



Wylfa Newydd Project

6.5.8 ES Volume E - Off-Site Power Station
Facilities: AECC, ESL and MEEG E8 - Surface
water and groundwater

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8 Surface water and groundwater

8.1 Introduction

- 8.1.1 This chapter describes the assessment of potential surface water and groundwater effects resulting from the construction, operation and decommissioning of the Off-Site Power Station Facilities.
- 8.1.2 Please refer to chapter B8 (surface water and groundwater) (Application Reference Number: 6.2.8) of this Environmental Statement for the technical basis for the assessment including a summary of legislation, policy and guidance; key points arising in consultation that have guided the surface water and groundwater assessment; and assessment methodologies and criteria.
- 8.1.3 The chapter includes a Flood Consequence Assessment (FCA) (see appendix E8-1 MEEG/AECC/ESL Flood Consequence Assessment, Application Reference Number: 6.5.16) with pertinent information from that appendix included in the main text below. Only limited information is included in this chapter regarding Water Framework Directive (WFD) water bodies as these are discussed in a standalone report, the WFD Compliance Assessment (Application Reference Number: 8.26). Assessment of effects on WFD water bodies is included in that document which forms part of the Environmental Statement.

8.2 Study area

- 8.2.1 This section describes the study areas relevant to the surface water, fluvial geomorphology and groundwater assessment for the Off-Site Power Station Facilities.

Surface water

- 8.2.2 The study area within this report is based upon the indicative areas of land that could be physically affected by the proposed Off-Site Power Station Facilities. In general, the surface water study area extends 500m in all directions from the proposed Off-Site Power Station Facilities site, see figure E8-1 (Application Reference number: 6.5.27). This is based on professional judgement (the use of which is outlined in section 8.4 of chapter B8 (Application Reference Number: 6.2.8)) and allows the inclusion of any surrounding water features and off-site receptors that may be affected. The study area also extends up to 2km along key flow pathways leading downstream to ensure that the most likely potential sensitive surface water environment receptors have been identified. Beyond 2km, the effects of any changes to the surface water environment would be unlikely to be significant.
- 8.2.3 The assessment of flood risk takes a catchment approach. The surface water study area with respect to flood risk is therefore based on the stream catchments in and around the proposed Off-Site Power Station Facilities site. The catchment upstream of the Off-Site Power Station Facilities is

within the 500m area shown on figure E8-1 (Application Reference Number: 6.5.27). In a downstream direction, flood risk is considered for as far downstream as any identified flood risk extends (see appendix E8-1, Application Reference Number: 6.5.16).

Fluvial geomorphology

- 8.2.4 The fluvial geomorphology study area encompasses all drainage features within a 250m radius of the proposed Off-Site Power Station Facilities site see figure E8-1 (Application Reference Number: 6.5.27). This is based on professional judgement and allows the inclusion of any surrounding water features and off-site receptors that may be affected. However, where a watercourse is within or immediately adjacent to the boundary of the proposed Off-Site Power Station Facilities site, the assessment extends for a distance of 1km both upstream and downstream to allow for an assessment of any potential effects on flow and sediment processes.

Groundwater

- 8.2.5 Given the size of the development and the absence of significant dewatering proposals, a 1km study area is considered sufficient to assess groundwater movement in the area see figure E8-1 (Application Reference Number: 6.5.27). In all likelihood, given the low permeability of the aquifers present, any effects are likely to be limited to an area out to a maximum of 500m from the site, but following a precautionary approach, the study area has been extended to 1km.

8.3 Baseline environment

- 8.3.1 This section provides a summary of the baseline conditions for surface water, fluvial geomorphology and groundwater within the study areas described in section 8.2.
- 8.3.2 The assessment of baseline conditions has been undertaken using the methodology specified in section 8.4 of chapter B8 (Application Reference Number: 6.2.8). A walkover survey of the proposed Off-Site Power Station Facilities site and the wider survey area was undertaken on 11 February 2016. This included the collection of surface water samples from three locations see figure E8-1 (Application Reference Number: 6.5.27). Sample location LF3 was positioned at the outfall of the section of East Drain culverted beneath the site of the proposed Off-Site Power Station Facilities to enable an assessment of the impact of the existing land use on baseline water quality. LF2 is located on the Afon Llanrhuddlad upstream of the proposed Off-Site Power Station Facilities to assess the baseline conditions upstream of the proposed development. The LF1 sampling location was located in the East Drain culvert within the proposed Off-Site Power Station Facilities site to gain an additional source of information on baseline water quality within the site.
- 8.3.3 The Off-Site Power Station Facilities site is located approximately 350m to the north-east of the centre of the village of Llanfaethlu with direct access onto the A5025. It is approximately 2ha in size and situated on the east

side of the A5025. The topography comprises a shallow valley formed between drumlins (small hillocks formed by glacial action). The ground surface falls towards the east, from an elevation of 55m Above Ordnance Datum in the west of the Off-Site Power Station Facilities site, down to 48m Above Ordnance Datum in the east. As detailed in chapter E1 (proposed development) (Application Reference Number: 6.5.1), the site for the Off-Site Power Station Facilities is currently being used as a garage and for vehicle parking.

Surface water

Catchment and water features

- 8.3.4 The proposed Off-Site Power Station Facilities site is located within a parcel of land that has been heavily modified by previous development. A review of historical mapping indicates that a spring and watercourse used to flow from west to east across the north of the Off-Site Power Station Facilities site where the garage buildings are currently located. Any watercourses or flow paths that would have previously been open are now culverted or potentially realigned. Historical mapping to the west of the site indicates that the ponds located to the west of the site have formed within former quarries.
- 8.3.5 At the time of writing, the site is predominantly hardstanding and includes two commercial garages and a motor vehicle repair building, which have been present on the site since 1979. Prior to this, the site was agricultural fields. There is an existing single-storey house in the south-west area of the site. Vegetation and scattered planting is present on the northern boundary including an evergreen tree shelterbelt, while earth bunds and hedgerows are present along the eastern and southern boundaries.
- 8.3.6 The main watercourse within the proposed Off-Site Power Station Facilities site emerges at the eastern corner of the site and is a small unnamed tributary of the Afon Llanrhuddlad, referred to as the East Drain for the purposes of this assessment. Upstream of the site, there is no evidence of a formal watercourse. However, based on historical Ordnance Survey (OS) mapping, it is assumed that this stream is fed by the spring recorded on historical mapping, by overland flow from two ponds located approximately 100m and 330m to the west (see figure E8-1, Application Reference Number: 6.5.27) of the proposed Off-Site Power Station Facilities site, land drainage to the west of the A5025 and possibly the A5025 itself.
- 8.3.7 Based on analysis of mapping and a site walkover survey, East Drain is assumed to be culverted beneath the proposed Off-Site Power Station Facilities and first becomes visible at its eastern boundary. The East Drain, which has a catchment of approximately 0.25km² upstream of the A5025, flows eastwards as an open channel to the Afon Llanrhuddlad approximately 80m to the east. The criteria for defining the value of identified receptors are presented in table B8-12 of chapter B8 (Application Reference Number: 6.2.8). As a minor watercourse with only local importance and no important fisheries identified, East Drain has been assessed as being of low value.

- 8.3.8 The catchment area for the Afon Llanrhuddlad upstream of the proposed Off-Site Power Station Facilities site is estimated from OS mapping to be 1.6km², and as such, it has been assessed as being of low value due to it being environmentally important at a local scale only. The Afon Llanrhuddlad flows in a north to south direction parallel to the A5025 and joins the Tan R'Allt, approximately 2.7km downstream. The Tan R'Allt is more than 2km downstream of the proposed Off-Site Power Station Facilities and therefore, falls outside the study area. This far downstream, processes of dispersal and dilution are considered to be sufficient such that any predicted effects would be negligible and the Tan R'Allt has been scoped out of the assessment.
- 8.3.9 During the site walkover, a small drain was observed flowing from north to south along the eastern field boundary of the proposed site for the Off-Site Power Station Facilities. This drain, referred to here as the Hen-shop Drain (see figure E8-1, Application Reference Number: 6.5.27), runs perpendicular to and discharges into the East Drain. Given the current land use, it is likely that there is a network of subsurface structures and drains beneath the hardstanding at the proposed site for the Off-Site Power Station Facilities. The Hen-shop Drain conveys flow from a sub-catchment to the north of the proposed Off-Site Power Station Facilities site, which includes the adjacent residential properties. This small drain has been assigned a value of low as a result of its status as a minor watercourse.
- 8.3.10 Tan-y-bryn is a field ditch located approximately 460m to the south and running southwards away from the proposed Off-Site Power Station Facilities site. The connectivity of this ditch to other watercourses further downstream within the study area is unknown. It has been scoped out of the assessment on the basis that it is not part of the surface water catchment of the Off-Site Power Station Facilities.
- 8.3.11 It is noted that Llyn Garreg-lwyd Site of Special Scientific Interest (SSSI) is outside the study area at a distance of approximately 650m north west of the proposed Off-Site Power Station Facilities site. It is shown on OS maps as being connected to the Afon Llanrhuddlad upstream of the proposed Off-Site Power Station Facilities. However, the surface water flow directions in that area are complex, as the Afon Llanrhuddlad appears to potentially feed two catchments. This is likely due to local drainage ditches. Based on the primary direction of flow, it is unlikely that there is any surface flow from the proposed Off-Site Power Station Facilities to the SSSI. The SSSI is outside the 500m study area and has no surface water connectivity to the Off-Site Power Station Facilities, and so has been scoped out of the assessment.

