acidity associated with emissions from the Project.

International designations

5.5.6 *Lee Valley SPA and Ramsar Site* (Walthamstow Reservoirs) is located, at the closest point, approximately 1.5km to the south of the Application Site boundary and comprises a series of man-made and semi-natural wetlands. Lee Valley is designated as an SPA as it supports bird populations of European importance over the winter, specifically bittern *Botaurus stellaris*, shoveler *Anas clypeata* and gadwall *Anas strepera*[51]. Lee Valley is also designated as a Ramsar site as it supports qualifying populations of shoveler and gadwall, as well as the nationally scarce plant species whorled water-milfoil *Myriophyllum verticillatum* and the rare or vulnerable invertebrate *Micronecta minutissima* (a water-boatman)[52]. Lee Valley SPA and Ramsar is of **international** value.

5.5.7 These designated sites are considered further due to the potential for emissions associated with the operation of the Project to lead to the deposition of nitrogen and acidity within the SPA and Ramsar site, or to indirectly affect these designated sites through deposition on Chingford Reservoirs SSSI and the River Lee Navigation. As stated in Section 11 Water Resources and Flood Risk, there is the potential for hydraulic connectivity as the Reservoirs are located downstream of the Application Site. A further consideration is the proximity of the Application Site to Chingford Reservoirs SSSI. Although not part of Lee Valley SPA and Ramsar, the SSSI supports nationally important populations of shoveler, which is one of the qualifying features of these European sites (i.e. one of the features that justify the designation of the Ramsar and SPA). There is therefore a potential for indirect impacts on the SPA and Ramsar due to disturbance to bird species associated with the SSSI.

5.5.8 *Epping Forest SAC* is located to the east of the Application Site, approximately 2.8km at the closest point. This site is designated as a SAC because it supports habitats of European importance, specifically[53]:

a. Northern Atlantic wet heaths with cross-leaved heath *Erica tetralix*;

b. European dry heaths; and

c. Atlantic acidophilous beech forests with holly *Ilex aquifolium* and sometimes also yew *Taxus baccata* in the shrub layer *Quercion robori-petraeae* or *Ilici-Fagenion*.

5.5.9 This SAC is also designated as it supports stag beetle *Lucanus cervus* and great crested newt *Triturus cristatus*, being one of only four known outstanding localities for stag beetle in the United Kingdom.

5.5.10 Epping Forest SAC is of **international** value. The Application Site lacks suitable habitat for qualifying features of the SAC, but the qualifying habitats

[51] Joint Nature Conservation Committee (2006) UK SPA Data Form. Lea Valley.
[52] Joint Nature Conservation Committee (2008) Information Sheet on Ramsar Wetlands (RIS). Lea Valley.
[53] Natural England (2011) UK SAC Data Form. Epping Forest.

are considered to be vulnerable to potential deposition of nitrogen compounds and acidity resulting from emissions associated with the Project. Therefore, this designated site is considered further in the assessment.

National designations

5.5.11 *Chingford Reservoirs SSSI* is located approximately 300m to the north-east of the Application Site boundary and comprises a series of drinking water storage basins. William Girling Reservoir is closest, with King George's Reservoir located approximately 2.5km from the Application Site boundary, further north. Chingford Reservoirs are one of the major wintering grounds for wildfowl and wetland birds in the London area. During the winter months the reservoirs regularly support nationally important populations of shoveler and great crested grebe *Podiceps cristatus*. Chingford Reservoirs SSSI is of **national** value and is considered further due to its proximity to the Application Site and the potential for effects associated with airborne emissions and disturbance to birds. In terms of effects associated with water pollution, this site is unlikely to be in hydraulic connectivity with the Application Site groundwater due to its distance, and the likely presence of low permeability liners in the reservoirs (see Section 11 Water Resources and Flood Risk).

5.5.12 There are two further SSSIs within Lee Valley SPA and Ramsar site, which are located within 10km of the Application Site, which are described below.

5.5.13 *Walthamstow Reservoirs SSSI* is located approximately 1.5km to the south of the Application Site boundary and comprises ten relatively small and shallow water storage basins. The reservoirs support one of the country's major heronries and have a large concentration of breeding wildfowl, as well as nationally significant populations of wintering shoveler and tufted duck *Aythya fuligula*. Breeding birds include pochard *Aythya ferina*, yellow wagtail *Motacilla flava*, reed warbler *Acrocephalus scirpaceus* and sedge warbler *Acrocephalus schoenobaenus*. Locally important plants at this SSSI include marsh marigold *Caltha palustris* and lesser bulrush *Typha angustifolia*. Walthamstow Reservoirs SSSI is of **national** value and is considered further due to its proximity to the Application Site and the potential for effects associated with the deposition of acidity and nitrogen.

5.5.14 *Turnford and Cheshunt Pits SSSI* is located 8.5km north of the Application Site boundary and comprises ten former gravel pits. The pits are of national importance for wintering gadwall *Anas strepera* and shoveler and locally important for wintering bittern *Botaurus stellaris*. This SSSI is considered to be of **national** value. Due to the distance from the Application Site, there is considered to be no potential for disturbance from noise, lighting or activity. There is also a lack of suitable habitat within the Application Site for the qualifying species and this SSSI is considered to be too far from the Application Site to be affected by emissions associated with the Project. As such, this designated site is not considered further in this assessment.

5.5.15 The majority of *Epping Forest SSSI* is also designated as an SAC as described above. It is one of the few remaining large-scale examples of ancient wood-pasture in Lowland Britain, with habitats of conservation value including ancient semi-natural woodland, old grassland plains (including unimproved acid grassland) and scattered wetland. In addition, Epping Forest SSSI supports a nationally outstanding assemblage of invertebrates, notably for a number of communities associated with over-mature trees and deadwood. There is also a major amphibian interest and an exceptional breeding bird community characteristic of woodland and scrub. There is an abundance of bogs, pool and ponds, some of which are of considerable botanical and entomological interest. This SSSI is of **national** value and is considered further due to the potential for effects associated with the deposition of nitrogen compounds and acidity associated with the operation of the Project.

County designations

5.5.16 *Ainslie Wood Local Nature Reserve (LNR)* is a statutory site located approximately 1.5km east of the Application Site boundary. This is a locally important area of woodland containing a range of tree species including English oak *Quercus robur*, hornbeam *Carpinus betulus* and the rarer wild service tree *Sorbus torminalis*. Many species of birds and bats also occur here. This LNR is considered to be of **county** value. Due to the distance from the Application Site, there is no potential for disturbance from noise, lighting or activity. As such, this designated site is not considered further.

Non-statutory sites

5.5.17 There are nine Sites of Importance for Nature Conservation (SINCs) within 2km of the Application Site. Only the Lea Valley Site of Metropolitan Importance for Nature Conservation (SMINC), which is located partly within the Application Site, is sensitive to impacts associated with the Project and is considered further in Paragraph 5.5.19.

5.5.18 The other SINCs are at least 1km from the Application Site and as such, are of sufficient distance away to ensure there is no potential for disturbance due to noise, lighting or activity. Therefore, these SINCs are not considered further in the assessment.

5.5.19 Lea Valley SMINC is part of the much larger LVRP. It covers 947 hectares (ha), including parts of the LBs of Enfield, Hackney, Haringey, Newham, Tower Hamlets and Waltham Forest. Many of the watercourses within the Lea Valley SMINC support diverse aquatic flora, which includes many regionally uncommon species. The SMINC is extremely important for birds, particularly wintering wildfowl, but also breeding birds such as kingfisher *Alcedo atthis*. The SMINC is also important for water vole *Arvicola amphibius*, great crested newt *Triturus cristatus* and the freshwater fish species bullhead *Cottus gobio*. Reedbeds and other riparian habitats within the SMINC support a nationally important assemblage of invertebrates.

5.5.20 Approximately 4.5ha of the Application Site falls within the SMINC. This mainly comprises an area of scrub and species-poor grassland associated with the proposed Temporary Laydown Area, although there is also an area of plantation woodland, with Enfield Ditch along the eastern edge of the Edmonton EcoPark, and habitats associated with Lee Park Way along the southern access road. This non-statutory site is considered to be of **county** value and is considered in this assessment due to its location within the

Application Site and the potential for disturbance to bird species associated with the SMINC.

Habitats and plants

5.5.21 An extended Phase One habitat survey was undertaken in April 2013, which was subsequently updated in 2014 and 2015. The 2014 and 2015 update surveys considered areas beyond the boundary of the Edmonton EcoPark that now fall within the Application Site. A data search for notable and protected species within 2km of the Application Site was also undertaken by GiGL as part of the desk study. No records of rare or scarce plant species or plant communities within the Application Site were obtained during the field surveys or desk study.

5.5.22 The main operational site is dominated by hardstanding and buildings associated with the existing facilities. Natural and semi-natural habitats within the Application Site include scattered broadleaved trees; standing open water; ruderal vegetation; introduced shrub; amenity grassland; and young broadleaved plantation woodland. The habitats recorded on the Application Site are described below. Consistent with the CIEEM methodology[46], features of less than parish importance (comprising those of site or of negligible importance) are not considered in the assessment.

5.5.23 *Amenity grassland* – there are several areas of amenity grassland at the Application Site, comprising a low diversity of grasses and other common plant species. These include perennial rye-grass *Lolium perenne*, annual meadow grass *Poa annua*, daisy *Bellis perennis*, dandelion *Taraxacum sp*. and white clover *Trifolium repens*. The amenity grassland areas are generally mown regularly to a short sward although some areas have margins with taller growth and slightly higher species diversity. This habitat is considered to be of **site** value only and has therefore not been considered further in the assessment.

5.5.24 *Broadleaved plantation woodland* – there is an area of young plantation woodland to the north-east of the Edmonton EcoPark. The trees are densely planted with the ground flora being generally sparse due to the lack of light. Species recorded here include: hawthorn *Crataegus monogyna*, field maple *Acer campestre* and ash *Fraxinus excelsior.* This habitat provides a potential foraging and nesting resource for birds and a foraging resource for bats and small mammals. The value of this type of habitat is recognised under the former UK Biodiversity Action Plan (UK BAP) and London (Local) Biodiversity Action Plan (LBAP). Broadleaved woodland is listed as a priority habitat under the former UK BAP (deciduous woodland) and LBAP (woodland) and is on the Section 41 list[54] as required under the Natural Environment and Rural Communities Act 2006[55]. This habitat is considered to be of **site** value, since the woodland is recently planted and has been planted densely, therefore limiting the diversity and extent of the ground flora. It has therefore not been considered further in the assessment.

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[54] Secretary of State (2010) Section 41 of the Natural Environment and Rural Communities Act 2006 - Habitats and Species of Principal Importance in England.

[55] HMSO (2006) Natural Environment and Rural Communities Act.

5.5.25 *Broadleaved scattered trees* – some scattered trees occur across the Application Site, including along the Lee Park Way, Salmon's Brook and northern access road. A line of mature hybrid black poplars *Populus x canadensis* is present at the eastern boundary of the Application Site. The scattered trees provide nesting habitat for birds and foraging habitat for bats and common invertebrates. This habitat is considered to be of **site** value and so is not considered further.

5.5.26 *Scrub* – this habitat was predominantly noted in the area of the proposed northern and southern access roads, along the northern boundary and within the Temporary Laydown Area. Bramble *Rubus fruticosus* agg*,* hawthorn*,* blackthorn *Prunus spinosa,* and elder *Sambucus nigra* were dominant species. This habitat provides foraging and nesting opportunities for birds, including common whitethroat *Sylvia communis* and dunnock *Prunella modularis.* It also provides cover for small mammals. This habitat type is considered to be of **site** value and is therefore not considered further.

5.5.27 *Tall ruderal* – this habitat was largely recorded around the Application Site boundary, along Lee Park Way and within the Temporary Laydown Area. Plant species include typical tall ruderal species such as common nettle *Urtica dioica*, teasel *Dipsacus fullonum,* bristly ox-tongue *Picris echioides,* hoary mustard *Hirschfeldia incana* and creeping thistle *Cirsium arvense.* Tall ruderal vegetation provides habitat for invertebrates and small mammals and foraging opportunities for birds. It is considered to be of **site** value and is not considered further.

5.5.28 *Introduced shrub* – recorded predominantly in the area directly north of the current Edmonton EcoPark entrance and also around some buildings and car parking areas. These offer limited nesting and foraging opportunities for birds and limited foraging habitat for bats. The introduced shrub habitat is considered to be of **site** value and is therefore not considered further.

5.5.29 *Invasive plants* – species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) are present at the Application Site and comprise Himalayan balsam *Impatiens glandulifera*, Japanese knotweed *Fallopia japonica* and giant hogweed *Heracleum mantegazzianum*. These species out-compete native species and Japanese knotweed undermines built structures. The invasive species are of **negligible** value and are therefore not considered further in the assessment.

5.5.30 *Buildings and hardstanding* – most of the buildings within the Application Site are in use and are considered to be of negligible value to roosting bats and of limited value to nesting birds. However, there is some potential for breeding birds to utilise the buildings and several pairs of starling were recorded nesting in the raised concrete roadway close to the existing reception building. Analysis of bat survey data obtained from the Application Site concluded that no bats were using the buildings on the Application Site for roosting purposes. This habitat is considered to be of **site** value and is not considered further.

5.5.31 *Standing water* – one artificial pond is present within the Application Site, towards the north-east corner, in an area of amenity grassland with adjacent plantation woodland. This aritificial pond was considered unlikely to support great crested newts following a Habitat Suitability Index (HSI) assessment (Vol 2 Appendix 5.3). It may support common amphibians (e.g. common frog *Rana temporaria* and smooth newt *Lissotriton vulgaris*) but these have not been previously recorded at the Application Site. The pond contains introduced ornamental fish and there is little aquatic or marginal vegetation largely due to the presence of the fish as well as mallards *Anas platyrhynchos* and Canada geese *Branta canadensis*. Ponds are listed on the former UK BAP, Section 41 list and LBAP, meaning that this habitat type is a priority for conservation effects locally and nationally. However, this is not considered to apply to the artificial pond at the Application Site considering that it does not have a potential to support notable and protected species.

5.5.32 Enfield Ditch is situated along the eastern edge of the Application Site and is generally not flowing except in times of heavy rainfall. Indeed, most of the ditch tends to dry out during periods of dry weather. This ditch is approximately 1m to 1.5m wide, with steep banks, and contains shallow water (less than 50cm in depth). Limited emergent vegetation was recorded in the wetter sections, with species here including great willowherb *Epilobium hirsutum* and reedmace *Typha angustifolia*. The drier sections contain no aquatic vegetation and in several places are heavily shaded by bramble and hawthorn scrub. Considering that the bodies of standing water have not been found to support notable or protected species, this habitat is of **site** value only and is not considered further.

5.5.33 *Running water* – Salmon's Brook is situated within and along the western boundary of the Application Site. This brook provides habitat for a range of common species, including birds, such as mallard and grey heron *Ardea cinerea*. Considering that the running water has not been found to support notable or protected species, the section of Salmon's Brook that is associated with the Application Site is of **site** value only and is not considered further.

Species

5.5.34 *Bats* – Bat scoping surveys were undertaken in September 2012, June 2013, September 2014 and February and April 2015. All trees within the Edmonton EcoPark are listed under Category 3, in line with the Bat Conservation Trust (BCT) Guidelines[56], due to the lack of bat roosting opportunities, such as splits, holes and cavities. Two Category 1 crack willow *Salix fragilis* trees were recorded on the eastern side of Lee Park Way within the Application Site. All buildings within the Application Site were assessed as being of negligible bat roost potential, with the exception of buildings B3 and B4 in the Sea Cadet area; the elevated concrete ramp near the current reception building; the main site weighbridge (building B5), located just north of the main Edmonton EcoPark entrance; and the bridge over the River Lee Navigation along Lee Park Way (B26) (refer to Figure 1 within Vol 2 Appendix 5.3). These were all assessed as being of low potential to support roosting bats, with the exception of B26 that was

[56] Bat Conservation Trust (2012) Bat Surveys; Good Practice Guidelines. Second Edition.

considered to have moderate potential, considering the presence of suitable foraging and commuting habitat associated with the river and Lea Valley SMINC.

5.5.35 Emergence and return and activity surveys were undertaken at the Edmonton EcoPark in September 2012, June and September 2013 and September 2014. The results of these surveys indicate that Application Site provides a foraging resource and commuting corridor for a low number of bats, specifically common pipistrelle *Pipistrellus pipistrellus*, soprano *Pipistrellus pygmaeus*, Nathusius' pipistrelle *Pipistrellus nathusii* and noctule *Nyctalus noctula*. Bats were recorded foraging over the Edmonton EcoPark and dispersing along the tree lines along the eastern edge of the Edmonton EcoPark. These tree lines connect the Application Site to other green spaces, such as the River Lee Navigation and the wider area of the Lee Valley, as well as local parks and amenity areas such as Lee Valley Golf Course. However, no bat roosts were recorded.

5.5.36 Further emergence and return surveys were undertaken on the two Category 1 crack willow trees along Lee Park Way and the bridge over the River Lee Navigation in June and July 2015. No roosting bats were recorded during these surveys, but the River Lee Navigation was found to provide important foraging habitat for noctule and common, soprano and Nathusius' pipistrelle bats. Lee Park Way also provides foraging habitat for common and soprano pipistrelle. Given that soprano pipistrelle and noctule are on the Section 41 list and that bats are identified as a priority for conservation through being listed on the London and Enfield BAPs, bats are considered to be of **district** value and will be considered further.

5.5.37 *Otter* – The banks of Salmon's Brook and the River Lee Navigation (where it runs adjacent to the eastern boundary of the Edmonton EcoPark) were surveyed for field signs of otter *Lutra lutra* in April 2012, and during other survey visits in April to June 2013, September 2014 and February and April 2015. No field signs were found. This species has therefore not been considered further in the assessment.

5.5.38 *Water vole* – The banks of Salmon's Brook and the River Lee Navigation (where it runs adjacent to the eastern boundary of the Edmonton EcoPark) were surveyed for field signs of water vole in April 2012, and during other survey visits in April to June 2013, September 2014 and February and April 2015. As no field signs were found in these areas, this species has not been considered further in the assessment.

5.5.39 *Badger* – Badger surveys were undertaken across the Application Site on May 2012 and during other survey visits from April to June 2013, September 2014 and February and April 2015. No badger field signs or setts have been recorded during these surveys. This species has therefore not been considered further in the assessment.

5.5.40 *Other wild mammals* – Signs of rabbit *Oryctolagus cuniculus* and red fox *Vulpes vulpes* have been recorded at the Application Site, including burrows and earths. Although not specifically recorded, it is likely that other common wild mammals occur within the Application Site. All wild mammals receive protection under the Wild Mammals Protection Act 1996. However, common wild mammals are not of conservation value, therefore collectively they are considered to be of **site** value and are not considered further in the assessment.

5.5.41 *Birds* – Six breeding bird survey visits were undertaken within the Edmonton EcoPark between March and June 2013. Incidental bird records were also noted during the Temporary Laydown Area reptile survey during April and May 2015. A total of 36 species of birds were recorded and, of these, 14 are considered 'notable'. Bird species with British breeding populations of <10,000 pairs or >10,000 pairs[57] that are included on either the former UK BAP or the Birds of Conservation Concern[58] Red or Amber Lists are considered notable. Species in the LBAP were also included. Notable species identified as definitely breeding at the Edmonton EcoPark in 2013 were starling *Sturnus vulgaris* and house sparrow *Passer domesticus*. Linnet was also recorded probably breeding within the Temporary Laydown Area, with a pair recorded around patches of dense bramble in the north-east corner. The number of species confirmed as breeding at the Application Site totalled 16.

5.5.42 All of the species recorded at the Application Site are considered typical for the type of habitats present and no Schedule 1 or otherwise further protected species were recorded. However, the breeding starling population within the Edmonton EcoPark and breeding population of linnet within the Temporary Laydown Area are considered to be of **parish** value, as these species have a British breeding population of 50,000 to 4 million individuals. The majority of starling breeding records were associated with buildings within the northern and western parts of the Application Site and several nests were observed under the elevated section of roadway close the Edmonton EcoPark reception area. Both linnet and starling are listed on the former UK BAP and Section 41 list. Therefore, starling and linnet are included in the assessment.

5.5.43 *Great crested newt* – the HSI score[59] for the artificial pond within the Application Site indicates that it is within the poor suitability category for great crested newt (<0.5), partly on account of the large fish population. There is a lack of suitable terrestrial habitat on the Application Site and the pond is isolated from the larger area of Lea Valley SMINC by the River Lee Navigation to the east and Salmon's Brook to the west. The North Circular to the south also forms a barrier to the movement of great crested newt onto the Application Site and there is a lack of connecting habitat between the Application Site and Epping Forest SAC and SSSI.

5.5.44 There is one pond located within 1km of the Application Site that is not separated from the Application Site by barriers. It is a drainage lagoon located at Deephams Sewage Treatment Works (STW), approximately

[57] Baker, H., Stroud, D., Aebischer, N.J., Cranswick, P.A., Gregory, R.D, McSorley, C.A., Noble, D.G. & Rehfisch, M.M. (2006). Population estimates of birds in Great Britain and the United Kingdom. *British Birds* 99:25-44.

[58] Eaton M. A., Brown A. F., Noble D. G., Musgrove A. J., Hearn R., Aebischer N. J., Gibbons DW, Evans A and Gregory RD, (2009) Birds of Conservation Concern 3: the Population Status of Birds in the United Kingdom, Channel Islands and the Isle of Man. British Birds 102, pp 296–341.

[59] Oldham, R.S., Keeble, J., Swan, M.J.S. & Jeffcote, M. (2000) Evaluating the suitability of habitat for the great crested newt (Triturus cristatus). Herpetological Journal 10 (4), pp 143 – 155.

370m to the north of the Application Site boundary. An HSI score of 0.40 for this pond indicates that this water body is also of poor suitability for great crested newt. This species does not have a potential to be affected by the Project and is therefore not considered further.

5.5.45 *Common amphibians* – the waterbodies within the Application Site have limited potential to support common amphibians, but none have been recorded within the Application Site. Common amphibians are only protected from sale under the Wildlife and Countryside Act 1981 (as amended), although common toad *Bufo bufo* is also listed on the former UK BAP and Section 41 list. Whilst it is possible that common amphibians may occur within the Application Site, collectively they are considered to be of **site** value and are not considered further.

5.5.46 *Reptiles* – a reptile survey was conducted on areas of suitable habitat within the Edmonton EcoPark during seven visits in September 2012. A further reptile survey was undertaken within the Temporary Laydown Area during April and May 2015. Survey results indicate that reptiles are absent from the Application Site and they are therefore not considered further.

5.5.47 *Terrestrial Invertebrates* – the Application Site is not considered to have the potential to support notable invertebrate assemblages due to the lack of suitable habitat at the Application Site. The young broadleaved plantation woodland lacks standing or lying deadwood that is required to support stag beetle larvae. No areas of deadwood were recorded in other areas of the Application Site. Common terrestrial invertebrates are likely to occur within the Application Site; collectively they are considered to be of **site** value and are not considered further.

5.5.48 *Aquatic Invertebrates* – Enfield Ditch and the artificial pond were not considered to be suitable for the rare or vulnerable invertebrate *Micronecta minutissima* (a water-boatman that is one of the qualifying features of Lee Valley Ramsar). The existing EfW facility draws treated effluent from the outfall of Deephams STW. The treated effluent flows into Deephams STW outflow channel and then into Salmon’s Brook. There is potential for changes in abstraction rates from Deephams STW outflow channel during operation of the Project to result in changes in flow within Salmons Brook. Refer to Vol 2 Section 11 of the ES for further details concerning the options being considered and effects on water resources. Although these options are likely to result in different impacts to populations of aquatic invertebrates present, the populations are likely to be of low value, due to poor existing water quality and average habitat quality within the brook (refer to Vol 2 Section 11). Aquatic invertebrates have therefore not been considered further.

5.5.49 Ecological features that have been considered in detail in the assessment are summarised in Vol 2 Table 5.1. Features of less than parish importance have not been assessed, but Section 5.6 describes embedded measures that would be expected to be implemented as part of the Project to ensure compliance with legislation and avoid potential effects.

Vol 2 Table 5.1: Ecological features

Ecological feature	Importance	Distance from Application Site boundary
Lee Valley SPA and Ramsar	International	1.5km
Epping Forest SAC	International	2.8km
Walthamstow Reservoirs SSSI	National	1.5km
Chingford Reservoirs SSSI	National	300m
Epping Forest SSSI	National	2.8km
Lea Valley SMINC	County	Within Application Site boundary
Bats	District	Within the Application Site boundary
Starling	Parish	Within Application Site boundary
Linnet	Parish	Within Application Site boundary

Future baseline

5.5.50 It is considered that planned development (Vol 1 Appendix 5.2) would not influence the baseline conditions described above because the majority of these planned developments do not fall within the Application Site and are therefore unlikely to affect the baseline conditions.

5.5.51 The North London (Electricity Line) Reinforcement DCO falls within the Application Site, but this relates to the power lines over the Temporary Laydown Area; there are no pylons within the Application Site. The works are restricted to the pylons, meaning that this scheme would not require any works that would alter the baseline conditions.

5.6 Potential effects and good environmental design management

5.6.1 The Project is described in Volume 1 of the ES. The elements of the Project relevant to ecology are set out below.

5.6.2 Mitigation and enhancement measures as described below have been incorporated into the design of the Project as embedded ecological measures. Enhancement measures have been described as appropriate, where these are considered to provide a net gain in biodiversity in accordance with EN-1 within the National Policy Statement (NPS).

Construction

5.6.3 The following measures apply to construction and demolition work during Stages 1, 2 and 3.

5.6.4 The CoCP (Vol 1 Appendix 3.1) contains detailed measures designed to ensure compliance with legislation and avoid potential adverse effects during the construction of the Project. These measures are to be implemented to protect biodiversity and limit losses to areas of conservation interest and any potentially negative impacts to legally-protected and notable species. The main points to note are:

a. Potential effects on statutory and non-statutory sites of ecological interest and notable habitats and species would be managed through the production of method statements. These would be specific to species and habitats and would require the presence of an ecological clerk of works at the Application Site at appropriate stages of clearance and construction.

b. Pre-construction surveys would be undertaken by an ecologist to determine the current status and distribution of protected and notable species and to inform requirements for any mitigation, including a bat and badger scoping survey within the fenced off area in the north-eastern part of the Application Site. The timing of construction works would have due regard to seasonal constraints for a range of species and their habitats (including breeding birds and roosting bats).

c. Removal of hedgerows, trees or shrubs would not take place between March and August inclusive, unless a competent ecologist has first undertaken a nesting bird survey and confirmed that no birds or active nests would be harmed and/or that there are appropriate measures in place to protect nesting birds.

d. Consideration would also be given to potential disturbance of nesting birds outside of, but adjacent to, the Application Site. This would require the preparation of a method statement detailing inspection methodology and the use of exclusion zones, where necessary, to prevent disturbance to breeding birds.

e. The Contractor would comply with the requirements of any wildlife licences, including all protected species licences as necessary.

f. Construction lighting would aim to maintain dark areas around the Application Site, where practicable and safe. Lighting across the Application Site would be minimised, in accordance with guidelines set out by the BCT[60].

g. Appropriate treatment and control of invasive non-native species would be undertaken in order to comply with the legislation and prevent their further spread.

h. Retained trees would be protected in accordance with the British Standards[61]. Adherence to the measures outlined in these standards and the employment of an arboricultural specialist to oversee works relating to the protection of trees would ensure the long-term preservation of retained trees.

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[60] Bats and Lighting. http://www.bats.org.uk/pages/bats_and_lighting.html (Accessed July 2015)
[61] British Standards Institute (2012) BS5837:2012 Trees in Relation to Design, Demolition and Construction - Recommendations.

i. The requirements relating to lighting, Air Quality and Odour, Noise and Vibration and Water Resources and Flood Risk would also be adhered to, with key points identified below.

5.6.5 Lighting would be at the minimum luminosity necessary and use low energy consumption fittings. Where appropriate, lighting to construction site boundaries would be provided and illumination would be sufficient to provide a safe route for the passing public. Where appropriate, lighting would be activated by motion sensors to prevent unnecessary usage. Lighting would not be directed towards Chingford Reservoirs SSSI and Lea Valley SMINC. The only exception relates to part of Lee Valley SMINC that falls within the Application Site, which will be subject to clearance and landscaping works. Light spill over the River Lee Navigation and along Lee Park Way and the eastern boundary of the Edmonton EcoPark, including EcoPark House, would be reduced as far as practical. Lighting in these areas would be designed to reduce disturbance to foraging and commuting bats.

5.6.6 The Contractor would manage dust, air pollution and exhaust emission during the construction works in accordance with best practicable means, to minimise temporary effects associated with the deposition of dust and pollutants on Lea Valley SMINC and Chingford Reservoirs SSSI. This includes reference to the general site requirements and good housekeeping procedures (relevant to limiting dust and air pollution). Controls and measures to control or mitigate the effect of potential adverse effects caused by the construction works; and dust and air pollution monitoring measures to be employed during construction of the Project.

5.6.7 To minimise disturbance to wildlife associated with Lea Valley SMINC and Chingford Reservoirs SSSI, management and monitoring processes would be employed during construction, including noise and vibration management and mitigation processes. This would consider: selection of quiet and low vibration equipment; review of construction programme and methodology to consider quieter methods (including non-vibratory compaction plant, where required); location of equipment on the Application Site; control of working hours; the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings; use of appropriate acoustic screening; and adherence to all relevant guidance and legislation.

5.6.8 Water resources, including River Lee Valley Navigation and Enfield Ditch that forms part of Lea Valley SMINC, would be protected through the implementation of working methods which protect surface and groundwater from pollution and other adverse impacts including change to flow volume, water levels and quality. This would be completed in accordance with relevant legislative requirements, including any relevant requirements and provisions in the DCO and documents approved pursuant to the DCO Application, and appropriate industry guidance. Measures to deal with pollution incidents at the Application Site would be included within the overall emergency planning for the Project.

5.6.9 Additional measures include the covering overnight of any deep holes and trenches which would have planked escape routes provided and maintained for any wildlife that may fall in. In addition, any hazardous liquids that are held on the Application Site would be stored in a secure lock-up. To avoid unnecessary harm to wild mammals, any burrows that are encountered during clearance works would be excavated sensitively, using hand tools where possible. Excavation would also ideally not occur between March and May inclusive, when female red fox and cubs may be below ground.

Operation

5.6.10 The following embedded ecology measures apply to the operation of the Project during Stages 2, 3 and 4.

5.6.11 Landscape proposals include the replacement and enhancement of existing habitats at the Application Site along with creation of new habitats. The main elements of the landscape design strategy are as follows:

a. Salmon’s Brook: sowing of native wildflower meadow mix along the eastern bank;

b. Enfield Ditch: sowing of wildflower meadow mixes and plug planting of native aquatic and marginal plants;

c. built development: inclusion of green and brown roofs on the proposed ERF with native species as appropriate, as well as a green or brown roof on EcoPark House;

d. Lee Park Way: retention of selected mature trees, removal of some scrub along Enfield Ditch to increase light levels to improve ground flora and enhancement planting of native species where necessary, including the dense scrub and trees between Lee Park Way and the River Lee Navigation;

e. artificial habitats: inclusion of log and stone piles and bird and bat boxes located on mature trees;

f. Temporary Laydown Area: retention of some existing trees and scrub, additional native species planting as appropriate and sowing of wildflower meadow mix; and

g. general principles: inclusion of native species planting wherever possible; retention of mature trees where possible; retaining and enhancing links with adjacent habitats where possible; and removal of invasive species.

5.6.12 Lighting across the Application Site would be minimised, in accordance with guidelines set out by the BCT[60]. The following principles would be applied:

a. lighting design would avoid light spill within the Chingford Reservoirs SSSI and the River Lee Navigation. Lighting proposed within the Lea Valley SMINC would be designed to maintain dark areas for wildlife, particularly to reduce disturbance to foraging and commuting bats.

b. narrow spectrum lights that emit minimal ultra-violet light and peak higher than 550 nanometres (yellow, orange and red wavelengths) would be used where possible.

c. the height of lighting columns and flat cut-off lanterns or accessories would be considered to minimise spillage.

d. light levels would be as low as guidelines permit and be turned off when not required.

5.6.13 Monitoring and management of landscaping and bat and bird boxes would be undertaken for maintenance purposes and to monitor their effectiveness.

5.7 Assessment – construction

Lee Valley SPA and Ramsar

5.7.1 These designated sites are considered to be sufficiently far from the Application Site to ensure that there would be no direct effects associated with the construction of the Project during Stages 1 to 3 due to lighting, noise and vibration, activity and dust. The implementation of measures outlined in the CoCP (Vol 1 Appendix 3.1) and in Paragraph 5.6.8 would avoid potential effects on surface watercourses by entry of contaminated run-off and the contamination of groundwater.

5.7.2 With respect to indirect effects on the SPA and Ramsar due to the potential for disturbance of bird species associated with Chingford Reservoirs SSSI, specifically shoveler, the implementation of the measures contained within the CoCP (Vol 1 Appendix 3.1) would avoid temporary disturbance effects associated with noise and lighting during Stages 1 to 3. Refer to the NSER (Vol 2 Appendix 5.2) for further details. The potential effects on Lee Valley SPA and Ramsar due to effects on water resources and disturbance to birds are therefore **not significant**.

Epping Forest SAC and SSSI

5.7.3 These designated sites are considered to be sufficiently far from the Application Site to ensure that there would be **no effects** associated with the construction of the Project due to lighting, noise and vibration, activity, polluted discharges and dust during Stages 1 to 3. Refer to the NSER (Vol 2 Appendix 5.2) for further details.

Walthamstow Reservoirs SSSI

5.7.4 This SSSI is of sufficient distance from the Application Site to ensure that bird species associated with this SSSI would not be disturbed by noise and lighting associated with the construction process. Similarly, the SSSI is considered to be too far from the Application Site to be subject to effects associated with dust. The implementation of the measures outlined in the CoCP (Vol 1 Appendix 3.1) are considered adequate to ensure that there would be no potential effects on the SSSI associated with polluted discharges. The potential effect during Stages 1 to 3 is therefore **not significant**.

Chingford Reservoirs SSSI

5.7.5 This SSSI is close to the Application Site, meaning that qualifying bird species are vulnerable to effects associated with dust, lighting, noise and vibration during the construction of the Project. Noise levels between 50 and 70 decibels (dB) may typically cause birds to be more alert or move around more[62], but not result in them leaving the area. The context of the SSSI is also a factor, being situated in a largely urban and industrial area, which is already subject to noise and disturbance. Vibration associated with piling activities is not considered to have potential to disturb bird species within the SSSI, due to its distance from the Application Site.

5.7.6 Potential effects from dust during construction would be limited by the implementation of control measures as described in the CoCP (Vol 1 Appendix 3.1). The sensitivity of the area to ecological impacts has been assigned as ‘low’, due to no statutory ecological receptors being located within 100m of the Application Site (Section 2 Air Quality and Odour). The implementation of control measures as described in the CoCP (Vol 1 Appendix 3.1) would avoid the potential for effects on bird species due to dust and construction lighting.

5.7.7 The potential effect on Chingford Reservoirs SSSI from lighting, noise and dust during Stages 1 to 3 is **not significant**, considering the implementation of the measures included within the CoCP (Vol 1 Appendix 3.1) during the construction process.

Lea Valley SMINC

5.7.8 Approximately 4.5ha of the SMINC falls within the Application Site. The majority of this area would be subject to changes in existing habitats and implementation of the Project landscape proposals. Vol 2 Figure 5.1 shows the extent of Lea Valley SMINC that falls within the Application Site. The total area of Lea Valley SMINC is 947ha. The area of the SMINC within the Application Site boundary therefore equates to 0.475 per cent of the total area of the SMINC. This indicates that a relatively small area within the SMINC would be affected.

5.7.9 Lea Valley SMINC is designated due to the assemblage of species and habitats described in Paragraph 5.5.19. The area of the SMINC within the Application Site does not contain these species or supporting habitats. Areas of habitat within the SMINC would be permanently lost as a result of the Project, associated with the following proposals: the footpath up the ramp between the proposed ERF and Lee Park Way access in the north-east corner of the Application Site; the fire/maintenance access; the section of the new road off Lee Park Way; and widening of Lee Park Way. However, these proposals are considered to be offset by the enhancement of habitats along Lee Park Way. Landscaping proposed within the SMINC includes creation of wildflower meadows and planting of trees and native scrub within the Temporary Laydown Area, selective scrub removal and wildflower meadow creation along Lee Park Way and Enfield Ditch and

[62] Cutts, N., Phelps, A & Burdon D. (2008) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA, University of Hull.

marginal plug planting along Enfield Ditch. The majority of these measures would be implemented during Stage 1, including enhancements along Lee Park Way and Enfield Ditch, thereby minimising the period between habitat loss and creation. Landscaping to the east of the proposed ERF is not due to take place until Stage 2 and within the Temporary Laydown Area in Stage 3. These elements would further mitigate effects associated with habitat loss during Stage 1.

5.7.10 Potential sources of disturbance associated with construction processes are subject to adequate control measures as described in the CoCP (Vol 1 Appendix 3.1). This includes measures to control potential impacts arising from lighting and noise and those upon water resources. Bird species associated with William Girling Reservoir could be sensitive to disturbance due to piling, but the reservoir is too far from the Application Site for such effects to occur.

5.7.11 The majority of habitat loss within the SMINC would be temporary, given the implementation of the landscape strategy. The potential disturbance effects would be controlled through measures contained within the CoCP (Vol 1 Appendix 3.1). The SMINC as a whole is a large and diverse area of species and habitats when compared to the part (of lower ecological value) within the Application Site. Therefore, the effect of habitat loss and creation and disturbance on Lea Valley SMINC during Stage 1 to 3 is considered **not significant.**

Bats

5.7.12 Lighting would be required during construction, although the design of this would seek to avoid light spill over the River Lee Navigation. It is possible that lighting along Lee Park Way and the eastern boundary of the Edmonton EcoPark could disturb foraging and commuting bats along Lee Park Way. This lighting would be designed to minimise disturbance (refer to Paragraph 5.6.5). However, the dark corridor along the river, where most bat activity was recorded, would be maintained. Effects to foraging and commuting bats during Stages 1 to 3 are therefore expected to be **not significant**.

Starling

5.7.13 The implementation of the measures described in the CoCP (Vol 1 Appendix 3.1) would ensure compliance with legislation with respect to the demolition of buildings and removal of vegetation found to, or with a potential to, support nesting birds.

5.7.14 The landscape proposals include the provision of bird nest boxes at appropriate locations within the Application Site, which would be installed during Stage 1 of the Project. Therefore, it is considered that the potential impacts on starling during Stages 1 to 3 would be **not significant**.

Linnet

5.7.15 Dense and scattered scrub, tall ruderal vegetation and semi-improved poor grassland within the Temporary Laydown Area is due to be cleared during Stage 1. The Temporary Laydown Area would be landscaped towards the end of Stage 3, with the creation of a meadow and planting of scrub and scattered trees around the perimeter. However, clearance work and disturbance associated with use of the Temporary Laydown Area during Stages 1 to 3 would be expected to deter birds from nesting within the Application Site.

5.7.16 Habitat loss and disturbance during Stages 1 to 3 are expected to lead to a **significant adverse effect** (temporary) at a parish scale. This effect is temporary as disturbance would cease during the operation of the Project. Furthermore, native scrub is proposed to provide permanent nesting opportunities.

5.8 Assessment – operation

Lee Valley SPA and Ramsar

5.8.1 Air quality modelling predicts that deposition rates for nitrogen in areas used by Lee Valley SPA/Ramsar features (therefore including Chingford Reservoirs SSSI) would decrease as a result of the Project. Concentrations of PM_{10} are predicted to be no worse than existing.

5.8.2 The predicted sulphur deposition rates within areas used by Lee Valley SPA/Ramsar features would increase. Modelling has assumed that the ERF would operate at emission limits, meaning that the proposed ERF would be likely to have lower emissions than modelled and also lower than the existing EfW facility. As such, it is considered that the ERF would in reality have the same or better sulphur deposition rates. However, given that the increases in sulphur deposition are slight, even assuming operation of the proposed ERF at emission limits, the Project is not expected to give rise to significant effects on the features of European sites.

5.8.3 Acid deposition within Lee Valley SPA and Ramsar site would remain below minimum critical loads during all stages. With respect to Chingford Reservoirs SSSI, acid deposition currently exceeds the minimum critical load, but is modelled to decrease during all stages apart from the Transition Stage (Stage 2), when acid deposition is predicted to be no worse than existing.

5.8.4 Refer to Vol 2 Appendix 2.2 for full air quality modelling results. The NSER (Vol 2 Appendix 5.2) provides further details regarding the implications of these results for European designated sites. The effects on Lee Valley SPA and Ramsar due to the deposition of nitrogen, sulphur, acidity and PM_{10} are **not significant** during Stages 2 to 4.

5.8.5 No effects are predicted on interest features of Lee Valley SPA and Ramsar site due to lighting and noise associated with the Project due to their distance from the Application Site.

Epping Forest SAC and SSSI

5.8.6 Deposition rates for nitrogen within Epping Forest SAC and SSSI are expected to decrease as a result of the Project. Concentrations of PM_{10} are predicted to be no worse than existing. Although sulphur deposition rates increase assuming operation of the ERF at emission limits, these would not cause acidity to exceed the minimum critical loads. Refer to Paragraph

5.8.2, as well as Vol 2 Appendix 2.2 and Vol 2 Appendix 5.2, for further details. The potential effects on Epping Forest SAC and SSSI due to the deposition of nitrogen, sulphur, acidity and PM_{10} are assessed as **not significant** during Stages 2 to 4.

5.8.7 No effects are predicted on interest features of Epping Forest SAC and SSSI due to lighting and noise associated with the Project due to their distance from the Application Site.

Walthamstow Reservoirs SSSI

5.8.8 Deposition rates for nitrogen within Walthamstow Reservoirs SSSI are expected to decrease as a result of the Project. Concentrations of PM_{10} are predicted to be no worse than existing. Sulphur deposition rates would increase assuming operation of the ERF and emission limits, although these would not cause acidity to exceed the minimum critical loads. Refer to Paragraph 5.8.2, as well as Vol 2 Appendix 2.2 and Vol 2 Appendix 5.2, for further details. The effects on Walthamstow Reservoirs SSSI due to the deposition of nitrogen, sulphur, acidity and PM_{10} are assessed as **not significant** during Stages 2 to 4.

5.8.9 No effects are predicted on interest features of Wathamstow Reservoirs SSSI due to lighting and noise associated with the Project due to its distance from the Application Site.

Chingford Reservoirs SSSI

5.8.10 Deposition rates for nitrogen within Chingford Reservoirs SSSI are expected to decrease as a result of the Project. Concentrations of PM_{10} are predicted to be no worse than existing. Although sulphur deposition rates would increase, assuming operation of the ERF at emission limits, these would not cause acid deposition within the SSSI to increase when compared to the existing EfW facility. As outlined in Paragraph 5.8.2, acid deposition currently exceeds the critical loads within the SSSI. Acid deposition is predicted to decrease during all stages, with the exception of the Transition Stage (Stage 2), when acid deposition within the SSSI is predicted to be no worse than existing. Refer to Vol 2 Appendix 2.2 and Vol 2 Appendix 5.2, for further details. The effects on Chingford Reservoirs SSSI due to the deposition of nitrogen, sulphur, acidity and PM_{10} are assessed as **not significant** during Stages 2 to 4.

5.8.11 Given the proximity of this SSSI to the Application Site, lighting and noise effects have also been considered.

5.8.12 Lighting across the Application Site during the operational stages would be minimised in line with the embedded ecology measures described in Section 5.6. The design and control measures that would be used to limit operational noise from the proposed ERF and RRF would prevent significant effects in both EIA and policy terms (refer to Volume 2 Section 8 of the ES). Therefore, potential effects on Chingford Reservoirs SSSI associated with lighting and noise are **not significant** during Stages 2 to 4.

Lea Valley SMINC

5.8.13 Operational lighting within the Lea Valley SMINC would be designed to maintain dark areas while providing lighting along Lee Park Way. The lighting in this area would comply with BCT Guidelines[60] and the design would seek to avoid light spill over the River Lee Navigation. As described in Paragraph 5.8.10, no significant effects have been identified due to operational noise. Therefore, potential effects from lighting and noise are considered **not significant** during Stages 2 to 4.

Bats

5.8.14 Sensitive lighting along Lee Park Way and the dense planting of trees and scrub between Lee Park Way and the River Lee Navigation would seek to avoid light spill along the River Lee Navigation and therefore minimise disturbance to foraging and commuting bats. Effects on foraging and commuting bats during Stages 2 to 4 are therefore **not significant**.

Starling

5.8.15 As described in Paragraph 5.8.12, no significant effects have been identified due to operational noise. Operational activities, including lighting, are unlikely to deter birds from using newly created habitats. Therefore, the effect of disturbance associated with noise and lighting during Stages 2 to 4 are **not significant**.

Linnet

5.8.16 As described in Paragraph 5.7.15, the Project proposes the retention of scrub, the planting of native scrub and creation of a meadow within the Temporary Laydown Area, which is expected to provide suitable breeding habitat for linnet. Disturbance associated with the use of the Temporary Laydown Area during Stage 2 and the majority of Stage 3 is likely to deter nesting birds. However, the Temporary Laydown Area would not be in use during Stage 4, meaning that these habitats are expected to become more suitable for nesting birds. Considering that the effects of disturbance and habitat loss are temporary, the operational effects on linnet are considered to be **not significant**.

5.9 Assessment – decommissioning of the Project

5.9.1 Epping Forest SAC and SSSI, Lee Valley SPA and Ramsar site and Walthamstow Reservoirs SSSI are considered to be too far from the Application Site to be affected by the decommissioning of the ERF, RRF and EcoPark House.

5.9.2 It is assumed that the measures described in the CoCP (Vol 1 Appendix 3.1) would be implemented during decommissioning to avoid significant impacts on Lea Valley SMINC and Chingford Reservoirs SSSI associated with dust, noise and lighting. Furthermore, a Decommissioning and Demolition Method Statement would be produced in consultation with the EA as part of the environmental permitting process (refer to Vol 2 Section

11.9), which would avoid potential effects on surface watercourses by entry of contaminated run-off and the contamination of groundwater.

5.9.3 It is assumed that the habitats retained and created during the course of the Project would be unaffected by the decommissioning of the ERF, RRF and EcoPark House, meaning that there are no effects on bats, starling or linnet associated with habitat loss. The implementation of measures described in the CoCP (Vol 1 Appendix 3.1) would also avoid significant disturbance effects due to noise and lighting.

5.10 Supplementary mitigation

5.10.1 As there are no permanent significant adverse effects, no mitigation measures are proposed with respect to effects from construction, operation or decommissioning of the Project.

5.11 Residual effects

5.11.1 As no mitigation measures are proposed, the residual construction/operational/decommissioning effects remain as described in Sections 5.7, 5.8 and 5.9. All residual effects are presented in Section 5.14.

5.12 Sensitivity test for programme delay

5.12.1 For the EcIA, a change to the programme of plus or minus 12 months would not be likely to materially change the assessment findings reported in Section 5.11.

5.12.2 Based on the Cumulative Development Schedule (Vol 1 Appendix 5.2), there would be no new receptors requiring assessment as a result of the programme change. This is because there are no developments identified on the Cumulative Development Schedule that would fall into the future baseline as a result of the programme change and therefore the future baseline would remain as described in Section 5.5.

5.13 Cumulative effects

Construction

5.13.1 Meridian Water Masterplan is a major regeneration project that would be under construction concurrently with the Project.

5.13.2 This scheme incorporates areas of open space and there are opportunities to enhance Lea Valley SMINC. However, there are also potential disturbance effects associated with construction work adjacent to and potentially within the SMINC. It is expected that, in order to comply with relevant legislation, the Meridian Water project would include strategies to control effects on ecological features arising from construction activities, such as those associated with air quality, noise and vibration and water resources. It is also expected that, in order to accord with planning policy, their landscape strategy would incorporate appropriate features to compensate for any clearance of habitats required within and adjacent to the SMINC and ensure a net gain in biodiversity. On this basis, no significant adverse cumulative effects would be expected.

