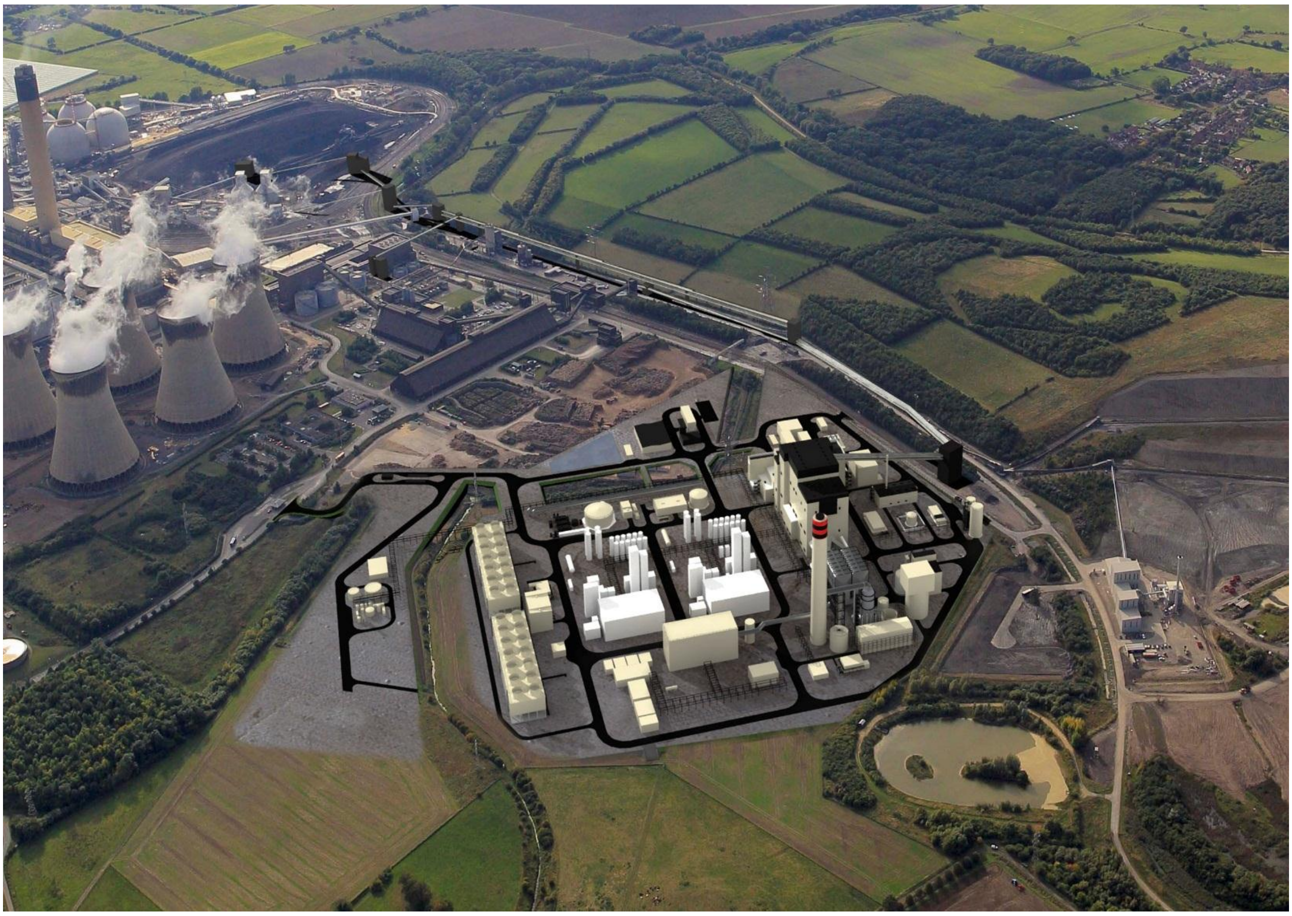
White Rose Carbon Capture and Storage (CCS) Project