Flood risk

- 8.3.12 An FCA (appendix E8-1, Application Reference Number: 6.5.16) has been prepared as part of the Environmental Impact Assessment. This identifies that the proposed site for the Off-Site Power Station Facilities is located within Flood Zone A. This is defined in *Technical Advice Note (TAN) 15: Development and Flood Risk [RD1]* as an area which has been assessed as having little or no risk of fluvial or tidal flooding. However, it is noted that small catchments (any catchment less than 3km²), such as the East Drain,

are not included in national-scale modelling exercises. The site may therefore be at risk of flooding, but still be shown as being within Zone A. The nearest Natural Resources Wales (NRW) modelled floodplain is associated with the Tan R'Allt downstream.

- 8.3.13 NRW surface water flood mapping [RD2] indicates that a flow path is present in the headwaters of the East Drain catchment running broadly south-east from the larger of the two ponds located approximately 330m west of the proposed Off-Site Power Station Facilities site. The flow path crosses the A5025 and runs along the northern edge of the proposed Off-Site Power Station Facilities site (see figures E8-1 to E8-3, Application Reference Number: 6.5.27). The NRW surface water flood risk mapping [RD2] indicates that areas along the northern site boundary have a high risk of surface water flooding and would be at risk from the 3.33% annual exceedance probability (1 in 30-year) pluvial event. However, it is noted that neither the NRW surface water modelling nor additional modelling (see below) includes road drainage or the culvert, which is assumed to convey the East Drain before it emerges to the east beyond the proposed Off-Site Power Station Facilities site.
- 8.3.14 Surface water modelling has been undertaken by Horizon to further quantify the baseline risks to the site from this source of flooding. This modelling is discussed in detail in appendix E8-1 (Application Reference Number: 6.5.16). This modelling predicts that the onset of surface water flooding within the Off-Site Power Station Facilities site would be during the 1 in 30-year rainfall event with flood depths and extents increasing during higher magnitude events (the 1 in 100 and 1 in 1,000-year rainfall events were also modelled). The flood extent for all modelled events is broadly similar in that surface water would pond on the western side of the A5025 before overtopping and flowing through the centre of the proposed Off-Site Power Station Facilities site and onwards to the East Drain. Runoff would also flow from the village of Llanfaethlu in a north-eastern direction across agricultural fields and along the A5025 onto the proposed Off-Site Power Station Facilities site.
- 8.3.15 The maximum flood depths vary between 0.1m in the centre of the proposed Off-Site Power Station Facilities site during the 1 in 30-year event to 0.15m in the same location during the 1 in 100-year event to 0.27m during the 1 in 1,000 year event. The water flow velocities during the 1 in 100-year event exceed 0.45m/s. At velocities above 0.45m/s it can become difficult to stand. Given the very high value of the Off-Site Power Station Facilities and a high probability of occurrence, the overall flood risk from surface water is determined as high.
- 8.3.16 Flood risk receptors currently within the extent of the surface water flow path include the garages on the proposed Off-Site Power Station Facilities site, off-site properties, the A5025 and agricultural land (see section 3.4 of appendix E8-1, Application Reference Number: 6.5.16). In accordance with table B8-12 of chapter B8 (Application Reference Number: 6.2.8), residential development has been assigned a high value, the garages a medium value and agricultural land a medium value. In accordance with the *Design Manual for Roads and Bridges* [RD3], highways are considered

as essential infrastructure; therefore, the A5025 has been assigned a very high value.

- 8.3.17 There are other built development receptors within the study area. These include residential properties, a church, and a post office within Llanfaethlu to the south-west. Residential properties are also located immediately north of the proposed Off-Site Power Station Facilities and a waste water treatment works is located to the south. A new school, Ysgol Rhyd y Llan was opened in autumn 2017 to the south-west, on the western side of the A5025.
- 8.3.18 The village of Llanfaethlu is located on sufficiently higher ground than the proposed Off-Site Power Station Facilities site so would not be affected by the proposals, and has been scoped out of further assessment. Whilst the residential properties to the north and waste water treatment works and school to the south-west are not at direct risk of flooding from the main surface water flow path flowing across the existing site, there is a risk that these flow paths and associated flood risk could be affected by development of the proposed Off-Site Power Station Facilities. For that reason, these receptors have been included within this assessment. In line with TAN 15 [RD1], residential development and public buildings (i.e. the school) are highly vulnerable and have therefore been assigned a high value. The waste water treatment works has been assigned a high value due to its importance as critical infrastructure and the potential for any flooding of the treatment works to spread contamination [RD1].
- 8.3.19 The FCA (appendix E8-1, Application Reference Number: 6.5.16) assesses the risk of groundwater flooding and the risk from drainage and water supply infrastructure to be low.

Surface water quality

- 8.3.20 One round of surface water sampling was undertaken by Jacobs hydrologists at three locations in February 2016:
- LF1 (East Drain from within the bus depot via a manhole);
 - LF2 (Afon Llanrhuddlad); and
 - LF3 (East Drain at the culvert outfall).
- 8.3.21 These sampling locations are shown on figure E8-1 (Application Reference Number: 6.5.27).
- 8.3.22 Samples were tested for a wide range of substances and the results are summarised in table E8-1. Based on one round of testing, the results do not indicate gross contamination of surface waters. Arsenic, cadmium, chromium, mercury and VOCs were all below the limit of detection, whilst dissolved solids were low and dissolved oxygen concentrations were high.

Table E8-1 Summary of water quality

Substance	LF1	LF2	LF3
pH	7.5	7.8	7.4
Conductivity ($\mu\text{S/cm}$)	370	238	363
Dissolved oxygen (mg/l)	9.2	9.0	9.1
Total suspended solids (mg/l)	9.0	7.0	12.5
Bicarbonate alkalinity (mg/l)	100	55	105
Ammoniacal nitrogen (N) (mg/l)	<0.2	<0.2	<0.2
Chloride (mg/l)	46	42	48
Sulphate (mg/l)	22	15	23
Nitrate (NO_3) (mg/l)	20	7	20
Sodium (mg/l)	26	22	28
Magnesium (mg/l)	7	6	7
Calcium (mg/l)	38	18	39
Potassium (mg/l)	3.8	2.7	3.7
Copper ($\mu\text{g/l}$)	0.9	1.1	1.0
Nickel ($\mu\text{g/l}$)	0.8	1.0	0.9
Zinc ($\mu\text{g/l}$)	3.5	2.7	6.7
Lead ($\mu\text{g/l}$)	0.1	0.1	<0.1
Chromium ($\mu\text{g/l}$)	1.6	0.9	2.1
Arsenic ($\mu\text{g/l}$)	0.2	0.4	0.3
Cadmium ($\mu\text{g/l}$)	<0.1	<0.1	<0.1
Ionic balance	-4.6	-5.1	-5.5
Volatile organic compounds ($\mu\text{g/l}$)	<1	<1	<1

Surface water abstractions and discharges

- 8.3.23 The Isle of Anglesey was, until January 2018, a licence-exempt area, and so NRW does not (at the time of writing) hold any details regarding abstractions. The Isle of Anglesey County Council holds details of private potable abstractions it is aware of, but their list is not exhaustive. However, the potential for any private/domestic potable abstractions from surface water in this area is extremely low given the existing water supply network in the area from Dŵr Cymru Welsh Water, and the potential health risks associated with drinking untreated surface water. It is possible that there are small, unlicensed abstractions for livestock drinking water across the rural study area.
- 8.3.24 There is a small waste water treatment works with a licensed discharge consent approximately 60m south of the southern site boundary and four

other industrial sites within 250m of the site boundary, including an alcoholic drinks distillery.

Existing water infrastructure

- 8.3.25 In addition to the culverted sections of East Drain and Hen-shop Drain, a foul water drainage pipe runs along the A5025 to the west of the proposed Off-Site Power Station Facilities site; it then branches off and crosses the middle of the western boundary. There are a total of three main foul water drainage pipes, running from west to east in the centre of the site.
- 8.3.26 Detailed surveys of the existing surface water drainage within the proposed Off-Site Power Station Facilities site have not been undertaken but observations made during the site walkover indicated that surface water drains directly into the culverted section of East Drain with no oil interceptors or flow control observed.
- 8.3.27 There is an existing mains water pipe that runs along the A5025 road to the west outside the site boundary. It is currently unclear where the existing building's water supply enters the site and how it is distributed.

