R&A Championship Ltd

Project Green

Drainage Strategy Report

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1.0 Introduction

Blyth and Blyth have been appointed by the R&A Championship Ltd via design lead Holmes Miller to develop the civil & structural design of the proposed hub and maintenance buildings as part of the redevelopment of the Lethamhill Golf club.

The purpose of this drainage strategy report is to outline the philosophy behind the design of the foul and surface water drainage systems. It further aims to relate this to local authority design criteria, Scottish Water requirements, SEPA guidance, and Scottish Government planning policies.

2.0 Existing Site

2.1 General Description

The site is located within Lethamhill Golf Course in the Hogganfield Loch area of Glasgow. The site is bordered to the north by Hogganfield Loch, to the west by the A80 Cumbernauld Road, to the south by the B765 Gartloch Road, and to the east by undeveloped land and residential development beyond. An overall location plan is shown in Figure 1.

The overall site covers a plan area of 45ha. The existing club house and associated car parking are located within the north-west part of the site adjacent to Cumbernauld Road.

This report is specifically for the proposed new hub building in the north west of the site and a new maintenance facility adjacent to the southern boundary off the existing access road to the Scottish Water reservoir. The locations and site boundaries are shown in Figure 2.

Figure 1 – Overall site Location

Figure 2 – Proposed Hub Building and Maintenance Facility Locations

The Topography of the site and surrounding areas is shown in Figure 3. This indicates that there is a high point in the middle of the site where ground level is approximately 112m AOD (Above Ordnance Datum). From this point ground elevation drops in all directions, dropping to 84m AOD to the west adjacent to Cumbernauld Road, to 83m AOD to the north adjacent to Hogganfield Loch, to about 90m AOD to the south, and to 86m AOD to the east

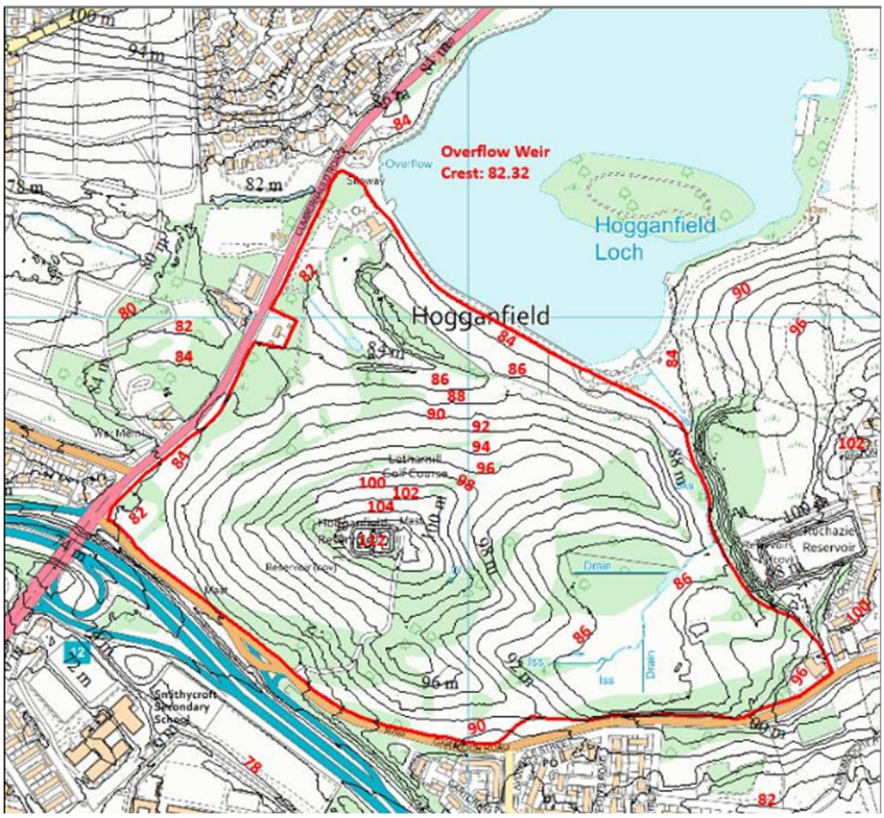


Figure 1 - Site Topography

2.2 Existing Natural Drainage Features

Hogganfield Loch is fed by overflow from Frankfield Loch to the North East. Outflow from Hogganfield Loch is to the West where water overtops a weir. Water overtopping the weir enters a 675mm dia. culvert under Cumbernauld Road and discharges in an open channel on the West side of the road. The watercourse is called Molendinar Burn. The burn runs West in a combination of open channel and culverted sections.