Land adjacent to and within the Drax Power Station site, Drax, near Selby, North Yorkshire

Environmental Permit
Chapter IX – Point Source Emissions to Water



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Glossary of Abbreviations and Definitions

AOD	Above Ordinance Datum
ASU	Air Separation Unit
BS	British Standard
CCS	Carbon Capture and Storage
CEMP	Construction Environmental Management Plan
CPL	Capture Power Limited
dB	Decibel
EA	Environment Agency
EIA	Environmental Impact Assessment
ES	Environmental Statement
FGD	Flue Gas Desulphurisation
FRA	Flood Risk Assessment
GPU	Gas Processing Unit
HGV	Heavy Goods Vehicle
LWS	Local Wildlife Site
MWe	Megawatt
NERC	Natural Environment and Rural Communities (Act 2006)
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
SAC	Special Area of Conservation
SINC	Site of Importance for Nature Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
WFD	Water Framework Directive
WHO	World Health Organisation
WSI	Written Scheme of Investigation

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1.0 INTRODUCTION

The White Rose Carbon Capture and Storage project (CCS project) will generate a number of liquid effluents (Table 1), both process and domestic effluents which will be collected and where necessary treated onsite and then be fed back into the existing power station's purge system which discharges to the River Ouse and is covered by the current station's existing Environmental Permit which limits both quantity and quality parameters, e.g. flow, temperature, pH and specific metals associated with the combustion process and the specific treatment of effluents.

Table 1. Provides information and data regarding the main effluents which will be generated and the associated data.

Effluent	Source(s)	Treatment	Design Flow rate
Cooling Tower Blowdown	Hybrid cooling towers following evaporative losses	Waste water collection prior to discharge	Maximum of 470 m^3/h
FGD Wastewater	Generated through wet FGD system	Direct to WWTP	44 m^3/h
GPU Condensate	GPU generates an effluent prior to CO2 processing and compression	Primary holding sump followed by WWTP	5 m^3/h
GPU DCC blowdown	Cooling water generated from GPU direct contact cooler	Direct to WWTP	42 m^3/h
Domestic Wastewater	Generated from amenity facilities	Existing Drax sewage treatment works	13 m^3/h
Site Drainage	Areas of hard standing and roofs	North of Carr Dyke, rainwater is directed to storm water basin and then to Drax Purge. South of Carr Dyke, rainwater is collected and discharged into Carr Dyke	Dependant on rainfall
Service Water	Site wide	Direct to WWTP	10 m^3/hour
Polishing Plant regeneration	Regeneration of ion- exchange resins	Neutralisation and then WWTP	1 m^3/h

The waste water treatment system is designed to treat 110 m^3/h which comprises the main effluents listed above.

The waste water treatment systems are designed to collect and treat the various effluents from the site (Power plant, ASU and GPU). Three terminal points are identified as below:

Terminal Point 8a (returned to Drax and discharged via Drax Purge system):

The Waste water systems are designed to collect various effluents and route them to the waste water treatment plant where treatment of the effluents is deemed necessary as well as provide some buffering capacity for specific areas of the plant.

Generally, the Power Plant will generate seven types of effluents from around the site which are listed below.

- Oil contaminated effluents;
- Chemically contaminated effluents;
- Rain water (Site drainage North of Carr Dyke);
- Fuel oil effluents;
- Industrial effluents;
- Cooling water blowdown;
- Fire fighting water.

Oil contaminated effluents could be generated due to accidents or incidents onsite where oils may be stored or in use. Those areas on site where oil is stored in significant quantities will be designed with suitable oil retention systems, e.g. impermeable bunds. Where oil is being employed, for example in transformers, retention basins and sumps will be employed which can be connected to an oil water separator via a larger common oil retention basin which provides greater capacity to allow for the volumes of oil generated and also volumes of firewater and rainwater.

Chemical effluents generated by the plant include the GPU condensate, effluents associated with the regeneration of the ion exchange resins applied within the water polishing plant. A neutralisation treatment system is employed to neutralise the common polishing plant effluents generated prior to further treatment via the waste water treatment plant.