Ecological designations

- 8.3.28 As described in chapter E9 and by Department for Environment, Food and Rural Affairs (Defra) [RD4], the nearest statutory designated ecological site to the proposed Off-Site Power Station Facilities site is Llyn Garreg-lwyd SSSI, located approximately 600m to the north-north-west. This SSSI is a large reedbed at the location of two former ornamental lakes. Llyn Garreg-lwyd is an example of tall fen dominated by common reed and supports a range of breeding birds. This site is outside the 500m study area and outside the surface water catchment of the proposed Off-Site Power Station Facilities. This receptor has therefore been scoped out of the assessment.

Fluvial geomorphology

- 8.3.29 As detailed in the surface water section, there is a minor watercourse within the proposed Off-Site Power Station Facilities site, the East Drain. Based on site observations and mapping, the watercourse is presumed to be culverted under the majority of the site. At the eastern boundary of the site, the East Drain becomes an open channel. The channel is artificially over-deep with earth banks and fine gravel bed substrate. The channel was observed during the site walkover in February 2016 to be brick-lined for approximately a 10m length downstream of the culvert outlet, with a grill laid across the culvert opening. At the culvert outlet, the channel was noted to be modified with a rectangular cross-section.
- 8.3.30 Measurements taken during the February 2016 walkover recorded the East Drain as being approximately 1.5m deep (bank full) and 0.75m wide where it emerged from the site boundary. The flow was observed to be typically uniform and with glide flow. Both banks were noted to be vegetated with brambles and nettles suggesting that it was disturbed ground.

- 8.3.31 Approximately 100m downstream of the site boundary the East Drain channel has a confluence with the Afon Llanrhuddlad, a small watercourse approximately 1m wide and 0.35m deep. The banks of this watercourse were noted during the site walkover to be typically 1m high. The bed substrate consisted of silt, gravel and cobbles. A uniform glide flow was also observed. Further downstream, the Afon Llanrhuddlad channel then joins the Tan R'Allt. The Tan R'Allt is outside of the study area and assessed in full within the WFD Compliance Assessment (Application Reference Number: 8.26).
- 8.3.32 Also within the site boundary is the Hen-shop Drain. The channel was found to be dry at the time of the walkover survey, with an overgrown vegetated riparian corridor. The bed and banks were noted to be brick-lined.
- 8.3.33 The on-site drains and the Afon Llanrhuddlad have been assessed as having a low value in terms of geomorphology as a result of limited morphological features and their modified nature.

Groundwater

Soils and geology

- 8.3.34 The site of the proposed Off-Site Power Station Facilities is predominantly covered by hardstanding which drains to the culverted section of East Drain. This would provide a degree of protection to the underlying aquifers from spills or leaks of polluting substances such as oils. However, this hardstanding was observed to be in a poor condition during the site walkover so the degree of protection would be variable. Whilst it is assumed that the natural topsoil would have been stripped as part of the construction of the existing site, where the soil remains around the edges of the existing hardstanding, it comprises slowly permeable seasonally wet acid loamy and clayey soils. Such soils typically comprise relatively compacted subsoil, which limits the downward movement of rainwater into the underlying bedrock, and offers some form of natural protection to underlying aquifers. Such soils are typically characterised by seasonal waterlogging and wet ground conditions after periods of intense rainfall.
- 8.3.35 The bedrock beneath the site [RD5] comprises the Gwna Group, a metamorphic bedrock unit containing psammite, quartzite and pillow lavas. A quartzitic igneous intrusion, also belonging to the Gwna Group, crosses the bedrock in the north-east of the site, with a north-east/south-west trend, and has a surface width of approximately 25m. Drift deposits are shown to be absent from the proposed Off-Site Power Station Facilities site. A more detailed description of the bedrock geology at the site is given in chapter E7 (soils and geology) (Application Reference Number: 6.5.7).

Aquifer characteristics

- 8.3.36 The bedrock beneath the proposed Off-Site Power Station Facilities site comprises a Secondary B aquifer [RD6]; such aquifers typically comprise lower permeability layers that can store and yield limited amounts of

- groundwater [RD6]. The low permeability soils and the existing hardstanding are likely to restrict local recharge rates to the aquifer.
- 8.3.37 Ground investigations along the adjacent A5025 in March 2016 [RD7] indicated that groundwater in the area is 3m to 4m below ground level at a borehole that is 170m to the south-west of the proposed Off-Site Power Station Facilities. Water levels are likely to drop further during the summer months with annual fluctuations in the bedrock in this area typically being of the order of 2m.
- 8.3.38 Details of the groundwater flow direction at the site are not known. However, the dominant groundwater flow direction in the bedrock at the regional scale is likely to be towards the coast (i.e. to the west). With regard to groundwater movement through subsoil/shallow strata and any superficial deposits, locally this is likely to be towards the east and the Afon Llanrhuddlad.
- 8.3.39 The aquifer beneath the site forms part of the WFD Ynys Môn Secondary Aquifer which includes much of Anglesey. The overall WFD status of the Ynys Môn Secondary Aquifer is 'poor' due to localised contamination in the vicinity of former mine workings at Parys Mountain to the east. However, as the water body is present beneath much of Anglesey, this assessment is generic and the local-scale water quality beneath the site has not been determined.
- 8.3.40 The bedrock aquifer has been assessed as having a low value in accordance with the criteria specified in table B8-12 of chapter B8 (Application Reference Number: 6.2.8) due to its low productivity and its local rather than strategic importance as a water resource.

Groundwater quality

- 8.3.41 During a site walkover carried out by Jacobs in January 2016, a number of potential contaminant sources were identified on-site. These included a petrol/fuel pump, a number of old oil storage barrels and a possible fuel storage tank. All potential contaminant sources are discussed in more detail in chapter E7 (Application Reference Number: 6.5.7). The proposed Off-Site Power Station Facilities site is classified as 'brownfield' as it is currently occupied by a commercial garage, which until recently included facilities for commercial heavy goods vehicle repairs. There may be some localised contamination in soils and groundwater resulting from spills or leaks of fuels/oils and chemicals where hardstanding was observed to be in a poor condition. The majority of hardstanding is likely to act as a barrier to contaminants entering soils and groundwater with surface runoff routed to the culverted section of East Drain.

Groundwater abstractions

- 8.3.42 The proposed Off-Site Power Station Facilities site lie within an area that was until January 2018 a licence-exempt area for groundwater abstractions, and, as a result, NRW does not (at the time of writing) hold any information relating to groundwater abstractions in the area. A list of potable abstractions in Anglesey is held by the Isle of Anglesey County

Council and one private water supply is identified to the immediate west of the site at Ty'n-y-Buarth as detailed in table E8-2 and shown on figure E8-1 (Application Reference Number: 6.5.27). However, it should be noted that there may be abstractions in the area that are unknown to the Isle of Anglesey County Council. A private water supply at Garreglwyd, to the north west of the proposed Off-Site Power Station facilities has been scoped out due to its distance (figure E8-1, Application Reference Number: 6.5.27).

Table E8-2 Private water supplies

Name	Address	Usage	Easting	Northing	Distance from scheme (m)	Direction from scheme
Ty'n-y-Buarth	LL65 4NW	Residential	231615	387175	<50m	West

- 8.3.43 A well is also shown on OS mapping, along the southern site boundary, although no evidence was found during the site walkover to suggest that this well was in use, or indeed present. It is noted that a spring is shown approximately at this location on historical mapping dating to 1889, which is subsequently marked as a well on the 1900 map. This suggests it may originally have been a natural feature that was formalised before falling into disuse.
- 8.3.44 Three more wells are recorded on OS mapping within 500m of the proposed Off-Site Power Station Facilities. As with the well recorded on-site, these were not observed during the site walkover and it is assumed they are no longer in use. There are a total of 13 wells shown within 1km on OS maps.
- 8.3.45 In the absence of any information to suggest that the wells recorded in the vicinity of the site are still in use, and given the availability of a public mains water supply in the area, it is assumed that if the wells recorded are still used they would likely be used for agricultural purposes only. Therefore, they are considered to be of low importance.

Groundwater supported waterbodies

- 8.3.46 No groundwater supported waterbodies have been identified within the study area. The SSSI citation [RD8] for Llyn Garreg-lwyd does not identify groundwater as being a significant source of water in the maintenance of this wetland, and the dominant inflow into the SSSI appears to be from a stream. This suggests that significant effects resulting from the proposed Off-Site Power Station Facilities site via the groundwater pathway are unlikely and the SSSI has therefore been scoped out of the groundwater assessment.

