CRAIG Y PARCAU DEVELOPMENT

DRAINAGE STRATEGY

29th April 2020.

Consulting Civil Engineer: WL Squared

Client: HD Ltd Masterplanner: Roberts Limbrick Architects Services Infrastructure Consultant: Troup Bywaters+Anders Planning Consultant: Savills

INTRODUCTION.

Craig Y Parcau is a circa 6.82 hectare site located within the south west outskirts of Bridgend alongside the A48 where the A4622 meets the A48 immediately adjacent to the roundabout junction a the intersection of the two highways.

The site is currently owned by HD Ltd.

The site is a mix of green and brown field land.

HD Ltd are proposing to develop the site to provide a residential development comprising of circa 86 to 110 dwellings.

The site forms part of a wider proposed allocation in BCBC's emerging new LDP, which also includes land at Island Farm (which is subject to a separate Drainage Strategy document).

WL Squared have been engaged to provide an outline drainage strategy for the proposed development based on the masterplan prepared by Roberts Limbrick Architects.

This document describes in outline terms:

- site constraints that affect the strategic approach to be taken when developing detailed designs to accommodate the discharge of storm and foul water from the proposed development,
- the hierarchical and design considerations to be given to the development of a storm water strategy for the proposed development,

and,

- the storm and foul water drainage strategy developed for the proposals as a result of those considerations,

SITE AND EXISTING CONDITIONS.

The overall site is of approximately 6.82 hectares and is shown opposite.

The existing site comprises of circa 2.0 ha of agricultural land that lies to the west of a stream that dissects the site and circa 4.82 ha of site to the east of the development that is occupied by two derelict properties known as Craig Y Parcau. The site is bounded to the north by the A48, to the south by New Inn Road and to the east by the adjacent River Ogwr.

The stream that runs through the site is a continuation of two streams that enter the site from a culvert under the A48 roundabout from the Broadlands residential development from the north, see section below.

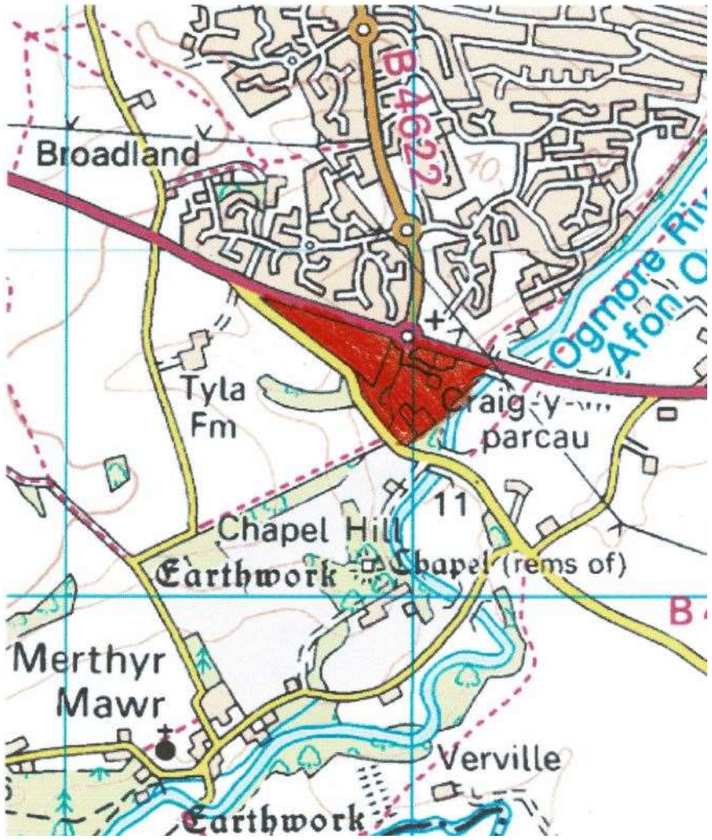
No intrusive site investigations have yet been undertaken on the site however a desk top study of local site investigation information available indicates that the site is likely to be underlain with relatively impervious glacial tills/clay soils containing some proportion of sands and gravels between circa 3 and 6.5 metres deep overlying Lower Lias beds overlying Carboniferous Limestone.

