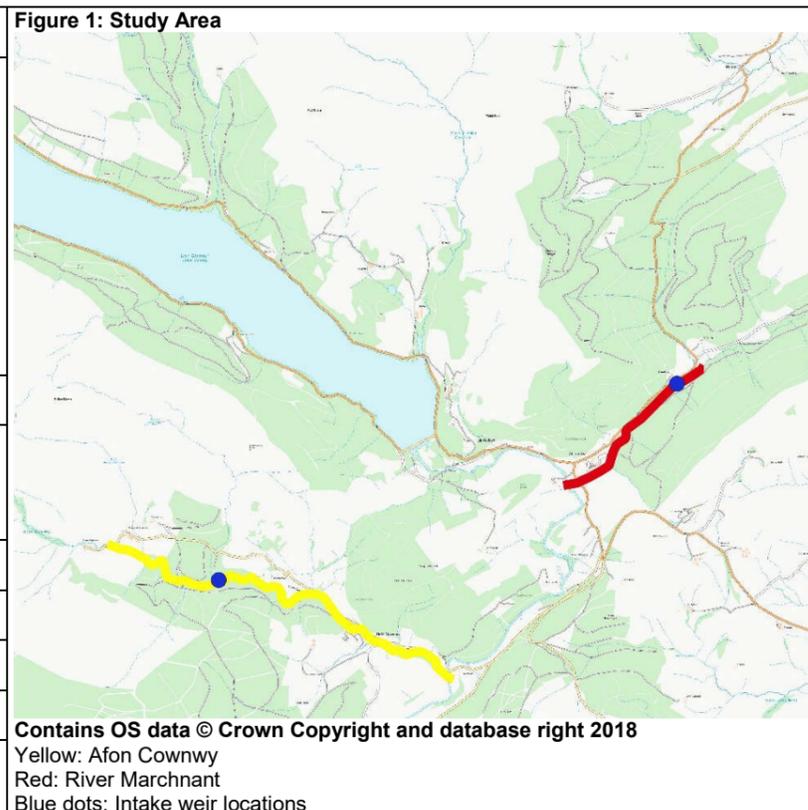


Site Description	
Proposed Works	Atkins was commissioned by North Midland Construction Plc to develop the design to enable construction of works on two existing intakes along the Afon Cownwy and River Marchnant which divert water from these watercourses to Lake Vyrnwy Reservoir. The purpose of the construction works is to provide environmental flow releases below the Afon Cownwy and River Marchnant diversion intakes to improve downstream aquatic habitat which is currently denuded as a result of the diversion of flows. This document provides an aquatic ecology baseline for both the Afon Cownwy and River Marchnant and details potential aquatic ecological constraints associated with the works as described in more detail below. It assumes no works are required to the existing watercourse alignments downstream of the intake structures. Should additional works be required then the constraints report will be updated to reflect.
Proposed Start Date and Duration of Works	Unknown
Night Works	Not anticipated
Location of Works Compound	Unknown
Grid Reference Afon Cownwy:	SH 99946 17986
Grid Reference River Marchnant:	SJ 04219 19807
Date of Survey:	13 th and 14 th of November 2018
Surveyor(s) Names:	Naomi Lowden



Client: North Midland Construction Plc (NMC) and Natural Resources Wales (NRW)
Project Number: 5168368
Project: Cownwy & Marchnant Intake Design

Member of the SNC-Lavalin Group

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Notice
This aquatic ecological constraints report has been prepared by Atkins Limited for the sole and exclusive use for NMC in response to their particular instructions. No liability is accepted for any costs claims or losses arising from the use of this document, or any part thereof, for any purpose other than that which it has specifically been prepared or for use by any part other than NMC.

The information which Atkins Limited has provided has been prepared by an environmental specialist in accordance with the Code of Professional Conduct of the Chartered Institute of Ecology and Environmental Management. Atkins Limited confirms that the opinions expressed are our true and professional opinions. This document does not purport to provide legal advice.

Methodologies and Limitations:
The MAGIC website (www.magic.gov.uk) was reviewed for information on designated sites of nature conservation importance (statutory sites only) within 2km of the Site. Biological records were provided by North Wales Environmental Information Service (Cofnod) to provide species and non-statutory designated site information within 2km of the Site. Ordnance Survey maps were used to initially identify the presence of water bodies within 2km of the Site boundary, in order to establish the connectivity of the Hafodyt reservoir to surrounding watercourses.

The walkover surveys on the Afon Cownwy and River Marchnant were undertaken on 13th and 14th of November 2018, broadly following River Habitat Survey methodology¹ for assessing instream habitats. All habitat within and adjacent to the Proposed Works Location was surveyed according to CIEEM guidance² adapting guidance for aquatic survey where necessary. This report identifies the constraints, required actions, and recommendations for the proposed Cownwy and Marchnant intake flow split weir works.