Water Framework Directive

- 8.3.47 All of the surface watercourses and the groundwater body detailed above fall within the Western Wales River Basin District which is discussed in the *Western Wales River Basin Management Plan 2015 – 2021* [RD9].
- 8.3.48 The proposed Off-Site Power Station Facilities site lies within the Tan R’Allt WFD fluvial water body. The Tan R’Allt ultimately discharges into the sea 8km downstream of the site, via the Alaw Estuary which is designated as a WFD transitional water body. The proposed Off-Site Power Station Facilities site also overlies the Ynys Môn Secondary groundwater WFD water body. Data from NRW rivers and water bodies online mapping [RD10] for surface waters and groundwater are summarised in table E8-3.
- 8.3.49 A Water Framework Directive Compliance Assessment (Application Reference Number: 8.26) has been completed for the Wylfa Newydd Project and provides a detailed summary of the baseline conditions, including those at the proposed Off-Site Power Station Facilities.

Table E8-3 Key WFD catchments

WFD catchment	Type	Hydromorphological Status	Overall Status (2015)
Tan R’Allt	Fluvial	Not Designated as a heavily modified water body	Moderate
Afon Alaw	Transitional (i.e. estuarine)	Not Designated as a heavily modified water body	Moderate
Ynys Môn Secondary	Groundwater	Not applicable	Poor

Summary of receptors

- 8.3.50 Environmental receptors potentially affected by the Off-Site Power Station Facilities are shown in table E8-4.

Evolution of the baseline

- 8.3.51 The watercourses within the study area exhibited (when observed during the walkover survey in 2016) little evidence of adjustment, with low energies (arising from a combination of low slope/discharge). The East Drain, Hen-shop Drain and Afon Llanrhuddlad were observed to be typically artificially modified, likely for drainage purposes. These could potentially receive fine sediment, which would become deposited over the channel bed, and in the absence of maintenance, this sediment could accumulate. No other changes to the baseline are anticipated for the lifetime of the Off-Site Power Station Facilities unless there are other developments in the area during the operation of the Off-Site Power Station Facilities.
- 8.3.52 The *Western Wales River Basin Management Plan* [RD9] provides details of the status objectives for the WFD water bodies within the study area for

years 2021 and subsequently 2027. As suitable mitigation is put in place, the objective is that WFD water body status would improve, potentially from moderate to good.

- 8.3.53 Over the medium- to long-term time period, climate change could potentially alter the hydrological regime of the watercourses. This is assessed as part of the surface water baseline and is included as part of the FCA (appendix E8-1, Application Reference Number: 6.5.16). Increased frequency/severity of droughts and floods could potentially lead to the watercourses adjusting to differing patterns of erosion and deposition. However, it is likely that the adjustment would remain localised and be of relatively low magnitude given the channel types.
- 8.3.54 No new substantial groundwater abstractions are anticipated in the area and so the status of the groundwater resource is unlikely to change. Groundwater levels could change in the lifetime of the Off-Site Power Station Facilities if rainfall increased markedly, but flow directions are unlikely to change.

Table E8-4 Key water environment receptors

Category	Key receptors	Value
Surface water including flood risk	East Drain	Low
	Hen-shop Drain	Low
	Afon Llanrhuddlad (including two unnamed ditches)	Low
	Garages on existing site	High
	Residential property and sewage works to the south and south-west of the existing site	High
	A5025	Very high
	Agricultural land	Medium
	Off-Site Power Station Facilities	High
Fluvial geomorphology	East Drain	Low
	Hen-shop Drain	Low
	Afon Llanrhuddlad	Low
Groundwater	Secondary B Aquifer	Low
	Private water supply at Ty'n-y-Buarth	Medium
	Wells	Low

8.4 Design basis and activities

- 8.4.1 This section sets out the design basis for this assessment of effects. It sets out where any assumptions have been made to enable the assessment to be carried out at this stage in the evolution of the design. This section also identifies the embedded and good practice mitigation that would be

adopted to reduce adverse effects as inherent design features or by implementation of standard industry good working practice.

- 8.4.2 As described in chapter E1 (proposed development) (Application Reference Number: 6.5.1), the application for development consent is based on a parameter approach. The assessment described within this chapter has taken into consideration the flexibility afforded by the parameters. A worst case scenario has therefore been assessed from a surface water and groundwater perspective within the parameters described in chapter E1 and taking into account the basis of assessment and assumptions outlined below.

Construction

Basis of assessment and assumptions

- 8.4.3 The key elements of the design that are of relevance to the surface water and groundwater assessment are outlined below:
- construction of the contractor's site compound including designated diesel fuel storage area and welfare facilities;
 - topsoil removal in limited areas and formation of landscaped areas;
 - demolition of existing buildings;
 - break out existing hardstanding that may expose buried and unknown water features;
 - new buildings would likely have pile foundations and a piling mat would be placed to facilitate construction;
 - storage and use of granular materials for forming road, car park and building sub-base;
 - storage and use of cement-related materials;
 - excavation and installation of new underground diesel storage tanks;
 - excavation and construction of a new drainage system;
 - excavation and construction of an underground storm water attenuation tank beneath the eastern side of the proposed Off-Site Power Station Facilities site to collect runoff from buildings and hardstanding;
 - excavation of a swale which would separate the majority of the proposed Off-Site Power Station Facilities site from the area of overspill parking to the south;
 - construction activities to take place right up to the edge of the stream on the eastern side of the proposed Off-Site Power Station Facilities site (i.e. no buffer zone);
 - during below-ground works, there would be potential for encountering contaminated soils/groundwater resulting from previous land use as a bus depot/garage/vehicle parking area;
 - construction of roads and buildings; and

- construction of a stone wall along part of the northern and eastern boundary (see figure E1-2, Application Reference Number: 6.5.27).

Embedded mitigation

- 8.4.4 No embedded mitigation has been proposed as part of the construction phase.

Good practice mitigation

- 8.4.5 Good practice mitigation would comprise the adherence to all relevant legislation, statutory and non-statutory guidance as detailed in section 8.2 of chapter B8 (Application Reference Number: 6.2.8) and as stated in the Wylfa Newydd Code of Construction Practice (CoCP) (Application Reference Number: 8.6).

- 8.4.6 The Wylfa Newydd CoCP (Application Reference Number: 8.6) and Off-Site Power Station Facilities sub-CoCP (Application Reference Number: 8.9) set out the overarching pollution management principles to be applied across the Off-Site Power Station Facilities site through the construction period. These detail good practice procedures that the contractor would be required to follow. The implementation of this mitigation would be the responsibility of the contractor, with no work being commenced before all contractors are familiar with the CoCPs. This would include management of materials, management of drainage and sediment, and an emergency response plan. The processes for checking and reporting compliance would be detailed, as would the process for changes if significant pollution of the water environment were to be identified. Specific good practice, as outlined in the CoCPs, would include the following.

- Soil storage mounds would have slopes of one in two or less where practicable and where soils would be stored for longer than 60 days, stockpiles would be seeded with an appropriate low maintenance seed mix.
- A risk assessment would be undertaken for use of any cementitious materials within 50m of any active watercourse. Appropriate controls, proportionate to the level of risk identified, would be applied to the works.
- All refuelling, oiling and greasing would take place above drip trays or on impermeable surfaces (e.g. plant nappy) with sealed drainage and an oil interceptor, which provides protection to underground strata and watercourses, and away from drains as far as is reasonably practicable. Vehicles and plant would not be left unattended during refuelling. Appropriate spill kits would be easily accessible during these activities. Only construction equipment and vehicles free of oil/fuel leaks which could cause material contamination would be permitted on-site. Drip trays would be placed below static mechanical plant.
- Measures would be taken to prevent the deposition of silt or other material arising from work operations in existing watercourses or

catchment areas. The measures would accord with the principles set out in industry guidelines, including the NRW's *Works and maintenance in or near or water: Guidance for Pollution Prevention 5 (GPP)* [RD11]. Measures include use and maintenance of temporary lagoons, tanks, bunds, silt fences or silt screens, as well as consideration of the type of plant used and the time of year for working in watercourses.