Operation

5.13.3 It has been recognised that modelling predicts an increase in sulphur deposition during operation of the Project. As such, the cumulative developments have been reviewed to identify any potential sources of additional sulphur or acid emissions that would increase deposition rates further.

5.13.4 The Kedco Waste Wood Biomass Plant project involves change of use from existing storage building to industrial facility for the production of renewable energy, but operation of this facility is not likely to give rise to sulphur emissions.

5.13.5 None of the other projects are likely to give rise to sulphur emissions and therefore there is no potential for cumulative effects during operation of the Project.

5.14 Assessment summary

Construction

Vol 2 Table 5.2: Assessment summary – construction

Ecology			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 1			
Lee Valley SPA and Ramsar	With the implementation of CoCP measures, effects on water resources and indirect effects associated with disturbance to shoveler at Chingford Reservoirs SSSI would be **not significant.**	None required	Effect unchanged **Not significant.**
Walthamstow Reservoirs SSSI	With the implementation of CoCP measures, effects on water resources would be **not significant.**	None required	Effect unchanged **Not significant.**
Chingford Reservoirs SSSI	With the implementation of CoCP measures, disturbance from lighting, dust, noise and effects on water resources would be **not significant**.	None required	Effect unchanged **Not significant.**
Lea Valley SMINC	The effect of clearance work and landscape reinstatement and enhancement along Lee Park Way and Enfield Ditch on habitat loss and creation would be **not significant**.	None required	Effect unchanged **Not significant.**
Lea Valley SMINC	With the implementation of CoCP measures, disturbance from construction related lighting, noise and effects on water resources would be **not significant**.	None required	Effect unchanged **Not significant.**
Bats	With the implementation of CoCP measures, disturbance would be **not significant**.	None required	Effect unchanged **Not significant.**

Ecology			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Starling	With the provision of artificial breeding sites as described in the CoCP, the effect on habitat loss and disturbance would be **not significant**.	None required	Effect unchanged **Not significant.**
Linnet	Loss of breeding habitat due to scrub clearance and disturbance associated with the operation of the Temporary Laydown Area would create a **significant temporary adverse** effect.	No further mitigation identified	Effect unchanged **Significant temporary adverse**.
Stage 2			
Lee Valley SPA and Ramsar	With the implementation of CoCP measures, effects on water resources and indirect effects associated with disturbance to shoveler at Chingford Reservoirs SSSI would be **not significant.**	None required	Effect unchanged **Not significant.**
Walthamstow Reservoirs SSSI	With the implementation of CoCP measures, effects on water resources would be **not significant.**	None required	Effect unchanged **Not significant.**
Chingford Reservoirs SSSI	With the implementation of CoCP measures, disturbance from lighting, dust and noise would be **not significant**.	None required	Effect unchanged **Not significant.**
Lea Valley SMINC	The completion of landscaping directly to the east of the ERF would cause a **not significant** effect on habitat creation.	None required	Effect unchanged **Not significant.**
Lea Valley SMINC	With the implementation of CoCP measures, disturbance from construction related lighting, noise and effects on water resources would be **not significant**.	None required	Effect unchanged **Not significant.**

Ecology			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Bats	With the implementation of CoCP measures, disturbance would be **not significant**.	None required	Effect unchanged **Not significant.**
Starling	With the implementation of CoCP measures, disturbance would be **not significant**.	None required	Effect unchanged **Not significant.**
Linnet	Loss of breeding habitat due to scrub clearance and disturbance associated with the operation of the Temporary Laydown Area would create a **significant temporary adverse** effect.	No further mitigation identified	Effect unchanged **Significant temporary adverse.**
Stage 3			
Lee Valley SPA and Ramsar	With the implementation of CoCP measures, effects on water resources and indirect effects associated with disturbance to shoveler at Chingford Reservoirs SSSI would be **not significant.**	None required	Effect unchanged **Not significant.**
Walthamstow Reservoirs SSSI	With the implementation of CoCP measures, effects on water resources would be **not significant.**	None required	Effect unchanged **Not significant.**
Chingford Reservoirs SSSI	With the implementation of CoCP measures, disturbance from noise, lighting and dust would be **not significant**.	None required	Effect unchanged **Not significant.**
Lea Valley SMINC	Completion of landscaping within the EfW facility footprint and Temporary Laydown Area would cause a **not significant** effect on habitat creation	None required	Effect unchanged **Not significant.**
Lea Valley SMINC	With the implementation of CoCP measures, disturbance from lighting and noise and effects on water resources would be **not significant**.	None required	Effect unchanged **Not significant.**

Ecology			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Bats	With the implementation of CoCP measures, disturbance would be **not significant**.	None required	Effect unchanged **Not significant.**
Starling	With the implementation of CoCP measures, disturbance would be **not significant**.	None required	Effect unchanged **Not significant.**
Linnet	Loss of breeding habitat due to scrub clearance and disturbance associated with the operation of the Temporary Laydown Area would create a **significant temporary adverse** effect	No further mitigation identified	Effect unchanged **Significant temporary adverse.**

Operation

Vol 2 Table 5.3: Assessment summary – operation

Ecology			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 1			
No effects have been identified, as this stage relates to operation of the EfW facility, which is baseline.			
Stages 2, 3 and 4			
Lee Valley SPA and Ramsar	The effect of decreasing deposition rates for PM_{10} and nitrogen, and increasing deposition rates for sulphur, would not cause acidity to exceed the critical load and so would be **not significant**	None required	Effect unchanged. **Not significant.**
Epping Forest SAC and SSSI	The effect of decreasing deposition rates for PM_{10} and nitrogen, and	None required	Effect unchanged. **Not significant.**

Ecology			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
	increasing deposition rates for sulphur, would not cause acidity to exceed the critical load, and so would be **not significant**		
Walthamstow Reservoirs SSSI	The effect of decreasing deposition rates for PM_{10} and nitrogen, and increasing deposition rates for sulphur, would not cause acidity to exceed the critical load, and so would be **not significant**	None required	Effect unchanged. **Not significant.**
Chingford Reservoirs SSSI	The effect of decreasing deposition rates for PM_{10} and nitrogen, and increasing deposition rates for sulphur, would not cause acidity to exceed the critical load, and so would be **not significant**	None required	Effect unchanged. **Not significant.**
Chingford Reservoirs SSSI	Lighting would not be directed towards the SSSI, therefore the effect would be **not significant**.	None required	Effect unchanged. **Not significant.**
Lea Valley SMINC	Sensitive lighting is proposed within the SMINC, therefore the effect would be **not significant**.	None required	Effect unchanged. **Not significant.**
Bats	Sensitive lighting along Lee Park Way and the dense planting of trees and scrub between Lee Park Way and the River Lee Navigation would minimise disturbance to foraging and commuting bats, therefore the effect would be **not significant**.	None required	Effect unchanged. **Not significant.**

Ecology			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Starling	Operational lighting, noise and activity are unlikely to deter nesting birds, therefore the effect would be **not significant**	None required	Effect unchanged. **Not significant.**
Linnet	Operational lighting, noise and activity are unlikely to deter nesting birds, therefore the effect would be **not significant**	None required	Effect unchanged. **Not significant.**

Decommissioning of the Project

Vol 2 Table 5.4: Assessment summary – decommissioning of the Project

Ecology			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Lee Valley SPA and Ramsar	With the implementation of standard water, lighting and noise controls, the effects on water resources and indirect effects due to disturbance to shoveler at Chingford Reservoirs SSSI would be **not significant**.	None required	Effects unchanged. **Not significant.**
Walthamstow Reservoirs SSSI	With the implementation of the standard water controls, effects on water resources would be **not significant**	None required	Effects unchanged. **Not significant.**
Chingford Reservoirs SSSI	With the implementation of standard lighting and noise controls, the effects of disturbance from noise and lighting and associated with dust would be **not significant**.	None required	Effects unchanged. **Not significant.**
Lea Valley SMINC	With the implementation of standard lighting, dust, noise and water controls, the effects of	None required	Effects unchanged.

Ecology			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
	disturbance from noise and lighting and effects on water resources and associated with dust would be **not significant**.		**Not significant.**
Bats	With the implementation of standard lighting controls, the disturbance due to lighting would be **not significant**.	None required	Effect unchanged. **Not significant.**
Starling	With the implementation of standard lighting and noise controls, the disturbance due to lighting, noise and activity would be **not significant**.	None required	Effect unchanged. **Not significant.**
Linnet	With the implementation of standard lighting controls, the disturbance would be **not significant**.	None required	Effect unchanged. **Not significant.**

6 Environmental wind

6.1 Introduction

6.1.1 This section presents an assessment of the likely significant effects of the Project on the local wind environment. The aim of the assessment is to identify the likely significant wind effects of the proposed development on pedestrian comfort and safety using relevant criteria[63].

6.1.2 Enhanced windiness may affect the usability of the spaces around buildings and can cause difficulties for the users of the building. There is the potential for significant wind effects within the Edmonton EcoPark. The Temporary Laydown Area would be used for temporary construction purposes only and has not been considered further in this assessment.

6.1.3 An assessment of the environmental wind conditions within and outside the Edmonton EcoPark is carried out.

6.1.4 The works plans (based on which the environmental wind assessment has been undertaken) are contained in the Book of Plans (AD02.01) which forms part of the DCO Application documents.

6.2 Engagement

6.2.1 The Scoping Report recommended that environmental wind be scoped out from the assessment.

6.2.2 However, the Scoping Opinion[1] states that:

> *"The proposals involve new large structures and a significant reconfiguration and change in size of the existing buildings on the site (the details of which have not yet been established). The ES should therefore include an assessment of any such changes on the microclimate within and surrounding the site. This should address the potential for adverse effects on nearby leisure/recreational users (including Edmonton Sea Cadets) and other users such as those occupying the Eley Industrial Estate."*

6.2.3 Based on the Scoping Opinion, a precautionary approach has been taken to scope in the environmental wind assessment. In particular, effects on nearby leisure/recreational users and the Eley Industrial Estate have been considered.

6.3 Methodology

6.3.1 This section provides an overview of the methodology for assessing the likely significant effects of the Project on environmental wind.

6.3.2 The massing of the proposed facilities (and surroundings) and the relative wind exposure have been reviewed based on drawings showing the maximum envelopes for the proposed buildings, aerial views of the

[63] T.V. Lawson (1990) The evaluation of the windiness of a building complex before construction, London Docklands Development Corporation.

Application Site and surroundings, and previous experience of wind tunnel testing around similar sized developments.

6.3.3 Stages 2 and 4 represent static situations for the Project and are therefore the stages assessed in the wind assessment. Stage 2 would see the proposed ERF and RRF completed while the existing EfW facility would remain present on the Application Site while the proposed ERF is being commissioned. Stage 4 presents the long-term site arrangement following the removal of the EfW facility, with all proposed facilities complete and operational.

6.3.4 Stages 1 and 3 represent dynamic situations where the Application Site is transitioning between the static situations described above. Stage 1 represents the construction period as the proposed ERF and RRF are constructed on the Application Site and some of the existing facilities removed. Wind conditions during this stage would transition from the existing conditions, described in Section 2.3, to those assessed for Stage 2. An assessment of Stage 1 wind conditions has therefore not been undertaken.

6.3.5 Similarly, Stage 3 would follow the completion of the decommissioning of the EfW facility and would see its demolition. Wind conditions would transition from those assessed for Stage 2 to those assessed for Stage 4. An assessment of Stage 3 wind conditions has therefore not been undertaken.

Criteria used to describe the level of windiness

6.3.6 The criteria used to describe windiness in this study are those of T.V. Lawson of Bristol University, extracted from "*The evaluation of the windiness of a building complex before construction*"[63]. These Lawson criteria were developed for windiness affecting activities by the general public around tall buildings.

6.3.7 The acceptability of windiness is subjective and depends on a number of factors, most notably the activities to be performed in the area being assessed. The Lawson Criteria describe acceptability for particular activities in terms of 'comfort' and 'distress' (or safety). Acceptable conditions for various activities in order of increasing windiness are described in Vol 2 Table 6.1.

Vol 2 Table 6.1: Comfort criteria as defined by T.V. Lawson

Criterion	Description
'Sitting'	Reading a newspaper and eating and drinking
'Standing' or short term sitting	Appropriate for bus stops, window shopping and building entrances
'Walking' or 'strolling'	General areas of walking and sightseeing

Criterion	Description
‘Business walking’	Local areas around tall buildings where people are not expected to linger

6.3.8 The conditions described above are the limiting criteria for comfort. For ideal conditions, the windiness will be a category better than outlined above. For more sensitive activities, such as regular use for external eating, conditions should be well within the ‘Sitting’ category.

6.3.9 In this assessment the words ‘Sitting’, ‘Standing’, ‘Strolling’ and ‘Business Walking’ have been used to describe comfort levels of windiness as described in Vol 2 Table 6.1.

6.3.10 The comfort criteria above describe more frequent wind conditions. There is also a distress criterion for ‘General Public Access’, equivalent to a mean speed of 15 metres per second (m/s) and a gust speed of 28m/s (62 miles per hour, mph) to be exceeded less often than once a year. This is intended to identify wind conditions which less able individuals or cyclists may find physically difficult. Conditions in excess of this limit may be acceptable for optional routes and routes which less physically able individuals are unlikely to use.

6.3.11 There is a further limiting distress criterion beyond which even ‘able-bodied’ individuals may find themselves in difficulties at times (see Vol 2 Table 6.2). This corresponds to a mean speed of 20m/s and a gust speed of 37m/s (83mph) to be exceeded less often than once a year. Beyond this gust speed aerodynamic forces approach body weight and it rapidly becomes impossible for anyone to remain standing.

Vol 2 Table 6.2: Distress criteria as defined by T.V. Lawson

Distress criterion	Description
‘General Public Access’	Above which the less able and cyclists may at times find conditions physically difficult
‘Able-bodied Access’	Above which it may become impossible at times for an able bodied person to remain standing

6.4 Assumptions and limitations

Assumptions

6.4.1 Environmental wind conditions have been assessed for the maximum envelope of the proposed buildings’ geometry. Considering the maximum height of the proposed facilities provides a generally conservative assessment of local wind conditions because taller buildings (relative to their surroundings) tend to downdraft a larger fraction of the upper level winds.

6.4.2 Considering the maximum breadth of the proposed facilities also provides a worst-case assessment. When the maximum breadth of the ERF and cooling condensers is considered, the size of the passage between them reduces to approximately 10-15m. This is the range where local wind funnelling between buildings is at its maximum.

Limitations

6.4.3 A qualitative assessment of the environmental wind conditions around the proposed development has been carried out. The assessment is based on evaluation of drawings showing the maximum envelope of the proposed facilities, on evaluation of aerial views of the Application Site and its surroundings and expert knowledge and previous extensive experience of wind tunnel testing of buildings.

6.4.4 A qualitative assessment is considered sufficiently accurate for the evaluation of the environmental wind conditions, given the scale of the proposed facilities, the wind exposure and the use of the space around the facilities.

6.5 Baseline

6.5.1 This section sets out the baseline conditions for the wind environment in and around the Application Site. Future baseline conditions are also described.

Current baseline

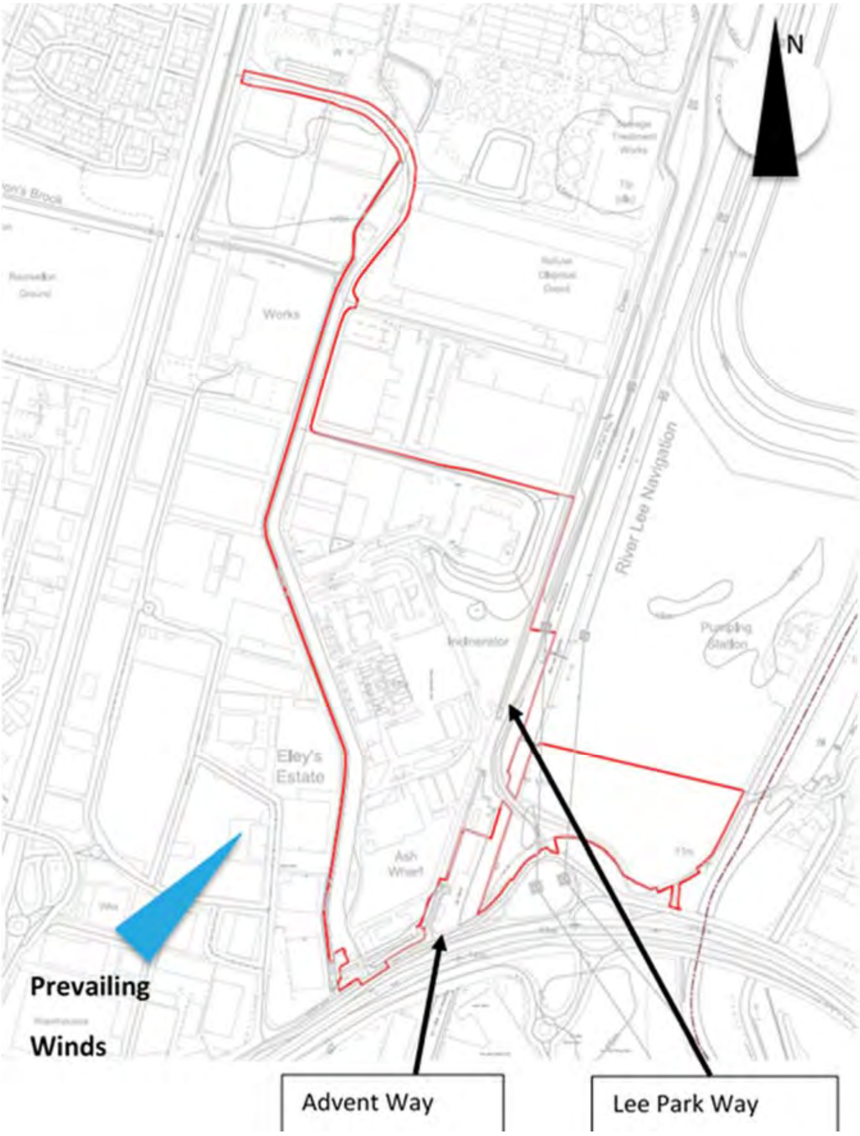
6.5.2 The current baseline refers to the existing Application Site and the areas that surround it.

6.5.3 The existing Application Site shown in Vol 2 Plate 6.1. It is bounded by Advent Way to the south, Lee Park Way and the River Lee Navigation to the east, and industrial units, including the Eley Industrial Estate, to the west and north. The existing surroundings are generally low-rise and, for the most part, used as industrial buildings. The nearest residential receptors are on Badma Close and Zambezie Drive, approximately 60m and 125m west of the Ardra Road Application Site access, respectively.

6.5.4 A review of mapping, aerial photography and site visits were undertaken to understand the layout of the existing Edmonton EcoPark and surrounding areas. Professional judgement was then used to conclude that the massing of the existing Edmonton EcoPark facilities and of the surrounding buildings do not generate significant windiness and wind conditions are generally considered acceptable for the current use of the areas.

6.5.5 The annual wind rose from historical data at London City Airport, the nearest meteorological station to the Application Site, is shown in Vol 2 Plate 6.2: Annual wind rose from London City Airport

6.5.6 A wind rose is a diagram which presents wind characteristics (direction, strength and frequency) across all times of day and all seasons.



Vol 2 Plate 6.1: Edmonton EcoPark (existing)

6.5.7 From the wind rose, it can be seen that south-west winds are the most frequent and strongest winds at all times of the year, blowing from a quadrant centred on west-south-west (240° east of north). These winds are relatively warm and wet.

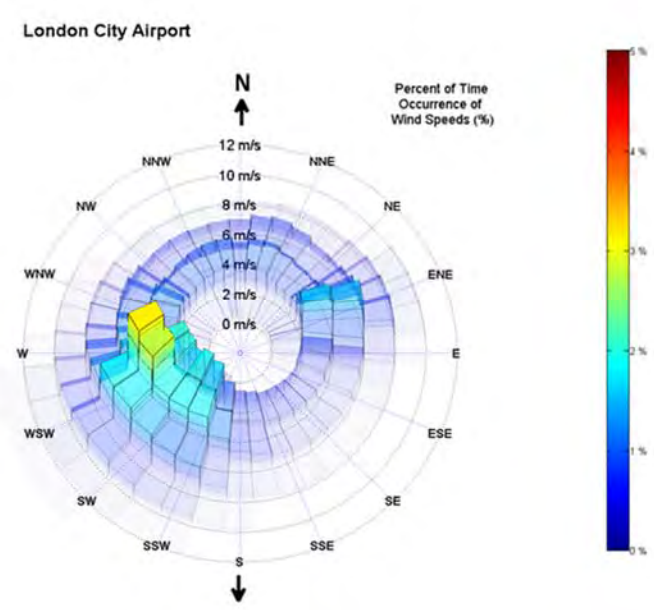
6.5.8 North-east winds are almost as common as the south-west winds during spring but are weaker. They are often associated with cold dry conditions.

6.5.9 Winds from the north-west can be as strong as the south-west winds but are less frequent.

6.5.10 South-east winds are generally rare and light.

Future baseline

6.5.11 Planned developments in the vicinity (see Vol 1 Appendix 5.2) have been reviewed. They are not anticipated to affect wind exposure in the vicinity of the Application Site.



Vol 2 Plate 6.2: Annual wind rose from London City Airport

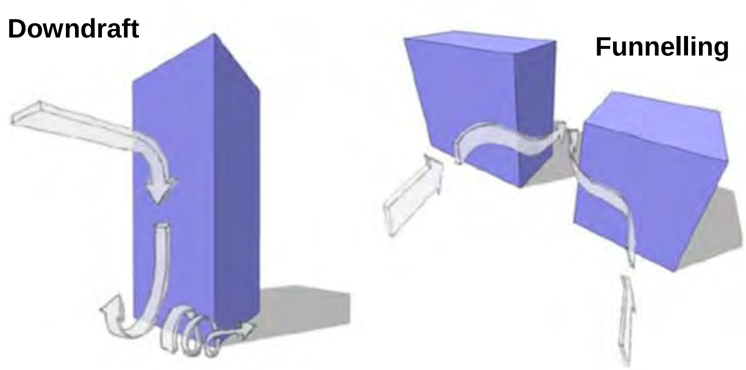
6.6 Potential effects and good environmental design management

6.6.1 The Project is described in Volume 1 of the ES. The elements of the Project relevant to the wind environment are: (a) the layout, massing and orientation of the proposed facilities, (b) the layout, massing and orientation of the surroundings, (c) the proposed use of the areas in and around the Application Site.

6.7 Assessment – operation

6.7.1 Wind conditions during Stages 2 and 4 have been assessed. Conditions following the completion of decommissioning of the facilities and clearance of the Application Site have also been assessed. The results of the assessment of each of these scenarios are presented in this section.

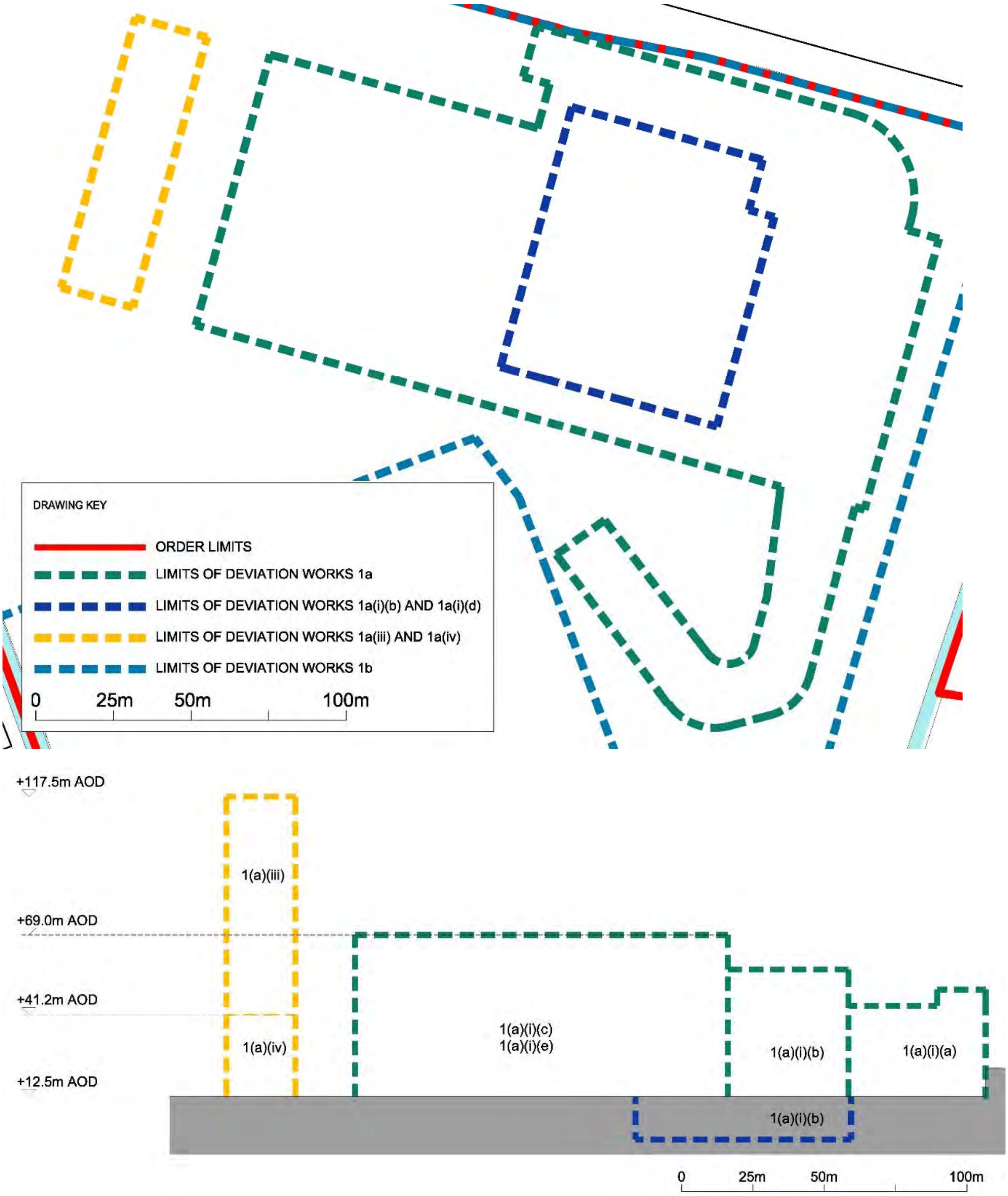
Stage 2 assessment – operation of all proposed buildings alongside EfW facility



Vol 2 Plate 6.3: Wind mechanisms affecting the proposed ERF

6.7.2 The RRF would not be significantly tall compared to the surroundings to the south and west. It is therefore not anticipated to enhance significantly any existing windiness at the Application Site and wind conditions around the RRF site would remain suitable for pedestrians.

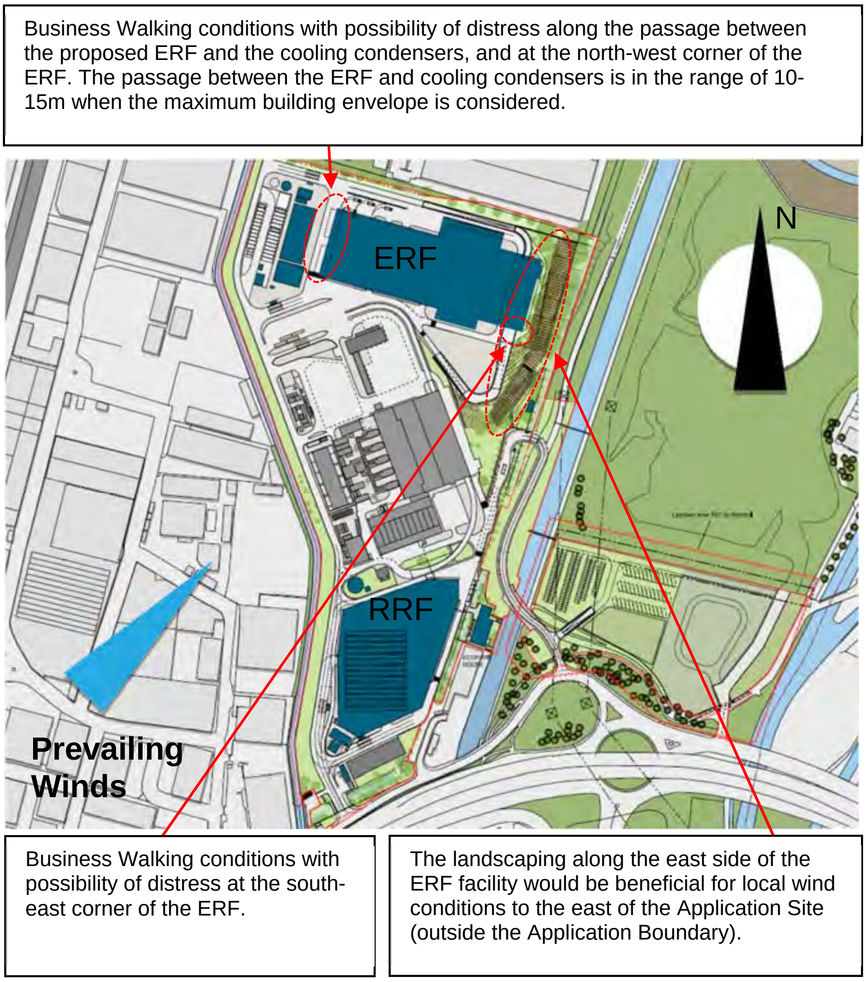
6.7.3 The proposed ERF would be taller than the existing surroundings and, due to its geometry, would promote a number of wind mechanisms such as downdrafting and funnelling (Vol 2 Plate 6.3).



Vol 2 Plate 6.4: Plan view and vertical section from south of the ERF's maximum envelope

6.7.4 The tallest section of the ERF building (not including the stack) containing the process lines, would be approximately 57m tall, while the cooling condensers adjacent to the ERF would be approximately 29m tall. The passage between the tallest section of the ERF (containing the process lines) and cooling condensers would be approximately 10-15m wide (see Vol 2 Plate 6.4).

6.7.5 Generally tall, bluff façades tend to deflect upper level winds to ground level, a mechanism commonly referred to as 'downdraft'; see Vol 2 Plate 6.3 (left). This typically results in increased windiness at ground level, especially around building corners where the winds accelerate. The tallest section of the ERF containing the process lines is expected to promote local downdrafting of the prevailing winds from the south-west. Business Walking conditions with the possibility of exceedance of the distress criterion for General Public Access is anticipated around the north-western corner of the ERF where the winds would be accelerated (see Vol 2 Plate 6.5). However, the proposed ERF does not feature any pedestrian entrances near its north-west corner and local wind conditions would be acceptable for vehicle access.



Vol 2 Plate 6.5: Edmonton Ecopark during Stage 2

6.7.6 The prevailing winds from south-west would also be forced through the passage between proposed ERF and cooling condensers. Such a mechanism is commonly referred to as 'funnelling' (Vol 2 Plate 6.3, right) and its effect is most pronounced when the size of the gap is in the range of 25 per cent to 100 per cent of the cross-breadth of adjacent buildings. Wind conditions in this area are anticipated to be in the Strolling to Business Walking range with the possibility of exceedance of the local distress criterion for ‘General Public’ access (see Vol 2 Plate 6.5). The passage would feature a pedestrian route for employees accessing the cooling condensers and the security checkpoint further to the north. As the conditions are not suited to this use, this has been assessed as a **significant adverse effect.**

6.7.7 The prevailing south-west winds would be accelerated at the south-east corner of the proposed ERF (i.e. around the south-east corner of ERF1, the tipping hall). The proposed ERF features an entrance at this corner, where Business Walking conditions are anticipated. These conditions are not suitable for entrance use. As the conditions are not suited to this use, this has been assessed as a **significant adverse effect.**

6.7.8 Calmer wind conditions (Standing to Strolling) are generally anticipated in other areas around the Application Site and would be acceptable for access use.

6.7.9 The existing EfW facility to the south of the ERF is considered sufficiently distant, so that any aerodynamic interaction between the two facilities would be precluded.

6.7.10 The nearest residential units are sufficiently distant from the existing and proposed buildings on the Edmonton EcoPark site that they would not be affected, e.g. over 300m from the ERF to the closest residences on Badma Close and Zambezie Drive. The impact of the Project on wind conditions in residential areas is considered negligible and **not significant.**

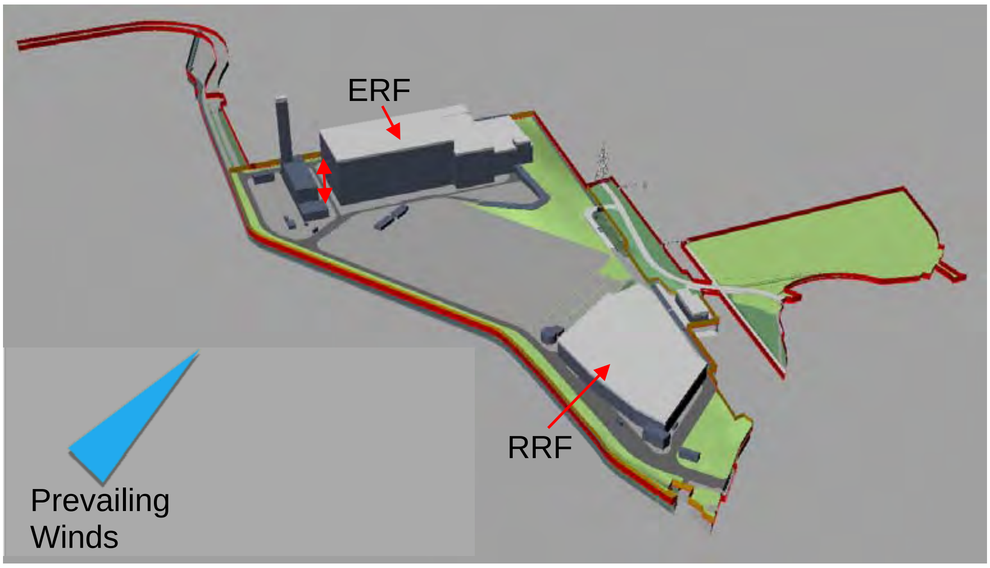
6.7.11 The proposed trees along the east side of the ERF would be beneficial for local wind conditions to the east (outside the Application boundary). Wind conditions along Lee Park Way (facing the River Lee Navigation) are anticipated to be suitable for the intended walking use. The River Lee Navigation would continue to be used by the Edmonton Sea Cadets for rowing or kayaking activities. Windiness along the canal is considered suitable for these activities and effects are therefore **not significant**.

6.7.12 The industrial areas to the west and the north of the Application are less sensitive to wind conditions as they do not include areas, such as public open space, outdoor cafés and retail areas, where sitting and strolling are likely to be required. Due to the distance from the Application Site, the direction of prevailing winds and the geometry of the buildings both on-site and in the industrial areas, the Project is not likely to give rise to adverse wind conditions in these areas. Effects are therefore considered **not significant**.

Stage 4 – operation of proposed buildings

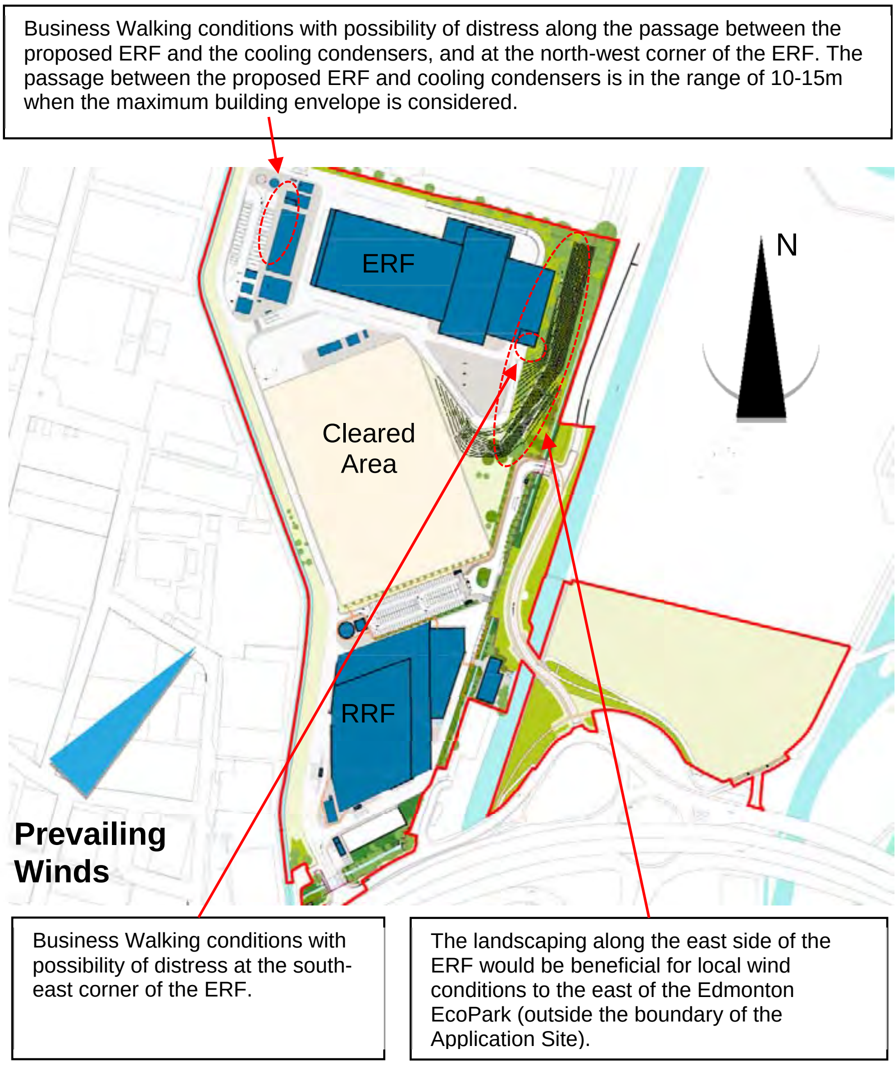
6.7.13 Vol 2 Plate 6.6 shows a 3D view of the proposed ERF and the RRF during Stage 4.

6.7.14 The area to the south of the ERF (between the ERF and RRF) would be vacant during Stage 4. There would be no interaction of windiness between the two buildings due to the distance between the two. Wind conditions in and around the proposed ERF and RRF are likely to be the same as for Stage 2 (i.e. some **significant adverse effects** around parts of the ERF) and are outlined in Vol 2 Plate 6.7.



Vol 2 Plate 6.6: 3D view of the proposed facilities during Stage 4

6.7.15 The effects of the Project outside the Application boundary are considered to be **not significant**, as for Stage 2.



Vol 2 Plate 6.7: Edmonton EcoPark with key areas of windiness during Stage 4

6.8 Assessment – decommissioning of the Project

6.8.1 Following decommissioning and demolition of the facilities on the Application Site, there would be no built development to cause local acceleration of winds. Future uses on the Application Site post-decommissioning are unknown but would need to take into account the wind environment in their design. Adverse wind effects are therefore not likely to occur and effects would be **not significant**.

6.9 Supplementary mitigation

6.9.1 With the potential for significant adverse effects at the passage between the ERF and the cooling condensers, and the south-east corner of the proposed ERF, mitigation measures may be necessary. Depending on the final building arrangement including locations of pedestrian entrances and pedestrian paths, mitigation such as screens or canopies may be required. The necessity for this should be confirmed and the design developed during the detailed design stage.

6.10 Residual effects

6.10.1 With suitable local mitigation, wind conditions at the passage between the ERF and the cooling condensers, and at the south-east corner of the proposed ERF would be acceptable for the walking use of these areas so effects would be **not significant**.

6.10.2 No other locations have been identified as having likely significant effects so residual effects would remain **not significant**.

6.11 Sensitivity test for programme delay

6.11.1 For the assessment of environmental wind, a change to the programme of plus or minus 12 months would not be likely to materially change the assessment findings reported in Section 6.7.

6.11.2 Based on the Cumulative Development Schedule (Vol 1 Appendix 5.2), there would be no new receptors requiring assessment as a result of the programme change. This is because there are no developments identified on the Cumulative Development Schedule (Vol 1 Appendix 5.2) that would fall into the future baseline as a result of the programme change and therefore the future baseline would remain as described in Section 6.5.

6.12 Cumulative effects

6.12.1 Cumulative developments (Vol 1 Appendix 5.2) are anticipated to have no effects in combination with the Project. They are sufficiently distant to not affect the local windiness at any phase of the Project. Similarly, the Project is too distant from the other developments to give rise to significant effects at the other sites.

6.13 Assessment summary

Operation

Vol 2 Table 6.3: Assessment summary – operation

Environmental Wind			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stages 2 and 4			
The passage between ERF and the cooling condensers	Conditions along the pedestrian route in the passage between the ERF and cooling condensers would not be suitable for use as a pedestrian route and access, therefore there would be a **significant permanent adverse** effect.	Local mitigation may be required – to be developed during detailed design stage.	**Not significant.**
The south-east corner of the proposed ERF	Conditions along the south-east corner of the ERF would not be suitable for use as a pedestrian route, therefore there would be a **significant permanent adverse** effect.	Local mitigation may be required – to be developed during detailed design stage.	**Not significant.**
Outside the Application boundary: amenity areas to the east and River Lee Navigation	Conditions along the east of the Application Site, used by the Edmonton Sea Cadets, would be in the Standing to Strolling range, therefore the effect on windiness would be **not significant**.	None required	Effect unchanged **Not significant.**
Outside the Application boundary: areas to the west and north, including Eley Industrial Estate	Due to the distance, direction of prevailing winds and geometry of buildings, the effect on windiness would be **not significant**.	None required	Effect unchanged **Not significant.**

Decommissioning of the Project

Vol 2 Table 6.4: Assessment summary – decommissioning of the Project

Environmental Wind			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
The Application Site	Similar wind conditions as existing are generally anticipated following decommissioning and demolition of the facilities, therefore the effect would be **not significant**.	None required	Effect unchanged **Not significant.**

7 Ground Conditions and Contamination

7.1 Introduction

7.1.1 This section describes the likely significant effects of the Project on ground conditions and contamination in particular on the effects on groundwater quality. Where present, poor quality soils and groundwater can impact human health, groundwater resources in designated aquifers, and also the quality of surface waters that receive inputs from groundwater.

7.1.2 The assessment of ground conditions and contamination identifies the construction, operation and decommissioning effects of ground conditions and contamination on groundwater receptors. Salmon's Brook is considered as a receptor as it is hydraulically connected to groundwater aquifers within the Application Site, while the other surface water bodies in the vicinity of the Application Site are assessed in Section 11 (Water Resources and Flood Risk).

7.1.3 The scope of the ground conditions and contamination assessment overlaps with that for Water Resources and Flood Risk Assessment in Vol 2 Section 11. Effects related to infiltration and surface process, such as accidental spills, and water management on the Application Site have been assessed in Section 10. Groundwater contamination from sources which are existing at the Application Site or mobilised by site activities have been considered in this assessment.

7.1.4 Construction, operational and decommissioning effects of ground conditions and contamination to human health receptors have been scoped out on the basis that the scoping assessment did not find any unacceptable risks to human health. No significant construction, operational or decommissioning effects on human health receptors are therefore likely and human health receptors have not been considered further in this assessment.

7.1.5 Construction, operational and decommissioning effects of ground conditions and contamination from surface water run-off and discharges have been scoped out[1] on the basis that the scoping assessment identified no change to the operational discharges, and that any potential construction run-off would be managed by the CoCP (Vol 1 Appendix 3.1). No significant construction, operational or decommissioning impacts from surface water run-off and discharges are therefore likely and these have not been considered further in this assessment.

7.1.6 Construction effects for ground conditions and contamination from current soil conditions at Edmonton EcoPark have been scoped out on the basis that any potential risks would be mitigated through measures to manage run-off set out in the CoCP (Vol 1 Appendix 3.1).

7.1.7 The Temporary Laydown Area for vehicles and plant would be established in the east of the Application Site. None of the proposed activities within the Temporary Laydown Area have been identified which would affect ground conditions and contamination. The proposed activities in the Temporary

Laydown Area would be managed in accordance with the CoCP (Vol 1 Appendix 3.1).

7.1.8 The works plans (based on which the ground conditions and contamination assessment has been undertaken) are contained in the Book of Plans (AD02.01) which forms part of the DCO Application documents. Figures associated with the ground conditions and contamination assessment are contained in the Appendix – Figures volume of the ES.

7.2 Engagement

7.2.1 A summary of the response to Scoping Opinion[1] relevant to ground conditions and contamination is detailed in Vol 2 Appendix 7.1.

7.2.2 Engagement with stakeholders relating to ground conditions and contamination commenced during the initial site investigation stage, continued throughout the design and scoping stages, and throughout the assessments undertaken in 2015. It is summarised below and detailed in Vol 2 Appendix 7.1.

7.2.3 The EA and LB Enfield were consulted on the Project from 2011 when the Phase One Desk Study and Human Health Risk Assessment was issued for comment. LB Enfield was satisfied with the content of the report but stated that "*additional work may be needed depending upon the future of the Application Site[64] (i.e. the future land use scenario)*." As the assessment was undertaken for land use as commercial or industrial use, further assessment using different criteria would only need to be undertaken if changed land use to, for example, residential or agricultural use. The EA stated in a letter that the 2011 site investigation report adequately characterised the environmental risk posed by the Application Site. In response to the comments, further site investigations were undertaken and have been considered in the assessment. Human health risk was scoped out of the assessment as described in Paragraph 7.1.4.

7.2.4 The 2012 Preliminary Source Protection Zone (SPZ) Risk Assessment, which concluded that the risk to groundwater receptors was low, and the 2012 Site Investigation were also issued to the EA. The EA indicated that they were satisfied with the content of the 2012 SPZ assessment and that the 2012 site investigation provided sufficient information on the thickness of the London Clay across the Application Site. As no unacceptable groundwater risk had been identified, the Project design was progressed with underground structures located where aquifer protection was greatest, i.e. in areas of thick London Clay. Site investigations in 2014 were undertaken to confirm the geology in the north of the Application Site. This was suggested from the EA consultation on the location of the ERF bunker and risks to groundwater receptors. The EA stated that a thickness of 5m to 8m London Clay should be retained beneath the ERF bunker. This led to the ERF bunker being located in the north-east of the Application Site where London Clay is thickest.

[64] Letter dated 3/10/11, from LB Enfield to AMEC, re: Edmonton SI Report

7.2.5 A Hydrogeological Risk Assessment was undertaken for the Application Site in March 2015. This has been reviewed by the EA who commented that they are satisfied with the report but updates to the Source Protection Zones (SPZ) would need to be incorporated into the assessment. These updates to the SPZ have now been included in an updated Hydrogeological Risk Assessment which is included as Vol 2 Appendix 7.2. The Hydrological Risk Assessment includes a summary of the 2012 Preliminary SPZ Risk Assessment, Phase One Desk Study and Human Health Risk Assessment and 2014 Site Investigation described above.

7.2.6 During the Phase Two Consultation, LB Enfield commented that further assessment of the risks from piling would need to be included in the assessment. The risk to groundwater has been a consideration for piling design and is included in the assessment. A Piling Risk Assessment has now been completed and is included as Vol 2 Appendix 7.3. As agreed during consultation with the EA, a Piling Method Statement will be prepared before any piling works are undertaken.

7.2.7 Thames Water comments from the Phase Two Consultation also stated that a Piling Method Statement would be required before piling is undertaken. A Piling Risk Assessment has now been completed as part of the ES and as stated above, a Piling Method Statement would be produced before any site works would be undertaken, as part of detailed design.

7.3 Methodology

7.3.1 This section provides an overview of the methodology for assessing the likely significant effects of the Project ground conditions and contamination on receptors. Full details of the topic methodology are provided in Vol 2 Appendix 7.1 which details the legislation, policy and guidance which has been used to derive the methodology for this assessment.