There are a couple of drains within the site itself. In the Western part of the site there is a small area where water ponds. Water from this pond runs in a North-Western direction in a small drain and enters a 450mm culvert. The culvert runs towards Cumbernauld Road, however its exact line and outfall is not currently known. A CCTV survey has been commissioned to confirm this.

The East drain originates from a swamp adjacent to the Southern boundary. It runs North towards the East boundary of the site. Along this section a couple of small drains join the main drain. At the North East boundary, the drain enters a 600mm culvert. The culvert runs North and discharges into an open channel just outside the site boundary, from where it runs North and discharges into Hogganfield Loch.

2.3 Existing Drainage Infrastructure

Scottish Water Asset Plan drawings were obtained for the site and surrounding area (see Appendix A).

2.4 Existing Drainage Within Site

There are a number of manholes around the existing club house which are assumed to be combined drainage lines which connects to the Scottish Water infrastructure on Cumbernauld Road.

Scottish Water asset plans indicate two combined sewers running parallel with Cumbernauld Road. Refer to plan in Appendix A. One just inside the site boundary and one running within the adjacent road/ footpath.

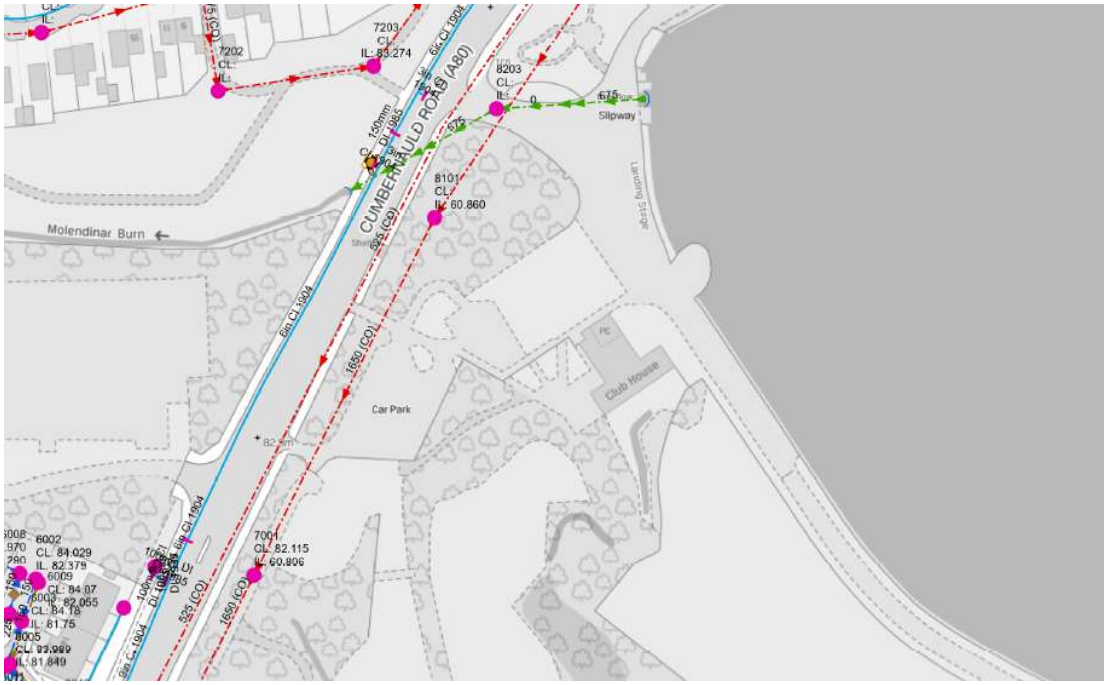
The pipe just inside the boundary is indicated as a 1650mm combined sewer with an invert depth of approximately 22m. This is considered impractical to connect to.