Cooling water blow down

Cooling tower blow down primarily consists of pre-treated water which will have become concentrated via evaporation and recirculation of cooling water. Other constituents include residual biocides applied to the cooling water and any proprietary anti-scalants. Cooling water blow down will be monitored for specific when passing through the waste water monitoring pit prior to discharge into the Drax Purge system.

The retention basin will service the following areas:

- Combined effluents in each transformer sump;
- Drains and overflow of lube oil tank;
- Specific drains in the turbine hall; and
- Effluents from the electrostatic precipitator transformer which is serviced by a buffer pit prior to being transferred to the oil retention basin for oil/water separation.

Clean water from the oil water separator will then be discharged to the storm water basin. The water treatment systems which will be employed onsite will include

The operational effluents will be discharged to an intercept pit before being monitored and discharged via the existing Drax system which is subject to Drax Power Ltd Environmental Permit regarding quantity and quality.

There are a number of terminal points between White Rose and the existing Drax station. Each of these terminal points will comprise different effluents transferring between the White Rose site and the Drax site or discharged to another receptor. These points are defined as follows:

Terminal Point 8a (Returned to Drax)

Terminal point 8a includes a number of treated effluents as well as the main cooling tower blowdown and raw water treatment backwash. Effluents returned to terminal point 8a will have passed through the waste water treatment plant, except the cooling tower blowdown and raw water treatment backwash. All effluents returning to terminal point 8a will pass through the waste water monitoring pit for sampling.

Terminal Point 8b (returned to Carr Dyke):

Terminal point 8b receives rain water from the areas of the plant to the south of Carr Dyke; site drainage from roofs, areas of hardstanding and car parks and roads will enter a storm basin prior to discharge into Carr Dyke.

Terminal Point 9 (returned to Drax):

Terminal point 9 comprises the domestic wastewaters which will be treated by the existing station's sewage treatment works. The existing works has sufficient capacity to effectively treat the additional volume and load generated by the White Rose plant.

Domestic waste water

Day to day wastewater discharges from the proposed plant will comprise cooling water purge, water treatment plant effluent, boiler blow down, general wash water, sewage, boiler drainage and turbine drain points. In the event of fire, fire-fighting water would also be captured, stored, tested and discharged. Process effluents will be mixed and discharged with the existing process effluents from the Drax installation.

All the above process effluents will be collected in a site effluent sump prior to disposal to the existing purge system and ultimately discharged back to the river Ouse by the Drax Power Ltd purge system. Monitoring systems will be placed at all interface points to ensure all effluents are within Environmental Permit limits at the point of discharge

The White Rose plant will utilise a Waste Water Treatment Plant (WWTP) which will comprise a number of processes to ensure that effluents are treated to the required quality prior to discharge. The plant will be served and protected by a balancing tank which will ensure that the treatment processes received a reasonably constant flow. A neutralisation tank will be used to modify the pH of the effluents in order to facilitate precipitation of metals which may be present in the influent liquid. Modification of the pH using a hydroxide followed by a coagulant and flocculant to assist with charge neutralisation and any solids and sediment removal. Solids removed will be further dewatered with a filter press to increase the solids content of the sludge generated by the precipitation and sedimentation processes.

A secondary treatment system involves another buffer tank which is designed to smooth flows and allows pH adjustments to be made prior to the effluent being treated by a biological treatment system. The biological treatment system is designed to reduce the nitrogen load being discharged back to the Drax purge system. The biological treatment system consists of a nitrification stage followed by a de-nitrification stage.

Discharges from the White Rose CCS plant will be monitored to ensure compliance with the relevant permit requirements for the existing station. These parameters comprise:

- Flow rate
- Temperature
- pH
- Suspended solids
- Copper
- Mercury
- Cadmium

Monitoring of the various elements of the streams which will eventually discharge into the existing Drax purge system will ensure that the current permit conditions are complied with and do not need to change. Compliance with the current relevant qualitative and quantitative requirements within the existing permit constitutes BAT.