- 8.4.7 As stated in the Wylfa Newydd CoCP (Application Reference Number: 8.6) any permanent oil storage tanks and temporary storage of over 200 litres of oil in drums and mobile bowsers, as well as ancillary pipe work, valves, filters, sight gauges and equipment require secondary containment, e.g. bunding or drip trays (Water Resources (Control of Pollution) (Oil Storage) (Wales) Regulations 2016).
- 8.4.8 Good practice mitigation during construction would include following guidance on pollution control and relevant Construction Industry Research and Information Association (CIRIA) guidance on good construction practice, such as *Control of Water Pollution from Construction Sites* [RD12], as stated in the Wylfa Newydd CoCP (Application Reference Number: 8.6).
- 8.4.9 Although Environment Agency Pollution Prevention Guidance Notes have been withdrawn they are being replaced in Wales by GPP. Two guidance notes relevant to the water environment and activities at the proposed Off-Site Power Station Facilities have been prepared to date. GPP 2 [RD13] relates to above-ground oil storage tanks whilst, as noted above, GPP 5 [RD11] relates to works or maintenance in or near water. As stated in the Wylfa Newydd CoCP (Application Reference Number: 8.6), these would both be followed as part of construction work for the Off-Site Power Station Facilities.
- 8.4.10 As stated in the Wylfa Newydd CoCP (Application Reference Number: 8.6), in order to reduce the potential effect of culverts and outfalls, the structures would be designed following industry guidelines including CIRIA, particularly C689, *Culvert Design and Operating Guide* [RD14]. This could include good practice such as ensuring that the culverts are at an appropriate elevation relative to stream level, use of scour protection and angling outfalls relative to the direction of stream flow.

Operation

Basis of assessment and assumptions

- 8.4.11 The key elements of the design that are of relevance to the surface water and groundwater assessment include the following.
- Storage and operation of underground diesel storage tanks with a capacity of up to 43,500 litres. The tanks would be located in the north-east of the site and would have a fuel pump to allow refuelling to take place. Tanks would be double skinned and fitted with an appropriate leak detection system.

- Operation of a back-up generator with associated above-ground fuel storage.
- Management of storm water runoff during operations through a drainage system with a geocellular attenuation tank. Discharge from hardstanding would pass through an oil interceptor prior to entry to the attenuation tank.
- Discharge of rainfall runoff and site drainage from the attenuation tank into the East Drain.
- Discharge of sewage to the main foul sewer or to an on-site treatment plant if the main sewer is not suitable.

Embedded mitigation

8.4.12 Embedded mitigation of relevance to the surface water and groundwater assessment includes the following.

- The overspill car parking would use sustainable drainage measures to limit the potential for increase in storm water runoff. These would include the use of 'grasscrete' which is a permeable paving material that provides a firm surface for parking on whilst still allowing rainwater to infiltrate to the ground rather than becoming storm water runoff to a watercourse.
- A Class 1 full retention oil/water separator would be used for drainage from hardstanding area.
- Foul drainage from the Off-Site Power Station Facilities will discharge foul water to the existing foul sewer, although there is potential for use of an on-site pumping station or on-site package wastewater treatment plant if connections to the existing sewer are not possible.
- Drainage and attenuation have been designed so that the peak discharge runoff rates, for a 1 in 100 storm event, are constrained to the current runoff rates such that there is no change to the risk of off-site flooding.
- Horizon will maintain the swale between the main part of the Off-Site Power Station Facilities site and the area of additional car parking. Maintenance will include regular inspection and if necessary clearing out to ensure that the swale does not become overgrown or blocked such that it would limit water movement.

Good practice mitigation

8.4.13 Good practice mitigation of relevance to the surface water and groundwater assessment includes the following. The Wylfa Newydd Code of Operational Practice (CoOP) (Application Reference Number: 8.13) sets out the overarching pollution management principles to be applied throughout the operation of the Off-Site Power Station Facilities. The Wylfa Newydd CoOP (Application Reference Number: 8.13) details good practice

procedures that the contractor would be required to follow. The implementation of this mitigation would be the responsibility of the contractor, with no work being commenced before all contractors are familiar with the Wylfa Newydd CoOP (Application Reference Number: 8.13). The mitigation therein, includes the following.

- All fuel storage would be within engineered containment facilities including suitably bunded tanks, and would comply with the Association for Petroleum and Explosives Administration guidance including their 'Blue Book' [RD15]. The above-ground system would comply with The Water Resources (Control of Pollution) (Oil Storage) (Wales) Regulations 2016 whilst the below-ground system would meet the requirements of The Environment Agency's approach to groundwater protection (which has been adopted by NRW) [RD16].
- Operational pollution prevention controls would include measures relating to:
 - the designation of refuelling areas and areas handling liquid chemicals;
 - operational controls around access to and use of refuelling and chemical storage facilities;
 - regular inspection and maintenance of fuel and chemical storage facilities and associated equipment, including oil interceptors;
 - spill response and clean-up procedures;
 - regular maintenance of any on-site sewage pipes or related sewage infrastructure;
 - cleaning out of any sediment traps on the drainage system; and
 - regular inspection of the parking areas for fuel and oils.
- Surface water drainage requirements designed in accordance with CIRIA C753, *The SuDS Manual* [RD17].
- Inspection and maintenance (where inspection has identified this requirement) of the drainage system would be undertaken, particularly oil water separators, attenuation facilities, and culverts and below-ground pipes, to ensure they are operating effectively and to prevent pollution and flooding.

Decommissioning

Basis of assessment and assumptions

- 8.4.14 Embedded and good practice mitigation of relevance to surface water and groundwater would be very similar to that for the construction works. If the proposed Off-Site Power Station Facilities site were to be sold for re-use then there would be no requirements for embedded mitigation.

Embedded mitigation

- 8.4.15 Upon closure of the Power Station the proposed Off-Site Power Station Facilities site would either be cleared of all buildings and returned to its pre-development state (minus buildings) or the buildings would be retained for re-use. Should demolition take place, all activities would be undertaken in accordance with the relevant legislation and guidance in place at the time.
- 8.4.16 The drainage system would not be removed during decommissioning and this system would continue to provide mitigation against surface water flooding and pollution within the runoff. Maintenance would be required to ensure the continued efficiency of this drainage system. Whilst in the ownership of Horizon this would remain their responsibility.

Good practice mitigation

- 8.4.17 Upon closure of the Wylfa Newydd Power Station the proposed Off-Site Power Station Facilities site will either be cleared of all buildings and returned to its pre-development state (minus buildings) or the buildings will be retained for re-use. Should demolition take place, all activities will be undertaken in accordance with the relevant legislation and guidance in place at the time.

8.5 Assessment of effects

- 8.5.1 This section presents the findings of the assessment of effects associated with the construction, operation and decommissioning of the Off-Site Power Station Facilities. The assessment only takes into account changes that would occur as a result of the proposed development.

Construction

- 8.5.2 The assessment of effects is based on the methodology detailed in section 8.4 of chapter B8 (Application Reference Number: 6.2.8) of this Environmental Statement. The values of the receptors which have been used to determine the significance of effect in the text below have been taken from table E8-4.

Surface water

Water availability

- 8.5.3 Deep excavations, the stockpiling of soil and materials, the removal of existing drainage infrastructure and the construction of a new drainage system including a swale would alter surface water flow paths and timing of rainfall response. This could potentially increase peak flow rates within East Drain and Hen-shop Drain, and further downstream in the Afon Llanrhuddlad. However, these works would be managed in line with the principles outlined in the Wylfa Newydd CoCP (Application Reference Number: 8.6) and the Wylfa Newydd CoOP (Application Reference Number: 8.13). This would include mitigation measures such as a drainage system, which would be installed prior to construction works. The magnitude of change on water availability within the East Drain, Hen-shop

Drain and Afon Llanrhuddlad (which have been assessed to be of low value) would be small (as defined in table B8-12 in chapter B8 (Application Reference Number: 6.2.8)), with the resulting significance of effect being minor adverse and therefore, not significant.

Water quality

- 8.5.4 The works associated with the construction phase could result in the degradation of water quality due to accidental leaks and spillages of fuels or oils used in plant for construction activities. Polluted runoff could reach East Drain or Hen-shop Drain directly or via construction phase drainage.
- 8.5.5 In accordance with the Wylfa Newydd CoCP (Application Reference Number: 8.6) and the Wylfa Newydd CoOP (Application Reference Number: 8.13) a number of mitigating activities would be implemented to manage the risks from fuel storage and use. These include appropriate maintenance of plant; management of refuelling; operational controls around access to and use of refuelling facilities; and the use of double bunded fuel tanks and vehicle collision protection. With this mitigation in place, a spill or leak is considered to be unlikely. If a spillage were to occur, implementation of the planned emergency response plan would contain the spillage. As there is a low likelihood of a spill, due to the mitigation outlined above, the magnitude of any change would be negligible (as defined in table B8-12 in chapter B8 (Application Reference Number: 6.2.8) of this Environmental Statement). As the East Drain and Hen-shop Drain receptors are of low value the potential effect would be negligible and therefore, not significant.
- 8.5.6 Surface water runoff from stockpiles or areas of bare earth could result in increased erosion and sediment inputs into East Drain and Hen-shop Drain compared to the baseline scenario. Increased concentrations of suspended solids would affect the water quality within the receiving watercourses. In addition to sediments, pollutants such as cement, if leached into a watercourse, would potentially have detrimental effects on water quality, such as changes to pH and dissolved oxygen concentrations. In accordance with the Wylfa Newydd CoCP (Application Reference Number: 8.6) and the Wylfa Newydd CoOP (Application Reference Number: 8.13) measures including restricting the height of stockpiles, revegetating areas of bare soil as soon as possible following earthworks and sediment control through the measures incorporated into construction phase drainage such as settlement ponds, filter drains or silt fencing would reduce any adverse changes in the water quality of receiving watercourses to a small magnitude. This small magnitude of change on the low value watercourses of East Drain and Hen-shop Drain is considered as a minor adverse, and therefore not significant, effect.