The other is a 525mm combined sewer located within the road with an invert level of circa 5-6m. This is most likely the line which the existing clubhouse drainage currently connects to.

There is a 675mm surface water overflow pipe which runs from the adjacent slipway area of Hogganfield Loch under the main road outfalling to the Molendinar Burn to the west side of Cumbernauld Road.

A CCTV survey is currently being procured to establish the location, depth, and condition of the existing drainage and to inform the most appropriate connection points.

A Ground Penetrating Radar (GPR) survey is currently being procured to confirm the position and depth of the various utilities within and adjacent to the site.



3.0 Proposed Development

3.1 General Description

The development proposals provide a new model for how golf can continue to be developed successfully with a focus on short-form golf, increased family orientation and accessibility. Key facilities will include the following: 9 or 12 hole golf course; 9 hole par 3 course; expansive short-game area; maintenance shed with associated hardstandings; driving range; instruction and fitness studios; adventure golf; golf hub/clubhouse including retail outlet, changing facilities, café/restaurant, indoor simulator/kids' movie theatre and associated parking facilities. There will also be a separate maintenance facility to the South of the development.

The existing Lethamhill Golf Course clubhouse will be demolished as part of the development.

3.2 Drainage Requirements

The design of the drainage systems must consider the guidance and design criteria published by various key stakeholders including the local authority (Glasgow District Council), SEPA, and Scottish Water.

The local authority, being responsible for flood prevention, is focused primarily on the issues surrounding the quantity of water discharging from the site and the degree of attenuation required to reduce the risk of flooding to an acceptable level.

As an environmental protection agency SEPA's role in the drainage approval process relates to issues of water quality and the protection of the natural water environment. Since April 2006 SEPA have fulfilled this duty through the Water Environment (Controlled Activities) (Scotland) Regulations 2005 – more commonly known as the Controlled Activities regulations or CAR.

Due to the site topography, the hub building can utilise a traditional gravity foul drainage system connected to the existing combined sewer in the existing car park. There are no foul or combined sewer pipes in the vicinity of the proposed maintenance facility, therefore the foul drainage will be treated by a Bio-disc package treatment plant with the clean water outfall connecting to the surface water drainage.

The surface water system for the Hub building will have an attenuation tank supplemented by at source treatment consisting of permeable paving and filter trenches. The controlled discharge from the attenuation tank will be connected to an existing manhole on the outfall line on the Hogganfield Loch overflow channel in the North West of the site. The surface water system for the Maintenance facility will have an attenuation tank with additional permeable paving and filter trenches supplemented by a Separator in the service yard. This will then connect into a 1m deep ditch for approximately 260m heading East before out falling into the East drain (see Section 2.2).

The drainage shall comply with the requirements of Sewers for Scotland 4th Edition.

4.0 Flood Risk

A Flood Risk Assessment has been undertaken by Kaya Consulting. A copy of the report was received 12th February 2021.

The summary and conclusions of the draft FRA are outlined below.

- the site is not at significant risk of flooding from the adjacent Hogganfield Loch for the 200 year plus climate change flood.
- the site is not at significant risk of flooding from the 200 year, 200 year plus climate change and 1000 year flood events.
- the risk of surface water run-off entering the site from the areas outside the boundaries is considered to be low.
- There are two drains originating from the areas within the site where water ponds. It is suggested that building development is not located within these areas and along the drains.
- It is suggested that existing overland flow paths from the entrances of the west and east drain culverts should be retained as at present.
- Any built development should take account of water supply pipes shown in Scottish Water service drawings.
- Finished Floor Level of buildings close to Hogganfield Loch should be set no lower than 83.32m AOD. This is 0.6m above the predicted 200 year plus climate change water level in the loch.
- The existing access to site from Cumbernauld Road, which will be retained, is not predicted to be at significant risk of flooding.