The list of invasive plant species included on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) is extensive and these plants are found in a range of different habitats including aquatic environments. The habitat survey checked for the presence of common invasive species including Japanese knotweed, giant hogweed and Himalayan balsam. Other invasive species may not have been recorded, but it is considered that this survey is sufficient to identify any constraints posed by invasive species.

Ecological surveys are limited by factors which affect the presence of plants and animals, such as the time of year, migration patterns and behaviour. The aquatic ecological surveys undertaken to support this report have not therefore produced a complete list of plants and animals. The absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future. However, the results of these surveys have been reviewed and are considered to be sufficient to undertake this constraints assessment. Full bankside access to both the Afon Cownwy, the River Marchnant as well as their associated weir pools was not available at the time of survey. However, where full access was not available for a reach, spot checks were undertaken at points providing sufficient survey coverage to provide an indicative assessment of watercourse characteristics and habitats, as well as to identify the key ecological constraints.

System and Habitat Descriptions

Defining the survey area: In defining the spatial extent of the ecological walkover surveys, the surveyors applied professional judgement in light of the proposed works, their potential for effects and the anticipated working methods. The aquatic ecological walkover surveys of the Afon Cownwy and River Marchnant concentrated on their weir pools and downstream watercourse reaches to their respective confluences with the River Vyrnwy. A representative site upstream of each weir pool was also visited to provide an understanding of the flow and habitat characteristics associated with the channels upstream of the diversion intakes to Lake Vyrnwy and to help inform the assessment of flow and habitat character downstream.

Afon Cownwy:
Structures: The existing Cownwy intake consists of a diversion weir (Photo 4) on the River Cownwy at the location shown in Figure 1. The weir diverts flows along an open brick abstraction channel into a 1.98km long diversion tunnel for transfer to Lake Vyrnwy. The diversion weir has a spillway (approximately 20m wide) which has been designed to spill water during high return periods to the downstream Afon Cownwy when inflow rates exceed the storage volume and intake structure capacity. The proposed works involves demolition of an approximately 10m length of the existing abstraction channel and replacement with a new reinforced concrete rectangular channel and weir structure. The new structure will consist of a bifurcating rectangular channel which will split flow between the diversion tunnel and the Afon Cownwy in a 75%:25% split respectively.

Habitats: The upstream reach of the Afon Cownwy (above the weir pool) is located within a wide unconstrained valley (Photo 1) and flows through grazing pasture. The watercourse is fast-flowing, approximately 6m wide (wetted width) with predominantly cobble substrates. Limited aquatic vegetation is present within the upper reach which is typical of high gradient systems. Downstream, the valley narrows and steepens, leading to a change from farming to forestry land uses. Flow is diverted from the River Cownwy at SH 99946 17986 and discharged via a tunnel to Lake Vyrnwy, resulting in all of the watercourse flow being removed from the downstream reach under normal flow conditions. The impounding weir structure and its associated diversion channel culvert, constructed in the late 1800s, has led to the formation of a large weir pool. This weir pool (Photo 2) consists of deep water and marginal shelves which are vegetated with grasses, herbs and small patches of marginal macrophytes. Large gravel deposits were recorded where the Afon Cownwy entered the weir pool and similarly, where the Nant y Ceunant Du tributary entered the pool on the left bank. These gravel bars were vegetated, indicating that they were established and stable. Immediately downstream of the weir pool the watercourse channel is characterised by stagnant pools of water within the wide river bed (approximately 10m wide; Photo 5). The bed substrate is dominated by coarse sediment (pebbles, cobbles and boulders) with limited gravels and finer material. Boulders were typically covered in moss, indicating that high flows are rare. Further downstream there is flow accretion from the surrounding catchment and watercourse begins to visibly discharge (Photo 6), however it is still significantly influenced by the reduced flow caused by the



diversion to Lake Vyrnwy. Limited aquatic and marginal macrophytes were observed within the channel and its corridor, likely to be a result of heavy shading caused by the dense tree cover and the setting within the wider catchment.

No fish were observed within the watercourse either up or downstream of the weir during survey. Several fallen trees were noted within the river channel which are likely to interact with high flows, especially once additional flow is reinstated following flow split at the upstream weir. Large wood is noted as beneficial for promoting habitat complexity.

River Marchnant:

Structures: The existing Marchnant intake consists of a diversion weir on the River Marchnant at the location shown in Figure 1. The weir diverts flows via a small approach channel directly into a 2.2km long diversion tunnel for transfer to Lake Vyrnwy. The diversion weir has a spillway (approximately 25m wide) which has been designed to spill water during high return periods to the downstream River Marchnant when inflow rates exceed the storage volume and intake structure capacity.