Assessment of Project stages

7.3.2 The Project has been divided into four stages. For the ground conditions and contamination assessment, Stage 1 and Stage 3 are identified to be construction related activities, while Stage 2 and Stage 4 are operational.

7.3.3 The approach used to assess the likely significant effects from ground conditions and contamination does not change between the construction, operational and decommissioning phases of the Project. Therefore, the methodology summarised below and presented in Vol 2 Appendix 7.1 describes the approach adopted for all stages. The results of the assessment are reported separately for each stage for clarity.

Assessment area

7.3.4 The assessment area encompasses the Application Site and includes groundwater receptors outside the Application Site which could be impacted by sources from within the Application Site. Salmon’s Brook along the western boundary of the Application Site has also been identified as a receptor and is included in the assessment as it is hydraulically connected and identified to receive groundwater from the Application Site. The other surface water bodies in the vicinity of the Application Site, such as Enfield Ditch, have not been identified to receive groundwater from the Application Site. In addition, the River Lee Navigation is hydraulically isolated from the Application Site aquifers as it is sheet piled. The potential for surface water flows to affect water quality in surface watercourses is assessed within Vol 2 Section 11 (Water Resources and Flood Risk Assessment).

Construction

Assessment method and significance criteria

7.3.5 Baseline information in relation to geology, hydrogeology, hydrology, historical site use and other indications of ground conditions has been reviewed. Data have been interpreted with reference to the regulatory regime for contaminated land, as described in the assessment methodology in Vol 2 Appendix 7.1. Iterative assessment has ensured that measures are incorporated into the Project to prevent or reduce land quality effects.

7.3.6 Stages 1 and 3 were identified as the relevant stages for assessment of construction-related effects on ground conditions and contamination. Stage 2 is not assessed in relation to construction effects as the construction works during this stage would be minor and controlled within the CoCP (Vol 1 Appendix 3.1). With these measures in place, it is not anticipated that minor construction activities would have an effect on ground condition or groundwater quality.

7.3.7 The receptors considered in this assessment are related to groundwater. Without the three essential components of a source, pathway and receptor, there can be no impact. Thus, the mere presence of a source of contamination does not mean that there will necessarily be an impact.

7.3.8 By considering the source, pathway and receptor linkage, an assessment has been made for each contaminant on a receptor by receptor basis with reference to the likelihood and magnitude of the impact. In assessing this information, a measure has been made of whether the source contamination can reach a receptor. The likelihood of this linkage being realised has then been determined. Finally the magnitude has been assessed if the linkage and hence impact is realised (this is termed the magnitude of impact).

7.3.9 The significance of any impacts caused by the Project on baseline conditions has been assessed qualitatively as part of the assessment, based on professional judgement and relevant guidance for contaminated land. The sensitivity of the receptor and the magnitude of any potential impact have been combined to determine the significance of the impact. The magnitude is determined by assessing the severity of the impact against its likelihood. Magnitude, severity, likelihood, sensitivity and significance criteria are detailed in the assessment methodology in Vol 2 Appendix 7.1.

7.3.10 An impact is considered not to be significant where the impact is assessed to be moderate or below where only minor harm to receptors is identified. Where the risk of significant impact is assessed to be substantial or above, mitigation/management will normally be required to reduce the level of risk to slight or negligible levels. In any situations where it is not possible or reasonable to mitigate the impacts down to this level, the residual risks have then been assessed. This is detailed in Vol 2 Appendix 7.1.

Operational

7.3.11 The approach for the assessment of operational effects for ground conditions and contamination is the same as that applied for the construction phase. Stages 2 and 4 were identified as the relevant stages for assessment of operational effects on ground conditions and contamination.

Decommissioning

7.3.12 The approach for the assessment of decommissioning effects is the same as that applied for the construction and operational phases.

7.4 Assumptions and limitations

Assumptions

7.4.1 The detailed civil engineering strategy for the demolition and removal of the EfW bunker has not yet been finalised and will be completed during the detailed design stage, therefore a qualitative assessment of the potential risks to groundwater from the removal of the EfW bunker has been undertaken. This has been based on the current proposed plan for infilling and that construction risks to groundwater receptors would be considered in the construction detailed design and method statements (referred to in the CoCP (Vol 1 Appendix 3.1)). It has been assumed that infilling after removal would include mitigation measures for protection of all sensitive receptors and would be developed in consultation with the EA. Based on EA consultation to date, the current proposed design is for infill material with suitable properties to be used. This would include a low permeability clay overlying the Lambeth Group which would help to protect the underlying aquifer. The low permeability clay would be overlain by granular material which would re-establish groundwater flow in the Kempton Park Gravels.

7.4.2 For new building foundations, piling would be required. It has been identified that piling has the potential to introduce groundwater pathways between aquifers, especially where the low permeability layers are punctured. This assessment assumes that the piling design would be undertaken in consultation with the EA and would consider and mitigate potential effects on sensitive groundwater receptors. Details of potential piling methodologies are included in the Piling Risk Assessment in Vol 2 Appendix 7.3.

7.4.3 It is assumed that the soils samples taken provide a reasonable representation of the Made Ground soil quality. The soil sampling was undertaken during the site investigations at a frequency which provides sufficient representation of the Made Ground soil quality. From the sampling undertaken, low risk to human health was identified (Vol 2 Appendix 7.2, Hydrogeological Risk Assessment) and therefore no additional sampling was undertaken. The frequency of sampling does not comprehensively rule out that potentially polluting substances could be encountered during excavations. This risk has been considered within the CoCP (Vol 1 Appendix 3.1) and appropriate best practice would be used.

Limitations

7.4.4 There is no data from the investigations at the Application Site to determine the base of the Lambeth Group or the depth to Thanet Sand or chalk underlying the Application Site. Additionally, no information is available on the water quality of the Thanet Sand and chalk aquifers underlying the Application Site. However, the depth to the chalk has been recorded at nearby boreholes at approximately 32m below ground level and potable groundwater quality abstractions are located within 500m of the Application Site in the Thanet Sand and chalk aquifer and the Application Site is within the SPZ source area for those abstractions. Therefore as the most stringent groundwater protection measures are applied within a SPZ, the assessment considers that no deterioration of the water quality in the Thanet Sand and chalk has occurred and so the data limitation has not affected the assessment. The drilling of investigation boreholes into the chalk aquifer has the potential to create potential pollution pathways to the aquifer and therefore was not undertaken at the Application Site as information from neighbouring boreholes was available.

7.4.5 There are two water quality sampling results for Salmon’s Brook for upstream and downstream of the Application Site. Therefore it is unclear if the Application Site is contributing positively or negatively to Salmon’s Brook water quality. Annual sampling of Salmon’s Brook is ongoing as part of the operational site monitoring plan. As the Water Framework Directive (WatFD) guidance indicates that no deterioration of the water quality should occur to surface water bodies, the assessment uses this criterion and therefore this data limitation has not affected the outcome of the assessment.

7.5 Baseline

7.5.1 This section sets out the baseline conditions for ground conditions and contamination in and around the Application Site. Future baseline conditions are also described. The Application Site boundary is shown in Vol 2 Figure 7.1.

Current baseline

7.5.2 Sources of data relating to ground conditions and contamination at the Application Site are summarised in Vol 2 Table 7.1. All site investigation, monitoring and sampling were undertaken using the applicable British Standards, best practice methodology and EA Pollution Prevention Guidelines as detailed in Vol 2 Appendix 7.1. The assessments and investigations were undertaken as part of the desk study, site investigation and operational site monitoring and reporting.

Vol 2 Table 7.1: Baseline data sources

Year	Relevant baseline data	Purpose
2011	Review of historical information and geological and groundwater vulnerability mapping	To determine the historical and current site conditions from the available literature and location mapping
2011	Soils data from 56 intrusive locations	To develop geological mapping of the Application Site and soil quality
2011	Two groundwater and six ground gas monitoring rounds	To determine the baseline groundwater and ground gas concentrations
2011	Three ground gas monitoring rounds and risk classification	To establish the potential risk to human health and to the environment
2012	A screening assessment for the SPZ for nearby public water supply (PWS) boreholes has been undertaken. This study included a conceptual site model (CSM) and preliminary risk categorisation for the proposed anaerobic digestion plant	To establish a CSM and preliminary risk categorisation
2013	Soils data from four additional boreholes installed into the London Clay and Lambeth Group	To develop geological mapping of the Application Site and groundwater quality in the Lambeth Group
2013	Additional investigation of groundwater quality, following feedback from the EA.	To confirm the water quality in the Lambeth Group by analysing with lower analytical minimum detection limits
2014	Soils and geotechnical data from 13 boreholes installed into the London Clay and Lambeth Group	To further develop geological mapping of the Application Site and determine the thickness of London Clay in the north of the Application Site. Geotechnical testing for informing building and foundation design.
2014	Soils analysis from four boreholes installed into the London Clay and Lambeth Group	To further develop geological mapping of the Application Site and determine the land quality
2015	Ten rounds of groundwater monitoring data from 19 boreholes, collected 2012-14	To determine the baseline groundwater quality on the Application Site and monitoring for

Year	Relevant baseline data	Purpose
		the Site Protection Monitoring Plan
2015	Hydrogeological Risk Assessment for the Application Site and proposed ERF	To establish the hydrogeological risks for the operational site
2015	Piling Risk Assessment	To establish the risks for the Application site

7.5.3 The geology, hydrology and hydrogeology data for the Application Site listed in Vol 2 Table 7.1 were reviewed and detailed in the Hydrogeological Risk Assessment which is provided as Vol 2 Appendix 7.2. All baseline information relevant to this assessment has been detailed in this section.

7.5.4 In addition further desk-based work has been undertaken to obtain up-to-date information on the baseline. This information can be seen in Vol 2 Table 7.2

Vol 2 Table 7.2: Desk study baseline information sources

Date	Relevant baseline data
Topography	Ordnance Survey 1:10K and 1:25K Mapping
Surface Waters	EA http://maps.environment-agency.gov.uk/wiyby/ (Last accessed July 2015)
Surface Water Quality	EA http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683&y=355134&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=wfd_lakes (Last accessed July 2015)
Groundwater Vulnerability	EA http://maps.environment-agency.gov.uk/wiyby/ (Last accessed July 2015)
Geology	British Geological Survey website, http://mapapps.bgs.ac.uk/geologyofbritain/home.html (Last accessed July 2015)
Water Abstractions and Discharges	http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683&y=355134&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=water_abstractions (Last accessed July 2015)

Topography

7.5.5 Elevation at the Edmonton EcoPark ranges from around 10.0m above ordnance datum (AOD) to 13.5m AOD, with some isolated areas at higher levels than this. Elevations are highest across the northern part of the Application Site, and at the landscaped area in the north-east where an artificial pond is located. Elevations fall generally from north towards the south part of the Application Site. There is a localised high point in the southern part of the Application Site at the grass landscaped area, where the elevations are in the range 11m AOD to 13m AOD. Low points are located in the north-west of the Application Site adjacent to the effluent treatment plant.

Geology

7.5.6 The geology at Edmonton EcoPark comprises Made Ground, Alluvium, Kempton Park Gravels, London Clay, Lambeth Group, Thanet Sand and White Chalk. A summary of the geology at the Application Site based on data obtained in ground investigations undertaken at the Application Site between March 2011 and December 2014 is provided in Vol 2 Table 7.3. The aquifer designations shown in the table are for the entire geological unit and therefore are applicable site-wide. Geological cross sections of the geological sequence is provided in Vol 2 Figures 7.2 and 7.3.

Vol 2 Table 7.3: Geological summary and aquifer designations across the Application Site

Strata	Typical constituents	Approximate thickness (m) max -min	Aquifer status
Made Ground	Variable historic demolition rubble, including ash and clinker	1.0 - 7.5m	Not applicable
Alluvium	Silty clay	Absent to 3.8m	Secondary Aquifer
Kempton Park Gravels (River Terrace Deposits)	Variably sandy, silty and clayey gravels	1.1 - 4.6m	Secondary Aquifer
London Clay	Grey, occasionally sandy or silty clay	0.7 - 18.1m	Unproductive Strata
Lambeth Group (formerly known as the Woolwich and Reading Beds)	Grey, mottled brown, sandy clay	Unknown	Secondary Aquifer
Thanet Sand	Silty or clayey sand	Unknown	Secondary Aquifer
Upper Chalk	Off-white carbonaceous limestone with flints	>50m	Principal Aquifer

Hydrogeology

7.5.7 As detailed in Vol 2 Table 7.3, the Alluvium, Kempton Park Gravels, Lambeth Group and Thanet Sand are designated as Secondary Aquifers while the chalk is a Principal Aquifer.

7.5.8 The Application Site is located within an EA designated groundwater SPZ which is a groundwater protection zone for Public Water Supply (PWS) boreholes, located within 250m of the south-eastern most part of the Application Site boundary. The Application Site is within designated SPZ 1 and SPZ 2 zones. A SPZ 1 is defined as the inner protection zone with a 50-day travel time from any point below the water table to the abstraction borehole, while the SPZ 2 is the outer protection zone, defined by the 400-day travel time from any point below the water table to the abstraction borehole. The extent of the SPZ with reference to the Application Site boundary is shown in Vol 2 Figure 7.4. The PWS sources abstract groundwater from the Lambeth Group, Thanet Sand and chalk aquifers. There are no licensed groundwater abstractions within Edmonton EcoPark.

7.5.9 Four private water supply boreholes, of which three are identified as being used as a potable source, are located within 500m of the Application Site boundary as shown in Vol 2 Figure 11.2.

7.5.10 Made Ground is not designated as an aquifer but during the Application Site investigation, water was encountered in this stratum on several occasions. This water is likely to be perched water in higher permeability Made Ground overlying the low permeability Alluvium.

7.5.11 The Alluvium is designated as a Secondary Aquifer. No water strikes were encountered in the Alluvium during site investigations. Due to the low permeability of the peaty silts, this layer does not appear to transfer water but rather acts as a barrier to flow and is likely to provide some protection to vertical flow to the underlying aquifer.

7.5.12 The Kempton Park Gravels is a Secondary Aquifer and has been described as highly permeable sands and gravels. Groundwater elevations have been measured between 7.12 and 9.45m AOD. Groundwater elevation data for 2012 to 2014 have been interpreted to understand flow directions. Flow was identified to be generally in a southerly to south-southwesterly flow direction but with some flow onto the Application Site noted at the north-western boundary. Groundwater levels in the Kempton Park Gravels have been contoured for May 2014 and November 2014 and are available in the Hydrogeological Risk Assessment, Vol 2 Appendix 7.2.

7.5.13 The Kempton Park Gravels are absent around the EfW bunker. It is understood that it was excavated during construction of the bunker and that the resulting void was backfilled with lower permeability gravelly clay and clayey sand and gravel.

7.5.14 The London Clay is categorised as Unproductive Strata. No water strikes or water bearing strata were found within the London Clay inside the boundary of the Application Site. Laboratory permeability testing indicates that the Clay has a low permeability with a mean value 2.9 x 10^{-11} m/s across the Application Site. The London Clay is therefore an aquitard that provides protection to the underlying aquifers by limiting vertical movement of groundwater. The London Clay thins from the north to the south of the Application Site, as shown in Vol 2 Figure 7.5 and cross sections in Vol 2 Figures 7.2 and 7.3. The areas where the London Clay is thickest provide the greatest protection to the underlying aquifers.

7.5.15 For the construction of the EfW bunker, an excavation was undertaken. The excavation extended 10m beyond the bunker on each side, and was subsequently backfilled after the construction was complete. In this EfW bunker excavation area, the London Clay is absent. It is understood that the London Clay was excavated in this location. The Lambeth Group is a Secondary Aquifer. Beneath the Application Site it consists of clayey sand and sandy clay and sandy silt layers. Water was encountered in the sandy silt layers. Groundwater elevation monitoring in the Lambeth Group is limited to four boreholes and groundwater was monitored at different depths but all within sandy silt layers. The sand layers do not appear to be laterally continuous across the Application Site. Laboratory permeability testing on samples of silty clay found low hydraulic conductivity with a mean 9.02 x 10^{-11} m/s, similar to the London Clay.

7.5.16 No site-specific information is available for the Thanet Sand or Chalk Formations. These formations are believed to be in hydraulic connection with each other. Groundwater flow directions within the deeper chalk aquifer are likely to be towards abstraction wells to the east.

Groundwater quality

7.5.17 Groundwater monitoring has been undertaken at the Application Site during site investigations and as part of Environmental Permitting to characterise groundwater quality and establish baseline concentrations for potentially polluting substances.

7.5.18 Site-specific groundwater quality monitoring data is available from the Kempton Park Gravels and Lambeth Group which were sampled to establish the baseline groundwater quality at the Application Site. No monitoring boreholes have been installed in the deeper aquifers to avoid the creation of pathways to the deeper aquifers during the drilling of the borehole.

7.5.19 Groundwater quality in the deeper aquifers (Thanet Sands and chalk) is anticipated to be good, reflecting its use nearby for potable water supply.

7.5.20 Groundwater quality in the Kempton Park Gravels is the most likely to have been affected by contamination from the existing site operations and from neighbouring sites due to its proximity to surface activities.

7.5.21 An assessment of groundwater contamination in the Kempton Park Gravels has been undertaken by comparing the results of groundwater sampling with water quality standards (WQS), taken from Environmental Quality Standards (EQS) and Drinking Water Standards (DWS). The full results with comparison are given in the Hydrogeological Risk Assessment Appendix C1 (contained in Vol 2 Appendix 7.2).

7.5.22 To give an indication of the groundwater quality, a summary of the comparison of the groundwater sampling to the DWS are summarised in Vol 2 Table 7.4, with exceedances of the standards highlighted in grey. Vol 2 Table 7.4 summarises the comparison of the Lambeth Group groundwater sampling results to the DWS with exceedances highlighted in grey. Groundwater data is not available for other strata.

Vol 2 Table 7.4: Summary of exceedance of Drinking Water Standards in Groundwater in the Kempton Park Gravels

Contaminants	Unit	DWS	BH119	BH101	BH101	BH102	BH106	BH106	BH107	BH109	BH109	BH110	BH110	BH113	BH114	BH114	BH114
Sulphate as SO4	mg/l	**250**	146	155	53	147	237	202	204	204	119	209	174	142	227	126	179
Sulphide	µg/l	**-**	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l	**250**	470	350	490	250	240	200	240	240	140	330	260	270	230	130	300
Ammonium as NH4	µg/l	**500**	17000	8100	2000	7000	5500	5100	7900	7900	1800	5400	7300	8800	9200	6400	10000
Aluminium	mg/l	**0.2**	< 0.001	0.47	0.09		0.22	0.12	0.058	0.058	0.031	0.32	0.072	0.062	0.41	0.15	0.013
Arsenic	µg/l	**10**	0.65	20	27	13	11	7.7	15	15	8.4	8.8	13	8.8	13	11	8.1
Barium	µg/l	**-**	49	53	69	20	85	73	62	62	58	44	38	47	39	13	43
Boron	µg/l	**1000**	550	320	1200	210	240	360	350	350	330	250	310	330	340	300	500
Cadmium	µg/l	**5**	< 0.02	< 0.10	< 0.08	< 0.10	< 0.08	< 0.08	< 0.10	< 0.10	< 0.08	< 0.10	< 0.08	< 0.08	< 0.10	< 0.08	< 0.08
Chromium	µg/l	**50**	0.4	0.5	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	0.4	< 0.4	0.8	0.8	0.5
Copper	µg/l	**2000**	< 0.5	1.5	4.2	< 0.7	1.4	1.3	< 0.7	< 0.7	1.2	0.9	1.5	< 0.7	1.7	1.5	1
Iron	mg/l	**0.2**	0.25	2.7	0.28		0.23	0.86	7.4	7.4	0.64	0.85	0.45	0.28	1.9	0.42	0.94
Lead	µg/l	**10**	< 0.2	2.5	3.3	< 1.0	< 1.0	2.2	< 1.0	< 1.0	1.1	1.2	< 1.0	1.5	4.3	2.3	2.6
Mercury	µg/l	**1**	0.51	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel	µg/l	**20**	9.8	5.2	23	7.2	22	2.8	2.6	2.6	1.5	4.2	2.9	2.9	3.9	5.1	3.2
Selenium	µg/l	**10**	2.9	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Zinc	µg/l	**-**	< 0.5	7.4	19	< 0.4	< 0.4	3.5	1.4	1.4	1.5	7.3	< 0.4	1.6	9.9	< 0.4	1
Total Phenols (monohydric)	µg/l	**0.5**	< 10	< 10	42	< 10	< 10	17	< 10	< 10	11	< 10	< 10	21	< 10	< 10	25

Contaminants	Unit	DWS	BH119	BH101	BH101	BH102	BH106	BH106	BH107	BH109	BH109	BH110	BH110	BH113	BH114	BH114	BH114
Vinyl Chloride	µg/l	**0.5**	< 1.0	< 10.0	< 10.0	10.4	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Total EPA-16 PAHs	µg/l	**-**	0.21	< 0.20	< 0.20	< 0.20	< 0.20	2.06	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20

Vol 2 Table 7.5: Summary of exceedance of Drinking Water Standards in Groundwater in the Lambeth Group

Contaminant	Units	DWS	BH201	BH202	BH204	BH202	BH201	BH203	BH204
Sulphate as SO4	mg/l	250	51.2	612	401	650	89	77	260
Sulphide	µg/l	-	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l	250	87	300	170	250	110	73	130
Ammonium as NH4	µg/l	500	680	3700	990	2000	730	1900	1300
Aluminium	mg/l	0.2	1.5	0.44	0.41	0.37	0.18	1.2	0.28
Iron	mg/l	0.2	0.84	0.2	0.26	0.16	0.075	1.5	0.19
Selenium	µg/l	10	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	15	< 4.0

Exceedance of the Drinking Water Standard

Made Ground

7.5.23 Groundwater samples were not collected from the perched Made Ground; instead leachate samples were prepared from Made Ground soil samples. The leachate samples were screened against DWS and fresh water EQS. Concentrations of ammonium, dissolved metals (aluminium, arsenic, boron, iron, lead, mercury and nickel) and total cyanide exceeded DWS and dissolved metals (cadmium, chromium, copper and zinc) exceeded the fresh water EQS. This is consistent with the parameters that exceeded these standards in the Kempton Park Gravels aquifer and indicate Made Ground may be a source of contamination to shallow groundwater.

Kempton Park Gravels

7.5.24 Ammonium, chloride, sulphate, metals and metalloids (aluminium, arsenic, boron, cadmium, chromium, copper, mercury, iron, nickel, and selenium), phenols and vinyl chloride have been found above DWS and/ or EQS in samples of groundwater from the Kempton Park Gravels. There is no DWS for total PAH but they were detected in two samples.

Lambeth Group

7.5.25 Groundwater in the Lambeth Group Vol 2 Table 7.5 shows WQS exceedances of ammonium in every sample and some exceedances for sulphate, chloride, aluminium, chromium, iron and selenium.

7.5.26 The concentration of ammonium is highest in the north-east which may imply a source outside the Application Site to the north. However, these concentrations may represent a natural baseline and may indicate that groundwater in the Lambeth Group is under reducing conditions (low level of oxygen available).

7.5.27 The bunker of the EfW facility in the centre of the Application Site is a potential vertical pathway for contaminant migration from near surface to Lambeth group aquifer. However, the groundwater quality data show ammonium concentrations down-gradient of the EfW facility to be lower than up-gradient and therefore there is no evidence from within the Edmonton EcoPark of this potential pathway lowering groundwater quality.

Hydrology

7.5.28 The Application Site hydrology is detailed in Section 11 (Water Resources and Flood Risk Assessment).

7.5.29 No surface water bodies within the Application Site have been considered in this assessment but Salmon’s Brook (the other surface water bodies are considered in Section 11), which lies along the western boundary of the Application Site, has been considered. Salmon's Brook has been identified to be hydraulically connected to the Kempton Park Gravel aquifer, and therefore if the aquifer is impacted, there would be an impact on Salmon's Brook.

Surface water quality

7.5.30 Under the WatFD, the EA has produced nine River Basin Management Plans (RBMPs) for England to manage water quality targets and river basin planning. The aim of the WatFD is for all water bodies (rivers, lakes and groundwater) to achieve good ecological status, unless they are heavily modified in which case they must achieve good ecological potential and ensure no deterioration from current status/potential. As Salmon's Brook is considered as a receptor in this assessment, no deterioration from the current status must occur. Salmon's Brook status is identified on the EA website[65] as a heavily modified water body with Ecological Quality of Moderate Potential, Biological Elements of Bad (invertebrates) and Supporting Elements of Poor.

7.5.31 As part of the Environmental Permitting Regulations (EPR) for the current operational site, surface water monitoring samples were collected (in 2011 and 2014) upstream and downstream of the Application Site on Salmon's Brook and subject to analysis. No exceedances of the freshwater EQS were identified but elevated ammonium has been identified in Salmon's Brook at concentrations of 4.1 milligrams per litre (mg/l) upstream and 2.1mg/l downstream. Lower concentrations downstream suggests that the Application Site is not a source of ammonium to the watercourse, and that dilution is occurring. Further detail is provided in the Hydrogeological Risk Assessment (Vol 2 Appendix 7.2).

7.5.32 Small increases in the concentration of a number of dissolved metals have been detected between upstream and downstream locations on Salmon's Brook. The 2014 samples indicate the majority of the parameters tested show no increase at the downstream location, with the exception of copper, zinc and calcium. In the 2011 sampling exercise, this increase in concentration of copper and zinc was not identified at the downstream location. As the 2011 and 2014 results are not consistently showing an increase, further sampling will be undertaken as part of the operational management plan to determine if the increase in dissolved metals is sourced from the Application Site. The limited data does not change the assessment as the assessment considers that the water quality must not deteriorate within Salmon's Brook and therefore the

[65] http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683&y=355134&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=wfd_rivers (Accessed July 2015)

environmental control measures are included to prevent any potentially polluting substances from entering surface water.

Groundwater – surface water interactions

7.5.33 Groundwater elevations in the Kempton Park Gravels at the Application Site (contoured in the Hydrogeological Risk Assessment, Vol 2 Appendix 7.2) indicates that there appears be hydraulic connection with Salmon's Brook. This flow appears to be into the Application Site in November 2014 in the north-west, but in May 2014 the flow was in the off-site direction.

7.5.34 The remaining surface water bodies are assessed in Section 11 Water Resources and Flood Risk as not in direct hydraulic connection with the shallow groundwater aquifers.

Conceptual model

7.5.35 The CSM has been developed as part of the hydrogeological risk assessment. The CSM represents the characteristics of the Application Site and indicates the possible relations between contaminants, pathways and receptors. The conceptual model is discussed in detail in the Hydrogeological Risk Assessment (Vol 2 Appendix 7.2) and elements which are applicable to this assessment are summarised below.

Potential sources

7.5.36 The potential sources of potentially polluting substances have been identified within the CSM; those which relate to ground conditions and contamination are listed in Vol 2 Table 7.6. Sources relating to on-site spills of potentially polluting substances are assessed in Section 11 Water Resources and Flood Risk Assessment. The impact of any historic spills has been considered when designing the ground investigation and is included within the sources considered in Vol 2 Table 7.6.

Vol 2 Table 7.6: Potential contaminant sources

Source	**Description**	**Potentially polluting substances**
Made Ground perched groundwater	Leachable concentrations from Made Ground could contain potentially polluting substances and high vulnerability to pollution.	Ammonium, dissolved metals, phenols, PAH, Total Petroleum Hydrocarbons (TPH) and VOCs.
Kempton Park Gravel aquifer	Water from the Kempton Park Gravel aquifer has been identified to have lower quality than that of the underlying aquifers and high vulnerability to pollution.	Ammonium, dissolved metals, phenols, PAH, TPH and VOCs.
Waste stored in Bunkers	Waste stored in underground bunkers	Dependant on waste stream but

Source	Description	Potentially polluting substances
		could contain: elevated concentrations of chloride, ammonium, dissolved metals, phenols, PAH, VOCs. Low risk of some pathogenic organisms.

Potential pathways and receptors

7.5.37 Pathways which currently exist at the Application Site are identified in Vol 2 Table 7.7.

Vol 2 Table 7.7: Receptors and pathways

Receptor	Pathway
Groundwater in the Kempton Park Gravel aquifer (Secondary Aquifer)	Drainage of contaminants to ground and vertical migration through Made Ground and Alluvium. Vertical migration via artificial pathways (e.g. foundations, services). Lateral groundwater flow.
Groundwater in the Lambeth Group and Thanet Sands aquifer (Secondary Aquifer)	Vertical migration of contaminants through London Clay. Vertical migration via artificial pathways (e.g. foundations, existing piles). Lateral groundwater flow. Possible pathway through EfW facility excavation infill
Groundwater in the chalk aquifer (Principal Aquifer)	Vertical migration through Lambeth Group and Thanet Sands. Lateral groundwater flow.
PWS boreholes in the chalk aquifer	Vertical migration through Lambeth Group and Thanet Sands. Lateral groundwater flow.
Private Water Supply Boreholes	As above for Lambeth Group, Thanet Sands and chalk aquifers (assuming boreholes abstract water from these deeper aquifers).
Surface water in Salmon's Brook	Overland flow of contaminants. Discharge of contaminated groundwater through lateral flow in Made Ground and Kempton Park Gravels. Surface water discharge to Salmon's Brook.

Potential receptors

7.5.38 The main receptors that could be impacted by the Application Site activities are summarised in Vol 2 Table 7.7.

7.5.39 One of the parameters required for the assessment of impact of Project works is the sensitivity of the receptor, as detailed in the assessment methodology in Vol 2 Appendix 7.1. As the same receptors are identified for each of the Project stages, the sensitivity is described in Vol 2 Table 7.8 is used in each of the stage assessments.

Vol 2 Table 7.8: Sensitivity of receptor

Receptor	Sensitivity	Comment
Groundwater in the Kempton Park Gravel aquifer (Secondary Aquifer)	Medium	Secondary Aquifer with no local potable water abstraction.
Groundwater in the Lambeth Group and Thanet Sands aquifer (Secondary Aquifer)	High	Secondary Aquifer, anticipated hydraulic connectivity with chalk aquifer. Aquifer has local potable water abstraction.
Groundwater in the chalk aquifer (Principal Aquifer)	Very high	Principal Aquifer, regionally important potable water source.
PWS boreholes in the chalk aquifer	Very high	Principal Aquifer, regionally important potable water source.
Private water supply boreholes	High	High importance but sensitivity decreases with distance from site.
Surface water in Salmon's Brook	Medium	Limited deterioration of water quality anticipated from on-site ground quality sources

7.5.40 The receptors can be grouped in the assessment by sensitivity category with the sensitivity categories containing the receptors of both the aquifer and the abstraction borehole from that aquifer (or aquifer and surface water body).

7.5.41 Other surface water bodies identified in the vicinity of the Application site are River Lee Navigation and Enfield Ditch. These were not considered as receptors in this assessment as they have not been identified as having hydraulic connectivity to the aquifers underlying and in the proximity of the Application Site. The River Lee Navigation is hydraulically disconnected due to sheet pilling, while Enfield Ditch is not identified to have inflow from groundwater.

Future baseline

7.5.42 The future baseline identifies the changes to sources, pathways and receptors as a result of other developments in the vicinity of the Application Site which will be completed prior to the Project. The potential effects from each development and a qualitative assessment of any change to future baseline is detailed in Vol 2

Table 7.9. It is assumed that each of the new developments would be designed with an understanding of the environmental sensitivities and therefore risks to groundwater receptors would be mitigated within the design.

7.5.43 There will be a number of developments within the vicinity of the Application Site that will be commenced prior to the Project. A full list of the developments and details can be seen in Vol 1 Appendix 5.2, but of the development proposals anticipated within the timescales of this development (future baseline), the developments discussed below have the potential to change the baseline for ground conditions and contamination.

7.5.44 Upgrade work to an existing overhead line between Waltham Cross and Tottenham Substations, and its operation at a higher voltage will involve works at each substation along the route including a substation located partially within the Application Site boundary. However any construction required has the potential to increase hardstanding within that area, decreasing the potential infiltration to groundwater. The scale of this change to the existing baseline is likely to be small.

7.5.45 Within the Application Site boundary at the southern part of the Edmonton EcoPark, a Lee Valley Heat Network (LVHN) Decentralised Energy Centre may be constructed. For the purpose of this assessment, it is anticipated that pipework for this facility would be constructed underground. This could change the baseline through altering flow pathways.

7.5.46 Other planned significant infrastructure changes include upgrades to the existing Deephams STW, which will result in 2,024m^2 sewage treatment infrastructure and 248 on-site car parking spaces. It is anticipated that these works may reduce groundwater infiltration through the increase in hard standing and may include piling and excavations which have the potential to alter groundwater flow pathways.

The Meridian Water area (approximately 400m south of the Application Site, south of the A406) is a priority regeneration area. It is anticipated that works for this development will include excavations, piles and dewatering and therefore it may have effect on the flow and water quality in the underlying aquifers.

Vol 2 Table 7.9: Assessment of future baseline

Future developments	**Potential Effect**	**New Source-Pathway - Receptor [Yes/No]**	**Change from existing baseline**
The North London (Electricity Line) Reinforcement	Additional hardstanding and reduced infiltration to ground.	No	Negligible

Future developments	Potential Effect	New Source-Pathway - Receptor [Yes/No]	Change from existing baseline
LVHN Decentralised Energy Centre	Ground disturbance on-site and potential to change groundwater flow and create groundwater pathways.	Groundwater pathways could be created but assumed these would be mitigated in the design and CoCP.	Negligible
Deephams STW	Ground disturbance, additional hardstanding and reduction infiltration to ground. Potential Piling and excavation operations.	Groundwater pathways could be created but assumed these would be mitigated in the design and CoCP.	Negligible
Meridian Water	Potential excavations, piling and dewatering. Potential to mobilise potentially polluting substances.	Groundwater pathways could be created but assumed these would be mitigated in the design and CoCP.	Negligible
Other small developments identified	Small local changes to hardstanding and structures.	No.	Negligible

7.5.47 Negligible change to the baseline conditions was identified from the future developments for the ground conditions and contamination assessment. In summary, the future baseline is anticipated to be the same as the current baseline.

7.6 Potential effects and good environmental design management

7.6.1 The design of the Project considered both the local and national planning policy and guidance. The Project considers the North London Joint Waste Strategy (2009). The Project design has been developed with reference to the London Plan, as well as LB Enfield's planning strategy and development plans which are listed in the Vol 2 Appendix 7.1. Each of these documents details the level of risk assessment, environmental control measures and mitigation which needs to be considered for the Project to be considered not to cause harm. Each of the documents have been considered in the assessment and the most stringent guidance for environmental protection has been applied.

Stage 1

7.6.2 Effects on ground conditions and contamination from Stage 1 activities (demolition/clearance of northern and southern part of Application Site and construction of the ERF, the RRF and EcoPark House, landscaping works) are considered to be:

ERF bunker

a. during construction of the ERF bunker, excavations would extend into the London Clay. However, the thickness of London Clay would be maintained at a minimum of 5m thereby maintaining adequate protection of the underlying aquifer.

b. possible vertical and lateral pathways created between aquifers along the outside walls and supporting structures of the bunker.

Deep foundation piling

c. construction of piled foundations, other deep structures and excavations may create vertical pathways between aquifers, particularly where they would fully penetrate low permeability layers. Piles may be required for three separate areas of the Application Site; in the north of the Application Site at the ERF building, in the south of the Application Site at the RRF building and at EcoPark House in the wharf area.

Excavations

d. where dewatering would be required for deep excavations, pumping has the potential to draw in contaminated groundwater from elsewhere on-site or from off-site sources creating new pathways or altering existing pathways.

Pumping station, underground services and pipework

e. demolition of northern pumping station and associated pipework may create vertical and lateral groundwater pathways.

f. it is anticipated that other pipework and underground services would be installed during this period which may create vertical and lateral groundwater pathways.

Temporary Laydown Area

g. a Temporary Laydown Area for vehicles and plant would be established in the east of the Application Site. There are no activities within the Temporary Laydown Area which have been identified to have effects on ground conditions and contamination. This would be managed in accordance with the CoCP (Vol 1 Appendix 3.1) and therefore it has not been assessed in relation to ground condition and contamination assessment.

Stage 2

7.6.3 Stage 2 would comprise commissioning of the ERF and operation of this alongside the existing EfW facility during a ‘transition period’ as detailed in Vol 1 Section 3.5. The RRF and EcoPark House would be operational. Minor construction and landscaping works would occur.

7.6.4 The potential effects in Stage 2 relate to the structures which have been introduced in the construction phase, as detailed in Stage 1. These effects consist of underground structures such as piling, services and ERF bunker existing in situ and any potential deterioration of these structures which could create new groundwater pathways.

Stage 3

7.6.5 Effects on ground conditions and contamination from Stage 3 activities (existing EfW facility decommissioned and demolished, operation of ERF, RRF and EcoPark House), Advent Way access road works are considered to be:

EfW bunker demolition

a. The detailed civil engineering strategy for the bunker removal would be developed during the detailed design phase with consultation with the EA on groundwater protection measures. This assessment assumes that the following potential effects would be considered in the design. Construction related effects would be mitigated in accordance with the CoCP (Vol 1 Appendix 3.1):

   1. dewatering and water management of the Kempton Park Gravel Aquifer;
   2. change in Kempton Park Gravel flow quantity and quality to Salmon’s Brook;
   3. basal heave due to pore pressures in the base of the excavation is identified as a potential risk and this would be mitigated within the detailed design for demolition;
   4. groundwater pathways created between aquifers;
   5. groundwater protection of the Lambeth Group and underlying aquifers as it is anticipated that there is no London Clay underlying the base of the bunker; and
   6. bunker infilling: The bunker removal and backfilling would remove some potential preferential vertical pathways between shallow groundwater and the Lambeth Group.

Advent Way Access road works

b. Two design options are considered in the EIA for the changes to the access to the Application Site from Advent Way. The first option is for widening of the bridge to access the

Edmonton EcoPark and the second is to demolish the bridge and construct a new access bridge. Both design options consider similar construction activities which include piling, concrete works and construction and earthworks. Construction related effects would be mitigated in accordance with the CoCP (Vol 1 Appendix 3.1), surface water effects are considered in Section 11 (Water Resources and Flood Risk), and therefore it is only the piling activity which is identified as having the potential to have an effect on ground conditions and groundwater.

c. Construction of piled foundations, other deep structures and excavations may create vertical pathways between aquifers, particularly where they would fully penetrate low permeability layers. The piling requirements for the bridge options will be specified as part of detailed design and therefore for the purposes of this assessment a worst-case scenario of deep foundation piling which penetrates the London Clay has been assessed.

Stage 4

7.6.6 Stage 4 would see operation of the ERF, the RRF and EcoPark House. This stage would see no changes to the Application Site with relation to ground conditions and contamination, and therefore the prevalent conditions would not have changed from those seen in Stage 3.

Vol 2 Table 7.10: Summary of potential pathways introduced in Stages 1 to 4

Receptor	Pathway
Groundwater in the Kempton Park Gravel aquifer (Secondary Aquifer)	Potential of mobilisation of potentially polluting substances with changes in hydraulic gradient due to dewatering or constructed barriers.
Groundwater in the Lambeth Group and Thanet Sands aquifer (Secondary Aquifer)	Vertical migration via artificial pathways (e.g. foundations, deep piles). Vertical migration in EfW facility excavation area from Made Ground through historic excavation infill. Vertical migration via excavation during removal of EfW bunker
Groundwater in the chalk aquifer (Principal Aquifer)	Vertical migration via artificial pathways (e.g. deep piles, deep boreholes).
PWS boreholes in the chalk aquifer	Vertical migration via artificial pathways (e.g. deep piles, deep boreholes). Vertical migration in EfW facility excavation area from Made Ground through historic excavation infill.
Private water supply boreholes	Vertical migration via artificial pathways (e.g. foundations, deep piles). Vertical migration in EfW facility excavation area from Made Ground through historic excavation infill.

Receptor	Pathway
Surface water in Salmon's Brook	As in current baseline

Construction

7.6.7 Design considerations and environmental control measures that have been incorporated into the proposed development are:

a. Greater than 5m thickness of London Clay would be maintained beneath deep excavations. The ERF bunker location, in the north-east of the Application Site, has been chosen through consultation with the EA and takes into account the hydrogeological risks. In particular, its location on-site has been selected because geological mapping identified that the London Clay is thickest in this part of the Application Site, as shown in Vol 2 Figure 7.5. The bunker design allows a thickness of London Clay greater than 5m to be maintained below the bunker, thereby minimising risks of creating vertical pathways to underlying aquifers.

b. Groundwater flow in the Kempton Park Gravels has been taken into account in the design of deeper structures and in the selection of infill materials with numerical modelling undertaken to estimate the effects on the groundwater levels. The model results indicated an increase of less than three centimetres up gradient of the ERF bunker with the same groundwater level decrease down gradient. Further details of the modelling are available in Vol 2 Appendix 7.2 (Hydrogeological Risk Assessment).

c. Dewatering, and groundwater and surface water management with respect to the EfW bunker removal would be managed in accordance with the CoCP (Vol 1 Appendix 3.1).

d. Best practice methodology and construction design to minimise effect on aquifers and any dewatering volumes would be minimised, controlled and tested in accordance with the CoCP (Vol 1 Appendix 3.1).

e. All bund and storage structures would be designed to have impermeable bases.

f. All underground structure would be constructed to relevant standards and with consideration for the Application Site conditions.

g. Environmental monitoring of surface and groundwater would be undertaken at the Application Site.

h. Piles would be designed to minimise hydrogeological risk by:

   1. not penetrating low permeability layers unless necessary; and

2. using piling techniques that minimise disturbance of low permeability layers and that also provide good seals with those layers, as detailed in the construction method statements.

i. Method statements would be prepared by the Contractor prior to work commencing on the Application Site. This would contain detailed instructions regarding the techniques and methods that would be used to prevent and reduce the environmental impacts of demolition and construction.

j. The Contractor would be required to obtain all permits and licences from the regulatory authorities as required by environmental law or regulation and would discharge the relevant conditions of the DCO prior to commencement of site works, or as otherwise appropriate in advance of specific site activities.

k. All Contractors involved in the construction of the Project would be required to comply with good construction practice, such as that detailed in the EA Pollution Prevention Guidelines, notably PPG6 Working at Construction and Demolition Sites[66].

l. Construction at the Application Site would require piling for building foundations in the north and south of the Application Site. The piling technique would be selected to consider the risk to the deeper Secondary and Principal Aquifers and would need to reference appropriate EA documents (as indicated in Vol 2 Appendix 7.1). The exact construction and foundation method would be determined during future design and would require approval by the EA and further details of potential risks from piling are assessed in the Piling Risk Assessment (Vol 2 Appendix 7.3).

Operational

7.6.8 As the operational phases focus on in situ structures, no additional environmental control measures would be required during Stage 2 and Stage 4 as these would have been considered in Stage 1 and Stage 3 construction.

Decommissioning

7.6.9 It is anticipated that the effects on the groundwater receptor will be similar to those considered and mitigated within the demolition and construction Stage 1 and Stage 3.

66 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290139/pmho0412bwfe-e-e.pdf (Accessed 15/07/2015)

7.7 Assessment – construction

Stage 1

Piling

7.7.1 During Stage 1, piling would be required for the foundations for the ERF, RRF and EcoPark House. Piling has been identified to have the potential to create groundwater pathways by ground disturbance but also the risk has been identified of puncturing the low permeability Alluvium/London Clay and allowing shallow groundwater to flow to underlying aquifers. With reference to the Piling Risk Assessment (Vol 2 Appendix 7.3) piling techniques would be selected during the detailed design stage to consider and mitigate the risk to the deeper Secondary and Principal Aquifers and would reference relevant guidance detailed in the Vol 2 Appendix 7.1. The design would consider using a technique which minimises the potential to create a groundwater pathway between aquifers and would avoid the puncturing of the London Clay where possible. The piling design and preparation of Piling Method Statement would be undertaken in consultation with the EA, as described in the CoCP (Vol 1 Appendix 3.1). With the environmental control measures as detailed in the guidance being implemented, the potential to create a groundwater pathway would be reduced. The severity of the impacts would then be considered to be moderate and likelihood as unlikely, giving a magnitude of the impact as negligible. Following the assessment methodology:

a. The impact on the very high sensitivity chalk aquifer and public supply borehole abstraction (SPZ1) has been assessed as **not significant**.

b. The impact on high sensitivity groundwater in the Lambeth Group and Thanet Sands aquifer and private water supply boreholes has been assessed as **not significant**.

c. The impact on medium sensitivity groundwater in the Kempton Park Gravel aquifer and hydraulically surface water in Salmon's Brook has been assessed as **not significant**.

ERF bunker

7.7.2 During Stage 1 the ERF underground bunker would be constructed within the London Clay in the north-east of the Application Site. The installation of the ERF bunker has been identified to have the potential to create groundwater pathways by ground disturbance during construction and by reducing the protection to aquifers underlying the London Clay by reducing the thickness of the low permeability clay. If these new pathways were created they would be potential pathways to the underlying aquifer if bunker failure occurred. The embedded design environmental measures and controls which would be included within the construction methodology are detailed in Section 7.6. With the implementation of these environmental control measures, the severity is considered to be moderate as, although deterioration of water quality could occur, it is likely to be short-term as the bunker would have regular inspection and monitoring as part of the site operational environmental management plan. The likelihood has been categorised as unlikely, giving a magnitude of the impact as negligible. Following the assessment methodology:

a. The impact on the very high sensitivity chalk aquifer and public supply borehole abstraction (SPZ1) has been assessed as **not significant**.

b. The impact on high sensitivity groundwater in the Lambeth Group and Thanet Sands aquifer and private water supply boreholes has been assessed as **not significant**.

c. The impact on medium sensitivity groundwater in the Kempton Park Gravel aquifer and hydraulically surface water in Salmon's Brook has been assessed as **not significant**.

Excavations

7.7.3 During Stage 1 it is anticipated that excavations would be undertaken within the Made Ground, Kempton Park Gravels and London Clay in the Application Site for activities such as removal or installation of pipework, and the removal or installation of building floor slabs. The assessment has identified that where dewatering would be required for deep excavations, pumping has the potential to draw in contaminated groundwater from elsewhere on-site or from off-site sources creating new pathways or altering existing pathways. The embedded design environmental control measures and controls which would be included within the construction methodology are detailed in Section 7.6. With the implementation of these environmental control measures, the severity is considered to be minor as it is likely to be a short term effect (while the excavation is open only). The likelihood has been categorised as low likelihood, giving the magnitude of the impact as negligible. Following the assessment methodology:

a. The impact on the very high sensitivity chalk aquifer and public supply borehole abstraction (SPZ1) has been assessed as **not significant**.

b. The impact on high sensitivity groundwater in the Lambeth Group and Thanet Sands aquifer and private water supply boreholes has been assessed as **not significant**.

c. The impact on medium sensitivity groundwater in the Kempton Park Gravel aquifer and hydraulically surface water in Salmon's Brook has been assessed as **not significant**.

Pumping station, underground services and pipework

7.7.4 During Stage 1 the existing water pumping station on Adra Road would be demolished and a new water pumping station and associated pipework would be installed. Also during Stage 1 other services and pipework would be installed and upgraded. The assessment has identified that the ground disturbance and installation of these underground pipes could create lateral and vertical groundwater pathways or alter existing pathways. The embedded design environmental control measures and controls which would be included within the construction methodology are detailed in Section 7.6. With the implementation of environmental control measures, the severity is considered to be minor as it is likely that these installations would be within the shallow ground and would not puncture the London Clay. The likelihood has been categorised as low likelihood, giving a magnitude of the impact as negligible. Following the assessment methodology:

a. The impact on the very high sensitivity chalk aquifer and public supply borehole abstraction (SPZ1) has been assessed as **not significant**.

b. The impact on high sensitivity groundwater in the Lambeth Group and Thanet Sands aquifer and private water supply boreholes has been assessed as **not significant**.

c. The impact on medium sensitivity groundwater in the Kempton Park Gravel aquifer and hydraulically surface water in Salmon's Brook has been assessed as **not significant**.