5.0 Surface Water Drainage Proposals and SUDS

5.1 General

The design of a surface water drainage system to serve a new development must consider water treatment and on-site attenuation as well as providing sufficient hydraulic capacity. The proposed surface water drainage layouts are shown on the drawings in Appendix B.

5.2 Surface Water Design Criteria

- Surface water runoff from the public highway designed not to flood for a 1 in 30-year return period.
- Surface water networks designed not to flood for a 1 in 200-year return period plus 30% climate change plus 10% urban creep
- Attenuation storage is to be provided by underground storage units and filter trenches as well as in the porous paving.

5.3 Surface Water Quality

Glasgow City Council requires that SUDS provide the level of treatment recommended in the SUDS Manual and as required by SEPA. Accordingly, SUDS components are designed in accordance with the Simple Index Approach.

Suitable pollution hazard indices for proposed land use are determined from the SUDS manual, refer to Table 1.

Table 1 – Pollution Hazard Indices for different land use classifications

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Commercial/Industrial Roofs	Low	0.3	0.2	0.05
Site Access, Hardstanding & Car Parks.	Low	0.5	0.4	0.4
Service yards	Medium	0.7	0.6	0.7

To deliver adequate treatment the selected SUDS components must have a total pollution migration index that is greater than or equal to the pollution hazard indices. Pollution migration indices for various SUDS components are found in Table 2

Type of SUDS Component	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Permeable Paving	0.7	0.6	0.7
Separator	0.85	0.65	0.99

Additional features that may be included within the development include underground cellular storage

5.4 Exceedance

In event of blockage of surface water drainage system, or rainfall event in excess of design capacities then surface water will flow overland. Levels will be set to direct overland flow away from and around buildings.

Finished floor levels are generally set above proposed external levels to prevent surface water flows from extreme storm events entering the proposed buildings.

External ground levels will be engineered to ensure falls are away from buildings and building access points where possible to provide positive drainage to prevent ponding. The risk of accumulation of standing water against the buildings would therefore be minimised.

5.5 Greenfield Runoff

Legislation and best practice guidance states that the surface water runoff from a new development to a receiving watercourse or sewer should not exceed the greenfield runoff rate. Glasgow City Council require the greenfield runoff rate to be calculated based on the hardstanding area discharging to the receiving sewer.

The Greenfield runoff equivalent was calculated using the "Greenfield Runoff Estimation Tool" from the Microdrainage/Windes software. This tool calculates the greenfield runoff rates using the IHR124 Method based on the formula:

$$Qbar = 0.00108 \times (0.01 \times AREA)^{0.89} \times SAAR^{1.17} \times SPR^{2.17}$$

The output report from this is included in the Appendix C.

The Qbar value was calculated as above to be 6.58/s.

5.6 Details of Attenuation

The main impact of a development is the increase in the proportion of impermeable surfaces (e.g. roofs and hard landscaped areas) within the site and without careful planning this can increase peak rate runoff. Sustainable urban drainage systems (SUDS) aim to mitigate this effect by emulating natural drainage systems.

Attenuation of the surface water will be required. The total volume has been determined based on a combined discharge of 6.58 l/s. This is split between 5.48 l/s for the Hub and 1.1 l/s for the maintenance facility.

For both The Hub and The Maintenance facility the attenuation systems will mainly consist of the following:

1. Below ground cellular storage tanks within the car park areas providing storage for the building roof drainage and adjacent hardstanding.
2. Underneath the proposed parking bays and drop off areas in the form of open graded sub-base material with 30% voids. The areas draining to this storage facility will be the car park area and access road.
3. Swale and filter trench adjacent to access road.

In all cases, flows will be limited to the pre-development rates using Hydro-Brake Flow control devices.

Area	Total Site Area (Impermeable Area) Ha	Greenfield Runoff (Discharge Limit l/s)	1:200 year Attenuation Volume m3
1&2	0.922	6.58	659

Table 3 – Surface Water Discharge Limit & Attenuation Volumes.