The proposed works involves demolition of the existing retaining stone wall which currently separates the overflow weir and the small approach channel to the tunnel and replacement with a new channel to deliver flows downstream. A new flow splitter weir is proposed above the diversion tunnel entrance to split flows between the diversion channel and the downstream River Marchnant in a 75%:25% split respectively.

Habitats: The upper reaches of the River Marchnant are located within a steep-sided valley, with a constrained floodplain. Land use is predominantly forestry.

Upstream of the weir pool the watercourse channel is approximately 3m wide and comprised of cobble, gravel and pebble substrates (Photos 8 and 9). The River Marchnant is joined by another similarly sized tributary approximately 20m upstream of the weir pool (Photo 9). No fish, marginal or aquatic macrophytes were observed upstream of the weir pool during the survey.

The rectangular weir pool is defined by steep sides and a large area of open water (Photo 10). The margins have several areas of marginal macrophyte cover. A large gravel deposit is located on the north eastern side of the weir pool where the River Marchnant enters. A noticeable lack of gravel and other coarser substrates is present downstream of the weir.

Immediately downstream of the weir and associated intake structure, the watercourse corridor is located within a steep sided valley, which has been clear felled making way for densely vegetated scrub, rushes, ferns, bramble and grasses, as well as emerging young trees (Photo 11). At this location the watercourse channel is poorly defined, instead the area is more typical of wetland habitat, with pooling water promoting the growth of rushes, sedges and ruderal herbs.

Access was restricted for much of the reach downstream of the weir to the saw mill (located at SJ 03690 19320) although the character of the watercourse is expected to be similar throughout this reach.

Further downstream, near the village of Abertridwr, the valley widens. Here the watercourse is more characteristic of the wider catchment, with small gravel deposits and a mixture of flow types, however, the flow appeared still significantly reduced compared to what would be expected if flows were not being diverted at the upstream weir structure (Photo 13).

Wider Catchment (including the downstream River Vyrnwy): The River Vyrnwy at the time of survey had very high flows associated with water being released from Lake Vyrnwy Reservoir and recent rainfall. The River Vyrnwy is much larger than both the Afon Cownwy and the River Marchnant so is likely to be only moderately influenced by their flow volume, water quality and sediment dynamics.

Photo 7 (SJ 02098 17147)



Photo 8 (SJ 04385 19915)



Photo 9 (SJ 04385 19915)



Photo 10 (SJ 04290 19855)



Photo 11 (SJ 04195 19826)



Photo 12 (SJ 04061 19674)



Photo 13 (SJ 03296 18916)



Photo 14 (SJ 03201 18856)



Compiled	Checked and Reviewed	Authorised
Naomi Lowden	Ian Morrissey	Alex Lorenz
Date	Date	Date
28/11/2018	04/12/2018	05/12/2018

Baseline Data Records

Habitat and biological records have been provided to Atkins by the North Wales Environmental Information Service (Cofnod). Searches were undertaken for all records held within a 2km radius of the site, and included:

- Designated sites (statutory and non-statutory)
- Species – of both high priority or protected status

A request has been made to NRW for any additional routine fish and aquatic invertebrate monitoring data associated with the watercourses within the Study Area. Following receipt of this information the baseline will be updated as required.

Watercourse and Water Framework Directive (WFD) Information³

Afon Cownwy: The Afon Cownwy lies within the *Afon Cownwy – source to conf. Afon Vyrnwy* WFD river water body (GB109054049750). The water body is Heavily Modified and is at Moderate Potential overall status (2015 Cycle 2). The primary Reason for Not Achieving Good (RNAG) status is due to Supporting Elements, particularly Mitigation Measures Assessment due to physical modifications.

River Marchnant: The River Marchnant is not a named WFD assessed river or classified as a Main River, however, it lies within the *Vyrnwy - Lake Vyrnwy to conf. Afon Cownwy* water body catchment (GB109054049880). The water body is Heavily Modified and at Moderate Potential status (2015 Cycle 2). The primary reason for the water body not achieving Good status is due to ecological elements.

River Vyrnwy: Downstream of the confluence with the Afon Cownwy, the River Vyrnwy is classified as the *Afon Vyrnwy – conf. Afon Cownwy to conf. Afon Banwy* (GB109054049720) water body. The water body is Heavily Modified and at Moderate Potential (2015 Cycle 2)