Stage 3

EfW bunker removal and infilling

7.7.5 During Stage 3, the EfW bunker would be removed. The civil engineering strategy for this activity and associated liaison with the EA would take place during detailed design phase. The detailed design would include environmental control measures for groundwater receptors and would be developed in consultation with the EA, with the CoCP (Vol 1 Appendix 3.1) addressing any potential effects from construction activities. The construction method, dewatering and groundwater and surface water management would be detailed in the method statements developed for this activity. The engineering design would consider the pore pressures during the deep excavation and therefore potential for structural failures would be mitigated within the design, as discussed in Section 7.6. The effects considered in this assessment are associated with potential groundwater pathways between aquifers created during the excavation. With the implementation of the environmental control measures, the severity is considered to be moderate as a pathway from surface directly to the Lambeth Group may be created but is likely to be for a short time period. The likelihood has been categorised as unlikely, giving the magnitude of the impact as negligible. Following the assessment methodology:

a. The impact on the very high sensitivity chalk aquifer and public supply borehole abstraction (SPZ1) has been assessed as **not significant**.

b. The impact on high sensitivity groundwater in the Lambeth Group and Thanet Sands aquifer and private water supply boreholes has been assessed as **not significant**.

c. The impact on medium sensitivity groundwater in the Kempton Park Gravel aquifer and hydraulically surface water in Salmon's Brook has been assessed as **not significant**.

7.7.6 The assessment has identified that after the removal of the EfW bunker and restoration of the ground to 'Like for Like' materials which were present before the bunker installation, groundwater flow would be restored in the Kempton Park Gravels in this area. Also the potential pathway which currently exists close to and below the bunker to the Lambeth Group would be removed. The embedded design environmental control measures and controls which would be included within the construction methodology are detailed in Section 7.6. With the implementation of the environmental control measures, the severity is considered to be minor as with the high permeability of the Kempton Park Gravels the removal of the bunker would be considered to change the hydraulic gradient only by a few centimetres (as has been estimated by the numerical modelling undertaken in the Hydrogeological Risk Assessment in Vol 2 Appendix 7.2). The Made Ground and Lambeth Group have been identified as being low permeability strata and therefore if a pathway exists it is not likely to rapidly transmit pollutants. These two impacts would be considered long term positive impacts. The likelihood has been categorised as likely inevitable, giving a magnitude of the impact as minor. The **positive** impact has been assessed as:

a. The impact on the very high sensitivity chalk aquifer and public supply borehole abstraction (SPZ1) has been assessed as **not significant.**

b. The impact on high sensitivity groundwater in the Lambeth Group and Thanet Sands aquifer and private water supply boreholes has been assessed as **not significant.**

c. The impact on medium sensitivity groundwater in the Kempton Park Gravels aquifer and hydraulically surface water in the Salomon Brook has been assessed as **not significant.**

Piling

7.7.7 During Stage 3, piling would be required for the foundations for the Advent Way access change, where bridge widening works or construction of a new bridge would be undertaken. Similar to the piling in Stage 1, piling has been identified to have the potential to create groundwater pathways by ground disturbance but also the risk of puncturing the low permeability Alluvium/London Clay and allowing shallow groundwater to flow to underlying aquifers has been identified. Piling techniques would be selected to consider and mitigate the risk to the deeper Secondary and Principal Aquifers and would be in accordance with relevant guidance detailed in the Vol 2 Appendix 7.1 and the Piling Risk Assessment Vol 2 Appendix 7.3. The design would use a technique which aims to eliminate the potential to create a groundwater pathway between aquifers and would avoid the puncturing of the London Clay where possible. Piling techniques would be developed in consultation with the EA, as described in the CoCP (Vol 1 Appendix 3.1). With the environmental control measures as detailed in the guidance being implemented, the potential to create a groundwater pathway would be low risk. The severity and likelihood of the impacts would then be considered to be moderate and unlikely, resulting in a negligible magnitude of impact. Following the assessment methodology:

a. The impact on the very high sensitivity chalk aquifer and public supply borehole abstraction (SPZ1) has been assessed as **not significant.**

b. The impact on high sensitivity groundwater in the Lambeth Group and Thanet Sands aquifer and private water supply boreholes has been assessed as **not significant.**

c. The impact on medium sensitivity groundwater in the Kempton Park Gravel aquifer and hydraulically surface water in Salmon’s Brook has been assessed as **not significant.**

7.8 Assessment – operation

Stage 2

7.8.1 The potential impacts during Stage 2 would be those from the operation of the facilities constructed in Stage 1, which consist of in situ underground structures such as piling, services, EfW facility operation and the ERF bunker.

Underground piles, ERF bunker and services

7.8.2 During Stage 2 piling, the ERF bunker and new services and pipework would be in situ. These structures have the potential to create groundwater pathways by the degrading of the structure or pipe which would open pathways along the structure. The environmental control measures such as construction to relevant standards, regular inspection and monitoring as part of the site operational environmental management plan, and operation in accordance with relevant guidance are discussed in Section 7.6. The severity of the impacts are considered to be minor and likelihood as unlikely, giving a magnitude of the impact as negligible. Following the assessment methodology:

a. The impact on the very high sensitivity chalk aquifer and public supply borehole abstraction (SPZ1) has been assessed as **not significant.**

b. The impact on high sensitivity groundwater in the Lambeth Group and Thanet Sands aquifer and private water supply boreholes has been assessed as **not significant.**

c. The impact on medium sensitivity groundwater in the Kempton Park Gravel aquifer and hydraulically surface water in Salmon's Brook has been assessed as **not significant.**

Stage 4

7.8.3 Stage 4 would see no further changes to the Application Site and considers the same in situ structures as Stage 2, with exception of the EfW facility which would be demolished and removed in Stage 3. The results for the impacts would therefore be the same as Stage 2, with **no significant impacts** to receptors identified.

7.9 Assessment – decommissioning of the Project

7.9.1 It is expected that the decommissioning and demolition of the new facilities would take up to a year with the majority of the facilities demolished using conventional measures as assumed for the demolition of the existing EfW facility. This includes the implementation of measures such as those set out within the CoCP (Vol 1 Appendix 3.1). Prior to removing the plant and equipment, all residues and operating chemicals would be cleaned out from the plant and disposed of in an appropriate manner.

7.9.2 Designing for the decommissioning and demolition of the Project would be considered at the detailed design stage as required by the Construction Design and Management (CDM) Regulations. The decision of whether to remove the below ground structures (bunker associated with the ERF and piles associated with the ERF, RRF and EcoPark House) would take into consideration the need to minimise risk of pollution to the underlying aquifer and any future buildings on the Application Site. For the same reasons it is expected that the hardstanding and sealed concrete areas (e.g. fuel storage areas sealed to contain any leaks or spillages) would be left in place.

7.9.3 At this stage the type of facilities that may replace the Project are unknown. Therefore, decommissioning at this stage cannot be sufficiently well defined (in terms of timing and extent) to allow detailed assessment. The latest environmental measures and guidance at the time of decommissioning would be reviewed and adhered to. In addition, a Decommissioning and Demolition

Method Statement would be produced and agreed with the EA as part of the environmental permitting process. It is anticipated these would prevent any significant effects from occurring.

7.10 Supplementary mitigation

7.10.1 As there are no significant adverse effects identified, no additional mitigation measures are required with respect to effects from construction, operation and decommissioning of the Project.

7.11 Residual effects

7.11.1 As no additional mitigation measures are proposed, the residual construction, operation and decommissioning impacts remain as described in Section 7.7, 7.8 and 7.9. A summary of residual effects is provided in Section 7.14.

7.12 Sensitivity test for programme delay

7.12.1 The assessment of ground conditions and contamination is not time dependant. Therefore, a change to the programme of plus or minus 12 months would not be likely to change the assessment findings reported in Section 7.11.

7.12.2 Based on the Cumulative Development Schedule (Vol 1 Appendix 5.2), there would be no new receptors requiring assessment as a result of the programme change.

7.12.3 This is because there are no developments identified on the Cumulative Development Schedule (Vol 1 Appendix 5.2) that would fall into the future baseline as a result of the programme change and therefore the future baseline would remain as described in Section 7.5.

7.13 Cumulative effects

7.13.1 Cumulative developments have been identified and are described in Vol 1 Appendix 5.2; this includes a plan showing the locations of the developments in Vol 1 Figure 5.1.

7.13.2 The construction and operational phases of future developments which may have an impact on the ground conditions and contamination at the Application Site have been assessed in Vol 2 Table 7.11. It is assumed that best practice guidance and environmental control measures suitable to those developments will be implemented.

Vol 2 Table 7.11: Cumulative effects

Future developments	Potential cumulative effects relative to this assessment [Yes/No]	Reason why cumulative impact is not considered
The North London (Electricity Line) Reinforcement (DCO)	No	Construction Effects: It is assumed that all construction would be undertaken following best practice construction guidance and a CoCP which would consider sensitive groundwater receptors. Operational Effects: Additional hardstanding anticipated. It is considered that changes to the infiltration to ground would be minor and therefore this development is not considered to affect the groundwater at the Application Site.
Meridian Water	No	Construction Effects: It is assumed that all construction would be undertaken following best practice construction guidance and a CoCP which would consider sensitive groundwater receptors. The Meridian Water development is residential and therefore its design will mitigate to human health receptors, applying the most stringent regulation. It is assumed that this development would be designed with an understanding of the environmental sensitivities of the Application Site and therefore risks to groundwater receptors would be mitigated within the design. Operational Effects: Change to infiltration to ground due to additional hardstanding anticipated. It is considered that changes to the infiltration to ground would be minor and therefore this development is not considered to affect the groundwater at the Application Site.

7.13.3 In summary, Vol 2 Table 7.11 identifies that the cumulative impact on the Application Site and related receptors would be negligible and therefore **no significant** cumulative impact would occur.

7.14 Assessment summary

Construction

Vol 2 Table 7.12: Assessment summary – construction

Ground Conditions and Contamination			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 1			
Piling works	With controlled piling design and methodology, the effect on groundwater pathways and groundwater quality in sensitive groundwater receptors would be **not significant**.	None required	Effect unchanged. **Not significant.**
ERF bunker construction	With the implementation of CoCP measures, the potential to reduce the protection to underlying aquifers and affect groundwater quality in sensitive groundwater receptors would be **not significant**.	None required	Effects unchanged. **Not significant.**
Excavations and dewatering	With the implementation of CoCP measures, the potential to draw in contaminated groundwater from on-site or off-site sources and create or alter pathways affecting water quality in sensitive receptors would be **not significant**.	None required	Effects unchanged. **Not significant.**
Pumping station, underground services and pipework	With the implementation of CoCP measures, the effect of ground disturbance and the installation of underground pipes on groundwater pathways and sensitive groundwater receptors would be **not significant**.	None required	Effect unchanged. **Not significant.**

Ground Conditions and Contamination			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 3			
EfW facility demolition	With the implementation of CoCP measures and design mitigation, the effect of the creation of groundwater pathways would be **not significant**.	None required	Effect unchanged. **Not significant.**
Piling for the bridge at Advent Way	With controlled piling design and measures from the Piling Method Statement, the potential to create groundwater pathways and affect groundwater quality in sensitive groundwater receptors would be **not significant**.	None required	Effects unchanged. **Not significant.**
Restoration of the ground to ‘Like for Like’ materials	With controlled demolition methodology and design developed in consultation with the EA, the potential effects of flow being returned to the Kempton Park Gravels and the removal of existing pathway close to the Lambeth Group would be **not significant.**	None required	Effects unchanged. **Not significant.**

Operation

Vol 2 Table 7.13: Assessment summary – operation

Ground Condition and Contamination			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stages 2 and 4			
ERF bunker and structures	With the implementation of CoCP measures and operational monitoring, the effect of structure or pipe degradation opening a pathway and changing the water quality in	None required	Effect unchanged. **Not significant.**

Ground Condition and Contamination			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
	sensitive groundwater receptors would be **not significant**.		

Decommissioning of the Project

Vol 2 Table 7.14: Assessment summary – decommissioning of the Project

Ground Condition and Contamination			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Construction and demolition	With a Decommissioning and Demolition Method Statement developed in consultation with the EA and the latest environmental measures and guidance at the time of decommissioning, the effects of decommissioning would be **not significant**.	None required	Effects unchanged. **Not significant.**

8 Noise and Vibration

8.1 Introduction

8.1.1 This section describes the likely significant effects of noise and vibration generated by the Project.

8.1.2 The noise and vibration effects scoped into the assessment, as set out in the Scoping Report, are as follows:

a. construction and operational traffic; and

b. operational plant.

8.1.3 Since the Scoping Report was issued there have been some amendments to the scope of the assessment following changes to the Application Site boundary and as a result of stakeholder engagement (described in Section 8.2). This has resulted in the inclusion of a construction noise assessment for the Temporary Laydown Area and a construction vibration assessment.

8.1.4 Noise and vibration effects on ecological receptors during construction and operation are assessed and reported in Vol 2 Section 5 (Ecology).

8.1.5 The works plans (based on which the noise and vibration assessment has been undertaken) are contained in the Book of Plans (AD02.01) which forms part of the DCO Application documents. Figures associated with the noise and vibration assessment are contained in the Appendix – Figures volume of the ES.

8.1.6 The noise and vibration assessment contained in this section has been prepared to satisfy the requirements of the EIA Regulations (2009), including an operational noise assessment. Separately, an operational noise assessment is also being undertaken to inform the permit application as part of the Environmental Permitting process, the application for which will be submitted to the Environment Agency in autumn 2015. This section makes reference to this permitting assessment work as appropriate, acknowledging the linkages between the two processes.

8.2 Engagement

8.2.1 Technical stakeholder engagement for noise and vibration has been undertaken with LB Enfield and the Environment Agency (EA). Engagement with the EA primarily concerns the permitting process.

8.2.2 Discussions were held with LB Enfield in 2013 prior to the baseline noise survey work for the EIA being undertaken (although the later surveys were also undertaken to meet the requirements of the permitting regime). The survey locations and methodology for the survey were discussed and agreed at that time.

8.2.3 In November 2014, responses on the approach to the noise and vibration assessment were received in the Scoping Opinion[1], full details of which are contained in Vol 2 Appendix 8.1 Section 1.2.

8.2.4 In summary, the main issues raised in the Scoping Opinion were:

a. Construction and demolition noise and vibration aspects should be scoped into the assessment, with particular reference to piling activities.

b. The baseline conditions for the assessment should be accurate and based on reliable and up-to-date data.

c. Methodology and choice of receptors should be fully explained in the EIA and agreed with the relevant local authority (LB Enfield) and with the EA.

d. All assumptions used to inform the assessment should be identified in the ES.

e. The noise and vibration assessments should take account of the traffic movements along access routes, especially during the construction phase.

f. The ES should describe clearly the proposals for mitigating any potentially significant adverse effects. This should include consideration of how noise generated during construction and operation could be monitored.

g. Confirmation should be provided to demonstrate that noise monitoring is carried out to British Standards, e.g. BS7445[67].

8.2.5 Subsequent to receipt of the Scoping Opinion, further discussion was held with LB Enfield during which it was agreed that:

a. Construction noise assessment on the Edmonton EcoPark could continue to be scoped out given the distance to the nearest noise sensitive receptors at Zambezie Drive and Badma Close (over 400m from the locations where works would take place).

b. Construction noise assessment for the Temporary Laydown Area (area to the east included in the Application Site boundary added post scoping) should be included in the assessment to account for proximity to noise sensitive residential receptors on Lower Hall Lane to the east (closest is approximately 150m from the Application Site boundary).

c. Qualitative construction vibration assessment should be scoped into the assessment due to concerns of vibration disturbance at distances beyond 400m experienced previously on another development in LB Enfield.

8.2.6 In response to the Phase Two Consultation, LB Enfield has identified that they require noise from any plant to be 10dB below the lowest measured background level during operational hours. These criteria are subject to ongoing discussions and agreement has not yet been reached. In all other respects they are satisfied with the information contained within the PEIR and the proposed methodologies for detailed assessment at the ES stage.

8.2.7 Engagement is ongoing with the EA regarding the suitability of noise survey locations used for baseline noise measurements and plant noise criteria in respect of the Environmental Permitting Regulations. This has been subject

[67] British Standards Institute (2003) Description and measurement of environmental noise – Part 1: Guide to quantities and procedures.

to two position papers since Phase Two consultation which are included in Volume 2 Appendix 8.3 for information. A permit to operate the plant will be applied for from the EA (application expected to be submitted in Autumn 2015) which will include controls on operational noise that will ensure that their requirements on industrial noise are met.

8.3 Methodology

8.3.1 This section provides an overview of the methodology for assessing the likely significant noise and vibration effects of the Project. Full details of the noise and vibration methodology are provided in Vol 2 Appendix 8.1.

Construction noise

8.3.2 The construction noise assessment considers activities which would take place in the Temporary Laydown Area only. Construction activities on the Edmonton EcoPark site all take place at distances over 400m from the nearest noise sensitive receptor over which distance construction noise would be not significant.

8.3.3 The construction activities assessed for the Temporary Laydown Area occur during Stages 1, 2 and 3. The assessment of construction noise arising from the Temporary Laydown Area begins in Stage 1b following its establishment in Stage 1a.

8.3.4 The assessment considers construction noise from the Temporary Laydown Area to receptors within 300m of the Application Site boundary in accordance with British Standard 5228-1[68] which states that "*at distances over 300m construction noise predictions have to be treated with caution, because of the increasing importance of meteorological effects*". The receptors assessed are within this distance.

8.3.5 The threshold for determining significant effects from construction noise has been set according to the time of day that they occur and the prevailing ambient noise levels. For the residential receptors, significant impacts would arise should construction noise during the day be predicted to exceed 65dB $L_{Aeq,10hr}$ (EIA significance criteria derived using the ABC method in Annex E of BS5228- 1:2009+A1:2014[68], which is described in detail in Vol 2 Appendix 8.1). The final assessment of EIA significance is determined by evaluating the construction noise thresholds along with other factors, such as the number of receptors and their sensitivity. Significance is also considered in Government policy terms according to requirements of Noise Policy Statement for England[69] as defined in Vol 2 Appendix 8.1, Section 1.3.

Construction vibration

8.3.6 The qualitative construction vibration assessment considers activities across the Application Site during all stages of construction (i.e. Stages 1a, 1b, 1c, 1d, 2 and 3) including demolition activities, identifying the activity

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[68] BS5228 -1:2009 +A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise

[69] Department for Environment Food and Rural Affairs (2010) Noise Policy Statement for England.

with the potential to result in most significant vibration effects (i.e. piling) at nearby residential properties. The assessment area extends 300m from the Application Site boundary as it is considered beyond this distance that there would be no ground-borne vibration effects. This assessment area is based on precedence from previous studies.

8.3.7 No vibration effects are likely to occur because residential receptors that could be affected by vibration are more than 400m from the Edmonton EcoPark site. This is the only location where piling works would be undertaken, and whereby piling is considered representative of the worst-case vibration generating activity to have the potential to give rise to significant vibration effects during construction and demolition activities. The assessment of ground-borne vibration is therefore limited to consideration of the types of sources that could generate vibration, as well as the separation distances between the construction activities and the nearest sensitive receptors. The likely exposure levels are then compared against the criteria described in Vol 2 Appendix 8.1 Table 8 and Table 9, to determine if there is a significant effect. Likely exposure levels are evaluated qualitatively.

Road traffic noise

8.3.8 Road traffic noise levels have been predicted for each stage for all roads included in the transport assessment (Vol 2 Section 10). The assessment of each development stage takes account of total generated traffic, i.e. construction and operational traffic flows.

8.3.9 The assessment of traffic noise effects is made by comparing changes in road traffic noise calculated with and without Project traffic in each development stage. If initial screening indicates that an assessment is required, the impact associated with change in construction traffic noise level is evaluated along with other parameters, such as the number of receptors and their sensitivity, to assess the significance of the effect in both EIA and policy terms.

Operational industrial noise

8.3.10 Noise limits and other requirements would be imposed through the Environmental Permit that will be sought and obtained from the EA. This will ensure that there are no significant effects at nearby residential or other sensitive receptors. The methodology to be used for the industrial noise assessment is described below. This would be undertaken in accordance with latest standards and guidance.

8.3.11 Industrial noise from the Project has been assessed using the method in BS4142:2014[70] to determine significance and, in particular, will consider the:

a. difference between the ‘background sound level’ without the proposed industrial noise and the ‘rating level’ of the industrial noise, at the receptor location;

[70] BS4142:2014 - Methods for rating and assessing industrial and commercial sound.

b. absolute level of industrial noise;

c. character of the new industrial noise compared to the character of the existing residual or ambient noise; and

d. sensitivity of the receptor.

8.3.12 The background sound level ($L_{A90,T}$) is the underlying level of noise over a period of time and provides an indication of the relative quietness at a given location. The specific noise level ($L_{Aeq,Tr}$) from the industrial source can be subject to weightings for features where it displays an identifiable feature or a combination of features (such as tonality, and/or impulsiveness or intermittency) to provide a 'rating level' ($L_{Ar,Tr}$).

8.3.13 BS4142 section 11 provides guidance on determination of significant effects, however determination is context dependent and the final criteria will be established in consultation with the EA and LB Enfield. The criteria will be implemented through the environmental permitting regime using the principle of Best Available Technique (BAT) i.e. best available techniques will be employed to attenuate sound to minimise noise pollution, and achieve compliance with the criteria. Another principle of the permitting regime is that no significant pollution is caused. It follows that compliance with the permit will ensure that the effects of the operational noise from the Project would be not significant.

Decommissioning

8.3.14 Noise and vibration for the ERF decommissioning phase would be less intensive than the Stage 3 construction and demolition activities (when the EfW facility is decommissioned), therefore the effects have been assessed to be no worse than those for Stage 3 construction and demolition activities.

8.4 Assumptions and limitations

Assumptions

8.4.1 In the absence of detailed information, assumptions have been made about the types of plant and equipment which are likely to be used during fabrication works in the Temporary Laydown Area, to inform the construction noise assessment for this area. The assumptions are based on experience of similar works and are detailed in Vol 2 Appendix 8.1 Table 6.

8.4.2 Whilst these assumptions are considered representative of a reasonably foreseeable worst-case, any uncertainty associated with the construction assumptions are unlikely to change the outcome of the assessment given the relatively large separation distances between the noise source and the receptors.

8.4.3 Also, it is assumed that construction activities on the Temporary Laydown Area take place at the Application Site boundary (i.e. the closest point to receptors). This again represents a worst-case assessment as in reality such fabrication works are likely to be undertaken away from the immediate site boundary.

8.4.4 The assessment of decommissioning is based on the assumption that the future ERF would be demolished at some future time in its lifecycle, using methods similar to those assessed during the construction of the Project, including the implementation of control measures set out within the CoCP (Vol 1 Appendix 3.1).

Limitations

8.4.5 In the course of undertaking this assessment, the following limitations to the assessment were encountered.

8.4.6 It was not possible during the June/July 2013 survey to install noise logging equipment to gather long term noise data at location 4 (see Vol 2 Figure 8.1) due to access and security issues. A manned noise survey was carried out at this location during February and March 2013 which supplied sufficient data to carry out the assessment. This location is very close to the North Circular Road (A406) so noise levels are expected to align closely with traffic flows on this road and remain fairly constant with peak noise levels during typical weekdays, which are the periods during which the survey data was gathered.

8.5 Baseline

8.5.1 This section sets out the baseline conditions for noise in and around the Application Site. Future baseline conditions are also described.

Current baseline

8.5.2 Baseline noise measurement surveys have been undertaken to establish the current baseline noise climate around the Application Site. The noise measurement surveys were carried out in accordance with the principles of BS7445-1:2003[67].

8.5.3 The noise survey locations were chosen to represent the nearest identified existing and future noise sensitive receptors (i.e. residential receptors) to the Application Site. Future receptors were identified from the Cumulative Development Schedule provided in Vol 1 Appendix 5.2. A description of the survey locations/receptors, which were agreed with LB Enfield, is provided in Vol 2 Table 8.1 and their locations are shown in Vol 2 Figure 8.1.

Vol 2 Table 8.1: Measurement and receptor locations

Measurement location no.	Description	Co-ordinates		Distance and direction from Application Site boundary
		X	Y	
1	Residential – representing sensitive receptor locations in Russell Road	536548	192830	502m north-east
2	Residential – representing existing sensitive receptor locations on Lower Hall Lane	536393	192540	150m east

Measurement location no.	Description	Co-ordinates		Distance and direction from Application Site boundary
		X	Y	
3	Residential – representing future sensitive receptor locations in the Meridian Water development.	536050	192122	215m south
4	Residential – representing potential future sensitive receptor locations in the Meridian Water development.	535610	192116	121m south-west
5	Amenity - representing recreational users along the River Lee Navigation.	535863	192457	Within Application Site boundary
6	Residential - representing future sensitive receptor locations in the Meridian Water development.	535092	192450	565m west
7	Residential - representing sensitive receptor locations on Zambezie Drive.	535413	193294	125m west

8.5.4 The following tables summarise the noise data gathered at each of the survey locations which represent sensitive receptors. The data is presented as a range of values measured during the period at the location stated. A plan of the survey/receptor locations is provided in Vol 2 Figure 8.1. The detailed methodology for the surveys is found in Vol 2 Appendix 8.1 Section 1.4. The full set of raw survey data and detailed analysis presented in the two position papers used during engagement with the EA can be found in Vol 2 Appendix 8.2 and Vol 2 Appendix 8.3 respectively.

8.5.5 Summary data tables of survey results are provided below for L_{Aeq} and L_{A90} which are the relevant assessment acoustic parameters to the assessment. Vol 2 Table 8.2 provides a summary of attended measured noise levels at all survey locations while Vol 2 Table 8.3 to Vol 2 Table 8.8 provide more detailed results for each individual survey location.

Vol 2 Table 8.2: Summary of attended measured period noise

Location	Sound pressure level, dB					
	Daytime (10:00-17:00)		Evening (20:00-22:00)		Night-time (midnight - 03:00)	
	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}
1	54-56	59-63	54	55-56	54	55-56
2	49-50	53-54	44-45	46-47	44-45	46-47
3	62-63	63-65	59-60	62	59-60	62
4	69-72	78-79	72-74	76-77	72-74	76-77
5	59-60	60-62	56-58	58-59	56-58	58-59
6	59-63	65-68	57-58	61-62	57	61-62
7	53-54	62-63	50	64	50	64

Vol 2 Table 8.3: Location 1 – residential receptor – continuously logged period noise survey results

Day	Period noise level (dB(A) free-field)					
	Daytime (0700-1900)		Evening (1900-2300)		Night-time (2300—0700)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Fri 21 June 2013	56	49 (45 - 53)[71]	54	52 (49 - 54)	52	50 (48 - 54)
Sat 22 June 2013	56	54 (52 - 55)	55	53 (51 - 54)	51	49 (47 - 51)
Sun 23 June 2013	53	51 (49 - 52)	52	49 (48 - 50)	50	46 (41 - 52)
Mon 24 June 2013	66	48 (41 - 55)	46	42 (38 - 45)	45	40 (37 - 43)
Tue 25 June 2013	54	44 (38 - 49)	48	42 (39 - 45)	48	43 (40 - 49)
Wed 26 June 2013	55	46 (42 - 49)	48	41 (36 - 46)	48	37 (34 - 43)

Vol 2 Table 8.4: Location 2 - residential receptor – continuously logged period noise survey results

Day	Period noise level (dB(A) free-field)					
	Daytime (0700-1900)		Evening (1900-2300)		Night-time (2300—0700)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Fri 21 June 2013	57	52 (48 - 56)	58	56 (52 - 58)	56	53 (52 - 57)
Sat 22 June 2013	60	58 (56 - 59)	59	57 (56 - 59)	55	53 (50 - 55)
Sun 23 June 2013	56	54 (52 - 55)	53	52 (51 - 54)	52	49 (45 - 54)
Mon 24 June 2013	62	54 (46 - 62)	48	46 (45 - 48)	48	49 (43 - 47)
Tue 25 June 2013	57	49 (43 - 53)	50	47 (44 - 49)	50	47 (44 - 51)
Wed 26 June 2013	57	50 (46 - 55)	50	46 (43 - 49)	47	43 (41 - 47)

Vol 2 Table 8.5: Location 3 – residential receptor – continuously logged period noise survey results

Day	Period noise level (dB(A) free-field)					
	Daytime (0700-1900)		Evening (1900-2300)		Night-time (2300—0700)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Thu 27 June 2013	58	53 (51 - 56)	55	52 (50 - 54)	53	47 (42 - 53)

[71] Mean (arithmetic) average presented with the range (min to max) in brackets

Day	Period noise level (dB(A) free-field)					
	Daytime (0700-1900)		Evening (1900-2300)		Night-time (2300—0700)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Fri 28 June 2013	59	54 (51 - 57)	57	54 (53 - 56)	55	51 (48 - 55)
Sat 29 June 2013	57	54 (51 - 56)	55	50 (48 - 52)	53	48 (46 - 51)
Sun 30 June 2013	56	52 (46 - 55)	56	53 (53 - 55)	53	48 (42 - 55)
Mon 01 July 2013	53		-*	-*	-*	-*

* data logger failure

Vol 2 Table 8.6 : Location 5 – public amenity – continuously logged period noise survey results

Day	Period noise level (dB(A) free-field)					
	Daytime (0700-1900)		Evening (1900-2300)		Night-time (2300—0700)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Fri 21 June 2013	57	54 (49 - 58)	59	57 (52 - 58)	57	55 (53 - 58)
Sat 22 June 2013	60	59 (57 - 60)	59	57 (56 - 59)	59	54 (51 - 56)
Sun 23 June 2013	58	55 (54 - 57)	55	53 (52 - 54)	55	50 (46 - 56)
Mon 24 June 2013	56	52 (48 - 55)	51	47 (46 - 50)	55	47 (44 - 50)
Tue 25 June 2013	54	49 (45 - 52)	52	48 (47 - 51)	53	49 (46 - 54)
Wed 26 June 2013	54	51 (48 - 53)	51	47 (44 - 51)	52	45 (42 - 50)
Thu 27 June 2013	53		-*	-*	-*	-*

* data logger failure

Vol 2 Table 8.7: Location 6 – residential receptor – continuously logged period noise survey results

Day	Period noise level (dB(A) free-field)					
	Daytime (0700-1900)		Evening (1900-2300)		Night-time (2300—0700)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Thu 27 June 2013	66	60 (58 - 62)	62	56 (53 - 59)	59	49 (43 - 59)
Fri 28 June 2013	65	59 (56 - 62)	62	57 (55 - 58)	60	50 (45 - 58)
Sat 29 June 2013	69	58 (55 - 62)	60	55 (53 - 56)	56	49 (45 - 54)

Day	Period noise level (dB(A) free-field)					
	Daytime (0700-1900)		Evening (1900-2300)		Night-time (2300—0700)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Sun 30 June 2013	61	57 (50 - 59)	60	56 (55 - 57)	59	51 (45 - 60)
Mon 01 July 2013	67		-*	-*	-*	-*

* data logger failure

Vol 2 Table 8.8: Location 7 – residential receptor – continuously logged period noise survey results

Day	Period noise level (dB(A) free-field)					
	Daytime (0700-1900)		Evening (1900-2300)		Night-time (2300—0700)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Thu 27 June 2013	61	49 (48 - 51)	61	49 (47 - 50)	55	43 (36 - 51)
Fri 28 June 2013	62	51 (49 - 53)	61	50 (47 - 53)	54	44 (40 - 48)
Sat 29 June 2013	52	48 (46 - 52)	53	49 (48 - 50)	51	45 (41 - 50)
Sun 30 June 2013	53	49 (43 - 53)	54	51 (49 - 53)	57	47 (41 - 52)
Mon 01 July 2013	57		-*	-*	-*	-*

* data logger failure

Receptor identification and sensitivity

8.5.6 Residential (and amenity) receptors for the noise and vibration assessment are the same as those identified for the monitoring locations as set out in Vol 2 Table 8.1 and Vol 2 Figure 8.1.

8.5.7 The sensitivity of receptors identified in Vol 2 Table 8.1 is as follows in accordance with IEMA guidelines[72] described in Vol 2 Appendix 8.1:

a. Receptor 1, Russell Road residential – high sensitivity;
b. Receptor 2, Lower Hall Lane residential – high sensitivity;
c. Receptor 3, Meridian Water Masterplan residential – high sensitivity;
d. Receptor 4, Meridian Water Masterplan residential – high sensitivity;
e. Receptor 5, River Lee Navigation amenity – medium sensitivity;
f. Receptor 6, Meridian Water Masterplan residential – high sensitivity;
g. Receptor 7, Zambezie Drive residential – high sensitivity.

[72] Institute of Environmental Management and Assessment (2014) Guidelines for Environmental Noise Impact Assessment, October 2014.

Future baseline

8.5.8 It can be reasonably expected that the existing baseline noise survey data is sufficiently representative of the future baseline noise situation. This is because future changes in traffic flow are expected to be incremental and associated with changes to the surrounding road network, of which none are currently proposed.

8.5.9 Future committed developments at Meridian Water Masterplan and Pumping Station House (set out Vol 1 Appendix 5.2) could introduce new noise sensitive receptors, both of which have been included in the assessment as set out in Vol 2 Table 8.1.

8.6 Potential effects and good environmental design management

8.6.1 The elements of the Project relevant to noise and vibration are set out below.

Construction

8.6.2 During construction and demolition there would be construction traffic travelling to and from the Application Site and also activities which have the potential to give rise to noise and vibration impacts. Activities such as percussive piling and breaking can generate high levels of noise and vibration, and whilst the CoCP (Vol 1 Appendix 3.1) would seek to implement quieter methods, these activities are sometimes unavoidable for reasons such as ground conditions.

8.6.3 The CoCP (Vol 1 Appendix 3.1) sets out general site requirements in terms of good housekeeping and site layout, many of which would assist in controlling noise and vibration emission, as well as more specific measures which include the implementation of recommendations in BS 5228-1:2009+A1:2014[68].

8.6.4 Also, as part of the Contractor's Construction Environmental Management Plan, noise and vibration management measures would be prepared to set out the management and monitoring processes to ensure as a minimum:

a. integration of noise control into the method statements;

b. proactive links between noise and vibration management activities and community relations activities to inform the public of any construction that may raise unusual concern such as high noise activities or extended working hours;

c. developing a noise and vibration monitoring protocol including noise and vibration monitoring locations as well as publishing all monitoring required to ensure compliance with all acoustic commitments and consents;

d. preparing and submitting Section 61 consent applications;

e. implementing management processes to ensure ongoing compliance with the Section 61 consent granted by the LB Enfield; and

f. the Contractor will assess, consider and implement best practicable means at all times to control noise and vibration from the construction works.

8.6.5 All of these measures are considered as embedded mitigation and thus part of the Project assumptions for construction noise and vibration assessment.

Operation

8.6.6 Potential sources of operational industrial noise within the Edmonton EcoPark include the on-site movement of waste and other materials, loading and unloading activities, waste processing, and fixed plant noise. These sources of noise are expected to be similar to those currently experienced from existing site operations.

8.6.7 Given the large separation distances between the proposed ERF and the nearest noise sensitive receptors, any likely significant effects would be avoided. In addition, reasonably practicable steps would be taken to minimise the magnitude and extent of any adverse impacts, typically through the design of the building envelope and plant attenuation measures. This will be achieved through the application of BAT.

8.6.8 Acoustic design and control requirements would be established to design, construct, operate and maintain the proposed plant so as to: a) avoid any significant effects; and b) to minimise any adverse effects as far as reasonably practical. Impacts have been assessed in accordance with the assessment method set out in BS4142:2014[2].

8.7 Assessment – construction

Construction noise

8.7.1 The assessment of construction noise only considers activities taking place in the Temporary Laydown Area, which are within 300m of the nearest sensitive receptors. The closest distance from the Temporary Laydown Area to existing sensitive receptors is approximately 150m to location 2 (Lower Hall Lane) and 110m to the future residential receptor, Pumping Station House at the west of Lower Hall Lane. The assessment has been undertaken at the closest residential receptor, i.e. Pumping Station House.

8.7.2 This assessment applies to all stages during which the Temporary Laydown Area is in use i.e. Stage 1b through to Stage 3.

8.7.3 The results of the construction noise assessment are shown in Vol 2 Table 8.9 (Note: the table presents façade levels[73]).

[73] Façade levels are noise levels which represent noise at the façade of a building affected by acoustic reflection. A +3dB correction is made to free field ambient noise levels measured away from buildings or other vertical reflecting surfaces.

Vol 2 Table 8.9: Construction noise assessment for the closest sensitive receptor

Closest sensitive receptor	Assess ment Period (T)	Lowest measured ambient noise level, $dBL_{Aeq, T}$	Threshold category and decibel value (dB)	Highest predicted construction noise level $dBL_{Aeq,T}$	Level above ABC threshold, dB	Potential significant effect
Pumping Station House	Weekday Daytime (07:00-19:00)	57	A (65)	58	-7	No

8.7.4 The construction noise prediction resulted in a typical total construction noise level of $58dBL_{Aeq,10hr}$ at the closest sensitive receptor during Stages 1b to 3.

8.7.5 The predicted highest construction noise level of $58dBL_{Aeq,10hr}$ is 7dB below the construction noise threshold of 65dB, established for the residential receptors and therefore **not significant**.

8.7.6 In policy terms the construction noise exposure level at any sensitive receptors surrounding the construction works is below the Significant Observed Adverse Effect Level (SOAEL) threshold[74] as defined in full in Vol 2 Appendix 8.1 Section 1.5, hence this is not significant in policy terms either.

Construction vibration

8.7.7 Piling is the most likely construction activity to give rise to potential significant vibration effects.

8.7.8 The nearest residential premises (existing and the proposed Pumping Station House off Lower Hall Lane as described in Paragraphs 8.5.7 and 8.5.9) are located more than 300m from the Edmonton EcoPark where piling works would be undertaken.

8.7.9 Given that there are no residential properties within 300m, it has been determined that at this distance there is no potential for adverse impact from vibration during the use of piling plant. Therefore, the vibration effects as a result of the Project would be **not significant** at nearest sensitive receptors.

8.7.10 Neither would the levels of vibration at the nearest sensitive receptors give rise to any adverse impacts in policy terms according to requirements of Noise Policy Statement for England[69] as defined in Vol 2 Appendix 8.1, Section 1.3.

Road traffic noise

8.7.11 Road traffic noise levels have been assessed using combined baseline, construction and operational traffic data for each of the stages. Combined traffic flows are used because existing operations continue during the construction stages until the proposed ERF is built and commissioned. Using combined traffic flows therefore allows the total road traffic impact to be determined.

[74] SOAEL – Significant Observed Adverse Effect Level - this is the level above which significant adverse health effects on health and quality of life occur.

8.7.12 The Application Site is located near the A406 North Circular Road, which is the main noise source in the area. The other local roads of interest are Advent Way and Lee Park Way which are located approximately 300m from the nearest residential receptors and are very close to the A406 North Circular Road. Sensitive receptors in Zambezie Drive are located 20m from Meridian Way and 1km from the A406 North Circular Road.

8.7.13 On this basis, Meridian Way has been selected as the potentially worst affected road link based upon its proximity to residential receptors combined with distance from other major arterial roads such as the A406 which would inherently dominate the noise climate. Meridian Way also forms a main access route to the Application Site, referred to as Flow 1 on Vol 2 Figure 8.2. The assessment is undertaken on the basis that effects at receptors in the vicinity of all other roads would be less than those experienced near to Meridian Way.

8.7.14 Traffic flows used for the assessment are presented in Vol 2 Appendix 8.4 Table 1. The traffic flows presented are combined operational and construction flows for each stage of the Project for Meridian Way. Vol 2 Table 8.10 shows which access routes would be used during the different stages.

Vol 2 Table 8.10: Site accesses for operational and construction traffic, that determines which roads are being used. (X-construction, O-operational).

Access location	Stage 1a	Stage 1b	Stage 1c	Stage 1d	Stage 2	Stage 3	Stage 4
Southern access	XO	XO	O	XO	O	XO	O
Northern access	X		X	X	X	XO	O
Eastern access		XO	O	O	XO	O	O

8.7.15 The percentage change in traffic flows across all stages on Meridian Way varies between 0 per cent and 3 per cent for inclusion of the Project. This is less than the 25 per cent change in traffic flow which is associated with a 1dB(A) change in traffic noise level, which is considered to be negligible and not perceptible according to the Design Manual for Roads and Bridges (DMRB) methodology[75].

8.7.16 Consequently, changes in road traffic noise as a result of the Project are **not significant** at nearest sensitive receptors. Neither are the noise levels predicted to be significant in noise policy terms according to requirements of Noise Policy Statement for England[69] as defined in Vol 2 Appendix 8.1, Section 1.3.

8.8 Assessment – operation

Operational industrial noise

8.8.1 The design and control measures that would be used to limit operational noise from the proposed ERF and RRF would prevent significant effects in both EIA and policy terms. The design and control measures would also

[75] Highways Agency et al. (2011) DMRB, HD213/11

minimise any adverse effects, as far as it is reasonable to do so. Accordingly, the measures proposed to control operational industrial noise would meet the aims of national noise policy. Typical measures that could be implemented include, but are not limited to, selection of quiet plant, provision of sound attenuators and location of noisy plant at greatest distance from noise sensitive receptors.

8.8.2 Based on the above it can be concluded that operational industrial noise effects at the closest sensitive receptors would be **not significant**.

8.9 Assessment – decommissioning of the Project

8.9.1 The assessment of decommissioning is based on the assumption that the future ERF would be demolished at some future time in its lifecycle, using methods similar to those considered during Stage 3 (existing EfW facility decommissioning and demolition).

8.9.2 Based on the results of the assessment of the construction assessment for Stage 3, this leads to the conclusion that construction noise effects at the closest sensitive receptors would be **not significant.**

8.9.3 In policy terms, the highest predicted total construction noise level of 58dB$L_{Aeq,T}$ is well below the threshold for significant adverse impacts. It follows that there are no significant adverse impacts from construction noise in policy terms.

8.9.4 The same is assessed for vibration associated with decommissioning and also road traffic as the activities would be no more intensive than assessed for Stage 3. Effects would therefore be **not significant**.

8.10 Supplementary mitigation

Construction

8.10.1 As there are no significant adverse effects identified for the Project, no additional mitigation measures are required with respect to effects from construction noise activities in the Temporary Laydown Area, construction vibration activities, or traffic noise emissions.

Operation

8.10.2 The design and control measures that would be used to limit operational industrial noise from the proposed development would prevent significant effects in both EIA and policy terms. The design and control measures would also minimise any adverse impacts, as far as it is practicable to do so, in accordance with noise policy.

8.11 Residual effects

8.11.1 As no mitigation measures are proposed, the residual construction/operational/decommissioning effects remain as described in Section 8.7, 8.8 and 8.9. All residual effects are summarised in the assessment summary matrices in Section 8.14.

8.12 Sensitivity test for programme delay

8.12.1 For the assessment of noise and vibration, a change to the programme of plus or minus 12 months would not be likely to materially change the assessment findings reported in Section 8.11.

8.12.2 Based on the Cumulative Development Schedule (Vol 1 Appendix 5.2), there would be no new receptors requiring assessment as a result of the programme change. This is because there are no developments identified on the Cumulative Development Schedule (Vol 1 Appendix 5.2) that would fall into the future baseline as a result of the programme change and therefore the future baseline would remain as described in Section 8.5.

8.13 Cumulative effects

Construction

8.13.1 Construction noise from each of the developments identified in Vol 1 Appendix 5.2 will be regulated through local authority planning conditions. Assuming compliance with these conditions, each development will not adversely affect sensitive receptors. It can therefore be assumed that cumulatively, effects would be **not significant**.

Operation

8.13.2 Nearby committed developments as set out in Vol 1 Appendix 5.2 may also generate operational noise which would be subject to design and control measures to limit operational industrial noise from the proposed developments to prevent significant effects.

Cumulative traffic noise assessment

8.13.3 Additionally, nearby committed developments as set out in Vol 1 Appendix 5.2 would also generate construction and operational traffic which when combined with the Project construction and operational traffic allows cumulative traffic noise effects to be identified.

8.13.4 Traffic flows used for the cumulative assessment for Meridian Water are presented in Vol 2 Appendix 8.4 Table 2.

8.13.5 Percentage changes in traffic volumes on all assessed roads due to the Project and the cumulative developments varies between 0 per cent and 3 per cent. This is less than the 25 per cent change in traffic flow which is associated with a 1dB(A) change in traffic noise level, no further assessment has been undertaken and the cumulative effects of traffic noise are considered to be **not significant**.

8.14 Assessment summary

Construction

Vol 2 Table 8.11: Assessment summary – construction

Noise and Vibration			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stages 1-3			
Construction noise	At the closest sensitive receptors, calculated noise levels from construction activities in the Temporary Laydown Area would be **not significant**.	None required	Effect unchanged. **Not significant.**
Construction vibration	At the nearest residential premises, there is no potential for adverse impact from vibration and therefore construction vibration would be **not significant**.	None required	Effect unchanged. **Not significant.**
Road traffic – construction and operation	Changes in traffic volumes would result in a noise increase of less than 1dB(A) for all stages which is not perceptible and therefore **not significant**.	None required	Effect unchanged. **Not significant.**

Operation

Vol 2 Table 8.12: Assessment summary – operation

Noise and vibration			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
All stages			
Operational industrial plant	With the implementation of measures to comply with noise limits defined in	None required	Effects unchanged.

Noise and vibration			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
	accordance with BS4142:2014[70] and the further requirements of Environmental Permitting, the effects of noise from the operation of the proposed ERF would be **not significant**.		**Not significant.**

Decommissioning of the Project

Vol 2 Table 8.13: Assessment summary – decommissioning of the Project

Noise and vibration			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Construction	On the basis that construction and demolition works would be similar to that in Stage 3, the noise effects at the closest sensitive receptors would be **not significant**.	None required	Effects unchanged. **Not significant.**

9 Socio-economics

9.1 Introduction

9.1.1 This section describes the likely significant effects of the Project on employment and the community. The assessment covers effects from construction, operation and decommissioning relating to:

a. employment, including relevant opportunities for local people; and

b. Edmonton Sea Cadets.

9.1.2 The assessment uses both quantitative and qualitative assessment techniques and considers assessment areas at the local and regional level which are relevant to socio-economic characteristics.

9.1.3 The works plans (on which the socio-economics assessment has been undertaken) are contained in the Book of Plans (AD02.01) which forms part of the DCO Application documents. Figures associated with the socio-economics assessment are contained in the Appendix – Figures volume of the ES.

9.2 Engagement

9.2.1 The Scoping Report recommended that socio-economics be scoped out from the assessment. Agreement of scope and methodologies was sought from the Secretary of State and statutory consultees. A Scoping Opinion[1] was provided in November 2014 from the Secretary of State setting out the following main issues to be considered in the socio-economic assessment:

a. relocation of the LondonWaste Limited (LWL) fleet depot;

b. impacts on the Edmonton Sea Cadets facilities including access and any provision of alternative facilities;

c. any proposed improvements to community facilities;

d. types of jobs associated with construction and operation;

e. relevant policies relating to local employment opportunities; and

f. locationally specific assessment criteria and consideration of impacts in the local and regional context.

9.2.2 Based on this socio-economics has been scoped into the EIA to take account of these elements with the exception of the relocation of the LWL fleet depot. The response to the Scoping Opinion recommended that if the options relating to the depot include relocation off-site, the socio-economic assessment should consider associated impacts. However, the LWL fleet depot would be retained and remain operational on-site throughout with a permanent on-site location adjacent to the ERF. The impacts on the depot and depot employees are therefore likely to be negligible and have been scoped out.