6.0 Foul Water Drainage Proposals

The generally accepted hierarchy for disposal of wastewater, in order of preference, is as follows:

1. Connection to public sewer
2. Septic tank and soak-away
3. Package treatment plant

Foul water drainage for the Hub is envisaged to be a gravity system connected to the existing combined sewer in the existing car park. This then connects via an existing sewer to the combined sewer adjacent to Cumbernauld Road. For the Maintenance Facility the Foul drainage is treated by a Bio-disc package treatment unit with the clean water outfall connecting to the surface water drainage.

Foul flow from the development has been calculated not to exceed a peak flow of 0.668 l/s based on Flows and Loads 4's giving an equivalent average flow of 0.101 l/s.

Refer to the proposed foul flow calculations in Appendix D

7.0 Drainage Consultations & Approvals

Drainage Approval

A Pre-Development Enquiry (PDE) was submitted to Scottish water on 15th January 2021. To date we have not received a formal response.

Foul and surface water should be separated within the site.

Foul drainage should be connected to the existing combined manhole in the existing car park with surface water connecting to the existing Hogganfield Loch overflow.

8.0 Maintenance

Adoption

All new drainage within the site will remain private. As such operation and maintenance of the surface water drainage and SuDS features will remain the responsibility of the R&A Championship Ltd and any subsequent operator.

Maintenance

All drainage systems, including SuDS components, should be regularly inspected and maintained. This will ensure efficient operation and prevent failure. SuDS components are usually on or near the surface and many can be managed using landscape maintenance techniques.

Typically, a SuDS maintenance plan will include routine and occasional activities, along with long-term remedial actions. Recommended maintenance schedules for the proposed SuDS features are outlined below.

Recommended Maintenance Requirements for Permeable Paving

Maintenance Schedule	Required Action	Frequency
Monitoring	Initial Inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Annually
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface) – pay particular attention to areas where water runs onto porous surface from adjacent impermeable areas as this area is most likely to collect most sediment	Once a year, after autumn leaf fall, or reduced frequency as required, based on site specific observations of clogging or manufacturers recommendations
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds of management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance of or soil slip, has been raised to within 50mm of the level of paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)

Recommended Maintenance Requirements for Swales

Maintenance Schedule	Required Action	Frequency
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies.	Half yearly
Regular Maintenance	Remove litter and debris.	Monthly (or as required)
	Cut grass – to retain grass within specified design range	Monthly (during growing season) or as required
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required)
	Inspect inlets and outlets / overflows for blockages and clear if required	Inspect monthly
Occasional Maintenance	Reseed areas of poor vegetation growth; alter plant types to suit conditions, if required	As required, or if bare soil over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or reseeding.	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of soil surface	As required
	Remove build up of sediment and silt	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Recommended Maintenance Requirements for Filter Drains

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices.	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage.	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices.	Six monthly or as required
Occasional Maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly or as required
	Clear perforated pipework or blockages.	As required

9.0 Conclusions

- The site is not at significant risk from flooding from the adjacent Hogganfield Loch and is at low risk of fluvial flooding.
- The site is low risk of pluvial flooding (Surface Water) as a result of the adjacent outside the boundaries.
- The proposed surface water drainage will discharge to the existing Hogganfield Loch surface water overflow located to the North West of the site.
- Foul water will outfall into the existing foul sewer manhole in the existing golf course car park.
- Through the reduction of surface water discharge by means of volumetric attenuation and flow control, the site development will limit the discharge rate to the existing network to 6.58 l/s.
- The proposed surface water drainage has been designed not to flood for 1:30 year return period. The model has also been checked for 1:200-year.
- This study concludes that development of the site as proposed, should not be restricted by matters related to flood risk or drainage capacity.

Appendix A: Scottish Water Asset Plans

Appendix B: Proposed Drainage Layout drawing

Appendix C: Calculation of Greenfield Runoff

Appendix D: Post-Development Foul Water Discharge Calculations