Works Compound	Any compounds or layout areas should be installed away from watercourses and the weir pool margins, preferably on higher land. Please consult an ecologist for further advice.
Timing of Works	Records of brown trout (<i>Salmo trutta</i>) are present on the River Vyrnwy around the confluences with the Afon Cownwy and River Marchnant. Although, salmonid habitat within the Afon Cownwy and River Marchnant is limited, due to reduced flows associated with the weir impoundments and the limited clean gravels, it is recommended that works avoid the salmonid spawning season (typically October-December) since brown trout are known to be present in the downstream watercourse. In order to avoid harm to the aquatic ecology and habitats of the downstream River Vyrnwy, which may arise as a result of the discharge of fine sediment or chemical pollutants from the works area, appropriate sediment and pollutant control measures are required for inclusion within the projects Working Method Statements. Avoidance of working during the winter should also be considered because it would reduce the potential for high flow events that could compromise the efficiency of silt control measures.
Pollution	All Pollution Prevention Guidance (PPGs) that was previously maintained by the Environment Agency is currently under review and a new set of guidance notes are presently being issued by the Northern Ireland Environment Agency (NIEA), Scottish Environment Protection Agency (SEPA) and Natural Resources Wales (NRW) as Guidance for Pollution Prevention documents. These include GPP5 for works and maintenance in or near water (which replaces PPG5 - works near or liable to affect watercourses) and GPP21 for pollution incident response planning (which replaces PPG21 – pollution incident response planning) that form key points of reference for the proposed works. In the absence of a complete set of new GPP documents the existing PPGs should also be used as a source of information on good practice only.

¹ Environment Agency (2003) *River Habitat Survey in Britain and Ireland*.

² Chartered Institute of Ecology and Environmental Management (2013) *Guidelines for Preliminary Ecological Appraisal*.

³ WFD status as reported on the Environment Agency's Catchment Data Explorer (Environment Agency, 2018) and the Welsh Government and NRW's Lle Geo portal (Welsh Government and Natural Resources Wales, 2018).

Constraints and Recommendations					
Constraints	Description	Potential Constraints to the Works?	Requires Further Surveys?	Working Method Statement Required?	Recommendations and Notes for Works
Afon Cownwy					
Designated Sites of Nature Conservation Value associated with the Afon Cownwy	The existing impoundment on the Afon Cownwy is approximately 0.5 km downstream from the Berwyn Site of Special Scientific Interest (SSSI), Berwyn Special Protection Area (SPA) and Berwyn and South Clwyd Mountains Special Area of Conservation (SAC).	Yes	No – in relation to aquatic species	Yes	Since the designated sites are upstream of the impoundment, there is no impact pathway to aquatic ecological receptors within the designated sites and thus the potential for impacts to aquatic habitats within these sites is not considered a constraint to the works. However, other potential impact pathways to different ecological receptors within these sites (e.g. birds) may be present and care should be taken that access routes to work locations avoid designated sites and designated habitat features such as blanket bog and dry heath. The separate Preliminary Ecological Appraisal Reports for the Cownwy and Marchnant should be reviewed for further information on constraints associated with designated sites and protected species. NRW should be consulted to insure compliance with associated legislation. A Working Method Statement (WMS) should contain appropriate procedures and measures that act to identify suitable access routes and working methods that avoid harm to these features.