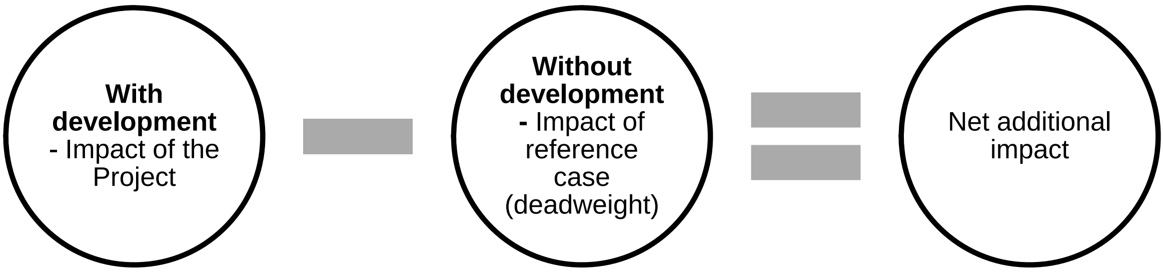
9.2.3 Full details of the comments received during scoping are provided in Vol 2 Appendix 9.1.

9.2.4 No further engagement has been undertaken in relation to the socio-economics assessment.

9.3 Methodology

9.3.1 This section provides an overview of the methodology for assessing the likely significant effects of the Project on socio-economics. Full details of the topic methodology are provided in Vol 2 Appendix 9.1.

9.3.2 The assessment has been desk-based and combines quantitative and qualitative assessment techniques. The approach is based on a widely accepted methodology used in socio-economic assessments including the estimation of effects on a 'with development' and 'without development' basis to identify the 'net additional'. The net additional impact is the impact of the Project less the outputs (e.g. employment generation) that would have occurred without the Project (the 'reference case', sometimes referred to as 'deadweight')[76] (see Vol 2 Plate 9.1).



Vol 2 Plate 9.1: Approach to socio-economics assessment methodology

9.3.3 Since the assessment is concerned with net additional impact, the Project has been assessed on a 'before' and 'after' basis.

9.3.4 Guidance for assessing additionality has been taken from three main sources:

a. The Green Book[77] – guidance on appraisal and evaluation;

b. Single Programme Appraisal Guidance[78] – sets a framework for the development, appraisal, delivery and evaluation of programmes; and

c. Additionality Guide[79]– outlines the process of calculating additionality and offers guidance on estimating several additionality parameters.

9.3.5 To determine the genuinely additional outputs offered by the Project in line with the approach set out in this section, the following factors have been considered in the assessment:

a. leakage – the proportion of outputs which benefit those outside the Project's assessment areas;

b. deadweight – the outputs (e.g. employment benefits) which would have occurred without the Project; and

[76] Homes and Communities Agency (2014) Additionality Guide Fourth Edition, January 2014
[77] HM Treasury (2011) The Green Book: Appraisal and Evaluation in Central Government, July 2011
[78] Department for Trade and Industry (2003) Single Programme Appraisal Guidance, 2003
[79] Homes and Communities Agency (2014) Additionality Guide Fourth Edition, January 2014

c. displacement/substitution – the proportion of the Project's outputs accounted for by reduced outputs elsewhere in the assessment areas.

9.3.6 Construction employment effects take into account:

a. direct impacts – the jobs directly created or supported;

b. indirect impacts – the employment effects that arise from a business's expenditure with its suppliers; and

c. induced impacts – those effects arising from expenditure associated with the direct and indirect impacts (namely, expenditure from direct and indirect employees, principally from salary receipts).

9.3.7 Employment multipliers for indirect and induced elements have been used to capture the 'knock-on' impacts in the local economy such as additional local income, local supplier purchases and longer term development effects.

9.3.8 The approach to the assessment of significance of effects of the Project on socio-economics has been consistent across construction, operation and decommissioning. There are no established guidelines for assessing the significance of socio-economic effects. The assessment has therefore been based on professional judgement and experience and has considered the value and sensitivity of receptors from the baseline socio-economic characteristics, based on their importance, size and potential for substitution, as well as the magnitude of the net additional impact based on qualitative and quantitative (where applicable) evidence. As set out in the methodology, receptors for the socio-economic assessment are people, employment opportunities, and Edmonton Sea Cadets. The assessment of significance accounts for the ability of these receptors to continue to function effectively.

Construction

Employment

9.3.9 A quantitative assessment of employment effects from construction has been undertaken at the Greater South East level, that is London, South East and East of England, and for the UK. The assessment considers construction employment effects for Stages 1, 2 and 3 of the Project as a whole and comprised a calculation of full-time equivalent employees (FTE) employment based on the capital expenditure of the Project. A qualitative assessment of opportunities for providing skills and training opportunities has been undertaken based on measures proposed in the CoCP (Vol 1 Appendix 3.1).

Edmonton Sea Cadets

9.3.10 A qualitative assessment of effects on the Edmonton Sea Cadets has been undertaken for Stages 1, 2 and 3 of the Project as a whole. The assessment is based on changes associated with those facilities such as any potential disruption to the Edmonton Sea Cadets functions and proposed alternative facilities, measures in the CoCP (Vol 1 Appendix 3.1) and baseline socio-economic conditions.

Operation

Employment

9.3.11 The assessment of employment effects from operation has been undertaken for Stages 1, 2, 3 and 4. The assessment comprises a quantitative assessment at the local level (LB Enfield, LB Waltham Forest and LB Haringey), and for the UK based on estimated employment at the Application Site. A qualitative assessment of opportunities for providing skills and training has also been undertaken based on available Project information and baseline socio-economic conditions.

Edmonton Sea Cadets

9.3.12 The Edmonton Sea Cadets facilities are run by volunteers and there is no direct employment associated with it. A qualitative assessment of the effects on the Edmonton Sea Cadets has been undertaken based on relevant elements of Stages 1, 2, 3 and 4.

Decommissioning

9.3.13 A qualitative assessment based on professional judgement has been undertaken for decommissioning of the Project.

9.4 Assumptions and limitations

Assumptions

9.4.1 Assumptions relating to the quantitative assessment of employment effects in construction and operation have been set out in Vol 2 Appendix 9.1. These include assumptions in terms of leakage, deadweight, displacement and multipliers.

Limitations

9.4.2 In the course of undertaking this assessment, no limitations to the assessment process were encountered.

9.5 Baseline

9.5.1 This section sets out the baseline conditions for socio-economics in and around the Application Site. The baseline assessment has included a comparative analysis of the neighbourhood, local and regional level in order to identify key socio-economic characteristics. Data for each of these areas comprised the following:

a. neighbourhood – Census Lower Super Output Areas ('LSOA' – the smallest area for presenting census data) within and adjacent to the Application Site boundary as shown in Vol 2 Figure 9.1.

b. local – LB Enfield, LB Waltham Forest and LB Haringey; and

c. regional – London.

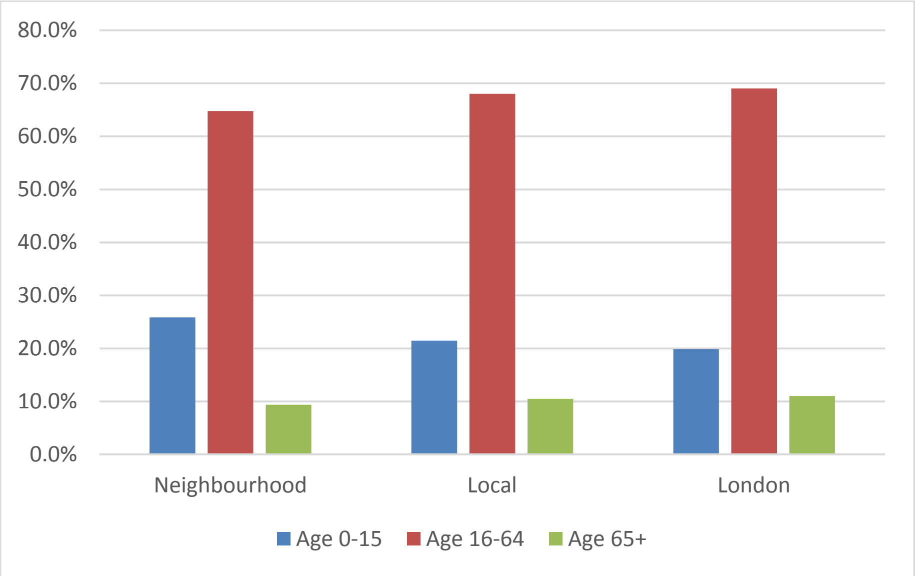
9.5.2 Future baseline conditions have also been described. From baseline information, key socio-economic characteristics of the area have been identified, which have informed assumptions for the quantitative assessment of socio-economic effects and the identification and sensitivity of the receptors for the assessment. Receptors are people (the catchment population and employees), employment opportunities (the level of employment and access to that employment) and on-site community facilities (i.e. the Edmonton Sea Cadets facilities).

Current baseline

Population

9.5.3 The 2011 census shows that the neighbourhood area had a population of 22,650 and was less densely populated compared to the local and regional levels at 39.6 people per hectare. The low density of the neighbourhood area reflects its character as an employment area. The workday population of the local area was approximately 86 per cent of the resident population according to the 2011 census. This differs from the London trend where the workday population is higher than the resident population and suggests that although the neighbourhood area is characterised by employment, at the local level people are likely to be travelling outside of the local area for work.

9.5.4 The neighbourhood area had a higher proportion of residents aged under 15 years (26 per cent) and a lower proportion of working age residents (aged 16-64) (65 per cent) compared to the local and London levels in the 2011 Census (see Vol 2 Plate 9.2). There was also a lesser proportion of residents aged over 65 years in the neighbourhood area compared to the local and London level, at around 9 per cent. This data indicates a proportionately smaller workforce in the neighbourhood area and potential relevance of training and apprenticeships.



Vol 2 Plate 9.2: Age profile, Census 2011

9.5.5 The closest residents to the Application Site are located on Badma Close approximately 60m west of the Application Site. Residential receptors are also located approximately 125m west of the Application Site on Zambezie Drive and 150m east of the Application Site on Lower Hall Lane. Lower Hall Lane is on the eastern side of the LVRP.

Employment

9.5.6 The Edmonton EcoPark operates 24 hours a day, seven days a week. There are approximately 193 FTE, with approximately 96 of these directly related to the existing EfW facility. The remaining employees are responsible for other site operations and or the management of LWL and the Edmonton EcoPark as a whole.

9.5.7 An understanding of the employment characteristics of the neighbourhood and local area provide an indication of the likely relevance of employment opportunities in the context of the local workforce.

9.5.8 The Application Site is adjacent to employment areas such as that at the Eley Industrial Estate. The 2011 Census shows that the economically active population in the neighbourhood area was 64 per cent compared to 70 per cent in the local area and 72 per cent in London. Of that population, around 7 per cent were unemployed in the neighbourhood area, notably higher than the local and London level.

9.5.9 LB Enfield as a whole had also experienced an increase in the proportion of the population claiming out of work benefits[80] between the 2001 Census and 2011 Census. Measured by the proportion of claimants, Edmonton Green, where the Edmonton EcoPark is located, was the fourth most deprived ward in London in 2011. This contrasted to the west of the LB Enfield which has a lower proportion of people claiming out of work benefit[80]. This, together with unemployment levels in the neighbourhood area, provides an indication of the comparatively high proportion of residents out of employment.

9.5.10 According to the 2011 Census, the greatest proportion of residents in the neighbourhood area held no qualifications, at 29 per cent. 20 per cent held the highest levels of academic or professional qualifications (i.e. the highest qualification attained is degree level and above). The highest professional or academic qualifications held by the remaining 51 per cent ranged from GSCEs to A Levels and apprenticeships, or ‘other’ qualifications. This indicates notable contrasts in skills levels within the neighbourhood area. The percentage of no qualifications held is high compared to the local and London level where 32 per cent and 38 per cent respectively have level four qualifications. There is therefore potential for some employment requiring higher skills sets to be sourced from outside the neighbourhood area.

9.5.11 According to the 2011 Census, fewer residents in the neighbourhood area were employed in managerial, professional and technical occupations (30 per cent) than at the local (44 per cent) and London (50 per cent) level. There was a comparatively higher proportion of residents in all other types of occupations such as skilled trades and process, plant and machine operative occupations. This provides an indication of the types of occupation that local people are likely to be able to access.

9.5.12 2011 Census data on industry shows that the majority of residents were employed in wholesale and retail trade in the neighbourhood area, such as repair of motor vehicles, at 19 per cent, and in human health and social

[80] National Policy Institute (2011) Edmonton’s socio economic profile: meeting the challenge: A Report for the London Borough of Enfield, October 2011.

work activities at 14 per cent. Both of these were comparatively greater than that for the local and London level. The proportion of residents employed in construction was 8 per cent which was comparable to the local area (8 per cent) and London (7 per cent) indicating average potential to access construction employment opportunities. Water supply, sewerage, waste management and remediation activities made up around 1 per cent of employment industries for residents of the neighbourhood area. This is approximately double the proportion at the local and London levels.

9.5.13 According to Business Register Employment Survey data [81], the neighbourhood area supported a total of 8,238 workplace based employees in 2013, an increase of 2.5 per cent on 2009. Approximately 5 per cent of those employees were in construction which is comparable to the local level and greater than at the London level. Equally, 5 per cent were employed in water supply, sewerage, waste management and remediation activities which suggests that the majority of employees were not also residents of the neighbourhood area. This was notably higher compared to the local (0.7 per cent) and London levels (0.3 per cent). This suggests that the industry sector is a notable employer with 445 employees in the neighbourhood area in 2013. According to the 2011 Census, 80 residents of the neighbourhood area were employed in the sector.

Deprivation

9.5.14 The Application Site has historically supported employment in an area of relative deprivation. According to the Indices of Multiple Deprivation 2010[82], the overall deprivation in the neighbourhood area ranges from LSOAs in the top 6 per cent most deprived to the top 60 per cent least deprived showing a contrast across the area (see Vol 2 Figure 9.2). The Application Site is located in LSOA Enfield 030, which was in the top 6 per cent most deprived areas in England overall. The area was particularly deprived in relation to income, employment and barriers to housing and services.

Community facilities

9.5.15 To the east of the Edmonton EcoPark on the River Lee Navigation is a wharf which is currently leased to the Edmonton Sea Cadets. The wharf is typically used two evenings per week and is currently accessed through the Application Site. Given its waterside location adjacent to the LVRP the facility is also occasionally utilised by other cadet groups from LB Waltham Forest and LB Haringey. There are approximately ten existing water sports facilities in the LVRP such as Stonebridge Lock Waterside Centre and King George Sailing Club.

Future baseline

9.5.16 The future baseline for Stage 1 to Stage 4 would include additional residents associated with:

[81] Office of National Statistics (2013) Business Register and Employment Survey
[82] Department for Communities and Local Government (2010) Indices of Multiple Deprivation

a. 14 new homes as part of the Pumping Station House development at Chingford Mill, which would be approximately 110m east of the Application Site boundary.

b. Up to 5,000 new homes as part of Meridian Water[83], which would be approximately 300m from the Application Site.

9.5.17 The future baseline would support additional employment associated with:

a. office, industrial and warehousing, car showroom and other retail floor space associated with planned developments as set out in Vol 1 Appendix 5.2; and

b. up to 3,000 new jobs as part of Meridian Water[83].

9.6 Potential effects and good environmental design management

9.6.1 The Project is described in Volume 1 of the ES. The elements of the Project relevant to socio-economics are set out below.

Construction

9.6.2 At this stage, the estimated capital expenditure for the construction of the proposed ERF alone is £450-500 million. For the purposes of this assessment, a mid-point value of £475 million has been used to estimate construction employment. Because this figure does not include the capital expenditure for other elements of the Project, this is considered to be a conservative assessment.

9.6.3 During Stage 1, the Edmonton Sea Cadets would be relocated to EfW facility meeting rooms for a temporary period of approximately two years. Their equipment would be stored in a container located at the front of the EfW facility and boats would be relocated to an alternative Edmonton Sea Cadets facility on-site. During this two year period Edmonton Sea Cadets access to the water would be restricted. The Edmonton Sea Cadets would continue to follow safe and secure access routes shared with site staff. The operating hours of the Edmonton Sea Cadets would not be altered in relation to the construction of the Project.

9.6.4 On completion, EcoPark House would be part occupied by the Edmonton Sea Cadets, which would include a launch into the River Lee Navigation. EcoPark House would also be available for other community activities, visitor and Project information and LWL office requirements. This arrangement would continue for Edmonton Sea Cadets in all subsequent stages.

Operation

9.6.5 The existing employment supported at the Application Site is approximately 193 FTEs, of which the estimated FTE employment directly supported by the EfW facility is approximately 96. The estimated FTE employment

[83] LB Enfield (2013) Meridian Water Masterplan

supported at the Application Site would be approximately 153 for Stages 2, 3 and 4 of which around 49 would be directly supported by the ERF.

9.6.6 The LWL fleet depot would be retained and remain operational on-site throughout with a permanent relocation adjacent to the ERF. Incinerator Bottom Ash operations and the IVC facility would be decommissioned during Stage 1c of construction and those functions would be moved off-site.

9.6.7 On completion, EcoPark House would continue to be part occupied by the Edmonton Sea Cadets and be available for other community activities, visitor and Project information and LWL office requirements as described in Paragraph 9.6.4.

9.7 Assessment – construction

Employment

9.7.1 Calculations for the assessment of construction employment are set out in Vol 2 Appendix 9.2. The construction of the Project is expected to support a total of approximately 2,623 FTE net additional jobs across the UK comprising around 971 FTE net additional direct construction jobs and 1,651 FTE indirect and induced employment jobs.

9.7.2 Of the total net additional construction jobs, around 1,311 FTE net additional jobs are expected to be located at the Greater South East level. Around 486 of those FTE jobs are expected to be net additional direct construction jobs and an estimated 826 FTE jobs are expected to arise through indirect and induced effects based on the net additional direct construction jobs.

9.7.3 Given the timeframe of the construction process, the number of FTE jobs does not give an indication of the peak level of employment on the Application Site. Rather, it gives a more rounded indication of the employment effects on a comparable basis with on-going employment effects. The estimated average direct employment on-site per construction year is approximately 1,766.

9.7.4 The baseline identified that the construction workforce was comparable to local and regional levels and it is therefore likely that less specialised construction employment could be accessed. The CoCP (Vol 1 Appendix 3.1) states that the Applicant will require the Contractor to employ an appropriately qualified and suitably experienced workforce. The Contractor will be responsible for identifying the training needs of their personnel to enable appropriate training to be provided and engaging suitably qualified and experienced professionals for this purpose. Employment policies relating to opportunities for skills and training opportunities would be in line with LB Enfield policies.

9.7.5 Employment effects from construction are important considering the level of people seeking employment in the area. Effects are considered to be temporary as the construction process has a limited timeframe. Based on the magnitude of employment and the potential for employment opportunities, the effects on employment from construction at the Greater

South East level are considered to be **temporary, beneficial and significant**. Construction effects at the UK level are considered to be **not significant**.

Edmonton Sea Cadets

9.7.6 The Edmonton Sea Cadets would be temporarily relocated to appropriate facilities within the Edmonton EcoPark during construction. Access would be retained during temporary relocation and measures to ensure safe and secure access shared with site staff would be implemented through the CoCP (Vol 1 Appendix 3.1 for the CoCP). The operating hours of the Edmonton Sea Cadets would not be altered in relation to the operation of the Project. It is anticipated that Edmonton Sea Cadets' building-based activities would be able to continue as usual. Activities that require access to the water on the Application Site could not continue during construction of EcoPark House. Water access via the Application Site would be restricted during the two years before the Edmonton Sea Cadets would be relocated to EcoPark House. During this time, water activities would need to be relocated off-site for example at alternative facilities in the local area. It is noted that other Sea Cadets within this area of London currently use the Edmonton Sea Cadets' facilities (amongst others) for water activities. Upon completion of EcoPark House, the Edmonton Sea Cadets would have access to improved facilities with a new launch into the River Lee Navigation. The Edmonton Sea Cadets have been involved in the development of the proposals for their relocation during construction and their subsequent part occupation of EcoPark House on-site.

9.7.7 Overall it is considered that operation of facilities would be able to continue to function as usual for the majority of the construction period, with some disruption associated with requirements for water access for approximately two years during this time the Edmonton Sea Cadets would be relocated to the EfW facility. During this period any water-based activities could be undertaken at nearby public facilities of which there are several within the LVRP. The effect on the Edmonton Sea Cadets from construction is therefore considered to be minor adverse, but **not significant**.

9.8 Assessment – operation

Employment

9.8.1 As set out in Vol 2 Table 9.1, the estimated operational employment that the Project is expected to support a total of approximately 229 FTEs in the UK of which 197 FTEs would be at the local level. Of the 197 FTEs at the local level, 153 are expected to be direct operational jobs.

Vol 2 Table 9.1: Assessment of employment effects from the operation

	Local level FTEs			UK level FTEs		
	Baseline	Operation	Net additional	Baseline	Operation	Net additional
EfW facility /ERF	93	49	-44	93	49	-44
RRF	14	22	8	14	22	8

	Local level FTEs			UK level FTEs		
	Baseline	**Operation**	**Net additional**	**Baseline**	**Operation**	**Net additional**
Incinerator Bottom Ash operations	6	0	-6	6	6	0
IVC facility	6	0	-6	6	0	-6
Transport and vehicle depot	26	26	0	26	26	0
Edmonton EcoPark Administration	26	28	2	26	28	2
Other site-wide operations	22	28	6	22	28	6
Total direct FTEs	**193**	**153**	-40	**193**	**159**	**-34**
Indirect and Induced composite multiplier	1.29			1.44		
Indirect and Induced FTEs	56	44	-12	85	70	-15
Total FTEs	**249**	**197**	**-52**	**278**	**229**	**-49**

9.8.2 The overall employment effect from operation would be a net reduction of around 52 FTE jobs at the local level. An additional three FTE jobs would be retained within the UK (a total reduction of 49 FTE jobs at the UK level). The reduction in direct employment would be due to improvements in the proposed ERF compared to the existing EfW facility, such as operational efficiency and a reduced requirement for maintenance. This improved operational efficiency is likely to contribute to improved productivity overall.

9.8.3 The proposed Reuse and Recycling Centre would provide additional opportunities (an estimated 8 FTEs). Six of these are expected to be relocated staff from the IVC facility, which would be removed. It is expected that all other parts of the Project are likely to remain broadly similar to the existing numbers.

9.8.4 The jobs likely to be supported in operation range from managerial and specialist positions associated with the ERF, as well as maintenance, transport, administration and support staff. Employment is therefore expected to be similar to baseline conditions, relating to a range of skills sets with the potential for local people to access employment opportunities. Employment policies relating to opportunities for skills and training opportunities would be in line with LB Enfield policies.

9.8.5 Once the existing EfW facility is demolished the central area of the Edmonton EcoPark would become available for other waste management activities subject to the DCO and other approvals. Since the Edmonton EcoPark is allocated for employment, this area would therefore be likely to provide further employment opportunities in the future.

9.8.6 For current employment at the Edmonton EcoPark, the effect of this net reduction would be adverse and is likely to be of concern for the existing employees. However considering the overall magnitude and type of employment at the local level, the employment effect from the operation is unlikely to substantially change employment at the local level from baseline conditions and is therefore considered to be **not significant.** It also worth noting that the EfW facility would not cease operations until approximately 2026. This allows a significant time period in which existing employees would have the opportunity to find alternative roles on- and off-site such that job loss may be reduced.

Edmonton Sea Cadets

9.8.7 The Project would provide a modern and enhanced quality Edmonton Sea Cadets facility as part of EcoPark House which would include potential for use for other community activities. Based on the low scale of effect and alteration from baseline conditions as well as the improved quality facilities, the effect on the Edmonton Sea Cadets from the operation is considered to be beneficial but **not significant**.

9.9 Assessment – decommissioning of the Project

Employment

9.9.1 The decommissioning of the Project is likely to involve demolition of the facilities. This activity is likely to support some employment. The extent of the works is not known and therefore the level of employment cannot be estimated. However, in comparison to the construction of the Project, demolition is unlikely to support significant employment generation. As such, this considered to be beneficial but **not significant**.

9.9.2 The Edmonton EcoPark is allocated for employment, specifically for waste management. It is therefore considered reasonable to expect that at the point of decommissioning, the Application Site would continue to support operational employment. **No significant effects** (adverse or beneficial) from decommissioning are therefore anticipated.

Edmonton Sea Cadets

9.9.3 During and following decommissioning and demolition of EcoPark House, it has been assumed that suitable alternative facilities for the Edmonton Sea Cadets would be provided such that any associated disruption would result in **no significant effects**.

9.10 Supplementary mitigation

9.10.1 As there are no significant, adverse effects, no mitigation measures are required with respect to effects from construction, operation or decommissioning of the Project.

9.11 Residual effects

9.11.1 As no mitigation measures are proposed, the residual construction/operational/decommissioning effects remain as described in Section 9.7, 9.8 and 9.9.

9.12 Sensitivity test for programme delay

9.12.1 For the assessment of socio-economics, a change to the programme of plus or minus 12 months would not be likely to materially change the assessment findings reported in Section 9.11.

9.12.2 Based on the Cumulative Development Schedule (Vol 1 Appendix 5.2), there would be no new receptors requiring assessment as a result of the programme change.

9.12.3 This is because there are no developments identified on the Cumulative Development Schedule (Vol 1 Appendix 5.2) that would fall into the future baseline as a result of the programme change and therefore the future baseline would remain as described in Section 9.5.

9.13 Cumulative effects

Construction

9.13.1 The construction of developments identified in Vol 1 Appendix 5.2 is likely to result in employment from construction. In terms of construction industry and demands for labour, when a project does not proceed in a given time period because construction staff are engaged elsewhere, the project 'waits its turn' and uses those staff when they are next available. Given the relatively low magnitude of construction employment required (and the low proportion of construction activity that the Project represents), in the context of the regional construction workforce, the Project is not expected to result in adverse effects. The construction of cumulative developments is likely to support employment additional to that of the Project that would contribute to a beneficial effect from construction for those seeking employment.

Operation

9.13.2 The employment from operation of the Meridian Water development is likely to support a range of skills sets in the local area, which has the potential to contribute to a wider range of employment opportunities associated with the Project. Any operational employment associated with the UK Power Networks upgrade works to the south of the Application Site is likely to be limited. The cumulative effects from operation would be beneficial but **not significant**.

9.14 Assessment summary

Construction

Vol 2 Table 9.2: Assessment summary – construction

Socio-Economics			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Construction employment	Construction employment of approximately 2,623 FTE net additional jobs across the UK of which 1,311 would be local, therefore there would be **significant temporary beneficial** effects	None required	Effects unchanged **Significant temporary beneficial.**
Temporary relocation of the Edmonton Sea Cadets	With the implementation of CoCP measures, the alternative accommodation provided on-site would cause some temporary disruption to the Edmonton Sea Cadets activities associated with access to the water due to construction, but the effects would be **not significant.**	None required	Effects unchanged. **Not significant.**

Operation

Vol 2 Table 9.3: Assessment summary – operation

Socio-Economics			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Changes to operational employment	The net reduction of on-site employment is unlikely to substantially change the level of employment in the local area from baseline conditions and therefore the effect would be **not significant.**	None required	Effect unchanged. **Not significant.**

Socio-Economics			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
EcoPark House	EcoPark House would be occupied by the Edmonton Sea Cadets and which would include potential for use for other community uses. The effect on Edmonton Sea Cadets from operation would be **not significant.**	None required	Effect unchanged. **Not significant.**

Decommissioning of the Project

Vol 2 Table 9.4: Assessment summary – decommissioning of the Project

Socio-Economics			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Decommissioning of ERF and RRF	Since the Application Site has been allocated for employment, in the long term the Application Site is likely to continue to support employment such that employment effects would be **not significant.**	None required	Effects unchanged. **Not significant.**
Demolition of EcoPark House	It has been assumed that suitable alternative facilities for the Edmonton Sea Cadets would be provided such that effects would be **not significant.**	None required	Effects unchanged. **Not significant.**

10 Transport

10.1 Introduction

10.1.1 This section of the ES presents an assessment of the likely significant environmental effects of the Project on transport.

10.1.2 A Transport Assessment (TA) has also been prepared to support the Application for development consent for the Project. The following assessment draws on the data presented in, and the conclusions of, the TA which is appended to the ES at Vol 2 Appendix 10.2.

10.1.3 The transport-related environmental effects considered in this assessment have been broadly categorised as follows:

a. effects on road users in terms of delay due to changes in road conditions (including increases or decreases in traffic flows) or routes (‘road users’ would include cars, motorcycles, cycles, buses, taxis and commercial vehicles) and/or road safety;

b. effects on public transport users due to changes in demand or provision;

c. effects on pedestrians due to new or diverted routes or changes in pedestrian volumes, including a consideration of delay, amenity, severance and road safety;

d. effects on cyclists due to changes to the local cycle network or to cyclist volumes, including a consideration of delay, amenity, severance and road safety; and

e. effects on equestrians due to changes to local equestrian routes, including a consideration of delay, amenity, severance and road safety.

10.1.4 The assessment has not included effects on parking or users of the River Lee Navigation because all parking would be on the Application Site and there would be no additional trips on the River Lee Navigation during construction or operation of the Project.

10.1.5 Effects are assessed for various stages associated with the Project:

a. construction (Stages 1-3 of the Project);

b. operation (Stages 1-4 of the Project);

c. decommissioning; and

d. effect of the Project in combination with other developments close to the Application Site (i.e. cumulative effects).

10.1.6 The transport assessment considers accessibility to and movement in the vicinity of the Application Site by all modes of transport.

10.1.7 Air quality and noise effects associated with construction and operational traffic have been assessed and are reported in Vol 2 Sections 2 and 8 respectively.

10.1.8 The works plans (based on which the transport assessment has been undertaken) are contained in the Book of Plans (AD02.01) which forms part of the DCO Application documents. Figures associated with the transport assessment are contained in the Appendix – Figures volume of the ES.

10.2 Engagement

10.2.1 Engagement in relation to traffic and transport has been undertaken as follows:

a. Secretary of State with regard to the transport aspects of the EIA Scoping Opinion[1];

b. Transport for London (TfL) and LB Enfield's Transport Officer with regard to the scope of the TA. The scope of the TA has been agreed through the TfL formal pre-application process. The TfL pre-application process is separate to the formal consultation undertaken as part of the DCO process;

c. Highways Agency (HA) to ascertain whether it has any concerns regarding the Project;

d. Sustrans[84] to discuss the proposals for Lee Park Way;

e. Canal and River Trust to discuss any effects of the proposals on the River Lee Navigation; and

f. TfL, LB Enfield, GLA, Canal and River Trust, Highways England and Lee Valley Regional Park Authority (LRVPA) as part of the Phase Two Consultation.

10.2.2 Key issues raised included the scope and methodology of the TA, ensuring the 'busiest case scenario' has been assessed and the level of detail of the analysis of trip generation calculation, the need to explore the potential to make use of water transport, and the need for Road Safety Audits (RSAs) to assess the safety of proposed access arrangements. These issues have been addressed in the methodology by ensuring that the scope and depth of the TA (and hence the assessment of the effects identified in it as presented in this ES) is appropriate.

10.2.3 TfL (through the GLA and in its own right) and LB Enfield also requested that specific plans be developed to minimise any adverse transport impacts of the Project. A Delivery and Servicing Plan framework and Travel Plans for the different stages of the Project (i.e. Construction Travel Plan and Operational Travel Plan) have therefore been developed and are submitted as part of the DCO Application for the Project. These plans would contribute to minimising the transport impact of the Project and are referenced where relevant in the assessments outlined within the TA and ES. In addition a Construction Logistics Plan would be prepared prior to commencement of construction as specified in the CoCP (Vol 1 Appendix 3.1).

10.2.4 The LVRPA and the Canal and River Trust both seek to ensure that the Project does not adversely affect the River Lee Navigation or affect users of Lee Park Way.

[84] Sustrans is the charity which manages the National Cycle Network which Lee Park Way forms a part of.

10.2.5 Water-borne transport utilising the River Lee Navigation has been considered. The conclusions of the assessment were that the financial costs of providing water transport outweigh the benefits (including the environmental benefits). A detailed study of the use of water-borne transport is provided in Appendix I of the TA contained in Vol 2 Appendix 10.2.

10.2.6 All transport-specific comments from the EIA scoping and subsequent technical stakeholder engagement are included in Vol 2 Appendix 10.1.

10.3 Methodology

10.3.1 This section provides an overview of the methodology for assessing the likely significant effects of the Project on transport. Full details of the topic methodology are provided in Vol 2 Appendix 10.1.

Construction and operation

10.3.2 The approach to the assessment methodology for the assessment of the construction and operation effects for transport takes into account the requirements of National Policy Statement for Energy 1 (NPS EN-1) and National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) relating to transport, guidance on transport environmental effect assessment from the Institute of Environmental Management and Assessment (IEMA)[85] and the HA[86], and guidance on transport assessment from the Department for Communities and Local Government (DCLG)[87] and TfL[88].

10.3.3 The DCLG and TfL guidance have informed the approach taken in the TA for the assessment of road and rail transport (which in turn is used to determine the estimated environmental effects of the Project on transport receptors). The IEMA and HA guidance, along with professional judgement, has been used to develop the overall approach taken in the environmental effects assessment and to identify significance criteria applicable to the assessment. For a number of effects there are no ready thresholds of significance, in which case interpretation and professional judgement has been applied based on knowledge of the Application Site or quantitative data where available. The assessment combines quantitative and qualitative assessment methods, with quantitative assessment methods used where appropriate data is available but qualitative assessment methods used otherwise.

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[85] Institute of Environmental Assessment (1993), now the Institute of Environmental Management and Assessment). Guidelines for the Environmental Assessment of Road Traffic.
[86] Highways Agency (1993) Design Manual for Roads and Bridges (DMRB): Volume 11 Section 3 Parts 3, 8 9 and 12 (‘Disruption Due to Construction’, ‘Pedestrians, Cyclists, Equestrians and Community Effects’, ‘Vehicle Travellers’ and ‘Effect of Road Schemes on Policies and Plans’).
[87] Department for Communities and Local Government (2015) Planning Practice Guidance: Travel plans, transport assessments and statements in decision-taking [http://planningguidance.planningportal.gov.uk/blog/guidance/travel-plans-transport-assessments-and-statements-in-decision-taking/ (accessed 2 September 2015)]
[88] Transport for London (2015) Transport Assessment Guidance [https://tfl.gov.uk/info-for/urban-planning-and-construction/transport-assessment-guidance (accessed 2 September 2015)].

10.3.4 Based on the approach recommended by the documents discussed above, the process for the environmental effects assessment for Stages 1-4 has been as follows:

a. to identify the different groups or receptors that would be affected by the transport effects of the Project;
b. to develop a checklist of potential effects on the different groups/receptors;
c. to develop a significance framework, setting out the levels of significance of effects on different users/receptors;
d. to develop a baseline (to be used for comparison against the different stages of the Project);
e. to identify what the changes would be for the different stages of the Project; and
f. to assess the changes in terms of significance using the significance framework.

10.3.5 The effects of the Project have been determined for the following stages:

a. Stage 1a: site preparation and enabling works;
b. Stage 1b: construction of RRF, EcoPark House and commence use of Temporary Laydown Area;
c. Stage 1c: operation of RRF, EcoPark House and demolition/ clearance of northern area;
d. Stage 1d: construction of ERF;
e. Stage 2: Commissioning of ERF alongside operation of EfW facility, i.e. transition period;
f. Stage 3: Operation of ERF, RRF and EcoPark House, demolition of EfW facility;
g. Stage 4: Operation of ERF, RRF and EcoPark House, i.e. final operational situation; and
h. Decommissioning of ERF.

10.3.6 For the purposes of the assessment for Stage 1, the assessment focuses on Stage 1d which is the ‘busiest case scenario’ in terms of trips on the local transport network. During Stage 1d, an additional two-way 1,176 trips would be generated while for Stage 1b, 202 additional two-way trips would be generated with 776 additional two-way trips during Stage 1c. During Stage 1a, the number of trips would be similar to that of the existing operational site. Therefore, for all other Stage 1 sub-stages, the effect of Project on the local transport network would be lower than that of Stage 1d. The effects of the Project during Stages 2 and 3 of construction as well as Stage 4 (operation) are also detailed.

10.3.7 Each of the Project stages is considered in terms of both construction and operational traffic, including construction and operational employees. This has been undertaken to account for the traffic associated with the continued operation of some or all of the existing facilities during Stage 1, the operation of the existing EfW facility and the proposed ERF during Stage 2 and the operation of the proposed ERF during Stage 3 while the existing EfW facility is decommissioned.

10.3.8 For construction vehicle trips, vehicles would typically be spread evenly across the day between the hours of 08:00 and 18:00. A very small number of trips associated with start-up and close-down activities may occur between 07:00 and 08:00 or between 18:00 and 19:00. On occasions, trips may be undertaken outside of the core working hours to ensure that any conflict with the on-going operation of the Edmonton EcoPark is minimised.

10.3.9 The operational vehicle trip generation (excluding employee trips) for the completed Project has been derived based on the information provided by the Applicant. This includes the following assumptions:

a. refuse collection vehicles (RCV) would arrive with a payload of 8 tonnes;
b. the proportion of bulked waste arriving to the Application Site would be as existing (i.e. from Hornsey Street Waste Transfer Station) with the addition of waste from Hendon Waste Transfer Station; this would equate to approximately 42 per cent of waste being bulked;
c. bulked waste would arrive with an average payload of 22 tonnes;
d. waste deliveries for the ERF and RRF (with the exception of the RRC) are based on a five day working week and waste exports (output waste) are based on a five and a half day working week;
e. public/resident deliveries to the RRC would be undertaken on the weekend with up to 40 per cent of waste deliveries undertaken over a weekend (based on data from other existing RRC facilities); the typical daily trip generation has been adjusted to account for the higher number of RRC trips on a weekend;
f. the removal of waste output would be evenly distributed across the year;
g. the proposed trip generation is based on the maximum capacity of the facilities proposed as part of the Project and that all facilities are operational.

10.3.10 For the ERF, the total number of daily trips has been calculated as follows:

a. the total number of external waste deliveries (i.e. not from the RRF) was determined by subtracting the volume of waste anticipated to be transferred (which accounts for approximately 250,000 ktpa or 35 per cent of the total annual ERF throughput) from the RRF from the total maximum throughput; the arrival of waste transferred to the ERF from the RRF has been accounted for in the RRF calculations.
b. 42 per cent of the external waste is then assumed to arrive in bulked vehicles with a payload of 22 tonnes; and
c. the remaining waste is then assumed to arrive in vehicles (e.g. RCVs) with a payload of 8 tonnes.

10.3.11 The following assumptions have been made in order to distribute the traffic generated by the Project to the local highway network:

a. waste deliveries to the new ERF and RRF have been distributed to the local highway network using the existing distribution of waste trips;

b. any rejects for which an outlet cannot be found would go to landfill in Buckinghamshire or Bedfordshire and travel west along the A406 North Circular Road;

c. IBA and air pollution control residue trips would be distributed evenly in an east and west direction along the A406 North Circular Road;

d. all employees would arrive with an even east/west distribution with trips distributed from the A406 North Circular Road according to the likely destinations within and outside London; and

e. construction trips would be undertaken with an even east/west distribution.

10.3.12 The methodology for distributing traffic to the local highway network is the same as that agreed with LB Enfield and TfL as part of the traffic analysis undertaken to support the Edmonton EcoPark SPD.

10.3.13 The assessment area for assessing impacts on road users focuses on the highway network in the vicinity of the Application Site including the following junctions:

a. A406 North Circular Road/Advent Way (Cooks Ferry Roundabout);

b. A406 North Circular Road/Montagu Road;

c. A1055 Meridian Way/Conduit Lane;

d. A406 North Circular Road/A1010 Fore Street; and

e. A406 North Circular Road/A10 Great Cambridge Road.

10.3.14 The above junctions/links (shown in Vol 2 Figure 10.2) have been included as they have been specifically referenced in the Edmonton EcoPark Planning Brief which has been referred to by LB Enfield during stakeholder engagement[89].

10.3.15 The assessment area for assessing impacts on public transport users focuses on the public transport services within the vicinity of the Application Site which have been identified in the Section 10.5.

10.3.16 The assessment area for assessing impacts on pedestrians, cyclists and equestrians focuses on the relevant local networks which have been identified in Section 10.5.

10.3.17 The significance of effects is assessed by evaluating the sensitivity of the receptor, the magnitude of effect and then the significance of effect using the matrices set out in Vol 2 Appendix 10.1 Table 7 and Table 8. Negligible

[89] Enfield Council (2013) Edmonton EcoPark Planning Brief Supplementary Planning document, May 2013. http://www.enfield.gov.uk/downloads/file/7603/edmonton_ecopark_spd_adopted last accessed September 2015

and minor effects are considered not significant while moderate and major effects are considered significant.

10.3.18 The assessment contained in this section of the ES draws on the data presented in, and the conclusions of, the TA (see Vol 2 Appendix 10.2).

10.3.19 The transport-related environmental effects considered in this assessment have been broadly categorised as follows:

a. effects on road users in terms of delay due to changes in road conditions or routes (‘road users’ would include cars, motorcycles, cycles, buses, taxis and commercial vehicles) and/or road safety;

b. effects on public transport users due to changes in demand or provision;

c. effects on pedestrians due to new or diverted routes or changes in pedestrian volumes, including a consideration of delay, amenity, severance and road safety;

d. effects on cyclists due to changes to the local cycle network or to cyclist volumes, including a consideration of delay, amenity, severance and road safety; and

e. effects on equestrians due to changes to local equestrian routes, including a consideration of delay, amenity, severance and road safety.

10.3.20 A separate cumulative assessment of the effect of other nearby developments (as set out in Vol 1 Appendix 5.2) on all receptors during each stage has also been undertaken. This includes all other developments that would generate additional trips on the local transport network including from the Meridian Water Masterplan. The methodologies for these assessments are the same as the assessment of the effects of the Project. The effect of cumulative developments has been determined by utilising trip generation figures from these developments’ TAs or through trip generation estimates carried out for these developments specifically for this assessment. This approach to the cumulative effects assessment trips generation has been agreed with TfL.

Decommissioning

10.3.21 The effects of decommissioning would be no worse than the effects assessed for Stage 3 (operation of ERF, RRF and EcoPark House, demolition of existing EfW facility) of the Project. No additional assessment for decommissioning has therefore been undertaken but instead the assessment draws on the results of the Stage 3 assessment to determine the transport effects during decommissioning of the ERF.

10.4 Assumptions and limitations

Assumptions

10.4.1 For the purposes of this assessment, future year background traffic growth has been applied using growth factors derived from TEMPRO (Trip End Model Presentation Programme). Growth factors have been applied for the relevant year throughout the construction period (i.e. between 2019/20 and 2028). This approach has been agreed with TfL.

10.4.2 It is assumed that there would be no changes to the public transport network or infrastructure (on the basis that there are no confirmed changes) and the assessment of the additional trips on public transport services has therefore been undertaken on this basis.

10.4.3 The assessment of road traffic and public transport considers trips across a 24-hour day and where appropriate, the highway peak hours (08:00 to 09:00 and 17:00 to 18:00) and the Application Site peak hour of 11:00 to 12:00, but focuses on the ‘busiest case’ scenarios (i.e. the times at which most traffic is generated) for the different stages of the Project. For each stage, the trips presented are for the period within that stage when the combined construction and operation-related trips would be at their greatest. This includes the demolition of the existing EfW facility during Stage 3.

10.4.4 Full details of the assumptions relating to the trip generation are set out in Section 5 of the TA (Vol 2 Appendix 10.2).

10.4.5 The southern access to the Application Site from Advent Way would be improved as part of the Project. This would be achieved by either widening the existing access or constructing a replacement bridge. For both options, access from Advent Way could be maintained so the operation of the Application Site for both construction and operational vehicle movements would not be affected. Therefore, the improvement to the southern access has not been considered any further in this assessment.

Limitations

10.4.6 As construction would be temporary and the change in the estimated number of vehicle trips during operation (Stage 4) compared to the existing Edmonton EcoPark is small (less than 10 per cent), traffic modelling has only been undertaken for the accesses to the Application Site and for the junctions that connect the Application Site to the local highway network (i.e. Cooks Ferry Roundabout and the junction of A1055 Meridian Way with Ardra Road). A quantitative analysis has been undertaken as part of the TA to determine the temporary effects at other locations on the local highway network. It is considered that this provides a robust assessment of the likely significant effects of construction and operational traffic that would arise from the Project.

10.4.7 There are two rail lines operating close to the Application Site, namely:

a. the East Anglia line from Liverpool Street/Stratford to Hertford East and Stansted Airport, via Angel Road, which is located approximately 470m to the west of the Application Site; and

b. the East Anglia line from Liverpool Street to Chingford, which is located approximately 3km to the east of the Application site.

10.4.8 There is no rail connection to the Application Site and there are no railway lines running directly adjacent to the Application Site. As such, the transporting of waste or construction materials via rail has not been considered as part of the Project. For a direct rail connection to be provided, a new railway spur and associated loading and unloading infrastructure would be required. The construction of any such spur would require significant investment and land take, if an appropriate alignment could be found, it would be likely to cause significant disruption to the operation of the existing railway, to residents and businesses and to the local highway network.

10.4.9 While waste or construction materials could be moved to a local rail transfer station, if one were available, the waste or construction materials would still need to be transferred from the rail transfer station to the Application Site via road so this would not provide any benefits for the local highway network.

10.4.10 The TA and this assessment do, however, consider the effect of the employee trips associated with the Project on rail and London Underground networks.

10.5 Baseline

10.5.1 This section sets out the baseline conditions for transport in and around the Application Site. Future baseline conditions are also described.

Current baseline

10.5.2 Details of the current baseline conditions for transport within and around the Application Site are set out in full in Section 3 of the TA, which is provided in Vol 2 Appendix 10.2. The following Paragraphs provide an overview of baseline conditions for each of the receptor groups.

Road users

10.5.3 Within the vicinity of the Application Site, the A406 North Circular Road (part of the TfL Route Network, TLRN) is a key route and provides the main east to west connection across north London. There is no direct access to the Strategic Road Network[90] (SRN) in the vicinity of the Application Site, but it can be accessed via two north to south routes, the A1010 Fore Street to the west of the Application Site and the A112 Chingford Mount Road to the east of the Application Site. Other key highway links in the direct vicinity of the Application Site include the A1055 Meridian Way, Advent Way, Argon Road, Walthamstow Avenue, A1009 Hall Lane, Montagu Road, Eley Road, Nobel Road, Ardra Road, Deephams Farm Road and Lee Park Way.

10.5.4 The area is characterised by high traffic flows throughout the day with moderate traffic flows at night, particularly on the A406 North Circular Road and associated slip roads.

10.5.5 The local highway network can be seen in Vol 2 Figure 10.1.

Public transport users

10.5.6 The Application Site currently has a Public Transport Accessibility Level (PTAL) of 1b[91]. This is rated as ‘very poor’ (with 1a being the lowest accessibility and 6b being the highest accessibility). The closest London Underground station to the Application Site is Tottenham Hale which is

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[90] The SRN is section of the London Road network for which the borough within which it is located is the local highway authority but TfL must be consulted on any work to be carried out.
[91] Transport for London Planning Information Database.

approximately 3.7km walking distance to the south of the Edmonton EcoPark. National Rail services are available at Angel Road station, located approximately 600m walking distance to the west of the Application Site boundary. Two London Bus routes (routes 34 and 444) operate from bus stops approximately 500m walking distance from the Application Site boundary, with an additional two routes available from bus stops approximately 800m walking distance from the Application Site.

10.5.7 The local public transport stations and stops can be seen in Vol 2 Figure 10.2.

Pedestrians

10.5.8 Footways are provided along Advent Way and Walthamstow Avenue leading to and from the Application Site and public transport stops and stations. However, the pedestrian environment is generally poor and the quality of the environment is reduced by noise associated with high traffic flows on the A406. The quality of footways and availability of crossing facilities is mixed. A pedestrian route is available along the east side of the River Lee Navigation although there is no direct access to this pedestrian route from the Edmonton EcoPark. It is, however, accessible from Lee Park Way.

