



**Former Roslin Institute  
Drainage Strategy**

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## **FORMER ROSLIN INSTITUTE**

### **DRAINAGE STRATEGY**

## **1.0 Introduction**

### **1.1 Background**

BBSRC intends to secure a Planning Permission in Principle (PPP) for a residential development on an approximate 16.52 ha site located off Main Street (B7006), Roslin. Ironside Farrar Limited has been commissioned by BBSRC via DTZ to prepare a Drainage Strategy that will be used in support of the planning application for the development.

Reference should also be made to the separate Flood Risk Assessment that provides a detailed assessment of the potential flood risks of the proposed development from all sources.

### **1.2 Consultation and Data Sources**

The following sources have been used in the compilation of this Drainage Strategy: -

- Proposed Site Plan.
- Topographical Survey Data.
- Walkover Survey.
- Scottish Environment Protection Agency
- Scottish Water Sewer Record Plans.
- Midlothian Council.

## **2.0 Existing Site Description**

### **2.1 Site Location**

The former Roslin Institute is located to the east of Main Street, Roslin; the City centre of Edinburgh is some 10km to the north; the location of the site is indicated in Appendix 2a.

### **2.2 Detailed Site Description**

The total site area extends to approximately 16.52 ha (40.80 acres) and is presently occupied by the Roslin Institute, a poultry research centre; together with more recent buildings that formed the basis of the Roslin Biocentre.

Vehicular access to the site can be gained directly from the B7006, Main Street. Access roads run through the site to the northern area and also along the southern boundary to a secondary site access in the south east corner of the site. This access gives vehicular access to an unclassified road that runs to the north east; to the west vehicular access is excluded at the eastern extremity of Roslin.

The northern boundary of the site is formed by an established hedge beyond which is a surfaced track and beyond that Killburn Wood; through which the Kill Burn runs.

The remaining site boundaries all have significant woodland, either on the boundary or immediately beyond.

At the existing site entrance there is a security gate and adjacent to Main Street a nursery with associated car parking. The site access continues to a roundabout where the road divides to run to the north and south. Following the northern access road to the east the first building encountered is the Wallace building, a relatively modern office building with associated car parking located between the road and the northern boundary. To the north of the road there is open land to the east of the Wallace building until the Logan building, another modern, single storey office building is encountered at the northern end of the access road.

Towards the centre of the site are the main Poultry Research Centre buildings that consist of the wooden poultry sheds, the poultry unit and the main Roslin Institute office buildings. There are car park areas to the south east of the main office buildings that are served from the southern access road. Between the Roslin Institute and Wallace buildings there is generally open grass land; the southern access road is lined with existing trees.

The Existing Site Plan is included in Appendix 2b.

Generally the site falls to the northern corner of the site and the North West corner adjacent to the Main Street boundary.

### **2.3 Topography**

As detailed previously, the topography of the site is generally a fall to the northern corner of the site; the Topographical Survey is included as Appendix 2c.

The northern boundary of the site falls from the northwest corner where the level is 148.20m to a level of 143.64 at the hedge in the north. Beyond the hedge on the northern boundary, Kill Burn falls from a level of 144.84m at Main Street to 134.53m at the northern corner of the site. It can be seen, therefore, that Kill Burn is located a minimum of 3.36m and a maximum of 9.11m below the lowest levels of the site. The Main Street boundary rises from 148.20m close to the point where it crosses Kill Burn to a level of 156.00m at the southern corner of the site.

The southern boundary falls gradually from west to east from the level of 156.00m to 152.00m at the south east access. Within the site the Roslin Institute building is generally at a level of 150.00m and the poultry sheds at 150.20m. The Wallace and Logan Buildings have not been surveyed but the Wallace Building is estimated as approximately 148.00m and the Logan Building as 145.00m.

### **2.4 Existing Watercourses and Drainage**

There are no watercourses crossing the site but the Kill Burn runs to the north of the site; at the closest point Kill Burn is some 20m north of the site. Farther afield, the site is located approximately 500m north of the River North Esk and 1km south of the Bilston Burn.

The location of existing watercourses is indicated on Appendix 2b.

The record of Public Sewers was obtained from Scottish Water and is included in Appendix 2d. From these records it can be seen there is a combined sewer running across the site from the Bowling Green Pavilion on Main Street to the Scottish Water Kill Burn Wastewater Pumping Station located to the north west corner of the site on the west side of Main Street. The sewer runs from the pavilion to a point very close to

the south west corner of the Wallace Building before turning to run to the pumping station.

Within the site there is a well established, private drainage system; an investigation has been undertaken that indicates the presence of separate foul and surface water drainage on the site but it is not clear if the systems combine before connecting to the public system. A total of three pumping stations have been identified on the site, the first immediately to the west of the Roslin Institute buildings, the second to the north of the poultry sheds and the third in the open land to the west of the Logan Building.

The full extent of the existing drainage should be investigated, together with the degree of separation, to determine the potential existing flows to the public sewerage system and the adjacent watercourses.

### **3.0 Proposed Development**

Details of the final layout have still to be agreed but the form of the layout is illustrated in Appendix 3a.