Weir Pool Habitat	The weir pool is a manmade feature created by flow impoundment at the weir structure and as such is not characteristic of natural standing water body habitats within the area. However, the pool has been part of the landscape for over 100 years and therefore is likely to provide important still water habitat for species within the area. The weir pool is isolated from the downstream watercourse system due to the presence of the weir structure and the diversion of flow to Lake Vyrnwy. Consequently, colonisation by migratory and other fish species from downstream is likely to be impeded.	No	No	Yes	Since the weir pool is not expected to be lost as a result of the works it is not considered to be a constraint. However, a WMS should be produced that contains appropriate procedures and measures that act to protect the pool and its habitats from disturbance and reduce the risk of pollution spills and fine sediment mobilisation during construction works.
Watercourse Fish	<p><i>Desk study:</i> No recent desk study records exist for brown trout or other salmonids within the Afon Cownwy, although historically they were present. One record of bullhead (<i>Cottus gobio</i>) from 2007 is present on the Afon Cownwy, downstream of the weir, suggesting non-migratory minor species of fish are supported by the watercourse. Bullhead is an Annex II non-priority species under the Habitats Directive (1992)⁴.</p> <p><i>Upstream:</i> No fish were observed during the survey. Flow and habitats were suitable to support fish, but existing weir and flow conditions downstream likely to act as a barrier to migration to upstream reach. Upper reaches above the weir are isolated from potential colonisation of fish species from downstream, although habitat is notably more suitable here with higher flows and some fine gravels observed.</p> <p><i>Downstream:</i> No fish observed during survey. Water levels within watercourse are typically low (due to flow diversion), resulting in sub-optimal habitat for fish. Several isolated pools are present immediately downstream of the weir, indicating that habitat suitability is lowest where flows are most impacted by the diversion.</p>	Yes – potentially in relation to barriers to movement	No	Yes	<p><i>Upstream:</i> No impact to upstream the watercourse habitat or its flow regime is expected to result from the works. Fish that may be present upstream of the weir pool are, therefore, not considered a constraint to the works.</p> <p>However, a WMS should be produced that contains appropriate procedures and measures that act to protect the upstream watercourse and its habitats from disturbance and reduce the risk of pollution spills and fine sediment mobilisation during construction works.</p> <p><i>Downstream:</i> As there is an absence of suitable habitat and limited colonisation potential due to the low flows within the reach immediately downstream of the weir, fish are not considered to be a constraint to the works.</p> <p>However, despite fish habitat currently being sub-optimal for much of the downstream reach between the weir and the River Vyrnwy (due to flow diversion), a WMS should be produced that contains appropriate procedures and measures that act to protect the watercourse from physical disturbance and reduce the risk of pollution spills and fine sediment entering the watercourse to avoid any associated impacts on fish in the downstream catchment.</p> <p>The works will result in increased flow within the watercourse channel downstream of the weir. This will improve habitat suitability for fish and ultimately benefit the wider fish populations. However, the improved conditions for fish may result in the weir becoming a more significant barrier issue, since habitat conditions within the watercourse are more likely to promote fish presence within the reach immediately downstream of the weir. It is therefore recommended that issues around barriers to fish movement be discussed with NRW to ascertain compliance with objectives for the watercourse in relation to fish to ensure that barrier issues are not a constraint to the works.</p>