10.5.9 The local pedestrian routes can be seen in Vol 2 Figure 10.1.

Cyclists

10.5.10 There are a number of cycle routes within the vicinity of the Application Site. The following routes are available:

a. Lee Park Way directly to the east of the Application Site which forms part of National Cycle Network (NCN) Route 1;

b. a north to south route along the eastern side of the River Lee Navigation which forms part of NCN Route 1 to the south of the A406 North Circular Road;

c. an east to west off-carriageway route along Lower Hall Lane, connecting with NCN Route 1 at Lee Park Way. This route connects to the LVRP to the north; and

d. an off-carriageway route in a north to south direction along A1055 Meridian Way both to the north and south of the A406.

10.5.11 The local cycle routes can be seen in Vol 2 Figure 10.2.

Equestrians

10.5.12 Lee Park Way, which is part of the NCN and part of the LVRP, can also be used by equestrians. The route is wide enough to accommodate both cyclists and equestrians and the surface is of a quality that would enable comfortable use by equestrians. Equestrian usage of Lee Park Way is, however, observed to be very low. This is the only equestrian route within the vicinity of the Application Site.

Receptor identification and sensitivity

10.5.13 The significance of any effect (related to both construction and operation) is dependent upon both the sensitivity of the receptor affected and the magnitude of the effect. Vol 2 Table 10.1 sets out the sensitivity of the identified receptors based on baseline conditions and in accordance with the methodology set out in Vol 2 Appendix 10.1 Table 4.

Vol 2 Table 10.1 Matrix for determining receptor sensitivity

Receptor	Description	Sensitivity	Reason for sensitivity level
Road users	Road users, including construction workers and operational employees, on the road network in the immediate vicinity of the Application Site (i.e. access points)	Medium	The area is already characterised by high traffic flows and a large number of road users.
Public transport users	Public transport users, including construction workers and operational employees, travelling on bus, rail or Underground services in the vicinity of the Application Site	High	There are limited public transport services available in the vicinity of the Application Site and so users of these services would be more sensitive to delay or disruption (although they would be fewer in number compared to areas with greater public transport provision).
Pedestrians	Pedestrians, including construction workers, operational employees, wheelchair users, people with pushchairs and people with mobility impairments, using footways and pedestrian infrastructure including those leading to local public transport stops, in the vicinity (including people alighting or boarding public transport services)	High	Pedestrians are vulnerable road users. Any changes to conditions are likely to have a greater impact on them due to the effort and time required to travel on foot.
Cyclists	Cyclists, including construction workers and operational employees, using cycle routes in the vicinity of the Application Site affected by the proposals	High	Cyclists are vulnerable road users. Any changes to conditions are likely to have a greater effect on them due to the effort and time required to travel by bicycle.
Equestrians	Equestrians using Lee Park Way	High	Equestrians are vulnerable road users.

Future baseline

10.5.14 For each of the four assessed stages, the future baseline includes the future background growth of traffic (including cyclists) on the local highway network and this forms that baseline against which the additional traffic generated by the Project is assessed. For each stage, the background traffic growth has been derived by applying a growth factor for the year in which that stage is expected to occur to the existing baseline traffic flows.

Full details are provided in Section 5 of the TA, which is provided in Vol 2 Appendix 10.2.

10.5.15 No additional receptors which have not been considered in the existing baseline need to be considered for the future baseline (i.e. there are no new receptors).

10.6 Potential effects and good environmental design management

10.6.1 The Project is described in Volume 1 of the ES. The elements of the Project relevant to transport are set out below.

Construction

10.6.2 The following aspects of the construction of the Project are particularly relevant to transport and may give rise to effects:

a. an increase in the number of trips on the local highway and public transport networks due to construction workers accessing the Application Site;

b. local traffic changes due to HGV movements;

c. temporary highway and footway closures; and

d. temporary use of highway or land adjacent to the highway for HGV holding areas.

10.6.3 Potentially adverse effects during construction would be managed through implementation of the CoCP (Vol 1 Appendix 3.1). The CoCP for the Project sets out the control measures and standards of work required of the Contractor to control potential effects of the construction of the Project. Section 11 of the CoCP (Vol 1 Appendix 3.1) sets out the requirements for transport. Measures for reducing the traffic and transport effect of the construction of the Project include:

a. the production of a Construction Logistics Plan;

b. measures to minimise the effect of any works within the highway or on a Public Right of Way (PRoW);

c. measures to reduce construction traffic effects;

d. measures to manage and control lorries and their movements;

e. measures to manage worker access, including a Construction Travel Plan and shuttle buses from local rail stations to the Application Site;

f. measures to avoid/limit and mitigate the deposition of mud and other debris on the highway;

g. traffic safety measures including risk reduction measures, HGV safety measures and the provision of traffic signs and road markings where necessary; and

h. monitoring of traffic management schemes to maintain their effectiveness.

Operation

10.6.4 The following aspects of the operation of the Project are particularly relevant to traffic and transport and could give rise to effects:

a. changes to the number of trips on the local highway and public transport networks due to operational vehicles, employees, visitors and the general public (accessing the Reuse and Recycling Centre) travelling to and from the Application Site; and

b. the provision of new accesses to the Application Site.

10.6.5 Potentially adverse effects during operation would be managed through implementation of the Operational Travel Plan containing measures such as the provision of cycle parking, travel information and encouraging car sharing.

10.6.6 A Delivery and Servicing Plan will also be prepared for the Project. A framework for this is included in Section 8 of the TA and this will be continually reviewed and updated, if required, throughout each of the Project stages.

10.7 Assessment – construction and operation

10.7.1 The assessment has been carried out by Project stage and considers the transport effects of construction and operation concurrently. The effects of the Project considered in the assessment of the construction and operational aspects of each stage are:

a. trips generated by construction vehicles and construction workers;

b. trips generated by operational vehicles and operational employees (for the facilities which are operational during different stages); and

c. changes to the highway network to facilitate construction (such as the new access on Lee Park Way).

10.7.2 Section 5 of the TA (Vol 2 Appendix 10.2) includes full details of the estimated trip generation for the different stages of the Project.

10.7.3 The trip generation of the existing Edmonton EcoPark is compared to trip generation for each of the stages to assess the effect of the Project during each stage.

10.7.4 A summary of the aspects of each stage relevant to the transport assessment is set out in Vol 2 Table 10.2.

Vol 2 Table 10.2 Aspects of each Project stage relevant to the transport assessment

Stage	Relevant aspect
1a Site preparation and enabling works	Establishment of access along Lee Park Way Establishment of Temporary Laydown Area Construction trips – construction vehicles and employees – access and egress via existing southern access on Advent Way for southern demolition and enabling works. Access and egress via new northern Ardra Road/Deephams Farm Road access for northern enabling works.

Stage	Relevant aspect
	Operational trips – operational vehicles and employees access and egress via Advent Way.
1b Construction of RRF, EcoPark House and commence use of Temporary Laydown Area	Use of the Temporary Laydown Area Construction trips – access and egress via existing southern access on Advent Way for construction works associated with RRF and EcoPark House. Some traffic may arrive at Temporary Laydown Area and then travel to the Application Site via Walthamstow Avenue/Advent Way. Some light vehicles including construction shuttle buses may travel to the Application Site via the proposed Lee Park Way access. Construction employees would travel to the Temporary Laydown Area then onwards to the main construction site via Lee Park Way (in shuttle buses). Operational trips – operational vehicles access and egress via Advent Way. Employee vehicles to use Advent Way and Lee Park Way accesses for ingress and egress.
1c Operation of RRF, EcoPark House and demolition/clearance of northern area	Use of the Temporary Laydown Area Construction trips – access and egress via Ardra Road/Deephams Farm Road for northern site clearance. Construction employees would travel to the Temporary Laydown Area then onwards to the main construction site via Lee Park Way (in shuttle buses). Operational trips – operational vehicles access and egress via Advent Way to serve EfW facility and RRF. Employee vehicles to use Advent Way and Lee Park Way accesses. Members of public visiting the RRC element of RRF and EcoPark House would access and egress via Lee Park Way.
1d Construction of ERF	Use of the Temporary Laydown Area Construction trips – access and egress via Ardra Road/Deephams Farm Road for the majority of vehicles associated with the construction of the ERF. Vehicle movements associated with the delivery of concrete would be undertaken directly to Application Site while approximately 50 per cent of all other construction vehicle movements would be undertaken to the Temporary Laydown Area, equating to approximately ten trips per day, travelling to the Application Site when required. The majority of these vehicles would travel via the A406 North Circular Road and A1055 Meridian Way to the Ardra Road/Deephams Farm Road access. However, any abnormal loads may travel between the Temporary Laydown Area and the Application Site via the existing Advent Way access. This would be undertaken at a time that minimises any conflicts with site operational vehicles. Construction employees would travel to the Temporary Laydown Area then onwards to the main construction site via Lee Park Way (in shuttle buses). Operational trips – operational vehicles access and egress via Advent Way to serve EfW facility and RRF. Employee vehicles to use Advent Way and Lee Park Way accesses. Members of public visiting the RRC element of RRF and EcoPark House would access and egress via Lee Park Way.
2 Commissioning of ERF alongside operation of EfW	Use of the Temporary Laydown Area Construction trips – access and egress via Ardra Road/Deephams Farm Road for ERF commissioning works.

Stage	Relevant aspect
facility, i.e. transition period	Construction employee shuttle buses to use Lee Park Way access as required. Operational trips – operational vehicles access and egress via Advent Way to serve EfW facility, ERF and RRF. Employee vehicles to use Advent Way and Lee Park Way accesses. Members of public visiting the RRC element of RRF and EcoPark House would access and egress via Lee Park Way.
3 Operation of ERF, RRF and EcoPark House and demolition of EfW facility	Use of the Temporary Laydown Area Construction trips – access and egress via Advent Way for decommissioning/demolition works of existing EfW facility. Some vehicles associated with the removal of materials may travel via the Temporary Laydown Area, waiting there until required on the Application Site when they would travel via Walthamstow Avenue/Advent Way. Ardra Road/Deephams Farm Road access may also be used for some vehicle movements if required. Construction employees would travel to the Temporary Laydown Area then onwards to the main construction site via Lee Park Way (in shuttle buses). Operational trips – operational vehicles access and egress via Advent Way to serve ERF and RRF. Members of public visiting the RRC element of RRF, EcoPark House and employee car park would access and egress via Lee Park Way.
4 Operation of ERF, RRF and EcoPark House, i.e. final operational situation	Operational trips – operational vehicles access and egress via Advent Way to serve ERF and RRF. Members of public visiting the RRC element of RRF, EcoPark House and staff car park would access via Lee Park Way. Ardra Road/Deephams Farm Road access and egress may also be used for some operational vehicle movements.

Stage 1

Effect on road users

10.7.5 The effect of the Project on road users fluctuates across Stage 1, depending on the construction and ongoing operational activities being undertaken during Stages 1a to 1d. Stage 1d (when the ERF is under construction and construction trips are highest) has the most significant increase in the number of vehicles travelling to and from the main operational site and the Temporary Laydown Area compared to the existing Edmonton EcoPark. Since this constitutes the ‘busiest case’ for Stage 1 of the Project, it is this stage which the transport assessment focuses on.

10.7.6 The daily profile of vehicle trips during Stage 1d shows two vehicular peaks throughout the day, from 07:00 to 08:00 and from 18:00 to 19:00 but also a smaller peak during the inter-peak period between 11:00 and 12:00. These peaks are predominantly as a result of construction employees arriving and departing from the Temporary Laydown Area. The total traffic generation for the various stages is outlined in the Section 5 of the TA, which also includes a full comparison between the estimated trip generation for Stages 1b to 1d and the trip generation from the existing Edmonton EcoPark (baseline).

10.7.7 There would be increased vehicle trips on the local road network (1,176 additional two-way vehicle trips per day) during Stage 1d compared with the existing Edmonton EcoPark (baseline). This daily increase in vehicle trips to the Application Site across a 24-hour period represents an increase in trips to the Application Site of 55 per cent when compared with the existing Edmonton EcoPark.

10.7.8 To ascertain the effect of this increase in vehicle trips on road users, analysis of the effect of the increases on the local roads has been undertaken for the largest increases (07:00-08:00, 11:00-12:00 and 18:00-19:00), as shown in Vol 2 Table 10.3. The future baseline traffic flows shown include background traffic growth.

Vol 2 Table 10.3 Two-way traffic increases during Stage 1d

Time	**Flow increase**	**A406 North Circular Road (NCR), west of Application Site)**		**Advent Way (leading from/to Cooks Ferry Roundabout)**		**Walthamstow Ave (leading from/to Cooks Ferry Roundabout)**	
		Baseline flow	**Increase (per cent)**	**Baseline flow**	**Increase (per cent)**	**Baseline flow**	**Increase (per cent)**
07:00 – 08:00	245	5,537	4.4	-	-	759	32.3
11:00 – 12:00	95	4,551	2.1	706	13.5	-	-
18:00 – 19:00	221	5,570	4.0	-	-	1,972	11.2
00:00 – 00:00	1,176	90,373	1.3	9,236	6.7[1]	29,762	1.6[2]

[1] Increase calculated based on total daily increase less construction employee trips which would travel via Walthamstow Avenue.

[2] Increase calculated only using construction employee trips which would travel via Walthamstow Avenue.

10.7.9 The largest proportional increase in traffic would be experienced along Walthamstow Avenue which would experience a flow increase of 32.3 per cent between 07:00 and 08:00. This would equate to a medium magnitude effect along this road during this time period based on the criteria identified in Vol 2 Appendix 10.1. On the A406 (which is part of the TLRN) the largest flow increase would be between 07:00 and 08:00 where traffic flows would increase by 4.4 per cent. This would equate to a very low magnitude adverse effect along this road during this time period based on the criteria identified in Vol 2 Appendix 10.1.

10.7.10 Across the local road network as a whole, the changes to traffic flows would constitute a low or very low magnitude effect. The changes in traffic flows on the road network as a result of the Stage 1d of the Project are not expected to affect safety for road users.

10.7.11 During Stage 1d, parking for construction workers would be provided on the Temporary Laydown Area while parking for operational employees would continue to be provided on the existing Edmonton EcoPark site such that the likelihood of overspill parking occurring is low. An appropriate level of car parking would be provided and through the Construction and Operational Travel Plans, Traffic Management Plan (TMP) and CoCP (Vol

1 Appendix 3.1), the provision of parking would be managed to ensure that no overspill parking is anticipated to take place.

10.7.12 Based on the methodology set out in Vol 2 Appendix 10.1, road users have been classified as having a medium level of sensitivity. This low or very low magnitude adverse effect on road users in the vicinity of the Application Site in Stage 1d (and hence throughout Stage 1) would therefore have a minor adverse or negligible significance, and this effect is considered to be **not significant**.

Effect on public transport users

10.7.13 The effect on public transport users as road users (e.g. people travelling on buses) of changes to traffic flows on the road network would be similar to the effect on other road users (discussed above). The effect of changes to traffic flows on the road network on public transport users as pedestrians (for public transport users boarding or alighting in the vicinity of the Application Site) would be similar to the effect on pedestrians (discussed in Paragraphs 10.7.28 to 10.7.32).

10.7.14 During Stages 1a, 1b and 1c, the overall number of construction workers using public transport to access the Application Site would be very low and it is expected that up to 75 per cent of construction employees would drive to the Application Site as car sharing and public transport use would be more difficult to encourage among the smaller workforce.

10.7.15 During Stage 1d when the construction workforce is expected to be at its largest, there would be up to 1,532 (two-way) construction and operational additional employee trips per day on all modes of transport (including 1,176 by private vehicle) with approximately 15 per cent (236) of these expected to be undertaken on public transport. Shuttle buses from public transport stations would be provided for employees and so greater use of public transport is expected than during other stages. Due to shift times, construction employee trips would typically be undertaken before 08:00 and after 18:00, avoiding the busiest times on public transport. However, for a robust assessment it has been assumed that all construction worker and employee trips would occur between 08:00 and 09:00 and between 17:00 and 18:00 which is usually the busiest period on public transport. Distributed across the London Underground, National Rail and London Bus services available, this would equate to a small number of extra passengers per service. This would account for an increase in passenger numbers of less than 10 per cent on each of the services when compared with the theoretical capacity.

10.7.16 This would constitute a very low magnitude adverse effect based on the criteria identified in Vol 2 Appendix 10.1. Public transport users have been classified as having a high level of sensitivity. This very low magnitude adverse effect on public transport users in the vicinity of the Application Site in Stage 1d (and hence throughout Stage 1) would have a negligible significance, and this effect is considered to be **not significant**.

Effect on pedestrians, cyclists and equestrians

10.7.17 There are six changes to existing pedestrian, cyclist and equestrian routes during Stage 1, each of which are assessed:

a. reconfiguration of Lee Park Way (an existing pedestrian, cyclist and equestrian route) to provide a new access to the Application Site during Stage 1a;

b. use of Lee Park Way by small/light construction vehicles during Stage 1a and 1b;

c. use of Lee Park Way by operational employees, shuttle buses transporting construction workers to the Application Site and for public access to the RRC during Stage 1c and 1d;

d. interruption to the PRoW that is provided between the River Lee Navigation towpath and Lower Hall Lane caused by the provision of the Temporary Laydown Area and the access to Lee Park Way;

e. changes in traffic flows on the local road network in the vicinity of the Application Site; and

f. changes in pedestrian access to public transport for vulnerable users accessing the Application Site.

Reconfiguration of Lee Park Way during Stage 1a

10.7.18 The proposed access to the Application Site from Lee Park Way would be constructed during Stage 1a. Lee Park Way is part of NCN Route 1 and is not used by vehicles at present, other than the occasional maintenance vehicle. The reconfiguration of this route would provide segregated cycle lanes (which can also be used by equestrians) and a footway for pedestrians between Advent Way and the Lee Park Way site access, to ensure vehicle access along this route can be safely accommodated. A safe cycle crossing point would be provided where NCN Route 1 crosses Lee Park Way. Facilities for pedestrians and equestrians would also be provided at this point. A safe route would also be provided for cyclists, pedestrians and equestrians during Stage 1a whilst the new access was being constructed.

10.7.19 Whilst the reconfiguration of Lee Park Way would not change the route length, the width available for use by pedestrians, cyclists and equestrians would be reduced (since at present the full route width is available to these users). However, the reconfiguration would also involve improvements to surfacing. No reduction in route safety is anticipated as a result of this reconfiguration of the route.

10.7.20 Overall, these changes (which have both benefits and disadvantages for these receptor groups) would constitute a very slight reduction in route amenity based on the criteria identified in Vol 2 Appendix 10.2. Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of this change in route amenity would therefore have a negligible significance, and this effect is considered to be **not significant**.

Use of Lee Park Way during Stages 1a, 1b, 1c and 1d

10.7.21 Some construction vehicles trips may be undertaken along Lee Park Way during Stages 1a and 1b. This would be limited to small/light vehicles. During Stages 1c and 1d, Lee Park Way would be used by operational employees and for public access to the RRC. It would also be used by shuttle buses (with a typical capacity of 30 people) transporting construction workers from the Temporary Laydown Area to the main construction site during Stage 1d. It is expected that between 15 and 20 shuttle bus movements would be required to transport all employees onto the main construction site at the start and end of the working day (between 07:00 and 09:00 and 17:00 and 19:00) during Stage 1d. This equates to an average of one bus every six to eight minutes, although the shuttle buses may not be distributed evenly and so more may be expected at the busiest arrival/departure times, with fewer buses at less busy times.

10.7.22 Appropriate measures would be taken to ensure that the use of Lee Park Way by vehicles does not have an adverse effect on the safety of pedestrians, cyclists and equestrians using this route. As well as the safety measures set out in the CoCP (Vol 1 Appendix 3.1), safe crossing points for pedestrians, cyclists and equestrians on Lee Park Way and on the access to the Temporary Laydown Area would be provided.

10.7.23 The presence of vehicles along the route is expected to cause a very slight reduction in route amenity along Lee Park Way but due to the provision of segregated cycle lanes (which can also be used by equestrians) and a footway this would not result in any reduction in route safety.

10.7.24 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of this change in route amenity would therefore have a negligible significance, and this effect is considered to be **not significant**.

Interruption to use of Public Right of Way

10.7.25 Construction trips undertaken between the Temporary Laydown Area and the main construction site would access Lee Park Way directly from the Temporary Laydown Area. However the provision of the Temporary Laydown Area and the access to Lee Park Way from it would interrupt the PRoW that is provided between the River Lee Navigation towpath and Lower Hall Lane. An alternative route would be available via NCN Route 1 or via Walthamstow Avenue and Lee Park Way using the existing footways. The existing route would be reinstated following completion of the construction (Stage 3). Crossing facilities for pedestrians, cyclists and equestrians would also be provided where the cycle route on Lower Hall Lane crosses the access to the Temporary Laydown Area.

10.7.26 The loss of access to the PRoW that connects Lower Hall Lane and the River Lee Navigation towpath would slightly increase severance (i.e. the route would be become less accessible) since it would constitute the loss (albeit temporary) of a crossing of the River Lee in this area. Journey length would also increase very slightly, since the alternative route which is available is 40m longer than the existing route. Based on the criteria identified in Vol 2 Appendix 10.1, this would constitute a very low magnitude adverse effect.

10.7.27 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of this temporary loss of access to the PRoW would therefore have a negligible significance, and this effect is considered to be **not significant**.

Change in traffic flows on local road network

10.7.28 The road network in the vicinity of the Application Site offers a generally poor environment for pedestrians and cyclists and pedestrian and cycle movements in the vicinity of the Application Site are very low. Any equestrian movements on the road network in the vicinity of the Application Site would be expected to be low. The changes in traffic flows as a result of Stage 1 of the Project are expected to be imperceptible to pedestrians, cyclists and equestrians and so the effect on route amenity and safety is considered to be very low. Journey length for pedestrians, cyclists and equestrians on the local road network would be unaffected.

10.7.29 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of changes in traffic flows as a result of Stage 1 of the Project would therefore have a negligible significance, and this effect is considered to be **not significant**.

Vulnerable pedestrian access to public transport

10.7.30 Access to public transport for employees (construction and operation) and visitors who are wheelchair users, people with pushchairs and people with mobility impairments would be via the pedestrian infrastructure and facilities in the vicinity of the Application Site. Apart from the provision of a dedicated footway on Lee Park Way and appropriate crossing facilities on Lee Park Way close to the eastern entrance and where the existing cycle route crosses Lee Park Way close to Advent Way, the pedestrian infrastructure in the vicinity of the Application Site would remain unchanged. The overall length of the route for all pedestrians, including wheelchair users, people with pushchairs and people with mobility impairments would not be significantly different from the existing route when movement around the Application Site is considered. Therefore, the effect on wheelchair users, people with pushchairs and people with mobility impairments is considered to be very low.

10.7.31 Vulnerable pedestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of changes in traffic flows as a result of Stage 1 of the Project would therefore have a negligible significance, and this effect is considered to be **not significant**.

Summary of effects on pedestrians, cyclists and equestrians

10.7.32 Overall, the combined effect of the changes to existing pedestrian, cyclist and equestrian routes during Stage 1 of the Project on pedestrians, cyclists and equestrians is considered to be **not significant**.

Stage 2

Effect on road users

10.7.33 There would be increased vehicle trips on the local road network (391 additional two-way vehicle trips per day) during Stage 2 compared with the existing Edmonton EcoPark (baseline). This daily increase in vehicle trips to the Application Site across a 24-hour period represents an increase in trips to the Application Site of 18 per cent when compared with the existing Edmonton EcoPark.

10.7.34 To ascertain the effect of this increase in vehicle trips on road users, analysis of the effect of the increases on the local roads which would be affected by the increases for the peak hours (07:00-08:00, 11:00-12:00 and 18:00-19:00) has been undertaken, as shown in Vol 2 Table 10.4. Walthamstow Avenue has not been considered as there would be minimal construction activity at the Temporary Laydown Area during this stage of construction.

Vol 2 Table 10.4 Two-way traffic increases during Stage 2

Time	Flow increase	A406 NCR (west of Application Site)		Advent Way (leading to/from Cooks Ferry Roundabout)	
		Baseline flow	Increase (per cent)	Baseline flow	Increase (per cent)
07:00 – 08:00	17	5,578	0.3	587	2.9
11:00 – 12:00	73	4,585	1.6	726	10.1
18:00 – 19:00	-7	5,611	-0.1	835	-0.8
00:00 – 00:00	391	91,034	0.4	9,304	4.2

10.7.35 The largest proportional increase in traffic would be experienced along Advent Way which would experience a flow increase of 10.1 per cent between 11:00 and 12:00. This equates to a low magnitude adverse effect along this road during this time period based on the criteria identified in Vol 2 Appendix 10.1. On the A406, the largest flow increase would also be between 11:00 and 12:00 where traffic flows would increase by 1.6 per cent. Across the local road network as a whole, the changes to traffic flows would constitute a low or very low magnitude adverse effect.

10.7.36 The changes in traffic flows on the road network as a result of Stage 2 of the Project are not expected to have an effect on safety for road users as the changes to the traffic flow as a result of the Project would not materially change the traffic flows on the local highway network.

10.7.37 During Stage 2, parking for construction workers would be provided on the Temporary Laydown Area while parking for operational employees would continue to be provided on the existing Edmonton EcoPark site such that the likelihood of overspill parking occurring is very low. An appropriate level of car parking would be provided and through the Construction and Operational Travel Plans, TMP and CoCP (Vol 1 Appendix 3.1), the provision of parking would be managed to ensure that no overspill parking is anticipated to take place.

10.7.38 Road users have been classified as having a medium level of sensitivity. This low or very low magnitude adverse effect on road users in the vicinity of the Application Site in Stage 2 as a result of changes to traffic flows would therefore have a minor adverse or negligible significance, and this effect is considered to be **not significant**.

Effect on public transport users

10.7.39 The effect on public transport users as road users (e.g. people travelling on buses) of changes to traffic flows on the road network would be similar to the effect on other road users. The effect of changes to traffic flows on the road network on public transport users as pedestrians (for public transport users boarding or alighting in the vicinity of the Application Site) would be similar to the effect on pedestrians (discussed in Paragraphs 10.7.46 to 10.7.48).

10.7.40 During Stage 2, additional trips on public transport services would be undertaken. A total of 369 (two-way) additional employee trips are expected in Stage 2 when both the proposed ERF and the existing EfW facility are running with waste input gradually transferred from the existing EfW facility to the proposed ERF. The total number of trips includes some construction employee trips. Due to the poor public transport accessibility of the Application Site and the shift working patterns that are likely to be in place over 24 hours, it is expected that less than 9 per cent of the trips (i.e. a maximum of 34 two-way staff trips) would be made by public transport. This would account for a passenger increase of less than 10 per cent on each of the services when compared with the theoretical capacity.

10.7.41 This would constitute a very low magnitude adverse effect based on the criteria identified in Vol 2 Appendix 10.1. Public transport users have been classified as having a high level of sensitivity. This very low magnitude adverse effect on public transport users in the vicinity of the Application Site in Stage 2 would have a negligible significance, and this effect is considered to be **not significant**.

Effect on pedestrians, cyclists and equestrians

10.7.42 The effects of the reconfiguration of Lee Park Way, the interruption to the PRoW that is provided between the River Lee Navigation towpath and Lower Hall Lane and the effects on vulnerable pedestrian access to public transport would be as described in the Stage 1 assessment. The other changes to existing pedestrian, cyclist and equestrian routes during Stage 2 are:

a. the use of Lee Park Way by public traffic accessing the RRC and operational employees; and

b. changes in traffic flows on the local road network in the vicinity of the Application Site.

Use of Lee Park Way

10.7.43 During Stage 2, the proposed access on Lee Park Way would be used by public traffic accessing the RRC and operational employees. This is expected to equate to a total of 165 employee trips and 215 public RRC trips per weekday. On a weekend day, the number of RRC trips would be expected to equate to 365. However, the number of employee trips would be significantly lower at the weekend. The presence of vehicles along the route is expected to cause a very slight reduction in route amenity but no reduction in route safety because of the segregation of pedestrians, cyclists and equestrians from vehicles accessing the Application Site along this route. No construction trips would be undertaken during this stage of the Project.

10.7.44 Cycle use along this route is expected to be highest during the weekend daytime, when the route would be most popular for leisure cycling trips. However, as cycle lanes would be provided along Lee Park Way between Advent Way and the entrance to the Application Site, it is expected that there would be no new safety concerns as a result of the Project.

10.7.45 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of the change in route amenity brought about by the presence of vehicles along Lee Park Way would therefore have a negligible significance, and this effect is considered to be **not significant**.

Change in traffic flows on local road network

10.7.46 The road network in the vicinity of the Application Site offers a generally poor environment for pedestrians and cyclists and pedestrian and cycle movements in the vicinity of the Application Site are very low. Any equestrian movements on the road network in the vicinity of the Application Site would be expected to be extremely low. The minor changes in traffic flows as a result of the operation of the ERF, EfW facility and other facilities which are active in Stage 2 are expected to be imperceptible to pedestrians, cyclists and equestrians and so the effect on route amenity and safety is considered to be very low. Journey length for pedestrians, cyclists and equestrians on the local road network would be unaffected.

10.7.47 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of changes in traffic flows as a result of Stage 2 of the Project would therefore have a negligible significance, and this effect is considered to be **not significant**.

Summary of effects on pedestrians, cyclists and equestrians

10.7.48 Overall, the combined effect of the changes to existing pedestrian, cyclist and equestrian routes during Stage 2 of the Project on pedestrians, cyclists and equestrians is considered to be **not significant**.

Stage 3

Effect on road users

10.7.49 There would be increased vehicle trips on the local road network (359 additional two-way vehicle trips per day) during Stage 3 compared with the existing Edmonton EcoPark (baseline). This daily increase in vehicle trips to the Application Site across a 24-hour period represents an increase in trips to the Application Site of 17 per cent when compared with the existing Edmonton EcoPark.

10.7.50 To ascertain the effect of this increase in vehicle trips on road users, analysis of the effect of the increases on the local roads which would be affected by the increases for the largest increases (07:00-08:00, 11:00-12:00 and 18:00-19:00) has been undertaken, as shown in Vol 2 Table 10.5.

Vol 2 Table 10.5 Two-way traffic increases during Stage 3

Time	Flow increase	A406 NCR (west of Application Site)		Advent Way (leading to/from Cooks Ferry Roundabout)		Walthamstow Ave (leading to/from Cooks Ferry Roundabout)	
		Baseline flow	Increase (per cent)	Baseline flow	Increase (per cent)	Baseline flow	Increase (per cent)
07:00 – 08:00	17	5,656	0.3	-	-	694	2.2
11:00 – 12:00	68	4,649	1.5	721	9.4	-	-
18:00 – 19:00	-4	5,689	-0.1	-	-	2,014	-0.2
00:00 – 00:00	359	92,310	0.4	9,434	3.8	33,228	0.4

[1] Increase calculated based on total daily increase less construction employee trips which would travel via Walthamstow Avenue
[2] Increase calculated only using construction employee trips which would travel via Walthamstow Avenue

10.7.51 The largest proportional increase in traffic would be experienced along Advent Way which would experience a flow increase of 9.4 per cent between 11:00 and 12:00. This equates to a very low magnitude adverse effect along this road during this time period based on the criteria identified in Vol 2 Appendix 10.1. On the A406, the largest flow increase would be between 11:00 and 12:00 where traffic flows would increase by 1.5 per cent. Across the local road network as a whole, the changes to traffic flows would constitute a very low magnitude adverse effect.

10.7.52 The changes in traffic flows on the road network as a result of the Stage 3 of the construction of the Project are not expected to affect road user safety.

10.7.53 During Stage 3, parking for construction workers would be provided on the Temporary Laydown Area while parking for operational employees would continue to be provided on the existing Edmonton EcoPark site such that the likelihood of overspill parking occurring is low. An appropriate level of car parking would be provided and through the Construction and Operational Travel Plans, TMP and CoCP (Vol 1 Appendix 3.1), the provision of parking would be managed to avoid overspill parking.

10.7.54 Road users have been classified as having a medium level of sensitivity. This very low magnitude adverse effect on road users in the vicinity of the Application Site in Stage 3 as a result of changes to traffic flows would therefore have a negligible significance, and this effect is considered to be **not significant**.

Effect on public transport users

10.7.55 The effect on public transport users as road users (e.g. people travelling on buses) of changes to traffic flows on the road network would be similar to the effect on other road users. The effect of changes to traffic flows on the road network on public transport users as pedestrians (for public transport users boarding or alighting in the vicinity of the Application Site) would be similar to the effect on pedestrians (discussed in Paragraphs 10.7.62 to 10.7.64).

10.7.56 During Stage 3, additional trips on public transport services would be undertaken. A total of 338 (two-way) additional staff trips, including construction staff, are expected in Stage 3. Due to the poor public transport accessibility of the Application Site and the shift working patterns that are likely to be in place over 24 hours, it is expected that less than 9 per cent of the trips (i.e. a maximum of 30 two-way staff trips) would be made by public transport. This would account for a passenger increase of less than 10 per cent on each of the services when compared with the theoretical capacity.

10.7.57 This would constitute a very low magnitude adverse effect based on the criteria identified in Vol 2 Appendix 10.1. Public transport users have been classified as having a high level of sensitivity. This very low magnitude adverse effect on public transport users in the vicinity of the Application Site in Stage 3 would have a negligible significance, and this effect is considered to be **not significant**.

Effect on pedestrians, cyclists and equestrians

10.7.58 The effects of the reconfiguration of Lee Park Way, the interruption to the PRoW that is provided between the River Lee Navigation towpath and Lower Hall Lane and the effects on vulnerable pedestrian access to public transport would be as described in the Stage 1 assessment. The other changes to existing pedestrian, cyclist and equestrian routes during Stage 3 are:

a. the use of Lee Park Way by public traffic accessing the RRC and operational employees; and

b. changes in traffic flows on the local road network in the vicinity of the Application Site.

Use of Lee Park Way

10.7.59 During Stage 3, the proposed access on Lee Park Way would be used by public traffic accessing the RRC and operational employees. This is expected to equate to a total of 306 employee trips and 215 public RRC trips per weekday. On a weekend day, the number of RRC trips would be expected to equate to 365. However, the number of employee trips would be significantly lower at the weekend. The presence of vehicles along the route is expected to cause a very slight reduction in route amenity but no reduction in route safety because of the segregation of pedestrians, cyclists and equestrians from vehicles accessing the Application Site along this route.

10.7.60 Cycle use along this route is expected to be highest during the weekend daytime, when the route would be most popular for leisure cycling trips. However, as cycle lanes would be provided along Lee Park Way between Advent Way and the entrance to the Application Site, it is expected that there would be no new safety concerns as a result of the Project.

10.7.61 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of the change in route amenity brought about by the presence of vehicles along Lee Park Way would therefore have a negligible significance, and this effect is considered to be **not significant**.

Changes in traffic flows on local road network

10.7.62 The road network in the vicinity of the Application Site offers a generally poor environment for pedestrians and cyclists and pedestrian and cycle movements in the vicinity of the Application Site are very low. Any equestrian movements on the road network in the vicinity of the Application Site would be expected to be extremely low. The minor changes in traffic flows as a result of the operation of the Project and construction activity during Stage 3 are expected to be imperceptible to pedestrians, cyclists and equestrians and so the effect on route amenity and safety is considered to be very low. Journey length for pedestrians, cyclists and equestrians on the local road network would be unaffected.

10.7.63 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of changes in traffic flows as a result of Stage 3 of the Project would therefore have a negligible significance, and this effect is considered to be **not significant**.

Summary of effects on pedestrians, cyclists and equestrians

10.7.64 Overall, the combined effect of the changes to existing pedestrian, cyclist and equestrian routes during Stage 3 of the Project on pedestrians, cyclists and equestrians is considered to be **not significant**.

Stage 4

Effect on road users

10.7.65 There would be increased vehicle trips on the local road network (175 additional two-way vehicle trips per day) for the Project compared with the existing Edmonton EcoPark. This daily increase in vehicle trips to the Project across a 24 hour period represents an increase in trips to the Application Site of 8 per cent when compared with the existing Edmonton EcoPark. The increase in trips is predominantly associated with an increase in activity at the RRC when compared with the existing operations on the Application Site.

10.7.66 To ascertain the effect of this increase in vehicle trips on road users, analysis of the effect of the increases on the local roads which would be affected by the increases for the AM and PM peak hours (08:00-09:00 and

17:00-18:00) and the weekday time period with the highest increase in vehicle trips (11:00-12:00) has been undertaken, as shown in Vol 2 Table 10.6.

Vol 2 Table 10.6 Two-way traffic increases during Stage 4

Time	Flow increase	A406 NCR		Advent Way (leading to/from Cooks Ferry Roundabout)	
		Baseline flow	Increase (per cent)	Baseline flow	Increase (per cent)
08:00 – 09:00	23	5,656	0.4	595	3.9
11:00 – 12:00	52	5,523	0.9	736	7.1
17:00 – 18:00	-12	6,216	-0.2	846	-1.4
00:00 – 00:00	175	92,310	0.2	9,434	1.9

10.7.67 The maximum increase in traffic flow would occur on Advent Way between 11:00 and 12:00, when traffic flows would be expected to increase by 7.1 per cent. This equates to a very low magnitude adverse effect along this road during this time period based on the criteria identified in Vol 2 Appendix 10.1. Across the local road network as a whole, the changes to traffic flows would constitute a very low magnitude adverse effect.

10.7.68 The changes in traffic flows on the road network as a result of Stage 4 of the Project are not expected to affect road user safety.

10.7.69 During Stage 4, parking for operational employees would be provided on the Application Site such that the likelihood of overspill parking occurring is very low. An appropriate level of car parking would be provided and through the Operational Travel Plan, the provision of parking would be managed to ensure that no overspill parking is anticipated to take place.

10.7.70 Road users have been classified as having a medium level of sensitivity. This very low magnitude adverse effect on road users in the vicinity of the Application Site in Stage 4 as a result of changes to traffic flows would therefore have a negligible significance, and this effect is considered to be **not significant**.

Effect on public transport users

10.7.71 The effect on public transport users of changes to traffic flows on the road network would be similar to the effect on other road users. The effect of changes to traffic flows on the road network on public transport users as pedestrians (for public transport users boarding or alighting in the vicinity of the Application Site) would be similar to the effect on pedestrians (discussed in Paragraphs 10.7.78 to 10.7.80).

10.7.72 Additional trips on public transport services that would be generated during Stage 4 of the Project would have an effect on public transport users and operators. A total of 306 (two-way) staff trips are expected in Stage 4 when the Project is fully operational. Due to the poor public transport accessibility of the Application Site and the shift working patterns that would be in place over 24 hours, approximately 9 per cent of trips (i.e. a maximum of 28 two-way staff trips) are expected to be made by public transport (see Section 5 of the TA for further details). This would account for a passenger increase of less than 10 per cent on each of the services when compared with the theoretical capacity.

10.7.73 This would constitute a very low magnitude adverse effect based on the criteria identified in Vol 2 Appendix 10.1. Public transport users have been classified as having a high level of sensitivity. This very low magnitude adverse effect on public transport users in the vicinity of the Application Site in Stage 4 would have a negligible significance, and this effect is considered to be **not significant**.

Effect on pedestrians, cyclists and equestrians

10.7.74 The effects of the reconfiguration of Lee Park Way, the interruption to the PRoW that is provided between the River Lee Navigation towpath and Lower Hall Lane and the effects on vulnerable pedestrian access to public transport would be as described in the Stage 1 assessment. The other changes to existing pedestrian, cyclist and equestrian routes during Stage 4 are:

a. the use of Lee Park Way by public traffic accessing the RRC and operational employees; and

b. changes in traffic flows on the local road network in the vicinity of the Application Site.

Use of Lee Park Way

10.7.75 During Stage 4, the proposed access on Lee Park Way would be used by public traffic accessing the RRC and operational employees. This is expected to equate to a total of 306 employee trips and 215 public RRC trips per weekday. On a weekend day, the number of RRC trips would be expected to equate to 365. However, the number of employee trips would be significantly lower at the weekend. The presence of vehicles along the route is expected to cause a very slight reduction in route amenity but no reduction in route safety because of the segregation of pedestrians, cyclists and equestrians from vehicles accessing the Application Site along this route.

10.7.76 Cycle use along this route is expected to be highest during the weekend daytime, when the route would be most popular for leisure cycling trips. However, as cycle lanes would be provided along Lee Park Way between Advent Way and the entrance to the Application Site, it is expected that there would be no new safety concerns as a result of the Project.

10.7.77 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of the change in route amenity brought about by the presence of vehicles along Lee Park Way would therefore have a negligible significance, and this effect is considered to be **not significant**.

Change in traffic flows on local road network

10.7.78 The road network in the vicinity of the Application Site offers a generally poor environment for pedestrians and cyclists and pedestrian and cycle movements in the vicinity of the Application Site are very low. Any equestrian movements on the road network in the vicinity of the Application Site would be expected to be extremely low. The minor changes in traffic flows as a result of Stage 4 of the Project are expected to be imperceptible to pedestrians, cyclists and equestrians and so the effect on route amenity and safety is considered to be very low. Journey length for pedestrians, cyclists and equestrians on the local road network would be unaffected.

10.7.79 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of changes in traffic flows as a result of Stage 4 of the Project would therefore have a negligible significance, and this effect is considered to be **not significant**.

Summary of effects on pedestrians, cyclists and equestrians

10.7.80 Overall, the combined effect of the changes to existing pedestrian, cyclist and equestrian routes during Stage 4 of the Project on pedestrians, cyclists and equestrians is considered to be **not significant**.

10.8 Assessment – decommissioning of the Project

10.8.1 The effects of decommissioning would be comparable to and no worse than the effects assessed for Stage 3 (operation of ERF, RRF and EcoPark House, demolition of EfW facility) of the Project. The effects identified in the assessment of Stage 3 were as follows:

a. increased vehicle trips on the local road network, with the largest flow increase along Advent Way between 11:00 and 12:00 (10.5 per cent) constituting a low magnitude adverse effect. The overall effect on road users would be **not significant** due to effects being either low or very low and road users being a medium sensitivity receptor.

b. additional trips on public transport services which would have a very low adverse effect on public transport users which would be **not significant**. This is due to the effect having a negligible significance because it would constitute a very low adverse effect (additional trips taking up less than 10 per cent of theoretical public transport capacity).

c. vehicle trips along Lee Park Way and additional vehicle trips on the local road network as well as changes to Lee Park Way and the PRoW between the River Lee Navigation towpath and Lower Hall Lane and the effects on vulnerable pedestrian access to public transport. The overall effect on pedestrians, cyclists and equestrians would be **not significant** despite these receptor groups having a high sensitivity, due to the effect of these changes being very low.

10.9 Supplementary mitigation

10.9.1 Taking account of the plans to be developed to minimise any adverse transport impacts of the Project (e.g. Construction and Operational Travel Plans), there are no significant adverse effects and therefore no mitigation measures are required with respect to effects from construction/operation/ decommissioning of the Project on transport.

10.10 Residual effects

10.10.1 As no mitigation measures are proposed, the residual construction/operational/decommissioning effects remain as described in Section 10.7 and 10.8. All residual effects are presented in Section 10.13.

10.11 Sensitivity test for programme delay

10.11.1 For the assessment of transport effects, a change to the programme of plus or minus 12 months would not be likely to materially change the assessment findings reported in Section 10.10. This is because the future year traffic flow growth factors (derived from TEMPRO) which are used in determining the future baseline change only marginally year on year, by less than 1 per cent per annum. This change would only result in very slight increases or decreases in the future baseline traffic flows and as such, it would not affect the conclusions of the assessment or change the significance of effects.

10.11.2 Based on the Cumulative Development Schedule (Vol 1 Appendix 5.2), there would be no new receptors requiring assessment as a result of the programme change.

10.11.3 This is because there are no developments identified on the Cumulative Development Schedule (Vol 1 Appendix 5.2) that would fall into the future baseline as a result of the programme change and therefore the future baseline would remain as described in Section 10.5.

10.12 Cumulative effects

Construction and operation

10.12.1 The cumulative effects during the construction and operation of the Project have been considered. This includes all other nearby developments that would generate additional trips on the local transport network including;

a. 1 and 2 Derby Road;

b. Pegamoid Works;

c. Kedco Waste Wood Biomass Plant;

d. 1A Towpath Road;

e. FR Shadbolt & Sons;

f. Pumping Station House; and

g. Meridian Water Masterplan.

10.12.2 Other developments, such as the North London (Electricity Line) Reinforcement which will not generate any operational traffic and for which construction will be completed prior to commencement of the Project have not been considered as part of the assessment.

10.12.3 In addition, the TAs prepared for the schemes at 2, 3A and 3B Stonehill Estate, Stonehill Estate and The Triangle Site (Stonehill Estate) indicate that there would either be no net increase or a net decrease in traffic generation when completed. Therefore, these schemes have not been considered as part of the cumulative assessment to provide a busiest case assessment.

10.12.4 A summary of cumulative effects is provided below.

Stage 1

Effect on road users

10.12.5 The cumulative effect of the increase in vehicle trips on road users is shown in Vol 2 Table 10.7. The future baseline flow includes the traffic flows generated by the cumulative development as well as background traffic growth.

10.12.6 When the cumulative developments are included in the future baseline traffic flows, the maximum increase in traffic flow as result of the Project would occur on Walthamstow Avenue between 07:00 and 08:00, when traffic flows would be expected to increase by 13.6 per cent and on Advent Way between 11:00 and 12:00, when traffic flows would be expected to increase by 14.1 per cent. This equates to a medium magnitude adverse effect along this road during this time period based on the criteria identified in Vol 2 Appendix 10.1. However, across the local road network as a whole, the changes to traffic flows would constitute a low or very low magnitude adverse effect.

10.12.7 The changes in traffic flows on the road network as a result of Stage 1d of the Project combined with the cumulative effect of other developments are not expected to affect road user safety.

Vol 2 Table 10.7 Effects of cumulative developments during Stage 1d

Time	Flow increase	A406 NCR (west of Application Site)		Advent Way		Walthamstow Ave	
		Baseline flow	Increase (per cent)	Baseline flow	Increase (per cent)	Baseline flow	Increase (per cent)
07:00 – 08:00	245	6,973	3.5	-	-	1,801	13.6
11:00 – 12:00	95	4,718	2.0	676	14.1	-	-
18:00 – 19:00	221	5,668	3.9	-	-	2,854	7.7
00:00 – 00:00	1,176	92,294	1.3	9,520	6.5[1]	35,602	1.6[2]

[1] Increase calculated based on total daily increase less construction employee trips which would travel via Walthamstow Avenue

[2] Increase calculated only using construction employee trips which would travel via Walthamstow Avenue

10.12.8 As well as the provision of parking for construction and operational employees on the Application Site, it is assumed that all other developments that are being considered would provide an appropriate, policy compliant level of parking. As such, the likelihood of overspill parking occurring is low.

10.12.9 Road users have been classified as having a medium level of sensitivity. This low or very low magnitude adverse effect on road users in the vicinity of the Application Site as a result of cumulative changes to traffic flows from Stage 1d of the Project with other schemes would therefore have a minor or negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

Effect on public transport users

10.12.10 The effect on public transport users of changes to traffic flows on the road network would be similar to the effect on other road users. The effect of changes to traffic flows on the road network on public transport users as pedestrians (for public transport users boarding or alighting in the vicinity of the Application Site) would be similar to the effect on pedestrians (discussed in Paragraph 10.12.14).

10.12.11 Combined with the other developments being considered in the cumulative effect assessment and distributed across the London Underground, National Rail and London Bus services available, the additional trips undertaken by employees of the Project would equate to a small number of extra passengers per service. This would account for an increase in passenger numbers of less than 10 per cent on each of the services when compared with the theoretical capacity.

10.12.12 This would constitute a very low magnitude adverse effect based on the criteria identified in Vol 2 Appendix 10.1. Public transport users have been classified as having a high level of sensitivity. This very low magnitude adverse effect on public transport users in the vicinity of the Application Site in Stage 1 would have a negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

Effect on pedestrians, cyclists and equestrians

10.12.13 The effect of Stage 1 of the scheme on pedestrians, including wheelchair users, people with pushchairs and those with mobility impairments, cyclists and equestrians would be as set out in Section 9.7. The effect of the cumulative developments on pedestrians, cyclists and equestrians would consist of changes to traffic flows on the road network.