It is likely that the Lower Lias geological unit identified beneath the site is susceptible to natural cavity formation. To the north east of the site, at least thirteen subsidences were recorded in the vicinity of Nolton Street, Bridgend between 1920 and 1950 within Lower Lias deposits which were, predominantly, overlain by Glacial Sand and Gravel.

It is thought that natural cavities within the limestone were previously at surface level and that these features were in-filled with superficial glacial deposits at the end of the ice age. Groundwater over time flows through the soils and washes out the cavity backfill resulting in the creation of voids which eventually reach the surface.

In view of these conditions the discharge of significant amounts of rainfall run-off via shallow filtration methods is likely to lead to ground instability.

Rainfall run-off currently discharges from the site via the stream, it is believed that the long derelict properties that are existing on the site were drained into the foul sewer that is located within the adjacent A48.



CURRENT HYDROLOGICAL REGIME

The site is considered to unaffected by fluvial or tidal/coastal flooding.

The development maps maintained by Natural Resources Wales (excerpt opposite) show the development site to be in a zone considered at little or no risk to flooding, see opposite top left.

The stream that runs through the site, it is believed to be the main means of stormwater discharge from the site given the site topography.

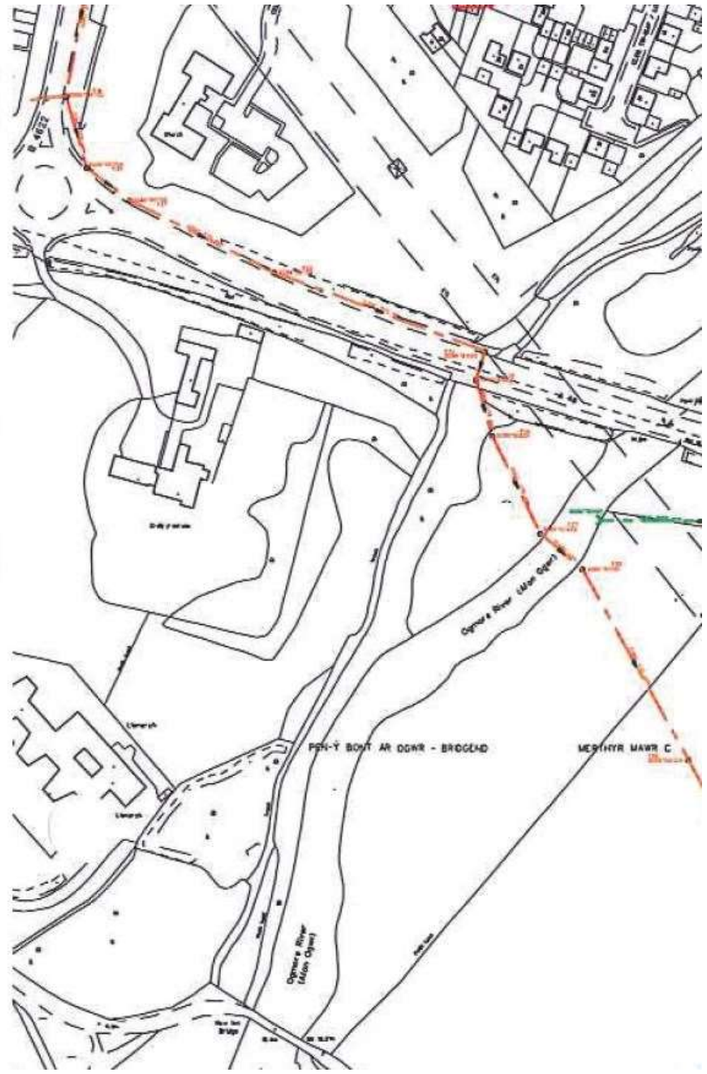
The detailed flood risk maps maintained by Natural Resources Wales (excerpt opposite left bottom) show the area of stream running through the site to be an area of low surface water flood risk (shown in yellow).

Environment Agency Wales have previously advised HD Ltd through their consultants Opus that the permitted *(stormwater)* discharge rate to the River Ogwr depended upon where on the River the development surface water was discharged. If the discharge to the River Ogwr was north of the A48 crossing then a maximum discharge rate of 28.2l/s/ha would be permitted.

If however the discharge was south of the A48 then there would be no restriction of discharge rate imposed by them provided SUDS features were incorporated within the proposed drainage scheme.