⁴ Conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) (92/43/EEC) - 1992 (implement Bern convention)

Constraints and Recommendations					
Constraints	Description	Potential Constraints to the Works?	Requires Further Surveys?	Working Method Statement Required?	Recommendations and Notes for Works
Watercourse Marginal Macrophytes	<p><i>Desk study:</i> No desk study data are available for marginal macrophytes within the Afon Cownwy.</p> <p><i>Upstream:</i> No marginal macrophytes were observed during the survey.</p> <p><i>Downstream:</i> The marginal macrophyte community structure recorded downstream is characterised by low species abundance and species richness. A few isolated patches of commonly occurring species were noted around the weir pool and immediately downstream of the weir where the tree canopy was more open. Marginal macrophytes were mostly absent within the downstream reaches due to heavy shading from surrounding trees on both banks.</p>	No	No	Yes	<p>No impact to upstream watercourse habitat or flow regime is expected as a result of the works. No notable marginal macrophytes were recorded during survey of the Afon Cownwy either upstream or downstream of the weir.</p> <p>However, a WMS should be produced that contains appropriate procedures and measures that act to protect the watercourse habitats from disturbance and reduce the risk of pollution spills and fine sediment mobilisation during construction works.</p> <p>The works will result in increased flow in the watercourse channel downstream of the weir. This will improve habitat suitability for marginal macrophytes where shading is not a constraint to their development.</p>
Watercourse Aquatic Macrophytes	<p><i>Desk study:</i> No desk study data are available for aquatic macrophytes within the Afon Cownwy.</p> <p><i>Upstream/Downstream:</i> Aquatic macrophytes in the Afon Cownwy are limited to bryophytes (mosses and liverworts) growing on large stable boulders and cobbles within the channel.</p>	No	No	Yes	<p>No impact to upstream watercourse habitat or flow regime is expected as a result of the works. Although aquatic macrophytes were limited to bryophytes, a WMS should be produced that contains appropriate procedures and measures that act to protect the watercourse habitats (both upstream and downstream) from disturbance and reduce the risk of pollution spills and fine sediment mobilisation during construction works.</p> <p>The works will result in increased flow in the watercourse channel downstream of the weir. This will improve habitat suitability for aquatic macrophytes where shading is not a constraint to their development.</p>
Watercourse Aquatic Macroinvertebrates	<p><i>Desk study:</i> No desk study data are available for aquatic macroinvertebrates within the Afon Cownwy.</p> <p><i>Upstream:</i> Although no aquatic macroinvertebrate surveys were undertaken it is assumed that there will be taxa present within the upstream reaches of the Afon Cownwy and communities are likely to be associated with fast flowing, well oxygenated water.</p> <p><i>Downstream:</i> Although no aquatic macroinvertebrate surveys were undertaken it is assumed that there will be taxa present within the Afon Cownwy that are primarily associated with low/still flow conditions. It is noted that the communities are likely to be occasionally influenced by high flows associated with heavy rainfall. However, species that are associated with fast flowing, well oxygenated water are likely to be absent/rare due to the low frequency of high flow events.</p>	No	No	Yes	<p><i>Upstream:</i> No impact to upstream watercourse habitat or flow regime is expected as a result of the works. Aquatic macroinvertebrates upstream of the weir pool are not considered a constraint to the works.</p> <p>However, a WMS should be produced that contains appropriate procedures and measures that act to protect the watercourse habitats from disturbance and reduce the risk of pollution spills during construction works.</p> <p><i>Downstream:</i> There is potential for the works to affect downstream watercourse aquatic macroinvertebrate assemblages. A WMS should be produced that contains appropriate procedures and measures that act to protect the watercourse habitats from disturbance and reduce the risk of pollution spills and fine sediment mobilisation during construction works.</p> <p>Following the works flows will be increased in watercourse downstream of the weir. This is expected to result in changes to the macroinvertebrate community structure through improvements in condition for species associated with fast flowing upland watercourse habitats.</p>
Invasive Aquatic Species	<p><i>Desk study:</i> No desk study data are available for aquatic invasive within the Afon Cownwy.</p> <p><i>Upstream/Weir Pool/Downstream:</i> No invasive aquatic plant species (or terrestrial plant species) were identified during the survey of the watercourse and its associated weir pool.</p>	No	No	Yes	<p>Whilst no invasive species were identified in, or adjacent to the river, they should be considered a potential risk. Invasive species are highly competitive and typically have effective dispersal methods. Because they are so effective at dispersion, biosecurity measures are required as best practice to avoid potential spread of invasive species. It is recommended that all site workers are familiar with invasive species that could be encountered. If an invasive species is identified on site, an appropriately qualified ecologist should be consulted to determine a management procedure.</p> <p>A WMS should be produced that includes best practice methods for managing the risk of spreading Invasive Non-Native Species (INNS) e.g. check-clean-dry procedures for plant, equipment and PPE when entering and exiting the site.</p>
Other Aquatic Fauna and Flora	<p><i>Desk study:</i> The desk study returned records of otter on the Afon Cownwy and along the River Vyrnwy. There are no records of white-clawed crayfish (WCC) within the Afon Cownwy and the most recent record from the River Vyrnwy is from 1981. A concurrent ecological assessment for mammals and protected species was undertaken and results from the survey are reported separately.</p> <p><i>Upstream/Weir Pool/Downstream:</i> No other aquatic species were observed during the survey.</p>	-	-	-	<p>Works are expected to be limited to the area in and around the existing weir, diversion channel and side spill channel therefore impacts to otter and WCC (if present) are likely to be minimal.</p> <p>However, due to the protected status of these species and their potential presence they are likely to be a constraint to the works and will require consideration. The Cownwy Preliminary Ecological Appraisal Report should be consulted for further assessment of these constraints.</p>