10.12.14 The minor changes in traffic flows as a result of Stage 1 of the Project combined with changes in traffic flows as a result of cumulative developments are expected to be imperceptible to pedestrians, cyclists and equestrians and so the effect on route amenity and safety is considered to be very low. Journey length for pedestrians, cyclists and equestrians on the local road network would be unaffected.

10.12.15 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of changes in traffic flows as a result of Stage 1 of the Project would therefore have a negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

Stage 2

Effect on road users

10.12.16 The cumulative effect of the increase in vehicle trips on road users is shown in Vol 2 Table 10.8. The future baseline flow includes the traffic flows generated by the cumulative developments as well as background traffic growth.

Vol 2 Table 10.8 Effects of cumulative schemes during Stage 2

Time	Flow increase	A406 NCR (west of Application Site)		Advent Way (leading to/from Cooks Ferry Roundabout)	
		Baseline flow	Increase (per cent)	Baseline flow	Increase (per cent)
07:00 – 08:00	17	6,973	-0.2	431	3.9
11:00 – 12:00	73	4,718	1.5	681	10.7
18:00 – 19:00	-7	5,668	-1.2	858	-0.8
00:00 – 00:00	391	92,956	0.4	9,587	4.1

10.12.17 The maximum increase in traffic flow would occur on Advent Way, when traffic flows would be expected to increase by 10.7 per cent between 11:00 and 12:00. This equates to a low magnitude adverse effect along this road during this time period based on the criteria identified in Vol 2 Appendix 10.1. In addition, across the local road network as a whole, the changes to traffic flows would constitute a very low magnitude adverse effect.

10.12.18 The cumulative changes in traffic flows on the road network as a result of Stage 2 of the Project combined with other developments are not expected to affect road user safety.

10.12.19 As well as the provision of parking for construction and operational employees on the Application Site, it is assumed that all other developments that are being considered would provide an appropriate, policy compliant level of parking. As such, the likelihood of overspill parking occurring is low.

10.12.20 Road users have been classified as having a medium level of sensitivity. This very low or low magnitude adverse effect on road users in the vicinity of the Application Site as a result of cumulative changes to traffic flows from Stage 2 of the Project and other developments would therefore have a negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

Effect on public transport users

10.12.21 The effect on public transport users of changes to traffic flows on the road network would be similar to the effect on other road users. The effect of changes to traffic flows on the road network on public transport users as pedestrians (for public transport users boarding or alighting in the vicinity of the Application Site) would be similar to the effect on pedestrians (discussed in Paragraph 10.12.25).

10.12.22 Combined with the other developments being considered in the cumulative effect assessment and distributed across the London Underground, National Rail and London Bus services available, the additional trips undertaken by employees of the Project would equate to a small number of extra passengers per service. This would account for an increase in passenger numbers of less than 10 per cent on each of the services when compared with the theoretical capacity.

10.12.23 This would constitute a very low magnitude adverse effect based on the criteria identified in Vol 2 Appendix 10.1. Public transport users have been classified as having a high level of sensitivity. This very low magnitude adverse effect on public transport users in the vicinity of the Application Site in Stage 2 would have a negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

Effect on pedestrians, cyclists and equestrians

10.12.24 The effect of Stage 2 of the scheme on pedestrians including wheelchair users, people with pushchairs and those with mobility impairments, cyclists and equestrians would be as set out above. The effect of the cumulative developments on pedestrians, cyclists and equestrians would consist of changes to traffic flows on the road network.

10.12.25 The minor changes in traffic flows as a result of Stage 2 of the Project combined with changes in traffic flows as a result of cumulative developments are expected to be imperceptible to pedestrians, cyclists and equestrians and so the effect on route amenity and safety is considered to be very low. Journey length for pedestrians, cyclists and equestrians on the local road network would be unaffected.

10.12.26 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of changes in traffic flows as a result of Stage 2 of the Project would therefore have a negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

Stage 3

Effect on road users

10.12.27 The cumulative effect of the increase in vehicle trips on road users is shown in Vol 2 Table 10.9. The future baseline flow includes the traffic flows generated by the cumulative developments as well as background traffic growth.

Vol 2 Table 10.9 Two-way traffic increases during Stage 3

Time	Flow increase	A406 NCR (west of Application Site)		Advent Way (leading to/from Cooks Ferry Roundabout)		Walthamstow Ave (leading to/from Cooks Ferry Roundabout)	
		Baseline flow	Increase (per cent)	Baseline flow	Increase (per cent)	Baseline flow	Increase (per cent)
07:00 – 08:00	17	7,120	0.2	-	-	1,835	0.9
11:00 – 12:00	68	4,816	1.4	690	9.8	-	-
18:00 – 19:00	-4	5,787	-0.1	-	-	2,912	-0.1
00:00 – 00:00	359	94,235	0.4	9,718	1.8	36,300	0.5

10.12.28 The maximum increase in traffic flow would occur on Advent Way during the inter-peak hour, when traffic flows would be expected to increase by 9.8 per cent. This equates to a very low magnitude adverse effect along this road during this time period based on the criteria identified in Vol 2 Appendix 10.1. In addition, across the local road network as a whole, the changes to traffic flows would constitute a very low magnitude adverse effect.

10.12.29 The cumulative changes in traffic flows on the road network as a result of Stage 3 of the Project combined with other projects are not expected to affect road user safety.

10.12.30 As well as the provision of parking for construction and operational employees on the Application Site, it is assumed that all other developments that are being considered would provide an appropriate, policy compliant level of parking. As such, the likelihood of overspill parking occurring is low.

10.12.31 Road users have been classified as having a medium level of sensitivity. This very low or low magnitude adverse effect on road users in the vicinity of the Application Site as a result of cumulative changes to traffic flows from Stage 3 of the Project and other developments would therefore have a negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

Effect on public transport users

10.12.32 The effect on public transport users of changes to traffic flows on the road network would be similar to the effect on other road users. The effect of changes to traffic flows on the road network on public transport users as pedestrians (for public transport users boarding or alighting in the vicinity of the Application Site) would be similar to the effect on pedestrians (discussed in Paragraph 10.12.36).

10.12.33 Combined with the other developments being considered in the cumulative effect assessment and distributed across the London Underground, National Rail and London Bus services available, the additional trips undertaken by employees of the Project would equate to a small number of extra passengers per service. This would account for an increase in passenger numbers of less than 10 per cent on each of the services when compared with the theoretical capacity.

10.12.34 This would constitute a very low magnitude adverse effect based on the criteria identified in Vol 2 Appendix 10.1. Public transport users have been classified as having a high level of sensitivity. This very low magnitude adverse effect on public transport users in the vicinity of the Application Site in Stage 3 would have a negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

Effect on pedestrians, cyclists and equestrians

10.12.35 The effect of Stage 3 of the Project on pedestrians, including wheelchair users, people with pushchairs and those with mobility impairments, cyclists and equestrians would be as set out above. The effect of the cumulative developments on pedestrians, cyclists and equestrians would consist of changes to traffic flows on the road network.

10.12.36 The minor changes in traffic flows as a result of Stage 3 of the Project combined with changes in traffic flows as a result of cumulative developments are expected to be imperceptible to pedestrians, cyclists and equestrians and so the effect on route amenity and safety is considered to be very low. Journey length for pedestrians, cyclists and equestrians on the local road network would be unaffected.

10.12.37 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of changes in traffic flows as a result of Stage 3 of the Project would therefore have a negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

Stage 4

Effect on road users

10.12.38 The cumulative effect of the increase in vehicle trips on road users is shown in Vol 2 Table 10.10. The future baseline flow includes the traffic flows generated by the cumulative schemes as well as background traffic growth.

Vol 2 Table 10.10 Two-way traffic increases during Stage 4

Time	Flow increase	A406 NCR		Advent Way (leading to/from Cooks Ferry Roundabout)	
		Baseline flow	Increase (per cent)	Baseline flow	Increase (per cent)
08:00 – 09:00	23	7,160	0.3	440	5.2
11:00 – 12:00	52	4,843	1.1	694	7.5

Time	Flow increase	A406 NCR		Advent Way (leading to/from Cooks Ferry Roundabout)	
		Baseline flow	Increase (per cent)	Baseline flow	Increase (per cent)
17:00 – 18:00	-12	5,820	-0.2	875	-1.4
00:00 – 00:00	175	94,772	0.2	9,772	1.7

10.12.39 The maximum increase in traffic flow would occur on Advent Way, when traffic flows would be expected to increase by 7.5 per cent during the inter-peak hour. This equates to a very low magnitude adverse effect along this road during this time period based on the criteria identified in Vol 2 Appendix 10.1. Additionally, across the local road network as a whole, the changes to traffic flows would constitute a very low magnitude adverse effect.

10.12.40 The cumulative changes in traffic flows on the road network as a result of Stage 4 of the Project combined with the effect of other developments are not expected to affect road user safety.

10.12.41 As well as the provision of parking for construction and operational employees on the Application Site, it is assumed that all other developments that are being considered would provide an appropriate, policy compliant level of parking. As such, the likelihood of overspill parking occurring is low.

10.12.42 Road users have been classified as having a medium level of sensitivity. This very low or low magnitude adverse effect on road users in the vicinity of the Application Site as a result of cumulative changes to traffic flows from Stage 4 of the Project and the other developments would therefore have a negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

Effect on public transport users

10.12.43 The effect on public transport users of changes to traffic flows on the road network would be similar to the effect on other road users. The effect of changes to traffic flows on the road network on public transport users as pedestrians (for public transport users boarding or alighting in the vicinity of the Application Site) would be similar to the effect on pedestrians (discussed in Paragraph 10.12.47).

10.12.44 Combined with the other developments being considered in the cumulative effect assessment and distributed across the London Underground, National Rail and London Bus services available, the additional trips undertaken by employees of the Project would equate to a small number of extra passengers per service. This would account for an increase in passenger numbers of less than 10 per cent on each of the services when compared with the theoretical capacity.

10.12.45 This would constitute a very low magnitude adverse effect based on the criteria identified in Vol 2 Appendix 10.1. Public transport users have been classified as having a high level of sensitivity. This very low magnitude adverse effect on public transport users in the vicinity of the Application Site in Stage 4 would have a negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

Effect on pedestrians, cyclists and equestrians

10.12.46 The effect of Stage 4 of the Project on pedestrians, including wheelchair users, people with pushchairs and those with mobility impairments, cyclists and equestrians would be as set out above. The effect of the cumulative developments on pedestrians, cyclists and equestrians would consist of changes to traffic flows on the road network.

10.12.47 The minor changes in traffic flows as a result of Stage 4 of the Project combined with changes in traffic flows as a result of other developments are expected to be imperceptible to pedestrians, cyclists and equestrians and so the effect on route amenity and safety is considered to be very low. Journey length for pedestrians, cyclists and equestrians on the local road network would be unaffected.

10.12.48 Pedestrians, cyclists and equestrians have been classified as having a high level of sensitivity. This very low magnitude adverse effect on these receptors as a result of changes in traffic flows as a result of Stage 4 of the Project would therefore have a negligible significance, and this effect is considered to be **not significant**. This is unchanged from the core assessment findings presented in Section 10.7 above.

10.13 Assessment summary

Construction and operation

Vol 2 Table 10.11: Assessment summary – construction and operation

Transport			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stages 1-4			
Road users	The effect of increased vehicle trips on the local road network in the vicinity of the Application Site would be **not significant**.	None required	Effect unchanged. **Not significant.**
Public transport users	The effect of increased passenger numbers on public transport services would be **not significant**.	None required	Effect unchanged. **Not significant.**
Reconfiguration of Lee Park Way	The reconfiguration would narrow the available route width but would include segregated footways and cycle lanes, new surfacing and safe vehicle crossing points. A safe route during construction would also be provided, therefore the effects on pedestrians, cyclists and equestrians would be **not significant**.	None required	Effects unchanged. **Not significant.**
Use of Lee Park Way	With the implementation of CoCP measures and the safe crossing points, the presence of vehicles along the route would not impact route safety but would cause a very slight reduction in route amenity, therefore the effects on pedestrians, cyclists and equestrians would be **not significant**.	None required	Effects unchanged. **Not significant.**
Temporary Laydown Area and the access to Lee Park Way	The loss of access to the PRoW that connects Lower Hall Lane and the River Lee Navigation towpath would have an	None required	Effect unchanged. **Not significant.**

Transport			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
	alternative route which is 40m longer than the existing route, therefore the effects on pedestrians, cyclists and equestrians would be **not significant**.		
Additional vehicles on the road network in the vicinity of the Application Site.	Due to the existing high volumes of traffic, the effect of additional vehicles on pedestrians, cyclists and equestrians would be **not significant**.	None required	Effect unchanged. **Not significant.**
Vulnerable pedestrian access to public transport	When moving around the Application Site, the overall length of the route for all pedestrians would not be significantly different from the existing route, therefore the effect would be **not significant**.	None required	Effect unchanged. **Not significant.**

Decommissioning of the Project

The effects of decommissioning would be comparable to and no worse than those assessed for Stage 3 (operation of ERF, RRF and EcoPark House, demolition of EfW facility) of the Project. Vol 2 Table 10.11 includes an assessment summary for Stage 3.

11 Water Resources and Flood Risk

11.1 Introduction

11.1.1 This section describes the likely significant effects of the Project on water resources and flood risk. Interactions between the Project and the water environment can lead to changes in potential for flooding, both on the Application Site and on neighbouring land, which must also be considered.

11.1.2 This section should be read with reference to the Project description in Vol 1 Section 3. Following a description of the overall existing and future baseline conditions within the Application Site and surrounding area, this section summarises the assessment methodology that has been adopted (see also Vol 2 Appendix 11.1). Potential receptors considered include surface waters, underlying aquifers, local abstractions and discharges, regional water resources and downstream designated sites, people and infrastructure. An assessment of the likely significant effects of the Project design on these receptors is then presented.

11.1.3 This section includes a summary of the findings of the Hydrogeological Risk Assessment, included in Vol 2 Appendix 7.2, which has reviewed and summarised the Phase One Desk Study, as well as site investigations and previous assessments undertaken at the Edmonton EcoPark. A summary is also provided of the findings of the Flood Risk Assessment (FRA) (see Vol 2 Appendix 11.2) which gives full consideration to flood risk posed by the Project and an preliminary sustainable drainage strategy (SuDS) for the Application Site.

11.1.4 Construction and operational effects for foul drainage at the Application Site have been scoped out on the basis that the design of any new foul drainage on-site would be in accordance with EA requirements for developments within an inner groundwater SPZ, known as SPZ1 (i.e. highest specification pipework and designs for projects involving new sewerage systems). No significant effects are therefore considered likely.

11.1.5 The works plans (based on which the water resources and flood risk assessment has been undertaken) are contained in the Book of Plans (AD02.01) which forms part of the DCO Application documents. Figures associated with the water resources and flood risk assessment are contained in the Appendix – Figures volume of the ES.

11.2 Engagement

11.2.1 Engagement with stakeholders commenced during the initial site investigation stages of this Project, which began in 2011 and is ongoing.

11.2.2 A Scoping Opinion[1] was received from the Secretary of State in November 2014 which included comments relevant to water resources and flood risk from the EA and the GLA. As a consequence of the Scoping Opinion effects on water resources as a result of water demand at the Application Site, including effects from abstractions and discharges at the Application Site, and pathways for pollution of groundwater from surface-based activities, were scoped back in to the assessment. The FRA was also scoped in to the assessment, as was consideration of the effects of the different options for process water demand.

11.2.3 Engagement was undertaken with the EA to ascertain their requirements for the FRA. At a meeting in February 2015 with the EA it was confirmed that upgrades to crossings of Enfield Ditch, and the proposed crossing of Enfield Ditch would be considered in the FRA.

11.2.4 LB Enfield was contacted with regard to the FRA and further discussions were held in June 2015 to discuss the developing drainage strategy. The drainage strategy forms an appendix to the FRA (Vol 2 Appendix 11.2). The final level of attenuation of drainage volumes and rates will reflect the outcome of this ongoing consultation.

11.2.5 Rainwater harvesting has been incorporated in the design, in line with the scoping response from GLA, and with the London Plan policy 5.13.

11.2.6 Phase Two Consultation responses included comments relevant to water resources and flood risk. These comments are addressed within the updated FRA, preliminary drainage strategy and Vol 2 Appendix 11.1.

11.2.7 A full record of all comments received from stakeholders and responses to the comments is provided in Vol 2 Appendix 11.1.

11.3 Methodology

11.3.1 This section provides an overview of the methodology for assessing the likely significant effects of the Project on water resources and flood risk. Full details of the topic methodology are provided in Vol 2 Appendix 11.1.

Construction and operation

11.3.2 The approach to the assessment of the effects on water resources and flood risk has been the same for both construction and operation.

11.3.3 The key aspects to identifying likely significant effects are:

a. understanding the physical characteristics of the Application Site in terms of climate, geology, soils, land use and hydrology;

b. determining how and where water flows through the system both on the surface and in the subsurface;

c. locating water supply installations or water dependent features (e.g. designated sites) and understanding their relationship with their hydrological catchments;

d. understanding how local private and public water supplies are utilised;

e. considering how the hydrological environment may change in the future (other than as a result of the Project) – the future baseline; and

f. integrating this understanding into an assessment of the likely overall sensitivity of the various component parts of the hydrological environment to the Project.

11.3.4 Once these are known, the significance of effects can be identified. The significance of an effect is considered by reference to:

a. the type of effect, i.e. whether it is adverse, beneficial, temporary, permanent, long-term or short-term etc.;

b. the importance or value of the resource or receptor under consideration, in a geographical context and based on designations: international, national, regional, or local; and

c. the magnitude of the effect in relation to the resource that has been evaluated, quantified if possible, but if that is not possible, then using the scale high, medium, or low. Where magnitude is considered to be negligible, no perceivable impact to quantity or quality of the water environment in either or both the short- and long-term would result from the activities.

11.3.5 These are described further in Vol 2 Appendix 11.1.

11.3.6 Magnitude and sensitivity of a receptor have been combined to determine the significance of an impact on the receptor.

Decommissioning

11.3.7 The approach used for undertaking the assessment of decommissioning of the Project is qualitative and based on a number of assumptions. Any available information on possible future site development has been considered. It has been assumed that the same embedded design requirements and guidelines would be in place as are used for the Project. Indications have been given of the approach that is likely to be undertaken and an assessment is made of any likely significant effects that would arise.

11.4 Assumptions and limitations

Assumptions

11.4.1 A number of assumptions have been made in completing this assessment:

a. during Stage 2 the ERF and EfW facility would operate in parallel. Assuming that the waste throughput would not change from existing operations then a worst-case assumption has been made that the greatest water demand corresponds to 100 per cent use of the proposed ERF.

b. it has been assumed that there would be no variation to any existing licences relating to the discharge of waters to the Chingford Sewer.

c. waste water from the thermal processes, washing operations, potable and non-potable water demand all would discharge to Chingford Sewer while discharges from site drainage, tanker spills and firefighting would be discharged to Enfield Ditch through construction and operation.

d. it is assumed that Thames Water Utilities Ltd (TWUL) has included the development at Meridian Water (Paragraph 11.5.59), and other developments, in their Water Resource Management Plan.

e. an average effluent discharge of 237 megalitres per day (Ml/d) is assumed from Deephams STW. This is based on a current average flow of 219Ml/d, and an estimated increase of 18Ml/d by March 2017.

Limitations

11.4.2 In the course of undertaking this assessment, one limitation to the assessment process was encountered in that there is no information available on rates of current surface water discharge to Enfield Ditch from the Application Site. However this has not affected the surface water drainage assessment, since run-off to Enfield Ditch is to be limited to greenfield rates.

11.5 Baseline

11.5.1 This section sets out the baseline conditions for water resources and flood risk in and around the Application Site. Future baseline conditions are also described.

11.5.2 A summary of the investigative work undertaken and data sources used in the preparation of this baseline is provided in Vol 2 Appendix 11.1.

Current baseline

Topography

11.5.3 Elevations at Edmonton EcoPark range from around 10.0m AOD to 13.5m AOD, with some isolated areas at higher levels than this. Levels are highest across the northern part of the Application Site and at the landscaped area in the north-east where an artificial pond is located. Levels fall generally from north towards the south part of the Application Site. There is a high point in the south part of the Application Site at the grass landscaped area, where levels are in the range 11m AOD to 13m AOD. Low points are located in the north-west of the Application Site adjacent to the effluent treatment plant.

Hydrology and water features

11.5.4 There are a number of watercourses that flow along the eastern, western and southern boundaries of the Application Site (Vol 2 Figure 11.1).

11.5.5 The River Lee Navigation, a canalised river, flows through the LVRP immediately to the east of the Edmonton EcoPark. It flows south from Hertfordshire into London, running parallel with and to the west of William Girling Reservoir. The River Lee (also known as the Lee New Cut) flows south, parallel to the Lee Navigation, to the west of William Girling Reservoir. An eastern flood relief channel runs to the east of the Reservoir, then flows into the River Lee (Lee New Cut) which continues in a southerly direction, south of the Application Site.

11.5.6 Enfield Ditch, a main river, runs partly within and partly outside the eastern boundary of the Edmonton EcoPark, running parallel with the River Lee Navigation and along the southern boundary of the Application Site, discharging to Salmon’s Brook near the A406 North Circular Road. The Hydrogeological Risk Assessment (Vol 2 Appendix 7.2) identifies that Enfield Ditch is ephemeral and is often dry or with little flow suggesting that it does not receive significant inflows from groundwater.

11.5.7 Salmon's Brook is located immediately west of the Edmonton EcoPark, flowing in an easterly direction, and then south along the western Application Site boundary. It flows into Pymmes Brook south of the Application Site and the A406 North Circular. The Deephams STW outflow channel flows into Salmon's Brook immediately north of the Application Site.

11.5.8 Mean flow at Salmon's Brook upstream of the Deephams STW confluence north of the Application Site, taken from the National River Flow Archive[92] is given as 0.253 cubic metres per second (m^3/s). Median flow from Deephams STW upstream of the Application Site, was measured as 219Ml/d (equivalent to $2.54m^3/s$).

11.5.9 In addition a number of other water features are located near the Application Site. Approximately 300m north-east of the Application Site is the William Girling Reservoir. Banbury Reservoir is located approximately 600m to the south-east of the Application Site. William Girling Reservoir and Banbury Reservoir are unlikely to be in hydraulic connectivity with Application Site groundwater due to their distance and the likely presence of low permeability liners in the reservoirs.

11.5.10 The River Lee is located to the east of William Girling Reservoir, and flows south in a number of channels before joining the River Lee Navigation in Stratford, approximately 10km south of the Edmonton EcoPark.

11.5.11 Vol 2 Figure 11.1 summarises the Application Site hydrology.

11.5.12 Within the Application Site there is a plastic-lined ornamental pond in the eastern landscaped area. There is no drainage or hydraulic connectivity to this pond.

Geology and hydrogeology

11.5.13 The geology of the Edmonton EcoPark is described in detail within the Hydrogeological Risk Assessment (Vol 2 Appendix 7.2). In summary the site investigation has confirmed the geological sequence across the Edmonton EcoPark as follows. A layer of Made Ground was encountered across the Edmonton EcoPark with a thickness that varied between 1.0m and 7.5m. Beneath this a thin layer of Alluvium (comprising clay, silt sand and gravel) has been identified across much of the Edmonton EcoPark overlying Kempton Park Gravels (River Terrace Deposits of sand and gravel), and further below this is London Clay (varying from 0.7m – 18.1m in thickness in the north of the Edmonton EcoPark). Deeper still are layers of Lambeth Group, Thanet Sand and Upper Chalk.

11.5.14 The superficial deposits across the Application Site are designated by the EA[93] as a Secondary Aquifer. This type of aquifer is capable of supporting water supplies at a local rather than strategic scale and in some cases can form an important source of base flow to rivers.

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[92] National River Flow Archive http://www.ceh.ac.uk/data/nrfa/data/search.html (Accessed July 2015).
[93] http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683&y=355134&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=groundwater

11.5.15 According to the EA mapping, the bedrock geology is unproductive strata that does not result in any aquifer designations. This bedrock geology is formed of the London clay, which by its nature has low permeability and negligible importance to water supply.

11.5.16 The Application Site is located primarily in the inner and partly in the outer zones (Zone 1 and 2) of an EA designated SPZ for groundwater sources to PWS.

11.5.17 The Hydrogeological Risk Assessment (Vol 2 Appendix 7.2) identifies the chalk as a Principal Aquifer. The low permeability layers in the Lambeth Group and the London Clay provide protection to the underlying chalk by limiting downward movement of groundwater from the surface.

Statutory designated nature conservation sites

11.5.18 England has areas of valuable landscape and natural environment that are rich in cultural heritage, wildlife or biodiversity. Statutory designations exist that protect these natural environments under both national and international law and by way of government policy.

11.5.19 There are no statutory designated nature conservation sites within the Application Site.

11.5.20 William Girling Reservoir, located approximately 300m to the north-east of the Application Site is designated as a SSSI, and forms part of the Chingford Reservoirs SSSI. The designation is related to being one of the major wintering grounds for wildfowl and wetland birds in London.

11.5.21 Approximately 1.5km to the south of the Application Site is Walthamstow Reservoirs SSSI. This area is also designated as Lee Valley Ramsar and SPA, supporting nationally scarce plant species and wildfowl that occur at levels of international importance[94]. There is the potential for surface water connectivity with the Application Site as these reservoirs are located downstream of the Application Site and form part of the Lower Lee catchment.

11.5.22 Approximately 1.5km to the east of the Edmonton EcoPark is Ainslie Wood LNR. This site is to the east of the River Lee and there is therefore no potential for surface water or groundwater connectivity with the Application Site.

Water quality

11.5.23 Under the Water Framework Directive (WatFD), the EA has produced nine River Basin Management Plans (RBMPs) for England to manage water quality targets and river basin planning. The aim of the WatFD is for all waterbodies (rivers, lakes and groundwater) to achieve good ecological status, unless they are heavily modified in which case they must achieve good ecological potential and ensure no deterioration from current status/potential.

[94] Joint Nature Conservation Committee (2008) Information Sheet on Ramsar Wetlands http://jncc.defra.gov.uk/pdf/RIS/UK11034.pdf (Assessed July 2015)

11.5.24 Cycle 1 of the WatFD implementation was from 2009 – 2015 and Cycle 2 is from 2015 – 2021. For Cycle 2, the extent and boundaries of waterbodies was re-appraised and amended in some cases. For example Salmons Brook was previously included in a waterbody with the River Lee Navigation, but is now separate. The waterbodies listed in Vol 2 Table 11.1 are those for Cycle 2. Cycle 2 River Basin Management Plans have been prepared and will be signed off by Ministers by December 2015.

11.5.25 The River Lee Navigation and surrounding area is located within the London catchment of the Thames River Basin District[95]. A web based Catchment Data Explorer[96] is available providing the most recent status of watercourses using 2014 data. The most recent waterbody classifications (in some cases including waterbody name changes compared to the 2009 RBMPs) are summarised in Vol 2 Table 11.1. All the water features are identified as 'heavily modified' under the WatFD, only being able to achieve good ecological potential rather than status because of substantial changes to the physical character of the waterbody resulting from physical alterations caused by human use.

Vol 2 Table 11.1: WatFD Waterbody designations

Waterbody name	**Current ecological quality**	**Biological elements (reason for status)**	**Supporting elements (Reason for status)**
Lee Navigation Enfield Lock to Tottenham Locks (including the River Lee)	Moderate Potential	Moderate (Invertebrates)	Poor (Phosphate) Moderate (pH, Triclosan, supporting elements)
Salmon's Brook Upstream Deephams STW	Moderate Potential	Poor (Invertebrates)	Poor (Phosphate) Moderate (Ammonia (Phys-Chem, Triclosan, Supporting elements) Bad (Dissolved Oxygen)
Pymmes Brook and Salmon's Brook – Deephams STW to Tottenham Locks	Moderate Potential	Poor (Invertebrates)	Bad (Phosphate) Poor (Dissolved Oxygen) Moderate (Ammonia (Phys-Chem), Triclosan)
William Girling Reservoir	Good Potential	Not assessed	Good (mitigation measures assessment, support elements)
Banbury Reservoir	Moderate Potential	Supporting elements	N/A

95 Environment Agency (2009) Water for life and livelihoods Thames River Basin Management Plan. https://www.gov.uk/government/publications/thames-river-basin-management-plan. (Assessed July 2015)
96 Environment Agency Catchment Data Search: http://environment.data.gov.uk/catchment-planning/ (Accessed July 2015)

11.5.26 Enfield Ditch is located within Pymmes and Salmon's Brooks – Deephams STW to Tottenham Locks waterbody and therefore has the same classification as given to all watercourses within that waterbody.

11.5.27 Salmon's Brook (Upstream Deephams STW) is classified as having moderate ecological potential, with high or good quality in terms of fish, macrophytes and phytobenthos, pH and temperature. The moderate or poor status (Vol 2 Table 11.1) relates to invertebrates, phosphate and ammonia (Phys- Chem). Dissolved oxygen is of bad status. This waterbody has an objective to reach good ecological potential by 2027. No information is currently available on mitigation measures for this catchment within the Cycle 2 RBMPs. The Cycle 1 (2009) RBMP indicated that mitigation would include sediment management strategies and preservation and where possible enhancement of ecological value of marginal aquatic habitat, banks and riparian zone[97].

11.5.28 The River Lee (Lee Navigation Enfield Lock to Tottenham Locks waterbody) is classified as having moderate ecological potential, for the reasons given in Vol 2 Table 11.1. For other parameters (such as fish, NH_3, dissolved oxygen, etc.) the classification is good or high. This waterbody has an objective to reach moderate ecological potential by 2027. Biological elements would not be able to reach good status due to the heavily modified classification of the watercourse.

11.5.29 Pymmes Brook is classified as having moderate ecological potential for the reasons given in Vol 2 Table 11.1. The watercourse is classified as poor status for biological elements due to invertebrates, with an objective of moderate status (good status is not achievable due to the heavily modified waterbody classification of the watercourse). Other supporting elements vary from bad to moderate status, such as phosphate, NH_3 and dissolved oxygen, all not of good status suspected to be due to diffuse drainage sources. This waterbody has an objective to reach good ecological potential by 2027 with planned mitigation measures to achieve this (as part of the WatFD policy requirements). No information is currently available on mitigation measures for this catchment within the Cycle 2 results. Cycle 1 (2009) results indicated that mitigation would include improving floodplain connectivity, preserving and where possible enhancing ecological value of marginal aquatic habitat, banks and riparian zone and sediment management strategies.

11.5.30 William Girling Reservoir is classified as having good ecological potential (Vol 2 Table 11.1). As described in Paragraph 11.5.20, this reservoir is designated as a SSSI. However, the reservoir does not form part of the Natura 2000 protected areas network[98]. Therefore the WatFD objectives

[97] EA, Thames River Basin Management Plan. https://www.gov.uk/government/publications/thames-river-basin-management-plan (Accessed March 2015).

[98] A network of nature protection areas established under the 1992 Habitats Directive designated as SACs or SPAs. http://ec.europa.eu/environment/nature/natura2000/index_en.htm. (Assessed July 2015).

apply to this waterbody in its own right, not in combination with the SSSI designation requirements[99].

11.5.31 Banbury Reservoir is classified as having moderate ecological potential. Supporting elements are of moderate status, based on expert judgement.

11.5.32 As part of the EPR workstream, surface water monitoring samples were collected (2011 and 2014) and subject to analysis at four locations, upstream and downstream of the Application Site on Salmon's Brook and the River Lee Navigation. Further detail is provided in the Hydrogeological Risk Assessment (Vol 2 Appendix 7.2). No exceedances of the freshwater EQS were identified but elevated ammonium has been identified in Salmon's Brook at concentrations of 4.1mg/l upstream and 2.1mg/l downstream. It is possible that the source of this could be related to the Deephams STW which discharges into the Deepham STW outflow channel (entering Salmon's Brook just north of the Application Site). The lower concentrations downstream could be partly due to dilution with water from the Deepham STW outflow channeland partly due to biological oxidation by bacteria in Salmon's Brook, but also suggests that the Application Site is not a source of ammonium to the watercourse. The concentration of ammonium in the River Lee Navigation is lower at 0.5mg/l at both upstream and downstream locations.

11.5.33 There have been increases in the concentration of a number of dissolved metals between upstream and downstream locations for both Salmon's Brook and the River Lee Navigation. The 2014 samples indicate increases in downstream concentrations for copper, zinc and calcium, compared to the 2011 samples where copper and zinc showed no change or a reduction downstream.

Flood risk

11.5.34 As indicated within the FRA (Vol 2 Appendix 11.2), parts of the Application Site are in Flood Zone 2, i.e. at medium risk of flood, at risk from a 0.1 per cent annual exceedance probability (AEP) fluvial flood. That is the flood event for which there is a 0.1 per cent chance it will be exceeded by a more extreme flood in any year. These areas are in the centre of the Application Site where the main EfW facility is currently located, along the south-west boundary adjacent to Salmon's Brook and on part of the Wharf. There is a small area of land on the Wharf which is in Flood Zone 3, i.e. at risk from a 1 per cent AEP fluvial flood, but it is outside of the Application Site.

11.5.35 Flood Zones 2 and 3 refer to risk of flooding from the Application Site without flood defences in place. Recent modelling of defended flood extents (taking account of flood defences within the catchment) undertaken by the EA, shows a much smaller area of the Application Site impacted by the 0.1 per cent AEP event. There are also very small areas within the defended 1 per cent AEP flood extent with climate change accounted for: adjacent to Enfield Ditch along the southern boundary of the Application Site, adjacent

[99] Environment Agency (2009) River Basin Management Plan Annex D Protected Areas Objectives. December 2009. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289942/geth0910bswe-e-e.pdf. (Assessed April 2015).

to Salmon's Brook along the western Application Site boundary and on the Wharf within the Application Site. These areas are not within the present day 1.0 per cent AEP defended extent, but at risk from the 1.0 per cent AEP event in the future with potential climate change impacts in place. Climate change is expected to result in higher flood levels as explained in Paragraph 11.5.62.

11.5.36 The FRA (Vol 2 Appendix 11.2), presents an assessment of current and future flood risk to the Application Site from fluvial, tidal, groundwater, sewer and artificial sources (e.g. reservoirs) and overland flows.

11.5.37 The assessment confirms that the Application Site is at risk from nearby watercourses.

11.5.38 The FRA concludes that groundwater is not a flood risk at the Application Site. The shallow Kempton Park Gravels Aquifer is in hydraulic continuity with Enfield Ditch and Salmon's Brook which would serve to control groundwater levels in the area by draining the aquifer. Therefore it is considered unlikely that groundwater levels would rise by more than 2.6m and breach the ground surface.

11.5.39 Risk of surface run-on (rainfall flowing onto the Application Site from adjacent land, following the local topography) is considered to be low with watercourses providing a buffer at the south, east and west edges of the Application Site. To the north the land has little slope, which would limit the rates of any run-on, reduced further by a landscape buffer between the two areas.

11.5.40 There is no known surface water sewer crossing or passing near to the Application Site which might present a flood risk to it. Flooding records held by Thames Water indicate that there have been no incidents of flooding in the area of the Application Site as a result of surcharging public sewers.

11.5.41 Currently the Application Site surface water drains partly to Enfield Ditch via a pumped discharge and partly to the foul sewer (Chingford Sewer). There is potential for the drainage system to be overwhelmed or the pumps to fail in times of high surface run-off, which would cause the Application Site to flood.

11.5.42 The entire Application Site lies within the maximum inundation (flood) extent from nearby reservoirs, which are owned and operated by TWUL. The FRA (Vol 2 Appendix 11.2) highlights that both nearby reservoirs are subject to a stringent maintenance and inspection regime under the Reservoirs Act[100], and therefore the risk of flooding is low.

Groundwater and surface water abstractions

11.5.43 Edmonton EcoPark abstracts water from Deephams STW outflow channel (therefore not requiring a licence) upstream of the confluence with Salmon's Brook. The water from this abstraction is used in the thermal treatment process at the Application Site. The water demand for this is approximately 130 cubic metres per hour (m^3/hr).

[100] Reservoirs Act 1975 http://www.legislation.gov.uk/ukpga/1975/23(assessed July 2015)

11.5.44 There are no licensed groundwater abstractions within the Application Site. However one licensed PWS borehole abstraction is located within 100m of the south-easternmost point of the Application Site (one licence with two abstraction points in close proximity) (See Vol 2 Figure 11.2).

11.5.45 To the north-east of the Application Site, approximately 250m from the north-eastern corner, are two groundwater abstraction points and further north-east a further two abstraction points. These all operate under a single licence used for potable water supply.

11.5.46 A further abstraction point is located to the south-west of the Application Site, approximately 250m distant. This is used for process water at a nearby industrial site.

11.5.47 To the west of the Application Site are three further abstraction licences approximately 300m of the Application Site (all of these licences have more than one possible abstraction point), all operated by Coca Cola. However the licences for these abstractions have expired.

11.5.48 There are no surface water abstractions within the Application Site. The nearest surface water abstraction is located approximately 500m north-east of the Application Site near Chingford Supply Channel/River Lee Diversion (See Vol 2 Figure 11.2). It is used for storage for potable water supply.

Discharges

11.5.49 Foul drainage from the Application Site (including process effluent from the existing EfW facility and surface water and domestic flows) is discharged to the Chingford Sewer. The sewer crosses the Application Site from the south-east corner to the western access road within the Application Site (Deephams Farm Road) and exits at the north-west corner of the Application Site. Current discharge to the sewer is approximately 70-80 m^3/hr. The current TWUL consent to discharge trade effluent into the Chingford Sewer has conditions which include:

a. a maximum trade effluent discharge on any one day (24 hours from midnight) should not exceed 5,682m^3; and

b. a maximum discharge rate should not exceed 237m^3/hr.

11.5.50 There is also an operational outfall from the Application Site that collects rainwater run-off from building roofs, roads and car parks) and discharges to Enfield Ditch on the eastern boundary of the Application Site. This water passes through an oil and grease interceptor and includes an attenuation tank of 400m^3 which is pumped to Enfield Ditch. This discharge is regulated by the EA through an Environmental Permit, but the Permit does not regulate rates or volumes of discharge. There is no information available on rates of current surface water discharge to Enfield Ditch.

11.5.51 Off-site discharges may be affected in the event that the Project may affect downstream water quality and flow volumes. There are four records of licenced discharge consents within 500m of the Application Site. However three of these were revoked between 1993 and 2005. The remaining operating licence is located on the north-west boundary of the Application Site and is for site drainage, discharging to Salmon’s Brook and is operated by Henry Group Ltd.

Water supply

11.5.52 The potable water supply to the Application Site is taken from the local distribution network which is owned and operated by TWUL. This potable water is used for washing plant, equipment and hard surfaces, personal hygiene and human consumption, dust suppression, fire suppression, and demineralised water for producing steam. Overall demand is 13-15m^3/hr.

Potential receptors and sensitivity

11.5.53 In summary the potential receptors associated with the Project are:

a. surface watercourses: Salmon's Brook, Enfield Ditch, River Lee Navigation, River Lee, Pymmes Brook and downstream watercourses.

b. groundwater in the Principal and Secondary Aquifers underlying the Application Site and by association the PWS abstractions associated with the SPZ in which the Application Site is situated.

c. the one licensed discharge from the Application Site located in the north-west of the Application Site, as noted in Paragraph 11.5.49.

d. regional water resources, due to a potential impact on water demand within the TWUL London Water Resource Zone[101] (WRZ) as a result of the Project.

e. foul sewerage network, due to a potential impact from increased input to the Chingford Sewer from the Project (i.e. process wastewater).

f. downstream nature conservation sites, due to connectivity between watercourses and reservoirs (Walthamstow Reservoirs SSSI).

g. flood risk to people, property and infrastructure, from watercourses, surface water (rainfall), groundwater, surface water sewers and reservoirs as a consequence of the Project.

h. Henry Group Ltd licenced discharge located on Salmon's Brook near the western boundary of the Application Site.

Future baseline

11.5.54 The future baseline identifies the changes to the water environment as a result of other developments or environmental changes in the vicinity of the Application Site which will be completed prior to the Project.

Land use change – other developments

11.5.55 There will be a number of developments within the vicinity of the Application Site that will be completed prior to construction of the Project. A full list of the developments and details can be seen in Vol 1 Appendix 5.2, and of the 15 development proposals anticipated within the timescales of this Project (future baseline) 14 of them have the potential to change the baseline for water resources and flood risk, although the extent of the change is often small.

[101] TWUL. Final Water Resources Management Plan 2015 – 2040. http://www.thameswater.co.uk/about-us/5392.htm. (Accessed July 2015).

11.5.56 Upgrade work to an existing overhead power line between Waltham Cross and Tottenham substations and its operation at a higher voltage is anticipated to be operational in 2016. The upgrading involves works at each substation along the route including a gas substation located within the Application Site. Any construction required has the potential to increase hardstanding within that area, increasing the run-off and flood risk potential. However, the scale of this change to the existing baseline is likely to be small.

11.5.57 Within the Application Site boundary in the southern part of Edmonton EcoPark, a District Energy Centre would be constructed to serve the LVHN. For the purpose of this assessment it is anticipated that pipework would be constructed underground, and therefore would change the baseline through altering groundwater flow pathways. The scale of this change would be dependent on the size and amount of pipework constructed.

11.5.58 Other planned significant infrastructure changes include upgrades to the existing Deephams STW, which would result in an additional 2,024 m^2 sewage treatment infrastructure and 248 on-site car parking spaces. The permitted dry weather flow from the STW is due to increase by 18Ml/d (equivalent to $0.208m^3/s$) from March 2017[102].

11.5.59 The Meridian Water area (the northern boundary of which is approximately 250m south of the southern entrance of the Application Site, south of the A406) is a priority regeneration area. Baseline conditions on completion of this development would be increased water resource use through provision of potable water and wastewater services. It will be a requirement of the development that site drainage will be the same as green field run-off rates, with suitable design measures to mitigate against flood risk.

11.5.60 Anticipated redevelopment at a number of other sites (all more than 150m from the Application Site) will provide changes in the use of existing light industrial units. Some of these include partial or complete demolition of buildings or storage areas and rebuilding or extensions to existing sites, often including creation of associated car parking. This will result in increased areas of hardstanding compared to the existing baseline and an associated increase in surface water run-off and flood risk.

11.5.61 The changes due to these developments are likely to be small; the greatest changes would be in relation to water resource requirements for the development of the Meridian Water area or the possible capacity changes at Deephams STW.

Climate change

11.5.62 The predicted future baseline water environment may change as a result of climate change. It is predicted that winters will become generally wetter and summers generally drier. This is demonstrated in Vol 2 Table 11.2, which provides estimates from UK Climate Projections (UKCP09)[103] of likely changes in temperature and rainfall under three plausible greenhouse gas

[102] Deephams ES. http://www.thameswater.co.uk/deephams/Deephams_ES_Chapter_18_2_of_2_FINAL_FOR_SUBMISSION.pdf (Accessed July 2015)
[103] http://ukclimateprojections.metoffice.gov.uk/21708?projections=23860 (Accessed: July 2015)

emissions scenarios, defined by UKCP09 and called Low, Medium and High. Changes in temperature and rainfall will result in changes to the magnitude and distribution of river flows and groundwater recharge and subsequently the water resources available for use and for the water environment.

Vol 2 Table 11.2: Climate change scenarios for London (from UK Climate Projections, UKCP09)

Parameter	Emissions scenario	Potential change anticipated for the 2020s*	Potential change anticipated for the 2050s*	Potential change anticipated for the 2080s*
Changes to winter mean temperature °C	Low emissions	1.3	2	2.6
	Medium emissions	1.3	2.2	3
	High emissions	1.4	2.5	3.7
Changes to summer mean temperature °C	Low emissions	1.6	2.5	3
	Medium emissions	1.6	2.7	3.9
	High emissions	1.5	3.1	4.9
Changes to winter mean precipitation %	Low emissions	6	12	16
	Medium emissions	6	14	19
	High emissions	7	16	26
Changes to summer mean precipitation %	Low emissions	-7	-14	-15
	Medium emissions	-7	-19	-23
	High emissions	-4	-19	-29

* Central estimates (50% probability)

11.5.63 It is also likely that peak rainfall intensities could increase and that the magnitude of flood events could also increase as a consequence. The EA's 'Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities' report[104] provides guidance on the potential future increases in river flood flows and extreme rainfall intensity to guide flood management scheme design, as shown in Vol 2 Table 11.3.

Vol 2 Table 11.3: Climate change allowances

[104] EA, Adapting to climate change: Advice for Flood and Coastal Erosion Risk Management Authorities. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297379/geho0711btzu-e-e.pdf. (Accessed July 2015).

Parameter	Emissions scenario	Potential change anticipated for the 2020s	Potential change anticipated for the 2050s	Potential change anticipated for the 2080s
Changes to river flood flows compared to 1961 – 1990 baseline (Thames River Basin District) %	Upper end estimate	30	40	70
	Change factor	10	15	25
	Lower end estimate	-15	-10	-5
	H++*	40	55	90
Change to extreme rainfall intensity compared to 1961 – 1990 baseline (England)	Upper end estimate	10	20	40
	Change factor	5	10	20
	Lower end estimate	0	5	10

* The H++ scenario provides an estimate of sea level rise and river flood flow change beyond the likely range but within physical plausibility. An estimate of what might be required if climate change were to happen much more rapidly than expected.

11.5.64 Climate change effects during the construction and operational lifetime of the Project have been fully assessed within the FRA (Vol 2 Appendix 11.2).

WatFD change

11.5.65 The focus of this assessment remains on water quality specifically, which forms a component of the ecological potential classification as part of WatFD. Given the current 'less than good' ecological potential of the surface water RBMP water bodies, it is anticipated that the future status of these will improve, ultimately to one of good potential, as an objective of the WatFD, seen in Paragraphs 11.5.23 - 11.5.31. This will have an associated improvement in water quality. This will be as a result of the application of mitigation measures and actions as identified within the RBMP and requirements placed on developers to ensure no deterioration from current status.

11.5.66 The assessment of construction and operational effects takes account of a future baseline environment that assumes good ecological status/potential would be attained during the construction/operational lifetime of the Project (with all waterbodies being of good potential by 2027).

Water resources change

11.5.67 TWUL is required to produce a Water Resources Management Plan to show the plans to balance demand and supply of water over a 25 year period. The most recent plan sets this out for the period 2015 - 2040[101]. Using forecasts of future water use, TWUL estimates that the baseline demand forecast for the London WRZ is expected to increase by approximately 200Ml/d over the planning period, while water supplies are forecast to reduce due to the impact of climate change and sustainability reductions in abstraction licences.

11.5.68 TWUL have identified that measures to balance supply and demand would focus on demand management (e.g. leakage reduction) in the early years of the planning period, together with minor groundwater water developments and temporary changes in bulk supplies. In the longer term focus would be on supply options (such as wastewater re-use) to maintain the required headroom in the supply demand balance over the forecast period. There is no anticipated overall deficit over the forecast period, when all supply and demand options are considered (the Final Plan). Future water demand at the Application Site will impact on the supply demand balance in the London WRZ.

11.5.69 The permitted dry weather flow from the Deephams STW is due to increase by 18Ml/d (equivalent to 0.208m^3/s) from March 2017[102].

11.6 Potential effects and good environmental design management

11.6.1 The Project is described in Volume 1 of the ES. The elements of the Project relevant to water resources and flood risk are set out below.

Construction

11.6.2 This section describes the construction (and demolition) elements of the Application Site that could have potential effects on the water resources and flood risk. The relevant construction element and effects are provided. This is followed by environmental design controls and commitments embedded within the Project. By nature these are temporary construction activities.

Potential effects

11.6.3 During construction there is the potential for ground disturbance and an associated increase in sediments in run-off, sediments directly reaching watercourses through bridge construction and contamination from spillage/pollution incidents infiltrating to groundwater. These may cause localised changes in water quality of groundwaters and watercourses, at the Application Site as well as downstream, at environmentally designated sites and within SPZs. The following activities have this potential:

a. demolition and clearance of existing buildings;

b. infilling of the ornamental pond;

c. construction of the Temporary Laydown Area;

d. piling and excavation works;

e. excavation of the existing EfW facility bunker and the proposed ERF bunker;

f. construction of attenuation tanks;

g. diversion of utilities and services effected by demolition and clearance works (including diversion of the sewer trunk main, owned by TWUL);

h. creation of access tracks and widening of existing roads;

i. widening of existing bridge or construction of proposed bridge at Advent Way site access road;

j. building construction; and

k. construction of parking and facilities areas.