Flood risk

- 8.5.7 An FCA has been undertaken for the proposed Off-Site Power Station Facilities site (see appendix E8-1, Application Reference Number: 6.5.16). The assessment follows the requirements of TAN 15 [RD1] which focusses on the flood risks of a development post-construction, but due to the

relatively short timescale of construction activities (which would not be affected by climate change), does not consider the risks during construction. These risks are therefore considered below.

- 8.5.8 During construction, the risk of flooding at a site is initially the same as that identified for the baseline condition, but depending upon the nature and timing of the construction activities that risk could change, principally through either an increase in exposure of people and plant or through changes to landforms that might increase the risk of flooding elsewhere. However, the risks are normally managed by the contractor's construction management procedures which may (depending upon site location) include a flood risk management plan that draws on NRW issued flood warnings or Met Office issued weather warnings.
- 8.5.9 It is normally the case that drainage is one of the first elements of the construction. Where such drainage is an integral part of flood risk management, including attenuation facilities for instance, then this can be assessed in a similar way to the risks during operation, albeit without consideration of climate change.
- 8.5.10 At the proposed Off-Site Power Station Facilities site, the removal of the existing hardstanding and existing site drainage would have the potential in the short-term to increase the risk of pluvial flooding to the site as rain falling directly onto the site could potentially pond. However, following site clearance, but prior to construction works, adequate drainage systems would be installed and so this risk would soon be mitigated. As no attenuation storage is currently provided within the site of the proposed Off-Site Power Station Facilities, and almost all of the surfaces are impermeable, no measurable increase in runoff rates is predicted as a result of the construction phase. Towards the end of the construction phase, the surface water drainage system would become fully operational and there would be a reduction in peak flows compared to the baseline scenario.
- 8.5.11 The risks to the construction site from an existing flood risk from off-site flows from the west would be mitigated by construction of a swale to the south of the proposed Off-Site Power Station Facilities buildings. This would also have a beneficial effect of reducing flood risk downstream in comparison to baseline conditions. Management requirements for flood risk during construction are outlined in section 10 of the Wylfa Newydd CoCP (Application Reference Number: 8.6).
- 8.5.12 No increase in peak water flows, above the existing flows, are predicted during the construction period for the Off-Site Power Station Facilities. The changes to runoff patterns and subsequent effect on flood risk during construction are considered to be negligible and therefore not significant.
- 8.5.13 An attenuation pond associated with the drainage strategy of Section 5 of the A5025 Off-line Highway Improvements is proposed adjacent to the Off-Site Power Station Facilities site. The outfall from this pond is proposed to flow into the East Drain. The effect of the operation of this pond and its associated outfall is presented in chapter G8 (surface water and groundwater) (Application Reference Number: 6.7.8) of the Environmental

Statement. The attenuation of flows from this pond would ensure that flood risk to the Off-Site Power Station Facilities does not increase.

Fluvial geomorphology

- 8.5.14 The construction phase of the Off-Site Power Station Facilities would require topsoil removal, excavations and below-ground works. These all have the potential to disturb fine sediment, with runoff from rainfall events potentially flowing into the East Drain and Hen-shop Drain. The fine sediment would have the potential to smother bed substrate and alter the morphology of the receiving watercourse and those further downstream including the Afon Llanrhuddlad.
- 8.5.15 With good practice mitigation in place, including sediment management measures such as silt fencing incorporated into the construction phase drainage, the magnitude of this change is likely to be small on the East Drain and Hen-shop Drain. Given the low importance of the identified receptors with regard to fluvial geomorphology, the significance of the effect is considered to be minor adverse and therefore, not significant overall. Any effects to the Afon Llanrhuddlad downstream of the study area are considered to be negligible due to distance from the source and potential for deposition.
- 8.5.16 In-channel working to construct the permanent outfall into the East Drain could also generate fine sediment with a similar effect to that detailed above. In-channel working also has the potential to cause the East Drain to become destabilised at the location of the bank removal, with localised adjustments of the watercourse. However, due to the nature and character of the channel, it is unlikely that this would have a significant effect or lead to significant channel change. With good practice mitigation in place including risk assessments for working in water and timing of the works to low flow periods, as per the Wylfa Newydd CoCP (Application Reference Number: 8.6) and the Wylfa Newydd CoOP (Application Reference Number: 8.13), the magnitude of this change is likely to be small. Given the low importance of the East Drain and Hen-shop Drain with regard to fluvial geomorphology, the significance of the effects is considered to be minor adverse and therefore, not significant.

Groundwater

- 8.5.17 The potential effects on groundwater in the bedrock during the construction period include changes to groundwater quality, groundwater recharge and groundwater flow. The potential effects for groundwater receptors for the construction phase are outlined below. Effects associated with contaminated land from existing and previous land uses are considered in chapter E7 (Application Reference Number: 6.5.7).
- 8.5.18 There is potential for deterioration in groundwater quality due to leaks and/or spills of fuels or other polluting materials (e.g. cement) used in plant or for construction activities contaminating the bedrock aquifer underlying the site. In accordance with the Wylfa Newydd CoCP (Application Reference Number: 8.6) and the Wylfa Newydd CoOP (Application

Reference Number: 8.13), a number of mitigating activities would be implemented to manage the risks from the storage and use of fuel and other potentially contaminating substances. These include appropriate maintenance of plant; management of refuelling; operational controls around access to and use of refuelling facilities; and the use of double banded fuel tanks and vehicle collision prevention. With this mitigation in place, a spill or leak is considered to be unlikely.

- 8.5.19 If a spillage were to occur, implementation of the emergency response plan would contain the spillage. Although there is a low likelihood of a spill, due to the mitigation outlined above, the magnitude of any change would be negligible. As the Secondary B aquifer and wells are of low value the potential effect would be negligible. The private water supply at Ty'n-y-buarth is of medium value such that any potential effect would be minor adverse. These potential effects are not significant.
- 8.5.20 Reductions to the extent of impermeable areas during the construction period would have the potential to increase the volumes of rainwater reaching the groundwater table within the bedrock aquifer. This has the potential to alter local recharge rates, groundwater levels and groundwater flows. However, the impermeable areas lost during the site clearance are very small in comparison to the groundwater catchment as a whole and measurable changes in groundwater levels are not predicted. Based on the negligible magnitude of the effect and the low value of the aquifer and wells, the significance of this effect is considered to be negligible and therefore, not significant.
- 8.5.21 Given the depth of groundwater (3-4m below ground level) identified at the borehole along the A5025 [RD7], there is unlikely to be a need for dewatering during construction of the below-ground fuel tank and below ground attenuation tank. It is likely that surface water would need to be pumped from the excavations and this would be far more significant in volume than any groundwater. Should groundwater dewatering be required, the magnitude of change on groundwater levels within the Secondary B Aquifer is likely to be small and of short duration. The significance of effect on the low value aquifer would therefore be considered to be minor adverse and therefore, not significant.

Operation

Surface water

Water availability

- 8.5.22 During the operational phase, the Off-Site Power Station Facilities would have a significantly smaller area of impermeable surfaces compared to the baseline scenario. These new areas of permeable surfaces include soft landscaping along the southern boundary, permeable surfaces used in car parking bays and the swale running to the north of the overspill parking area.

8.5.23 The increase in permeable surfaces would result in the East Drain responding much more slowly to rainfall events. The peak discharge during low flow (1 in 2 year) events would reduce but higher levels of flow would be maintained for longer following a storm. This increased availability of water in the East Drain, as well as further downstream in the Afon Llanrhuddlad, during low flow conditions, would represent a small beneficial magnitude of change. The low importance of the East Drain and the Afon Llanrhuddlad with regard to surface water flows means that the significance of this effect is considered to be minor beneficial.

Water quality

8.5.24 Any accidental leaks or spillages from vehicles could result in the degradation of water quality, in the East Drain, Hen-shop Drain and the Afon Llanrhuddlad downstream. Polluted runoff could reach East Drain or Hen-shop Drain directly or via the drainage system.

8.5.25 The potential for leakages and spills to occur during the operational phase of the Off-Site Power Station Facilities would be limited by good practice mitigation such as:

- effective maintenance of equipment;
- restriction of refuelling and other potentially polluting activities to dedicated areas; and
- controls around access to and use of refuelling facilities and potentially polluting substances.