Public sewer records have been obtained to better inform the extent of the existing foul drainage provision to the development site.

The Dwr Cymru, Welsh Water (DCWW) public sewer record asset plan, reproduced in part (opposite right) shows a public sewer running alongside the northern edge of the A48 alongside the site until it crosses over the A48 just west of the western road bridge abutment just to the north east of the site.



CURRENT DEVELOPMENT PROPOSALS.

The new development proposals provide for:

- 3.72 ha for blue/green infrastructure,ecological enhancement, nature conservation, heritage and public open space,
- 3.1 ha for Residential development which could comprise of 86 to 108 dwellings depending upon detailed design.

And,

- Direct access into the development using an existing spur of the existing roundabout within the A48.

STORMWATER STRATEGY, BRIEF, DISCHARGE, HIERARCHY AND STRATEGY.

The stormwater strategy takes account of the following brief.

The Stormwater drainage strategy should utilise SUDS systems wherever possible.

The proposals should aim to:

- manage water on or close to the surface and as close to the source of the runoff as possible,
- Treat rainfall as a valuable natural resource,
- ensure pollution is prevented at source,
- manage rainfall to help protect from increased flood risk, and the environment from morphological and associated ecological damage resulting from changes in flow discharge,
- take account of climate change and urban creep,
- incorporate a SuDS Management Train, utilising drainage components in series, across a site to achieve a robust surface water management system,
- maximise the delivery of benefits for amenity and biodiversity;
- seek to make the best use of available land through multifunctional usage of public spaces and the public realm;
- perform safely, reliably and effectively over the design life of the development taking into account the need for reasonable levels of maintenance;
- minimise the need for to pump flows as much as practically possible and be affordable, taking into account both construction and long term maintenance costs and the additional environmental and social benefits afforded by the system.

The Strategy should comply in outline terms with the “Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems” implemented by Welsh Government via “The Flood and Water Management Act 2010 (Schedule 3)” which came into effect in Wales on 7 January 2019,

The drainage strategy should pay due cognisance to the likelihood of Karst features/sinkholes forming as a result of uncontrolled discharge of run-off into the ground.

The drainage strategy should pay due cognisance to the restrictions that may exist with respect to the local offsite stormwater drainage infrastructure and local water courses.

National Resources Wales have confirmed that there would be no restriction of discharge rate imposed by them if the flows were to be discharged into the River Ogwr south of the A48 provided SuDS features were incorporated within the proposed drainage scheme.

An assessment of the hard areas has been undertaken using the masterplan produced by Roberts Limbrick.

For the purposes of developing the strategy; these are;

Provision	**Impermeable Surface (ha)**
Highways	0.8
Residential	1.2
Total	2.0

The Stormwater Greenfield runoff rate for a 1 in 100 year event on the site has been calculated using the IH124 method for the site at 73.79 l/s.

DISCHARGE HIERARCHY:

The hierarchical considerations given to the demands of accommodating surface water run-off from the development are as follows:

Standard	Title	Priority Level	Commentary
S1	**Surface Water Destination**	1: Collection for Re-use	Rainwater collection will be provided to provide a volume of water for grey water/irrigation purposes.
		2: Surface water run-off infiltrated to ground	The discharge of the substantial quantities of surface water run-off from this development to ground using shallow filtration methods are not suitable due to the risk of dissolution features occurring within the underlying Lias limestones.
		3: Surface water run-off discharged to a surface water body	The discharge of stormwater into the stream within the site and possibly the River Ogwr (depending upon adjacent land ownership) is possible.
		4: Surface water run-off is discharged to surface water sewer.	Not applicable.
		5: Surface water run-off is discharged to a combined sewer.	Not applicable.
S2	**Surface water runoff hydraulic control**	1: Surface water should be managed to prevent, so far as possible, any discharge from the site for the majority of rainfall events of less than 5mm	This will be accounted for in the detailed design of the system.
		2: The surface water runoff rate for the 1 in 1 year return period event (or agreed equivalent) should be controlled to help mitigate the negative impacts of the development runoff on the morphology and associated ecology of the receiving surface water bodies	This will be accounted for in the detailed design of the system.
		3: The surface water runoff (rate and volume) for the 1% (1 in 100 year) return period event (or agreed equivalent) should be controlled to help mitigate negative impacts of the development on flood risk in the receiving water body.	This will be accounted for in the detailed design of the system and by the provision of suitably designed attenuation systems.
		4: The surface water runoff for events up to the 1% (1 in 100 year) return period (or agreed equivalent) should be managed to protect people and property on and adjacent to the site from flooding from the drainage system.	This will be accounted for in the detailed design of the system and by the provision of suitably designed attenuation systems.
		5: The risks (both on site and off site) associated with the surface water runoff for events greater than the 1% (1 in 100 year) return period should be considered. Where the consequences are excessive in terms of social disruption, damage or risk to life, mitigating proposals should be developed to reduce these impacts.	This will be accounted for in the detailed design of the system provided
		6: Drainage design proposals should be examined for the likelihood and consequences of any potential failure scenarios (e.g. structural failure or blockage), and the associated flood risks managed where possible.	This will be accounted for in the detailed design of the system provided
S3	**Surface water quality management**	1: Treatment for surface water runoff should be provided to prevent negative impacts on the receiving water quality and/or protect downstream drainage systems, including sewers.	Use of filtering mediums such as permeable paving systems linked to impermeable collection and storage systems, conveyance via impermeable soft landscaped swales/reems and channels and storage lagoons will offer treatment opportunities that can be designed in during the detailed design of the drainage system.
S4	**Amenity**	1: The design of the surface water management system should maximise amenity benefits.	Impermeable soft landscaped swales/reems and channels and storage lagoons will offer opportunities amenity benefits that can be designed in during the detailed design of the drainage system.
S5	**- Biodiversity**	1: The design of the surface water management system should maximise biodiversity benefits.	Impermeable soft landscaped swales/reems, water gardens, channels and storage lagoons will provide opportunities to maximise bio-diversity within the site at the detailed design stage.
S6	**Design of drainage for Construction, Operation and Maintenance.**	1: All elements of the surface water drainage system should be designed so that they can be constructed easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).	Proposed system utilises well established construction technologies that can be constructed easily and cost effectively.
		2: All elements of the surface water drainage system should be designed to ensure maintenance and operation can be undertaken (by the relevant responsible body) easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).	Proposed system utilises well established construction technologies that can be maintained easily within the minimum of operational input.
		3: The surface water drainage system should be designed to ensure structural integrity of all elements under anticipated loading conditions over the design life of the development site, taking into account the requirement for reasonable levels of maintenance.	Proposed system utilises well established construction technologies that can be designed for a 50 year + design life and include suitable allowances for urban creep and climate change.

OUTLINE STORMWATER DRAINAGE STRATEGY.

Stormwater flows from developed areas (roofs, paved surfaces, etc) forming the residential development on the west side of the existing stream will be collected via a suitable mix of permeable paving and other positive drainage methods and conveyed through a series of attenuation systems (underground tanks, reens and ponds) that restrict the flow to the 1 in 100 year greenfield run-off for that part of the site prior to discharge into the stream bed that runs through the site.

Stormwater flows collected from the development located on the site to the east of the stream will be collected using similar means and discharged via attenuation systems to either directly to the River Ogwr or to the stream bed.

The option chosen will be dependent on the ownership of the narrow strip of land between the site and the bank of the River Ogwr. Whatever option is chosen the maximum discharge flow will be limited to the 1 in 100 year greenfield run-off for that part of the site.

Scoping calculations based on initial development areas indicate that the volume of storage likely to be provided to serve the western area of the development would be circa 1100m^3, whilst that serving the western area of the site would be circa 1650 m^3. Both figures allow for a 40% increase in flow for climate change and an increase in flow of 10% for urban creep.

OUTLINE FOUL DRAINAGE STRATEGY.

The site will be connected to the foul sewer that exists in the adjacent A48 either on southern side of the A48 just before the western abutment of the bridge that carries the A48 over the River Ogwr or if that's not technically possible by a connecting sewer that crosses the A48 northwards and connects to the existing sewer on the northern side of the A48.

The possible points of connection are indicated opposite.

Any connection will be subject to the approval of Dwr Cymru Welsh Water, detailed design considerations and compliance with relevant standards such as "Sewers for Adoption" and the normal S104 agreements.