11.6.4 Construction traffic has the potential to cause localised changes in water quality reaching groundwaters and watercourses. This is from accidental spills or leaks.

Good environmental design management

11.6.5 In accordance with relevant legislative requirements and guidance the works would be undertaken while protecting surface and groundwater from pollution and other adverse impacts including change to flow volume, water levels and quality. A summary of the good environmental design that would be embedded in the Project during construction relevant to water resources and flood risk is given below.

11.6.6 The CoCP (Vol 1 Appendix 3.1) contains measures relating to:

a. storage, bunding and use of potentially polluting materials;

b. required permits, consents and approvals from the EA and other relevant authorities;

c. construction site drainage systems;

d. measures to comply with relevant guidance;

e. flood risk management;

f. disposal of foul water and sewage effluents; and

g. protection of aquifers.

11.6.7 The Incident Control Plan (as required by the CoCP) includes measures to manage any pollution incidents (pollution incident response planning).

11.6.8 The FRA (Vol 2 Appendix 11.2) contains measures relating to:

a. emergency planning including procedures for receiving flood warnings from the EA;

b. temporary attenuation storage at the Temporary Laydown Area south of William Girling Reservoir; and

c. flood defence consent from the EA.

11.6.9 The Hydrogeological Risk Assessment (Vol 2 Appendix 7.2) contains measures relating to environmental monitoring of both surface and groundwater to be undertaken during construction.

Operation

11.6.10 This section describes the operational elements of the Project that could have potential effects on the water resources and flood risk. The relevant element and effects are provided followed by environmental design controls and commitments embedded within the Project. By nature these are permanent operational changes.

11.6.11 Options are being retained in relation to the source of water supplies. In summary the options are as follows:

a. Option A1 (Air Cooled Condenser, TWUL water supply): All water would be sourced from TWUL potable water supplies (anticipated to be 141.1m^3/hr). Water would be discharged to Chingford Sewer at 48.1m^3/hr, of which 47.0m^3/hr is from the ERF process after treatment at the proposed on-site wastewater treatment plant.

b. Option A2 (Air Cooled Condenser, TWUL and Deephams STW outflow channel): A split of water supply from TWUL (11.1m^3/hr) and abstraction from Deephams STW outflow channel (130m^3/hr with on-site filtration and pre-treatment). Two streams of water would be discharged to Chingford Sewer – 47m^3/hr from the ERF process after treatment at the proposed on-site wastewater treatment plant and 1.1m^3/hr that includes some rainwater used for non-potable uses.

11.6.12 In all options surface water from hardstanding, tanker spills and firefighting run-off would be treated appropriately on-site before discharge to Enfield Ditch, or (in the case of spills and firefighting run-off) may be tankered off-site for disposal.

Potential effects

11.6.13 There is the potential for operation of the Project (under all options described in Paragraph 11.6.11) to affect watercourse channel morphology and increase flood risk to people and properties downstream, due to increased run-off reaching watercourses from increased areas of hardstanding. The area of hardstanding within the proposed operational site is anticipated to increase by 10 per cent or 1.6ha.

11.6.14 Operational traffic is anticipated to increase by approximately 90 vehicles per day (under all options described in Paragraph 11.6.11). These additional vehicles have the potential to cause localised changes in water quality reaching groundwater and watercourses. This is from accidental spills or leaks.

11.6.15 There is the potential for change to the quantity of water discharged to Chingford Sewer and Enfield Ditch during operation that may give rise to localised changes in water quantity reaching groundwater, surface watercourses and Deephams STW. Under the different water demand options/sub-options the total water discharged to the sewer could increase compared to current operation. However, this would still operate within the limits set by the existing consent.

11.6.16 While there is no information available on rates of current surface water discharge to Enfield Ditch for the purpose of this assessment it is assumed that there would be an increase in the volume of water discharged due to increased areas of hardstanding. All options/sub-options anticipate flows of up to 200m^3 of water from tanker spills, 1,500m^3 from firefighting run-off, and up to 168 litres per second (l/s) surface run-off from site drainage. All three components would need appropriate treatment at the on-site STW before discharge to Enfield Ditch, although there would be the option for fire spill and tanker spill to be tankered off-site for treatment.

11.6.17 There is the potential for a decrease to the quantity of water abstracted from the channel downstream of Deephams STW which may result in changes in water quantity reaching groundwater and watercourses. Option A1 would source all water from TWUL potable water supplies while Option A2 water demand would be no different to that from the current operation.

11.6.18 There is the potential for a change to the potable water demand placed on the supply from TWUL which would affect demand placed on the WRZ and other associated water supplies. Option A2 would see a slight reduction in demand from the TWUL supply to $11.1m^3$/hr, compared to a current demand of $13\text{-}15m^3$/hr. This would increase water availability slightly. Option A1 is anticipated to have a water demand of $141.1m^3$/hr from the TWUL potable water supply. This would increase the demand of the WRZ and associated aquifers.

11.6.19 Site discharges and site drainage would have the potential to affect the water quality within receiving waters and other associated surface and groundwater.

Good environmental design management

11.6.20 Good environmental design measures that would be implemented for operation of the Project that are relevant to water resources and flood risk are summarised below.

11.6.21 An operational management plan would be prepared in consultation with the EA prior to commencement of construction and would contain the following measures:

a. suitable consents and approvals from the relevant authorities would be gained for waters discharged to Deephams STW via Chingford Sewer;

b. surface water site drainage would pass through oil interceptors and attenuation tanks before being discharged to Enfield Ditch at the greenfield run-off rate as specified within the FRA (see Vol 2 Appendix 11.2);

c. Application Site attenuation tanks would be designed to be able to accommodate volumes from storm events and/or volumes that could be released during a spillage or incident;

d. any identified requirements for water quality monitoring of discharges to surface or groundwater would be undertaken as appropriate to identify pollution risks and pollution incidents including spillages and leakages;

e. rainwater harvesting would be implemented to provide water for fire and dust suppression systems, non-potable water uses, and washing operations to reduce pressure on potable water supply; and

f. water demand at the Application Site would be managed by incorporating, as a minimum, water efficient appliances (such as taps, toilets, urinals, etc) to limit water consumption to between 4.5 and $5.5m^3$/person/year and a water meter with a pulsed output for each building unit at the Application Site.

11.6.22 Pollution incident response and appropriate measures at the Application Site will be detailed in the Incident Control Plan as set out in the CoCP (Vol 1 Appendix 3.1).

11.6.23 The FRA (Vol 2 Appendix 11.2) includes the following measures:

a. A new surface water drainage scheme would be implemented at the Application Site to manage surface run-off from the design rain event. An estimated 6,284m^3 of storage volume would be required for the completed development. Flow attenuation would be implemented in a way that ensures attenuation storage is provided for each stage of development as it proceeds. Additional storage would be provided to accommodate run-off in the case of a spill at the Application Site.

b. Finished floor levels for EcoPark House would be set at 10.97m AOD allowing 0.3m freeboard in the event of a flood.

c. An Emergency Flood Plan would be drawn up and be operational from the construction phase which includes procedures for receiving flood warnings from the EA and evacuating the Application Site in the event of flood defence failure.

d. 11m^3 of flood storage compensation would be provided for loss of floodplain volume associated with EcoPark House. The compensation storage would be provided in the landscaped area of the Application Site on the west bank of Enfield Ditch immediately upstream of the Wharf.

e. Run-off would be limited to greenfield rate, in line with LB Enfield and London Plan requirements, accounting for climate change over the development lifetime.

f. Surface water run-off from the main part of the Application Site would be discharged to Enfield Ditch as noted in the FRA. During the construction period run-off from the Temporary Laydown Area would be to the River Lee Navigation or River Lee (New Cut) which bound the Temporary Laydown Area to the west and east. Drainage from Ardra Road in the north of the Application Site would be to Salmon's Brook. Consent from the EA and the Canal and River Trust would be required.

g. Further attenuation (and water quality treatment and biodiversity value) would be provided on green and brown roofs proposed for parts of the Project where they are technically feasible, as well as permeable paving which would need to be agreed with the EA.

11.6.24 The Hydrogeological Risk Assessment (Vol 2 Appendix 7.2) contains the following measures:

a. a contained surface water drainage system would be in place to ensure that pollutants would be treated before the water is discharged; and

b. environmental monitoring of both surface and groundwater would be undertaken during operation.

11.7 Assessment – construction

Stage 1

Surface watercourses including Salmon's Brook, Enfield Ditch, Lee Navigation and downstream watercourses and designated sites including Walthamstow Reservoirs (water quality and flow)

11.7.1 Construction traffic, ground disturbance associated with demolition, clearance, infilling of the ornamental pond, diversion of utilities, construction, access widening, excavation and piling all have the potential to cause changes to the water quality of surface watercourses. This is through sediment entrained run-off from ground disturbance or pollution from leakage or spills (e.g. fuel spills).

11.7.2 These activities all also have the potential to cause changes to the quality of surface watercourses. This is through increased surface run-off and changes to flow pathways.

11.7.3 Following the assessment methodology described in Vol 2 Appendix 11.1 the watercourses are assessed to be of high (regional scale watercourses, Walthamstow Reservoirs) or medium (in the case of local scale watercourses) sensitivity (to maintain good WatFD status). The magnitude of any effects relating to water quality would be low (short-term, i.e. limited to the time over which the activities would take place) and those in relation to flows would be negligible (no significant change in run-off from the Application Site). This is due to the embedded control measures identified in Section 11.6. Therefore any temporary effects on water flow or quality in watercourses or downstream designated sites would be **not significant**.

Groundwater in the Principal and Secondary Aquifers underlying the Application Site and by association the PWS abstractions associated with the SPZ

11.7.4 The activities described in Paragraph 11.7.1 all have the potential to cause changes to the quality of groundwater. This is through sediment entrained run-off from ground disturbance or pollution from leakage or spills (e.g. fuel spills). These could infiltrate to ground and reach the underlying aquifers.

11.7.5 Following the assessment methodology described in Vol 2 Appendix 11.1 the groundwater is assessed to be of high sensitivity (due to the aquifer designations and associated use for water supply). The magnitude of effects related to quality would be negligible (short-term, i.e. limited to the time over which the activities would take place). This is due to the embedded control measures identified in Section 11.6. Therefore any temporary effects on water quality would be **not significant**.

Regional water resources, due to a potential impact on water demand within TWUL London WRZ as a result of the Project

11.7.6 There is anticipated to be an increase in the potable water requirements at the Application Site, from increased numbers of temporary workers and potable water use during construction. This would have the potential to increase demand on the TWUL London WRZ as described in Section 11.6.

11.7.7 Following the assessment methodology described in Vol 2 Appendix 11.1 the regional water resources are assessed to be of high sensitivity (due to requirement to supply London water). The magnitude of any effects would be negligible due to the small increases in relation to whole WRZ and the embedded control measures identified in Section 11.6. Therefore any temporary effects on water resources would be **not significant.**

People, property and infrastructure, at risk of flooding from watercourses, surface water (rainfall), groundwater, surface water sewers, and reservoirs, as a consequence of the Project

11.7.8 Demolition and clearance of existing buildings and landscaped areas, construction of the Temporary Laydown Area, parking and access tracks all have the potential to cause flood risk to people property and infrastructure (both on-site and downstream). This is through increased surface run-off from hardstanding areas and changes to flow pathways as described in Section 11.6.

11.7.9 Following the assessment methodology described in Vol 2 Appendix 11.1, the receptors are assessed to be of medium/high sensitivity (due to flood zone designations). The magnitude of any effects would be negligible (no significant change in run-off from the Application Site) due to the embedded control measures identified in Section 11.6 (e.g. adequate on-site drainage and maximum greenfield rates for run-off downstream). Therefore any temporary effects on flood risk would be **not significant.**

Stage 2

Surface watercourses including Salmon's Brook, Enfield Ditch, Lee Navigation and downstream watercourses and designated sites including Walthamstow Reservoirs (water quality and flow)

11.7.10 During Stage 2, construction traffic and ground disturbance associated with installation of ERF weighbridges and completion of landscaping works have the potential to cause changes to the water quality of surface watercourses. The scale of these works are minor compared to the overall Application Site. The nature of this work and therefore the pathways are the same as described for Stage 1 and any temporary effects on water quality and flow in watercourses and at downstream designated sites would be **not significant**.

Groundwater in the Principal and Secondary Aquifers underlying the Application Site and by association the PWS abstractions associated with the SPZ

11.7.11 During Stage 2, construction activities have the potential to cause changes to the flow of groundwater. The nature of this work and therefore the pathways are the same as described for Stage 1 and any temporary effects on groundwater flow would be **not significant**.

Regional water resources, due to a potential impact on water demand within TWUL London WRZ as a result of the Project

11.7.12 During Stage 2, there is anticipated to be potable water requirements at the Application Site from increased numbers of temporary workers and potable water use during the construction, compared to current operation. The numbers of workers are anticipated to be lower than for Stage 1. Therefore the effects would be slightly reduced compared to Stage 1 – **not significant**.

People, property and infrastructure, at risk of flooding from watercourses, surface water (rainfall), groundwater, surface water sewers, and reservoirs, as a consequence of the Project

11.7.13 Construction and landscaping works planned for Stage 2 have the potential to cause flood risk to people, property and infrastructure (both on-site and downstream). This is through increased surface run-off from hardstanding areas and changes to flow pathways as described in Section 11.6.

11.7.14 Following the assessment methodology described in Vol 2 Appendix 11.1, the receptors are assessed to be of medium/high sensitivity (due to flood zone designations). However the magnitude of any effects would be negligible due to the embedded control measures identified in Section 11.6 (e.g. adequate on-site drainage and maximum greenfield rates for run-off downstream). Therefore any temporary effects on flood risk would be **not significant.**

Stage 3

Surface watercourses including Salmon's Brook, Enfield Ditch, Lee Navigation and downstream watercourses and designated sites including Walthamstow Reservoirs (water quality and flow)

11.7.15 During Stage 3, construction traffic and ground disturbance associated with demolition, clearance, construction, Advent Way access bridge widening/construction, excavation, piling and removal of the EfW bunker all have the potential to cause changes to the water quality of surface watercourses. This is through sediment entrained run-off from ground disturbance or pollution from leakage or spillages (e.g. fuel spills) as described in Section 11.6.

11.7.16 These activities also have the potential to cause changes to the flow of surface watercourses. This is through increased surface run-off, changes to flow pathways and site drainage as described in Section 11.6.

11.7.17 Following the assessment methodology described in Vol 2 Appendix 11.1, the watercourses are assessed to be of high (regional scale watercourse, Walthamstow Reservoirs) or medium (local watercourses) sensitivity (to maintain good WatFD status). The magnitude of any effects on water quality would be low (short-term). The magnitude of any effects related to flow would be negligible (no significant change in run-off from the Application Site). This is due to the embedded control measures identified in Section 11.6. Therefore any temporary effects on water quality and flow in watercourses would be **not significant.**

Groundwater in the Principal and Secondary Aquifers underlying the Application Site and by association the PWS abstractions associated with the SPZ

11.7.18 During Stage 3, those activities identified in Paragraph 11.7.15 all have the potential to cause changes to the flow of groundwater. Following the assessment methodology described in Vol 2 Appendix 11.1 the groundwater is assessed to be of high sensitivity (due to the high aquifer designations and associated supply to water supply). The magnitude of any effects would be negligible (no significant change in run-off from the Application Site or flow pathways). This is due to the embedded control measures identified in Section 11.6. Therefore any temporary effects on groundwater flow would be **not significant**.

Regional water resources, due to a potential impact on water demand within TWUL London WRZ as a result of the Project

11.7.19 During Stage 3, there is anticipated to be increased potable water requirements at the Application Site from temporary workers and potable water use during the construction, compared to the baseline. The numbers of workers may be slightly lower than Stage 1, given the lower level of construction activity. Therefore the effects would be **not significant**.

People, property and infrastructure, at risk of flooding from watercourses, surface water (rainfall), groundwater, surface water sewers, and reservoirs, as a consequence of the Project

11.7.20 During Stage 3 demolition and clearance of existing buildings, completion of landscaping works, completion of parking and access tracks all have the potential to cause flood risk to people property and infrastructure (both on-site and downstream). This is through increased surface run-off from hardstanding areas as described in Section 11.6.

11.7.21 Following the assessment methodology described in Vol 2 Appendix 11.1 the receptors are assessed to be of medium/high sensitivity importance (due to flood zone designations). The magnitude of any effects would be negligible (no significant change in run-off from the Application Site) due to the embedded control measures identified in Section 11.6 (e.g. adequate on-site drainage and maximum greenfield run-off rates). Therefore any temporary effects on water quality would be **not significant.**

11.8 Assessment – operation

Stage 1

11.8.1 As there is no new plant operational in Stage 1, this operational scenario would be the same as the baseline (see Section 11.5).

Stage 2

Surface watercourses including Salmon's Brook, Enfield Ditch, Lee Navigation and downstream watercourses and designated sites including Walthamstow Reservoirs (water quality and flow)

11.8.2 During Stage 2 operational traffic and run-off from hardstanding, and requirements for the tanker spills or firefighting systems have the potential to cause changes to the water quality of the surface watercourses. This is through pollution and leakage and incidents (e.g. fuel spills) as described in Section 11.6.

11.8.3 Following the assessment methodology described in Vol 2 Appendix 11.1 the watercourses are assessed to be of high sensitivity (regional scale watercourses, Walthamstow Reservoirs) or medium sensitivity (local watercourses) to maintain good WatFD status. The magnitude of any effects would be negligible (no significant loss in water quality) due to the embedded control measures identified in Section 11.6 (use of on-site drainage system). Therefore any effects on water quality would be **not significant.**

11.8.4 During Stage 2 the activities in Paragraph 11.8.2 all have the potential to cause changes to the flow of surface watercourses during Project operation. This is through increased surface run-off, site drainage volumes and abstraction of water as described in Section 11.6.

11.8.5 Following the assessment methodology described in Vol 2 Appendix 11.1 Salmon's Brook is assessed to be of medium sensitivity (to maintain flow for water connectivity and ecology).

11.8.6 Under Option A1 (air cooling, TWUL supply) there would be no abstraction from the Deephams STW outflow channel, resulting in a slight beneficial effect to flows downstream in the Salmon's Brook, which is **not signifcant**. Under Option A2 (air cooling, TWUL and Deephams STW outflow channel) the abstraction from the Deephams STW outflow channel would remain at the current rate of 130m^3/hr, resulting in no detrimental effect, i.e. the effect would be **not significant**.

11.8.7 The proposed maximum discharge to Enfield Ditch from surface water run-off (including surface run-off) is 168 l/s. The maximum discharge rates are not known, but it is expected that the proposed rate, being the greenfield discharge rate (as discussed in the FRA, Vol 2 Appendix 11.2) is an improvement on the existing situation. The magnitude of any effects relating to discharge are assessed as significant (positive). Run-off from emergency spills and fire control, if to be discharged to Enfield Ditch after treatment, would be at a controlled discharge rate (in line with the embedded control measures identified in Section 11.6). Therefore the effects on water flow at Enfield Ditch as a result of implementing the drainage strategy are assessed as **not significant** (moderate beneficial).

The existing permitted discharge from Henry Group Ltd

11.8.8 During Stage 2 increased abstraction from the Deephams STW outflow channel has the potential to affect the ability of the downstream Henry Group Ltd licenced discharge to meet discharge consent limits. This is through reductions in flows within Salmon's Brook potentially resulting in changes to the consent requirements.

11.8.9 Following the assessment methodology described in Vol 2 Appendix 11.1 the Henry Group discharge is assessed to be of medium sensitivity (due to requirement to discharge from the facility). The magnitude of any effects would be negligible (as abstraction assumed to be operating at 100 per cent of current operation). Therefore any temporary effects on the discharge would be **not significant.**

Groundwater in the Principal and Secondary Aquifers underlying the Application Site and by association the PWS abstractions associated with the SPZ

11.8.10 During Stage 2 surface run-off from hardstanding has the potential to change the flow of groundwater. This is through increased surface run-off, changes to flow pathways and connectivity with watercourses as described in Section 11.6.

11.8.11 Following the assessment methodology described in Vol 2 Appendix 11.1 the groundwater is assessed to be of high sensitivity (due to the aquifer designations and associated use for water supply). The magnitude of any effects would be negligible (no significant change in groundwater quantity) due to the embedded control measures identified in Section 11.6 (on-site drainage system). Therefore any temporary effects on water quality would be **not significant.**

Existing permitted discharge from the Application Site

11.8.12 During Stage 2 cold testing, hot testing and test run (to include flushing and cleaning of systems) of the ERF and continued use of the EfW facility have the potential to increase requirements on the discharge to Chingford Sewer. This is through increased volumes of water compared to existing as the facilities operate in parallel. However, as the waste throughput at the Application Site would remain the same, it is assumed for this assessment that a worst-case ‘greatest discharge’ option is in place rather than both operating at maximum capacity. As the ERF discharge is less than the current discharge from the EfW facility, the current discharge rate of 70-80 m^3/hr has been assumed for the purposes of this assessment.

11.8.13 Following the assessment methodology described in Vol 2 Appendix 11.1 the discharge is assessed to be of medium sensitivity (due to requirement to discharge from the facilities). The magnitude of any effects would be negligible as there woud be no change to the existing discharge rate and this would remain within the discharge consent limit. Therefore any effects on the discharge to Chingford Sewer would be **not significant.**

Regional water resources, due to a potential impact on water demand within TWUL London WRZ as a result of the Project

11.8.14 During Stage 2, operations described in Paragraph 11.8.12 all have the potential to increase potable water supply demands from the London water resource. This is through increased use of the PWS for site processes. Following the assessment methodology described in Vol 2 Appendix 11.1 the regional water resources are assessed to be of high sensitivity (due to requirement to supply London water). Assuming operation of Option A1 (greatest demand on the WRZ) the magnitude of any effects would be negligible (small increases in relation to whole WRZ). Therefore any temporary effects on water resources would be **not significant**.

Foul sewerage network, due to a potential impact from increased input to the Chingford Sewer from the Project (i.e. process wastewater)

11.8.15 During Stage 2, the activities identified in Paragraph 11.8.12 all have the potential to cause changes to the foul sewerage network. This is through changes to the rate of discharge of waste water from these operations into the Chingford Sewer and associated water quality changes as described in Section 11.6.

11.8.16 Following the assessment methodology described in Vol 2 Appendix 11.1 the foul sewerage network has been assessed to be of low sensitivity (considered to be a local watercourse). The magnitude of flow effects would be negligible (the 'worse case' option discharge volumes would be the same as existing and would still operate within the limits of the existing consent). The magnitude of any water quality effects would be low. This is due to the requirements of the embedded control measures identified in Section 11.6 (including treatment before discharge to the sewer). Therefore any effects on water quality would be **not significant.**

People, property and infrastructure, at risk of flooding from watercourses, surface water (rainfall), groundwater, surface water sewers, and reservoirs, as a consequence of the Project

11.8.17 During Stage 2, operations described in Paragraph 11.8.2 all have the potential to cause flood risk to people, property and infrastructure (both on-site and downstream). This is through increased surface run-off from hardstanding areas as described in Section 11.6.

11.8.18 Following the assessment methodology described in Vol 2 Appendix 11.1 the receptors are assessed to be of medium/high sensitivity (due to flood zone designations). The magnitude of any effects would be negligible (no significant change in run-off or discharge from the Application Site) due to the embedded control measures identified in Section 11.6 (e.g. adequate on-site drainage and discharge of surface runoff limited to greenfield rates). Therefore any effects on flood risk would be **not significant.**

Stage 3

Surface watercourses including Salmon's Brook, Enfield Ditch, Lee Navigation and downstream watercourses and designated sites including Walthamstow Reservoirs (water quality and flow)

For the purpose of this assessment operation of the ERF is assumed to be 100 per cent therefore the nature of the operation and therefore the pathways would be the same as described for Stage 2 (both representing the worst-case). Therefore the effects on water quality or flow would be **not significant**.

Groundwater in the Principal and Secondary Aquifers underlying the Application Site and by association the PWS abstractions associated with the SPZ

11.8.19 The nature of this operation and therefore the pathways are the same as described for Stage 2. Therefore the effect on groundwater flow would be **not significant**.

The existing permitted discharge from Henry Group Ltd

11.8.20 The nature of this operation and therefore the pathways are the same as described for Stage 2 (Paragraphs 11.8.8 and 11.8.9). Therefore the effect on the discharge would be **not significant**.

Permitted discharge from the Application Site to TWUL Sewer

11.8.21 Stage 3 would see full operation of the air cooled condensers, steam and thermal processes, washing operations, potable water demand (washrooms, toilets and kitchens), non-potable uses (e.g. gardening and laundry), all with the potential to change the discharge from the Application Site to Chingford Sewer.

11.8.22 Following the assessment methodology described in Vol 2 Appendix 11.1 the discharge is assessed to be of medium sensitivity (due to requirement to discharge from the facilities). The magnitude of any effects would be negligible (decreases in volume compared to the existing and remaining within consent limits). Therefore any effects on the discharge to Chingford Sewer would be **not significant.**

Regional water resources, due to a potential impact on water demand within TWUL London WRZ as a result of the Project

11.8.23 During Stage 3, potable uses (washrooms, toilets and kitchens) and non-potable uses (e.g. gardening and laundry), fire and dust suppression systems have the potential to put increased pressure on the water resources available within the London WRZ. This is through increased demand as described in Section 11.6.

11.8.24 Following the assessment methodology described in Vol 2 Appendix 11.1 the WRZ is assessed to be of high sensitivity (to maintain water supply). The magnitude of any effects would be low (small increases in relation to whole WRZ). Therefore any temporary effects on regional water resources would be **not significant.**

Foul sewerage network, due to a potential impact from changes to the discharge to the Chingford Sewer from the Project (i.e. process wastewater)

11.8.25 During Stage 3 the activities in Paragraph 11.8.21 all have the potential to cause changes to the foul sewerage network. This is through decreased discharge of waste water from these operations into the Chingford Sewer (48.1m^3/hr compared to existing 70-80m^3/hr) and associated water quality changes as described in Section 11.6.

11.8.26 Following the assessment methodology described in Vol 2 Appendix 11.1 the foul sewerage network has been assessed to be of low sensitivity (local scale receptor that is an existing drainage network not classified under the WatFD). The magnitude of flow effects would be negligible (the 'worst-case' option discharge volumes would still operate within the limits of the existing consent). The magnitude of any water quality effects would be low. This is due to the requirements of the embedded control measures identified in Section 11.6 (including treatment before discharge to the sewer). Therefore any effects on water quality would be **not significant.**

People, property and infrastructure, at risk of flooding from watercourses, surface water (rainfall), groundwater, surface water sewers, and reservoirs, as a consequence of the Project

11.8.27 During Stage 3 the on-site process discharges and on-site hardstanding have the potential to cause changes to the flow of surface watercourses and surface water sewers. The issues are the same as described for Stage 2. Therefore the effects on flood risk would be **not significant**.

11.8.28 Under cooling water option A1 (described at Paragraph 11.6.11) abstraction from the Deephams STW outflow channel upstream of the confluence with Salmon's Brook would not be required. This abstraction, currently 130m^3/hr equivalent to 0.036m^3/s represents 1.3 per cent of mean flow in Salmon's Brook adjacent to the Application Site boundary (based on the flow information set out at Paragraph 11.4.1). This impact is assessed as negligible and not expected to have an effect on flood risk at the Application Site or downstream. The significance of the effect on flood risk would therefore be negligible, and so overall the effects on flood risk in Stage 3 would be **not significant.**

Stage 4

11.8.29 During this stage the Project operation would be the same as the operation for Stage 3 and therefore assessment of effects would be the same as set out for Stage 3 above.

11.9 Assessment – decommissioning of the Project

11.9.1 The decommissioning and demolition of the facilities would involve the majority of the facilities being demolished using the same conventional measures assumed for the demolition of the existing EfW facility in Stage 3. This includes the implementation of measures set out within the CoCP (Vol 1 Appendix 3.1). Prior to removing the plant and equipment, all residues and operating chemicals would be cleaned out from the plant and disposed of in an appropriate manner.

11.9.2 The decommissioning and demolition of the Project would be considered at the detailed design stage as required by the CDM Regulations. The decision of whether to remove the below ground structures (bunker associated with the ERF and piles associated with the RRF and EcoPark House) would take into consideration the need to minimise risk of pollution to the underlying aquifer and any future use of the Application Site. For the same reasons it is expected that the hardstanding and sealed concrete areas (e.g. fuel storage areas sealed to contain any leaks or spillages) would be left in place.

11.9.3 Traffic associated with the decommissioning and demolition of the Project would adhere to legal requirements and guidance applicable at the time.

11.9.4 At this stage the type of facilities that may replace the Project are unknown. Therefore it proposed that the Application Site would be cleared and operation would cease. In terms of water resource demand this would result in a significant benefit. More water would be available within the WRZ and no abstraction from the Deephams STW outflow channel would allow more water to flow within the downstream Salmon's Brook. Being returned to a cleared site would reduce the surface water run-off from the Application Site due to less areas of hardstanding, which would be a benefit in terms of reduced flood risk downstream and potential benefits to water quality within the nearby watercourses.

11.9.5 A decommissioning and demolition method statement would be produced and agreed with the EA as part of the permitting process for the decommissioning.

11.10 Supplementary mitigation

11.10.1 As no significant adverse effects have been identified, no supplementary mitigation measures are required in addition to those good environmental design measures already embedded into the Project (see Section 11.6).

11.11 Residual effects

11.11.1 Construction and operational effects would remain as described in Sections 11.7 and 11.8 respectively. A summary of all residual effects is provided in Section 11.14.

11.12 Sensitivity test for programme delay

11.12.1 For the assessment of water resources and flood risk, a change to the programme of plus or minus 12 months would not be likely to materially change the assessment findings reported in Section 11.11.

11.12.2 Based on the Cumulative Development Schedule (Vol 1 Appendix 5.2), there would be no new receptors requiring assessment as a result of the programme change. This is because there are no developments identified on the Cumulative Development Schedule (Vol 1 Appendix 5.2) that would fall into the future baseline as a result of the programme change and therefore the future baseline would remain as described in Section 11.5.

11.13 Cumulative effects

11.13.1 A number of additional developments have been identified in the area that may give rise to cumulative construction or operational effects.

Construction

11.13.2 Ground disturbance, excavations and construction traffic associated with the UK Power Networks grid connection power line upgrade works (Paragraph 11.5.56) have the potential to affect surface watercourses, groundwater and associated abstractions in the area. However this scheme would be subject to the same standard guidance and construction requirements as the Application Site (see Section 11.6). Therefore in considering the cumulative effects it is anticipated that they would be **not significant**.

11.13.3 The Meridian Water development (see Paragraph 11.5.59) has the potential to affect all the receptors identified in Section 11.5 due to the nature of the works. However, the same standard guidelines and requirements will be required during construction (e.g. prevention of sediment entrained run-off and spills). Therefore it is anticipated that all effects will be mitigated through the design and construction requirements. Therefore in considering the cumulative effects it is anticipated that they would be **not significant**.

Operation

11.13.4 Operation of the UK Power Networks grid connection upgrade works once completed has the potential to include increased hardstanding, increasing the run-off and flood risk potential. However the scale of this change to the existing baseline is likely to be small. Therefore in considering the cumulative effects it is anticipated that they would be **not significant**.

11.13.5 Operation of the Meridian Water development will put additional demand on the London WRZ to supply potable water and additional demand on Deephams STW to take foul water. Upgrades planned for Deephams STW (see Section 11.5) will alleviate the additional demand on foul water, while also ensuring that the receiving water will not deteriorate in WatFD status. Ongoing work by TWUL within the London WRZ will ensure that water resource demand from this development and the Edmonton EcoPark can be accommodated. Therefore in considering the cumulative effects it is anticipated that they would be **not significant**.

11.13.6 There may also be an increase in surface run-off due to changes to the hardstanding in the area. On-site drainage will be required to manage this surface run-off and prevent flood risk. Therefore in considering the cumulative flood risk effect it is anticipated that this would be **not significant**.

11.14 Assessment summary

Construction

Vol 2 Table 11.4: Assessment summary – construction

Water Resources and Flood Risk			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 1			
Demolition, clearance, and construction	With the implementation of CoCP measures and the requirements of the FRA, localised changes in water quality reaching watercourses due to increased sediments in run-off and pollution incidents would be **not significant.**	None required	Effects unchanged. **Not significant.**
Infill, construction, piling and excavation, and diversion of utilities and services	With the implementation of CoCP measures and the requirements of the FRA, localised changes in surface and subsurface flow patterns due to the infill of the artificial pond and landscaped area, construction of temporary Temporary Laydown Area, piling and excavation, construction of attenuation tanks, diversion of utilities and services, creation of access tracks, and construction of parking and facilities areas would be **not significant.**	None required	Effects unchanged. **Not significant.**
Construction traffic	With the implementation of measures including compliance with the CoCP and the requirements of the FRA, the potential for localised changes in water quality reaching watercourses due to pollution incidents would be **not significant.**	None required	Effects unchanged. **Not significant.**

Water Resources and Flood Risk			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 2			
Weighbridge construction, excavation for weighbridges	With the implementation of measures including compliance with the CoCP and the requirements of the FRA, localised changes in water quality reaching watercourses, due to increased sediments in run-off and pollution incidents, and localised changes in surface and subsurface flow patterns would be **not significant.**	None required	Effects unchanged. **Not significant.**
Construction traffic	With the implementation of measures including compliance with the CoCP and the requirements of the FRA, the effect of localised changes in water quality reaching watercourses due to pollution incidents would be **not significant.**	None required	Effect unchanged. **Not significant.**
Stage 3			
Demolition of EfW facility and construction of attenuation tanks, access tracks, and parking and facilities areas	With the implementation of measures including compliance with the CoCP and the requirements of the FRA, the localised changes in water quality reaching watercourses from increased sediments in run-off and pollution incidents and localised changes in surface and subsurface flow patterns would be **not significant.**	None required	Effects unchanged. **Not significant.**
Construction traffic	With the implementation of measures including compliance with the CoCP and the requirements of the FRA, localised changes in water quality reaching watercourses due to pollution incidents would be **not significant.**	None required	Effects unchanged. **Not significant.**

Operation

Vol 2 Table 11.5: Assessment summary – operation

Water Resources and Flood Risk			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 1			
There are no new plant operational in Stage 1, this operational scenario would be the same as the baseline (see Section 11.5).			
Stage 2			
Operation traffic, discharge from site operations	With the implementation of measures from the Operational Management Plan, the localised changes in water quality reaching watercourses due to pollution incidents, or water quality changes at discharges from site operations would be **not significant.**	None required	Effects unchanged. **Not significant.**
Hardstanding areas	With run-off being discharged at a controlled rate into Enfield Ditch, the potential increased flood risk to people and property (downstream and on-site) and changes to channel morphology due to increased run-off would be **not significant.**	None required	Effects unchanged. **Not significant.**
Discharge from site operations	The effect of operation within agreed discharge consents would change water discharge quantities to Chingford Sewer and Enfield Ditch, but this would be **not significant.**	None required	Effect unchanged. **Not significant.**
Abstraction from watercourse (Deephams STW outflow channel upstream of Salmon's Brook)	Potential effect: (Option A1): Increased water available within Salmon's Brook (downstream of abstraction point). Potential effect (Option A2): No change in water available within Salmon's Brook (downstream of abstraction point).	None required.	Option A1 (air cooling): **not significant** Option A2 (air cooling): **not significant**

Water Resources and Flood Risk			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
	Control measures: Future operations optimised to minimise water requirements. Significance: Option A1 (air cooling): **not significant** Option A2 (air cooling): **not significant**		
Abstraction from WRZ	Using water collection techniques for activities such as non-potable uses and fire suppression, the effect of increased demand put on the London WRZ from increased water use (operational and from workers) would be **not significant.**	None required	Effects unchanged. **Not significant.**
Stage 3			
Abstraction from watercourse (Deephams STW outflow channel upstream of Salmon's Brook)	Potential effect: As described for Stage 2 above. Control measures: Future operations optimised to minimise water requirements. Significance: Option A1 (air cooling): **not significant** Option A2 (air cooling): **not significant**	None required	Effects unchanged. Option A1 (air cooling): **not significant** Option A2 (air cooling): **not significant**
Discharge from site operations	The effect of operation within agreed discharge consents would change water discharge quantities to Chingford Sewer and Enfield Ditch, but this would be **not significant.**	None required	Effect unchanged. **Not significant.**
Abstraction from WRZ	Using water collection techniques for activities such as non-potable uses and fire suppression, the effect of increased demand on the London WRZ from increased water use (operational) would be **not significant.**	None required	Effects unchanged. **Not significant.**

Water Resources and Flood Risk			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Stage 4			
During this stage the ERF would be operating at full required capacity, while the RRF operates with a capacity to process of around 390,000 tonnes annually. This operation would be the same as the operation for Stage 3 and therefore assessment of effects on receptors would be the same as Stage 3 above.			

Decommissioning of the Project

Vol 2 Table 11.6: Assessment summary – decommissioning of the Project

Water Resources and Flood Risk			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
Removal of equipment including all residues and operating chemicals	Adhering to measures in the Decommissioning and Demolition Method Statement produced in consultation with the EA, changes to water quality or quantity in watercourses or groundwater from spills or leakage would be **not significant.**	None required	Effects unchanged. **Not significant.**
Demolition including in ground infrastructure	Adhering to measures in the Decommissioning and Demolition Method Statement produced in consultation with the EA, the effect of pollution to the underlying aquifer and the any future buildings on the Application Site would be **not significant.**	None required	Effects unchanged **Not significant.**
Traffic associated with the decommissioning and demolition of the Project	Adhering to standard control measures and guidance requirements, the effect of water quality changes to watercourses and	None required	Effects unchanged. **Not significant.**

Water Resources and Flood Risk			
Aspect of the Project	**Description of effect and significance**	**Supplementary mitigation**	**Residual effects summary**
	groundwater from spills and leakage would be **not significant.**		

12 Interactive Effects

12.1.1 Schedule 4, Part 1 of the EIA Regulations requires an ES to include an assessment of interactive effects. This is an assessment of multiple effects on a single receptor, i.e. bringing the outcomes of the individual topic assessments together.

12.1.2 The interactive effects for the sensitive human, ecological and water receptors in the vicinity of the Application Site are set out in Vol 2 Table 12.1 below.

12.1.3 There are no receptors predicted to experience a significant effect in relation to more than one topic.

Vol 2 Table 12.1: Interactive effects for the Project

Receptor	Topic	Effect	Further Information
Within the Application Site	Environmental Wind	Effects on pedestrians accessing the Application Site are not significant.	ES Vol 2 Section 5
	Daylight, Sunlight and Overshadowing	Effects on daylight and sunlight availability at EcoPark House are not significant.	ES Vol 2 Section 4
	Archaeology	Effects on buried archaeology at the Application Site are not significant	ES Vol 2 Section 3
Edmonton Sea Cadets	Environmental Wind	Effects on pedestrians at Edmonton Sea Cadets and adjacent wharf, and on boating use of River Lee Navigation not significant.	ES Vol 2 Section 6
	Socio-Economics	Temporary disruption during construction associated with access to the water assessed as not significant.	ES Vol 2 Section 9
		EcoPark House would provide improved facilities that would be beneficial but not significant.	ES Vol 2 Section 9
Residential areas to the east (closest: Chingford Mill (Pumping Station House) and Lower Hall Lane)	Air Quality and Odour	Construction dust effects have been assessed as not significant.	ES Vol 2 Section 2
		Emissions from road traffic have been assessed as not significant.	ES Vol 2 Section 2
		Emissions from stacks (EfW facility and ERF) have been assessed as not significant.	ES Vol 2 Section 2
		Odour has been assessed as not significant.	ES Vol 2 Section 2
		Human health impacts have been assessed as not significant.	ES Vol 2 Section 2
	Noise and Vibration	Construction noise and vibration have been assessed as not significant.	ES Vol 2 Section 8
		Road traffic noise has been assessed as not significant.	ES Vol 2 Section 8
		Industrial plant noise has been assessed as not significant.	ES Vol 2 Section 8
	Visual	Significant adverse effect on views from Chingford Mill from construction and operation of the Project in Stages 1, 2 and 3 and from decommissioning. In Stage 4, significant effect would not occur.	ES Vol 3
		Clearance of the Application Site following decommissioning of the Project would give rise to a significant beneficial effect on views from Chingford Mill.	ES Vol 3
		No other significant effects on residential areas to the east.	ES Vol 3

Receptor	Topic	Effect	Further Information
Residential areas to the west (closest: Badma Close and Zambezie Drive)	Air Quality and Odour	Construction dust effects have been assessed as not significant.	ES Vol 2 Section 2
		Emissions from road traffic have been assessed as not significant.	ES Vol 2 Section 2
		Emissions from stacks (EfW facility and ERF) have been assessed as not significant.	ES Vol 2 Section 2
		Odour has been assessed as not significant.	ES Vol 2 Section 2
		Human health impacts have been assessed as not significant.	ES Vol 2 Section 2
	Noise and Vibration	Construction noise and vibration have been assessed as not significant.	ES Vol 2 Section 8
		Road traffic noise has been assessed as not significant.	ES Vol 2 Section 8
		Industrial plant noise has been assessed as not significant.	ES Vol 2 Section 8
	Visual	No significant effects on residential areas to the west.	ES Vol 3
Meridian Water	Air Quality and Odour	Construction dust effects have been assessed as not significant.	ES Vol 2 Section 2
		Emissions from road traffic have been assessed as not significant.	ES Vol 2 Section 2
		Emissions from stacks (EfW facility and ERF) have been assessed as not significant.	ES Vol 2 Section 2
		Odour has been assessed as not significant.	ES Vol 2 Section 2
		Human health impacts have been assessed as not significant.	ES Vol 2 Section 2
	Noise and Vibration	Construction noise and vibration have been assessed as not significant.	ES Vol 2 Section 8
		Road traffic noise has been assessed as not significant.	ES Vol 2 Section 8
		Industrial plant noise has been assessed as not significant.	ES Vol 2 Section 8
	Visual	Significant adverse effect on views from Meridian Water from construction and operation of the Project in Stages 1, 2 and 3 and from decommissioning. In Stage 4, significant effect would not occur.	ES Vol 3
Industrial areas to west and north	Environmental Wind	Effects on pedestrians accessing neighbouring industrial areas have been assessed as not significant.	ES Vol 2 Section 6
Future hotel site on Advent Way	Visual	Significant adverse effect on views from construction and operation of the Project in Stages 2 and 3 and from decommissioning. In Stages 1 and 4, significant effects would not occur.	ES Vol 3

Receptor	Topic	Effect	Further Information
Local workforce	Socio-Economics	Construction employment generation has been assessed as a temporary, beneficial significant effect.	ES Vol 2 Section 9
Road users	Transport	Increased vehicle trips on the local road network have been assessed as not significant.	ES Vol 2 Section 10
Public transport users	Transport	Increased passenger numbers on public transport services have been assessed as not significant.	ES Vol 2 Section 10
Pedestrians, cyclists and Equestrians	Transport	Effects on pedestrians, cyclists and equestrians due to the reconfiguration and use of Lee Park Way and interruption to the PRoW adjacent to the River Lee navigation have been assessed as not significant.	ES Vol 2 Section 10
Schools	Air Quality and Odour	Construction dust effects have been assessed as not significant.	ES Vol 2 Section 2
		Emissions from road traffic have been assessed as not significant.	ES Vol 2 Section 2
		Emissions from stacks (EfW facility and ERF) have been assessed as not significant.	ES Vol 2 Section 2
		Odour has been assessed as not significant.	ES Vol 2 Section 2
		Human health impacts have been assessed as not significant.	ES Vol 2 Section 2
	Noise and Vibration	Construction noise and vibration have been assessed as not significant.	ES Vol 2 Section 8
		Road traffic noise has been assessed as not significant.	ES Vol 2 Section 8
		Industrial plant noise has been assessed as not significant.	ES Vol 2 Section 8
		Net reduction of on-site employment during operation has been assessed as not significant.	ES Vol 2 Section 9
Amenity areas	Daylight, Sunlight and Overshadowing	Effects on Montagu Recreation Ground due to overshadowing have been assessed as not significant.	ES Vol 2 Section 4
	Visual	Clearance of the Application Site following decommissioning of the Project would give rise to a significant beneficial effect on views from Montagu Recreation Ground.	ES Vol 3
LVRP	Daylight, Sunlight and Overshadowing	Effects on amenity spaces due to overshadowing have been assessed as not significant.	ES Vol 2 Section 4

Receptor	Topic	Effect	Further Information
	Ecology	Habitat loss and creation on-site, along Lee Park Way and Enfield Ditch, has been assessed as not significant.	ES Vol 2 Section 5
		Disturbance from construction-related lighting, noise and vibration, dust and effects on water resources has been assessed as not significant.	ES Vol 2 Section 5
		Deposition of acidity and nitrogen has been assessed as not significant.	ES Vol 2 Section 5
	Environmental Wind	Effects on amenity users would be not significant.	ES Vol 2 Section 6
	Noise and Vibration	Construction noise and vibration have been assessed as not significant.	ES Vol 2 Section 8
		Road traffic noise has been assessed as not significant.	ES Vol 2 Section 8
		Industrial plant noise has been assessed as not significant.	ES Vol 2 Section 8
	Visual	Significant adverse effect on close views from within LVRP from construction and operation of the Project in Stages 1, 2 and 3 and from decommissioning. In Stage 4, significant effect would not occur.	ES Vol 3
		Significant adverse effect on views from Picketts Lock from construction and operation of the Project in Stages 2 and 3. Significant effect would not occur in Stages 1 and 4 and during decommissioning.	ES Vol 3
		Clearance of the Application Site following decommissioning of the Project would give rise to a significant beneficial effect on views from within LVRP.	ES Vol 3
Chingford and Walthamstow Reservoirs	Ecology	Disturbance from construction-related lighting, noise and vibration, dust and effects on water resources has been assessed as not significant.	ES Vol 2 Section 5
		Deposition of acidity and nitrogen has been assessed as not significant.	ES Vol 2 Section 5
	Water Resources and Flood Risk	Effects on water quality have been assessed as not significant.	ES Vol 2 Section 11
Epping Forest	Ecology	Deposition of acidity and nitrogen has been assessed as not significant.	ES Vol 2 Section 5
Protected species	Ecology	Habitat loss and disturbance to starling have been assessed as not significant.	ES Vol 2 Section 5
		Loss of breeding habitat for linnet due to scrub clearance and disturbance associated with the operation of the Temporary Laydown Area assessed as significant adverse (temporary).	ES Vol 2 Section 5

Receptor	Topic	Effect	Further Information
Groundwater	Ground Conditions and Contamination	Potential for piling, installation underground pipes, removal of EfW facility bunker and construction of ERF bunker to affect groundwater quality have been assessed as not significant.	ES Vol 2 Section 7
		The effects on groundwater quality due to degradation of construction materials have been assessed as not significant.	ES Vol 2 Section 7
	Water Resources and Flood Risk	Localised changes to groundwater flow patterns have been assessed as not significant.	ES Vol 2 Section 11
Watercourses	Water Resources and Flood Risk	Localised changes to water quality and flow patterns have been assessed as not significant.	ES Vol 2 Section 11
		Potential increased flood risk to people and property has been assessed as not significant.	ES Vol 2 Section 11
		Effects on Salmon's Brook from abstraction of cooling water have been assessed as not significant.	ES Vol 2 Section 11
Utilities	Water Resources and Flood Risk	Increased water quantities placed on Chingford Sewer from site discharges has been assessed as not significant.	ES Vol 2 Section 11
		Increased potable water demand has been assessed as not significant.	ES Vol 2 Section 11

Series 06 Environmental Statement

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