8.5.26 In addition, the equipment held on-site would be subject to infrequent use that would be limited to training and potential emergency events. The likelihood of a spillage is therefore considered to be low.

8.5.27 In the unlikely event of a spillage or leak, management and mitigation would be implemented in accordance with procedures set out in the Wylfa Newydd CoOP (Application Reference Number: 8.13). In addition, the provision of a full retention oil interceptor within the drainage system would make it likely that, following a spill, no oil would be able to enter the East Drain. Therefore, following a spillage or leak, it is considered likely the effect would be of a negligible magnitude on a receptor of low value resulting in a negligible effect which is not significant.

Flood risk

8.5.28 The FCA (appendix E8-1, Application Reference Number: 6.5.16) assesses the flood risk associated with the Off-Site Power Station Facilities post-construction. The method applied within the FCA to determine the significance of effect (which is informed by TAN 15 [RD1] as outlined in appendix E8-1-4 (Application Reference Number: 6.5.16) of the FCA), differs from the methodology used for this Environmental Impact Assessment (see section 8.4 of chapter B8 (Application Reference Number: 6.2.8) of the Environmental Statement. The key differences relate to how the value of the receptor and the magnitude are assigned, which therefore drives slightly differing significances of effect.

- 8.5.29 In order to assess the flood risk consistently with other surface water and groundwater effects within this Environmental Statement, the following assessment of flood risk during operation of the Off-Site Power Station Facilities considers changes that would potentially be caused by the development. The assessment therefore assigns a magnitude of change to the risk of flooding to receptors based on the method stated in section 8.4 of chapter B8 (Application Reference Number: 6.2.8) of the Environmental Statement. The FCA (see appendix E8-1-4, Application Reference Number: 6.5.16) is the key source of information for this assessment; however, given the difference in methods between the FCA and the Environmental Statement, the magnitude of change within this assessment is not directly comparable to the magnitude of hazard or flood risk within the FCA. Nevertheless, whilst the significance of effect may vary between the FCA and the Environmental Statement, the overall conclusions are consistent (i.e. significant or not significant effect).
- 8.5.30 Surface water runoff from the Off-Site Power Station Facilities, the vehicular entrance to the Off-Site Power Station Facilities and the A5025 would be conveyed via the proposed drainage into the swale and onwards into the East Drain. Together with the increase in permeable surfaces within the Off-Site Power Station Facilities and attenuation of surface water flow from new impermeable areas, this would ensure that peak water levels and flows within East Drain would be lower in comparison to water levels predicted during an equivalent event in the baseline scenario.
- 8.5.31 The modelling (see appendix E8-1, Application Reference Number: 6.5.16) demonstrates that the existing surface water flow path through the centre of the proposed Off-Site Power Station Facilities site is successfully mitigated by the incorporation of the drainage and swale up to the 1 in 1,000 year event. There would remain some shallow ponding in hardstanding areas away from buildings, with depths of 0.007m during the 1 in 1,000 year event. However, this compares to depths of 0.27m during the baseline 1 in 1,000 year event, therefore there is a beneficial effect on flood risk to the Off-Site Power Station Facilities during operation. The magnitude of change to the pluvial flood risk to the high value Off-Site Power Station Facilities is considered to be medium by virtue of a significant and long-term reduction in pluvial flood risk. The resulting significance of effect is therefore moderate beneficial.
- 8.5.32 There is also a betterment in the risk of flooding to built development (the residential property and sewage works to the south and south-west of the Off-Site Power Station Facilities), the A5025 and agricultural land. The magnitude of change to the pluvial flood risk to these receptors is considered to be medium. The resulting significances of effect on these receptors are all beneficial and are major for built development, major for the A5025 and moderate for the agricultural land.
- 8.5.33 The Off-Site Power Station Facilities would be remote from any identified source of fluvial flood risk. No mechanisms have been identified by which on-site fluvial flood risk could be increased by operation of the Off-Site Power Station Facilities. The reduction in the area of hardstanding and operation of a drainage system designed to attenuate flows to the

greenfield runoff rate for the 1 in 2 year rainfall event would result in a reduction in runoff rate compared to the baseline scenario. Whilst these measures are unlikely to result in a measurable reduction in peak water levels in the receiving watercourses, no adverse effect on fluvial flood risk downstream is predicted as a result of the construction works.

- 8.5.34 The magnitude of change to flood risk from groundwater and water infrastructure would be low, and therefore the significance of effect to the proposed Off-Site Power Station Facilities would be minor adverse.

Fluvial geomorphology

- 8.5.35 The operational phase of the Off-Site Power Station Facilities would require one permanent outfall structure to be placed within the East Drain. This would replace a small length of channel bank and a portion of channel bed. The East Drain has been previously modified and has been assessed as being of low value. It is anticipated that the new outfall structure would have a small magnitude of change on the fluvial geomorphology at this location. As a result, the potential significance of effect is considered minor adverse and therefore, not significant.
- 8.5.36 The outfall would discharge to the East Drain during the operational phase, with water attenuated prior to discharge in a below-ground storage system. The operation of the new outfall could have the potential to alter local channel flow processes, creating scour or potential for sediment movement. The release of fine sediment as a result of scour in the vicinity of the outfall could lead to the smothering of bed substrate further downstream, including in the Afon Llanrhuddlad. Where the flow slackens, sediment could also be deposited. However, embedded mitigation, including limiting discharge from the site to the greenfield runoff rate for the 1 in 2 year rainfall event, would reduce the potential for significant changes to flow processes. As a result, the potential magnitude of change is considered small, with a minor adverse effect which is not significant.
- 8.5.37 Landscaping works close to the watercourse could potentially provide a localised improvement in the vegetated riparian corridor of the East Drain for a distance of approximately 10m. The stone wall boundary would encroach on the margins of the Hen-shop Drain. This could lead to removal of part of the vegetated riparian corridor, or re-landscaping. Due to the man-made nature of the drain, the magnitude of change is considered small, with a negligible significance of effect anticipated.

Groundwater

- 8.5.38 The only identified potential effect of the proposed Off-Site Power Station Facilities on the groundwater environment during its operational phase relates to changes in groundwater quality associated with leaks and/or spills of fuels, oils and other polluting substances. This risk is associated with the operation of vehicle parking areas, the operation and maintenance of vehicles, the proposed underground diesel storage tanks, fuel tanks associated with the back-up generator and cooling oil within the electrical transformer.

- 8.5.39 The risk of spills from vehicle use is considered to be low, due to good practice mitigation that would be introduced such as the effective maintenance of equipment; restriction of refuelling and other potentially polluting activities to dedicated areas; operational controls around access to and use of refuelling facilities and potentially polluting substances. In addition, the equipment held on-site would be subject to infrequent use that would be limited to training and potential emergency events.
- 8.5.40 Given the large volume of fuel in storage tanks and to a lesser degree in transformers, leaks from these infrastructure elements have the potential to result in quality effects on the bedrock aquifer. However, a range of embedded and good practice mitigation measures would be implemented in order to comply with the requirements of the Association for Petroleum and Explosives Administration's Blue Book [RD15]. This mitigation would include the use of double bunded tanks within an engineered containment system and appropriate leak detection monitoring inside the containment system. With this mitigation in place, the probability of an accidental discharge occurring is considered to be extremely low.
- 8.5.41 In the event of a leak occurring from the below ground tank, this would be detected by the leak detection system enabling the implementation of the spill response and clean-up procedures detailed in the Wylfa Newydd CoOP (Application Reference Number: 8.13). As the leak would be detected within the containment system, there would be no release to the groundwater environment and implementation of the spill response and clean-up procedures would ensure that the problem is rectified. The magnitude of change to the low value aquifer and medium value private water supply would be negligible which would result in an effect of negligible or minor adverse significance. These would not be significant effects.
- 8.5.42 There would be no increase in the area of impermeable surfaces. Therefore, there is no potential for reduction in recharge due to further limitation of groundwater recharge. There would therefore be a negligible magnitude of change to recharge and a negligible significance of effect.

Decommissioning

Surface water

Water availability

- 8.5.43 Decommissioning of the Off-Site Power Station Facilities to its pre-development condition would not result in any significant changes, as it would remain covered by hardstanding (albeit permeable in places) and potentially buildings. The drainage system would remain in place ensuring that attenuation of flows would continue, providing maintenance of this system continued. There would therefore be a negligible magnitude of change on the East Drain and Hen-shop Drain and a negligible significance of effect.