Constraints and Recommendations					
Constraints	Description	Potential Constraints to the Works?	Requires Further Surveys?	Working Method Statement Required?	Recommendations and Notes for Works
River Marchnant					
Designated Sites of Nature Conservation Value associated with the River Marchnant	The existing impoundment on the River Marchnant is approximately 1 km east of the Berwyn Special Protection Area (SPA) and Berwyn Site of Special Scientific Interest (SSSI).	Yes	No – in relation to aquatic species	Yes	Since the designated sites are upstream of the impoundment, there is no impact pathway to aquatic ecological receptors within the designated sites and thus the potential for impacts to aquatic habitats within these sites is not considered a constraint to the works. However, other potential impact pathways to different ecological receptors within these sites (e.g. birds) may be present and care should be taken that access routes to work locations avoid designated sites and designated habitat features such as blanket bog and dry heath. The separate Preliminary Ecological Appraisal Reports for the Cownwy and Marchnant should be reviewed for further information on constraints associated with designated sites and NRW should be consulted to insure compliance with associated legislation. A Working Method Statement (WMS) should contain appropriate procedures and measures that act to identify suitable access routes and working methods that avoid harm to these features.
Weir Pool Habitat	<p>The weir pool is a manmade feature created by flow impoundment at the weir structure and as such is not characteristic of natural standing water body habitats within the area. However, the pool has been part of the landscape for over 100 years and therefore is likely to provide important still water habitat for species within the area. The pool itself supports macrophytes, although these were limited to floating leaved rooted species.</p> <p>The weir pool is isolated from the downstream watercourse system due to the presence of the weir structure and the diversion of flow to Lake Vyrnwy. Consequently, colonisation by migratory and other fish species from downstream is likely to be impeded.</p>	No	No	Yes	<p>Since the weir pool is not expected to be lost as a result of the works it is not considered to be a constraint.</p> <p>However, a WMS should be produced that contains appropriate procedures and measures that act to protect the pool and its habitats from disturbance and reduce the risk of pollution spills and fine sediment mobilisation during construction works.</p>
Watercourse Fish	<p><i>Desk study:</i> No recent desk study records exist for fish within the River Marchnant.</p> <p><i>Upstream:</i> No fish were observed during the survey. Flow and habitats were suitable to support fish, but existing weir and flow conditions downstream likely to act as a barrier to migration to upstream reach. Upper reaches above the weir are isolated from potential colonisation of fish species from downstream, although habitat is notably more suitable here with higher flows and some fine gravels observed.</p> <p><i>Downstream</i> No fish were observed during the survey. Water levels within the watercourse are typically low (due to flow diversion), with no clearly defined channel immediately below the weir structure. Several isolated pools within a wetland/scrub landscape are present which offers sub-optimal habitat for fish and habitat suitability is lowest immediately downstream of the weir where flows are most impacted by the diversion. Habitat conditions for fish throughout the downstream reach are considered to be poor, particularly for those species that require clean gravel substrates for spawning, such as brown trout. Three culverts (one of which is approximately 1m wide and 80m long under a saw mill yard) pose barriers to fish migration. However, it is likely that fish present in the River Vyrnwy will utilise some of furthestmost downstream habitat for refuge.</p>	Yes – potentially in relation to barriers to movement	No	Yes	<p><i>Upstream:</i> No impact to upstream the watercourse habitat or its flow regime is expected to result from the works. Fish that may be present upstream of the weir pool are, therefore, not considered a constraint to the works.</p> <p>However, a WMS should be produced that contains appropriate procedures and measures that act to protect the upstream watercourse and its habitats from disturbance and reduce the risk of pollution spills and fine sediment mobilisation during construction works.</p> <p><i>Downstream</i> As there is an absence of suitable habitat and limited colonisation potential due to the low flows within the reach immediately downstream of the weir and the presence of several barriers (namely culverts and the weir structure itself), fish are not considered to be a constraint to the works.</p> <p>However, despite fish habitat currently being sub-optimal for much of the downstream reach between the weir and the River Vyrnwy, a WMS should be produced that contains appropriate procedures and measures that act to reduce the risk of pollution spills and fine sediment entering the watercourse to avoid any associated impacts on fish in the downstream catchment.</p> <p>The works will result in increased flow within the watercourse channel downstream of the weir. This will improve habitat suitability for fish and ultimately benefit the wider fish populations, assuming the channel becomes clearly defined without the need for intrusive channel works following flow reinstatement. However, the improved conditions for fish may result in the weir becoming a more significant barrier issue since habitat conditions within the watercourse are more likely to promote fish presence within the reach immediately downstream of the weir. It is therefore recommended that issues around barriers to fish movement be discussed with NRW to ascertain compliance with objectives for the watercourse in relation to fish to ensure that barrier issues are not a constraint to the works.</p>
Watercourse Marginal Macrophytes	<p><i>Desk study:</i> No desk study data are available for marginal macrophytes within the River Marchnant.</p> <p><i>Upstream:</i> No marginal macrophytes were observed during the survey.</p> <p><i>Downstream:</i> The River Marchnant immediately downstream of the weir does not have a clearly defined channel, however a number of commonly occurring marginal macrophyte species and wetland plant species were recorded along the river corridor.</p>	No	No	Yes	<p>No impact to upstream watercourse habitat or flow regime is expected as a result of the works. No notable marginal macrophytes were recorded during survey of the River Marchnant either upstream or downstream of the weir.</p> <p>However, a WMS should be produced that contains appropriate procedures and measures that act to protect the watercourse habitats from disturbance and reduce the risk of pollution spills and fine sediment mobilisation during construction works.</p>