Water quality

- 8.5.44 There is a risk of accidental spillages of fuels and other substances during decommissioning of the Off-Site Power Station Facilities. It is likely that there would be increased vehicle movement during decommissioning activities compared to the operational phase increasing the risk of a leak or spill from demolition plant. However, the risk would be reduced by the presence of the fully operational drainage system which would have an oil interceptor. The removal of the underground fuel storage tanks would also pose a risk of leaks and spillages. The demolition of buildings and excavation of underground fuel tanks would also result in the potential mobilisation of sediment by surface water runoff potentially increasing turbidity in local watercourses.
- 8.5.45 Mitigation measures similar to those proposed for the construction phase, including maintenance of plant and management of refuelling, would result in a low likelihood of any spills or leaks. A risk assessment would be prepared prior to the decommissioning of the underground fuel tanks and these would be emptied prior to decommissioning works.
- 8.5.46 The retention and continued maintenance of oil separators in the site drainage and execution of the emergency response plan would ensure that in the event of any spillage, the magnitude of change on surface water quality is likely to be small. Although not designed for this purpose, the oil separators and attenuation tank would trap sediment limiting the potential for significant inputs into watercourses providing maintenance of these features continues during decommissioning. The magnitude of change on the East Drain and Hen-shop Ditch would be negligible and therefore the significance of effect would be negligible, and not significant.

Flood risk

- 8.5.47 The flood risks would be unlikely to change from the operational phase, although any management activities would need to continue. Without maintenance of drainage systems and swale including the clearance of sediment from separators and cutting of vegetation within the swale, there would be potential for attenuation volumes to be reduced and for blockages, increasing flood risk over time. There would therefore be a small magnitude of change to flood risk from the East Drain and Hen-shop Drain and a minor adverse, and therefore not significant, effect.

Fluvial geomorphology

- 8.5.48 The decommissioning effects from the Off-Site Power Station Facilities are anticipated to be mostly similar to those identified for the construction phase. The key effect from the works would be the potential to mobilise fine sediment, associated with any demolition activity. Fine sediment could be transferred downstream via the East Drain and smother the bed substrate. There would therefore be a small magnitude of change on East Drain and Hen-shop Drain and a minor adverse, and therefore not significant, effect.

Groundwater

- 8.5.49 During the decommissioning phase, the main risk is associated with the decommissioning of oil storage infrastructure on-site including the underground fuel tanks and cooling oil within electrical transformers. There could also be potential effects to groundwater quality in soft standing areas due to leaks and/or spills of fuels or other polluting materials used in plant or for decommissioning activities.
- 8.5.50 A risk assessment would be prepared prior to the decommissioning of the underground fuel tanks and these would be emptied prior to decommissioning works. The execution of the emergency response plan would ensure that in the event of any spillage the effect on groundwater quality is likely to be negligible.
- 8.5.51 Mitigation measures similar to those proposed for the construction phase, including maintenance of plant and refuelling management, would help to ensure a low likelihood of any spills or leaks. The presence of an oil separator in the site drainage and execution of the emergency response plan would ensure that in the event of any spillage there would be a negligible or small magnitude of change to the Secondary B Bedrock aquifer and wells, and a minor adverse significance of effect.

8.6 Additional mitigation

- 8.6.1 In accordance with chapter B1 (introduction to the assessment process) (Application Reference Number: 6.2.1), embedded and good practice mitigation measures relevant to surface water and groundwater were taken into account when determining the 'pre-mitigation' significance of effects. These are detailed in the design basis and activities section of this chapter.
- 8.6.2 Additional mitigation measures would be implemented to address potential significant effects identified in the assessment of effects section. There are no additional mitigation measures required.

8.7 Residual effects

- 8.7.1 This section describes the residual effects for surface water and groundwater having taken into account the embedded, good practice and additional mitigation described above. No significant adverse effects were identified for surface water, fluvial geomorphology and groundwater during either construction, operation or decommissioning. However, significant beneficial effects were identified for surface water during operation in that the swale and associated drainage infrastructure like the attenuation tank would markedly reduce flood risks at the site and also to off-site receptors. These significant beneficial effects are detailed in table E8-5.
- 8.7.2 Minor effects identified in the assessment of effects section are summarised in appendix I3-1 (master residual effects table, Application Reference Number: 6.9.8).
- 8.7.3 A WFD Compliance Assessment (Application Reference Number: 8.26) has been completed for the proposed Off-Site Power Station Facilities. The

assessment has concluded that the Off-Site Power Station Facilities would not lead to any deterioration in the WFD water bodies or prevention of them achieving good status/potential.

Table E8-5 Summary of residual effects

Receptor (or group of receptors)	Value of receptor(s)	Description of potential effect	Nature of effect	Potential magnitude of change	Potential significance of effect	Additional mitigation	Post-mitigation magnitude of change	Significance of residual effect
Operation								
Off-Site Power Station Facilities	High	Reduction in flood risk due to construction of swale and attenuation tank	Beneficial Local Long term	Medium	Moderate beneficial	None required	Medium	Moderate beneficial
Off-Site receptors (residential property, A5025 and sewage works)	High	Reduction in flood risk due to construction of swale and attenuation tank	Beneficial Local Long term	Medium	Major beneficial	None required	Medium	Major beneficial
Off-Site receptors (agricultural land)	Medium	Reduction in flood risk due to construction of swale and attenuation tank	Beneficial Local Long term	Medium	Moderate beneficial	None required	Medium	Moderate beneficial

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8.8 References

Table E8-6 Schedule of references

ID	Reference
RD1	Welsh Government. 2004. <i>Technical Advice Note (TAN) 15: Development and Flood Risk</i> . [Online]. [Accessed: April 2017]. Available from: http://wales.gov.uk/docs/desh/publications/040701tan15en.pdf .
RD2	Natural Resources Wales. 2015. <i>Long term flood risk</i> . [Online]. [Accessed: May 2017]. Available at: https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en .
RD3	Highways Agency. 2009. <i>Design Manual for Roads and Bridges</i> . Volume 11, Section 3, Part 10: Road Drainage and the Water Environment (HD45/09). London: The Stationery Office.
RD4	Defra. 2016. <i>Multi-Agency Geographic Information for the Countryside (MAGIC). Interactive Mapping</i> . [Online]. [Accessed: October 2016]. Available from: http://magic.defra.gov.uk/MagicMap.aspx .
RD5	British Geological Survey. 2016. <i>Geology of Britain</i> . [Online]. [Accessed: October 2016]. Available from: http://mapapps.bgs.ac.uk/geologyofbritain/home.html .
RD6	Environment Agency. 2015. <i>What's in Your Backyard?</i> [Online]. [Accessed: March 2015 – now withdrawn]. Available from: http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=e .
RD7	AECOM. 2016. A5025 Wylfa, Ground Investigation, Section 3, Llanfachraeth.
RD8	Countryside Council for Wales. 1990. <i>Llyn Garreg-lwyd SSSI</i> . [Online]. [Accessed: May 2017]. Available from: http://angleseynature.co.uk/webmaps/llyngarreglwyd.html .
RD9	Natural Resources Wales. 2015. <i>Western Wales River Basin Management Plan 2015 – 2021 Summary</i> . [Online]. [Accessed: May 2017]. Available from: https://naturalresources.wales/media/676165/wwrbdsummary.pdf .
RD10	Natural Resources Wales. 2016. <i>Water Watch Wales Map Gallery</i> . [Online]. [Accessed: October 2016]. Available from: http://waterwatchwales.naturalresourceswales.gov.uk/en .
RD11	Natural Resources Wales, the Northern Ireland Environment Agency, the Scottish Environment Protection Agency. 2017. <i>Guidance for Pollution Prevention 5: Works and maintenance in or near water</i> . [Online]. [Accessed: May 2017]. Available from http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ .

ID	Reference
RD12	Masters-Williams, H., Heap, A., Kitts, H., Greenshaw, L., Davis, S., Fisher, P., Hendrie, M. and Owens, D. 2001. <i>Control of water pollution from construction sites. Guidance for consultants and contractors (C532)</i> . London: CIRIA.
RD13	Natural Resources Wales, the Northern Ireland Environment Agency, the Scottish Environment Protection Agency, the Energy Institute and the Oil Care Campaign. 2017. <i>Guidance for Pollution Prevention 2: Above Ground Storage Tanks</i> . [Online]. [Accessed: May 2017]. Available from: http://www.netregs.org.uk/media/1317/gpp-2-pdf-feb-2017.pdf .
RD14	Balkham, M., Fosbeary, C., Kitchen, A. and Rickard, C. 2010. <i>Culvert Design and Operating Guide (C689)</i> . London: CIRIA.
RD15	Association for Petroleum and Explosives Administration. 2011. <i>Guidance for Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations</i> . Third Edition. London: APEA and Energy Institute.
RD16	Environment Agency. 2017. <i>The Environment Agency's approach to groundwater protection</i> . Version 1.0, Bristol: Environment Agency.
RD17	Woods Ballard. B, Wilson S., Udale-Clarke H., Illman S., Scott T., Ashley R. and Kellagher R. 2015. <i>The SuDS Manual (C753)</i> . London: CIRIA.