Constraints and Recommendations					
Constraints	Description	Potential Constraints to the Works?	Requires Further Surveys?	Working Method Statement Required?	Recommendations and Notes for Works
					The works will result in increased flow in the watercourse channel downstream of the weir. This will improve habitat suitability for marginal macrophytes that have higher water requirements, where shading is not a constraint to their development.
Watercourse Aquatic Macrophytes	<p><i>Desk study:</i> No desk study data are available for aquatic macrophytes within the River Marchnant.</p> <p><i>Upstream:</i> No aquatic macrophytes were observed during the survey.</p> <p><i>Downstream:</i> Aquatic macrophyte species are limited to a few isolated patches of commonly occurring species. These are restricted to areas where the gradient is shallower and substrates more varied. A significant length of the river is culverted restricting aquatic macrophyte growth.</p>	No	No	Yes	<p><i>Upstream:</i> No aquatic macrophytes were recorded in the channel upstream and no impact to upstream watercourse habitat or flow regime is expected as a result of the works. Aquatic macrophytes that may be present upstream of the weir pool are, therefore, not considered a constraint to the works.</p> <p>However, a WMS should be produced that contains appropriate procedures and measures that act to protect the watercourse habitats from disturbance and reduce the risk of pollution spills during construction works.</p> <p><i>Downstream:</i> Although aquatic macrophytes were limited in abundance, a WMS should be produced that contains appropriate procedures and measures that act to protect the watercourse habitats from disturbance and reduce the risk of pollution spills and fine sediment mobilisation during construction works.</p> <p>The works will result in increased flow in the watercourse channel downstream of the weir. This will improve habitat suitability for aquatic macrophytes where shading is not a constraint to their development.</p>
Watercourse Aquatic Macroinvertebrates	<p><i>Desk study:</i> No desk study data are available for aquatic macroinvertebrates within the River Marchnant.</p> <p><i>Upstream:</i> Although no aquatic macroinvertebrate surveys were undertaken it is assumed that there will be taxa present within the upstream reaches of the River Marchnant and communities are likely to be associated with fast flowing, well oxygenated water.</p> <p><i>Downstream:</i> Although no aquatic macroinvertebrate surveys were undertaken it is assumed that there will be taxa present within the downstream reaches of the River Marchnant that are primarily associated with low/still flow conditions. It is noted that the species richness is likely to increase in the furthest downstream reach where flows are higher due to additional inputs from incoming tributaries and general accretion from surface water run-off in the catchment. However, species that are associated with fast flowing, well oxygenated water are likely to be absent due to the low frequency of high flow events.</p>	No	No	Yes	<p><i>Upstream:</i> No impact to upstream watercourse habitat or flow regime is expected as a result of the works. Aquatic macroinvertebrates upstream of the weir pool are not considered a constraint to the works.</p> <p>However, a WMS should be produced that contains appropriate procedures and measures that act to protect the watercourse habitats from disturbance and reduce the risk of pollution spills during construction works.</p> <p><i>Downstream:</i> There is potential for the works to affect downstream watercourse aquatic macroinvertebrate assemblages. A WMS should be produced that contains appropriate procedures and measures that act to protect the watercourse habitats from disturbance and reduce the risk of pollution spills and fine sediment mobilisation during construction works.</p> <p>Following the works flows will be increased in watercourse downstream of the weir. This is expected to result in changes to the macroinvertebrate community structure through improvements in condition for species associated with fast flowing upland watercourse habitats.</p>
Invasive Aquatic Species	<p><i>Desk study:</i> No desk study data are available for aquatic invasive within the Marchnant.</p> <p><i>Upstream/Weir Pool/Downstream:</i> No invasive aquatic plant species (or terrestrial plant species) were identified during the survey of the watercourse and its associated weir pool.</p>	No	No	Yes	<p>Whilst no invasive species were identified in, or adjacent to the river, they should be considered a potential risk. Invasive species are highly competitive and typically have effective dispersal methods. Because they are so effective at dispersion, biosecurity measures are required as best practice to avoid potential spread of invasive species. It is recommended that all site workers are familiar with invasive species that could be encountered. If an invasive species is identified on site, an appropriately qualified ecologist should be consulted to determine a management procedure.</p> <p>A WMS should be produced that includes best practice methods for managing the risk of spreading Invasive Non-Native Species (INNS) e.g. check-clean-dry procedures for plant, equipment and PPE when entering and exiting the site.</p>
Other Aquatic Flora and Fauna	<p><i>Desk study:</i> The desk study returned records of otter within the River Vyrnwy Catchment near the confluence with the River Marchnant. It is probable that otter may use the river corridor for commuting, resting and feeding habitat, especially the lower reach where water levels are more consistent and the channel more defined. A concurrent ecological assessment for protected species was undertaken and results from the survey are reported separately.</p> <p><i>Upstream/Weir Pool/Downstream:</i> No other aquatic species were observed during the survey.</p>	-	-	-	<p>Works will be limited to the area in and around the existing weir, diversion channel and side spill channel therefore impacts to otter and WCC are likely to be minimal.</p> <p>However due to the protected status of these species and their potential presence they are likely to be a constraint to the works and will require consideration within a WMS. The Marchnant Preliminary Ecological Appraisal Report should be consulted for further assessment of these constraints.</p>

Constraints and Recommendations					
Constraints	Description	Potential Constraints to the Works?	Requires Further Surveys?	Working Method Statement Required?	Recommendations and Notes for Works
Other Watercourses					
River Vyrnwy	<p><i>Desk study:</i> The desk study showed that there are active brown trout fisheries throughout the River Vyrnwy downstream of the Study Area. It also returned records for otter within the river corridor. The River Vyrnwy flows from North to South East towards Welshpool. The flow in the River Vyrnwy is controlled by the release from the Lake Vyrnwy Reservoir and was high (i.e. bankfull) during both days of the field visit.</p>	No	No	Yes	<p>No works are required to the River Vyrnwy. However, the habitats and aquatic ecological communities will be vulnerable to fine sediment loading and chemical pollutants that could potentially be discharged from the works areas on both the Afon Cownwy and River Marchnant. Although, the works are not expected to present a significant risk a WMS should be produced that contains appropriate procedures and measures that act to protect the River Vyrnwy from the risk of pollution spills and delivery of fine sediment from the upstream work activities.</p> <p>Following the works the River Vyrnwy will receive additional flow from the Afon Cownwy and River Marchnant. It is not anticipated that the increase in flow volume will have a material effect on the hydromorphology of the receiving watercourse.</p>