The main aspects of the proposed development include:-

- Of the total site area of 16.52ha, the area for development is 11.90ha; the balance of the site is allocated for retained woodland, Greenspace and SUDS.
- The proposed access roads follow the pattern of the existing and are supplemented where necessary. Footpath links are provided to adjacent paths.
- SUDS facilities are indicated to be located within the greenspace on the site.

### **4.0 Proposed Drainage Layout**

The site will be served on a completely separate system of drainage with the foul flows connected to the existing public sewerage system and surface water discharging to the nearby Kill Burn via a SUDS based surface water drainage system.

Drainage shall comply with CIRIA C697 The SUDS Manual, SUDS for Roads, Sewers for Scotland 2 and the SEPA guidance, Regulatory Method (WAT-RM-08) Sustainable Urban Drainage Systems (SUDS or SUD Systems), while safety issues relating to SUDS retention ponds shall comply with RoSPA guidance.

The discharge of surface water will be limited to the mean annual flood flow for all events up to the 200 year return period event.

#### **4.1 SEPA Guidelines for Drainage Design**

SEPA has policies and guidelines which are to be followed when preparing a drainage design, an overview of these policies is included below;

##### **Surface Water**

The treatment of surface water run-off by sustainable drainage systems (SUDs) is a legal requirement for most forms of development however; the location, design and types of SUDs are largely controlled through planning. Surface water run-off from all developments is to be treated by SUDs, in line with Scottish Planning Policy (Paragraph 2009), PAN 61 "Planning and Sustainable Urban Drainage Systems" and PAN 79 "Water and Drainage".

It is important to ensure that adequate space to accommodate SUDs is incorporated within the site layout and the opportunity to use such features as wildlife corridors linking green spaces, is maximised. Each individual type of SUDs facility, such as a filter drain, detention basin, permeable paving or swale, provides one level of surface water treatment.

Residential developments of 50 houses or less and retail/commercial/business parks with car parks of 50 spaces or less require one level of treatment for all hardstanding areas including roads. We encourage this first level of SUDs to be source controlled.

All roads schemes typically require two levels of treatment, except for residential developments of 50 houses or less and retail/commercial/business parks of 50 spaces or less. For technical guidance on SUDs techniques and treatment for roads, please refer to the SUDs for Roads Manual.

For all developments, run-off from areas subject to particularly high pollution risk (e.g. yard areas, service bays, fuelling areas, pressure washing areas, oil or chemical storage, handling and delivery areas) should be i.) minimised and ii.) directed to the foul sewer. Where run-off from high risk areas cannot be directed to the foul sewer SEPA can, on request, provide further site specific advice on what would be the best environmental solution.

Comments should be sought from the local authority roads department and the local authority flood prevention unit on the acceptability of post-development runoff rates for flood control.

### **Foul Drainage**

Details of the waste water provision for the development should be provided within any future planning submission, including consideration of options for wastewater treatment facilities.

Where there is a public sewage system, wastewater drainage from the development within and close to the settlement envelope should be directed to that system. If the system has insufficient capacity, then early dialogue with Scottish Water will be required to determine if works are planned to overcome this problem, or what developer pro-rata contributions will be necessary to remove the constraint.

If there is no or limited public sewage infrastructure, it would still be expected that the development of strategic infrastructure to adoptable standards be achieved. Contact should be made with Scottish Water to determine the standards required to ensure adoption of new infrastructure.

SEPA would not support proposals for private foul drainage systems for significant development (e.g. more than 25 houses) where we consider that development of public infrastructure is the sustainable long-term solution. An interim solution may be acceptable provided an appropriate upgrade has been agreed with Scottish Water and there will be no unacceptable impact on the water environment. For further guidance please refer to SEPA's Policy and Supporting Guidance on Provision of Waste Water Drainage in Settlements.

## **4.2 Sewage Network Design**

The proposed foul network should be designed as a separate system in accordance with Sewers for Scotland, 2nd edition, and modelled using the Microdrainage software package, with design flows based on the Wallingford Procedure.

The surface water pipes should be designed with a minimum velocity of 1m/s at pipe full flow and with a roughness of 0.6mm. The pipe should provide enough capacity to convey all the surface runoff flows to attenuation and treatment facilities.

The foul pipes should be designed to provide a self-cleansing regime with a minimum flow velocity of 0.75m/s at one-third design flow. Gradients should be restricted to no steeper than 1:10 to comply with safety standards. The foul sewer should provide enough capacity to convey the flows from the site to a discharge point on the existing public sewer network.

Both surface water and foul sewers should preferably be laid with a minimum cover of 1.5m to avoid interference with other underground utility pipes and cables, and have a minimum diameter of 150mm.

### **4.3 Surface Water Drainage**

The Institute of Hydrology Report 124 was used to calculate the mean annual flood flow rate, the 100 year return period flow and the 200 year return period flow for the existing site. The detailed micro drainage calculations are included in Appendix 3c; as detailed above, the mean annual flood flow rate will be utilised for the development areas and the discharge will be restricted in all events up to the 200 year event. An allowance for climate change of 20% has been made in the attenuation calculations.

The existing overall site area is estimated to be approximately 16.52ha and the resulting mean annual flood flow calculated as 92.5l/s; the equivalent run-off rate is therefore 5.59l/s/ha.

A detailed hydraulic network was compiled, based on the drainage network indicated on the Indicative Drainage Layout included in Appendix 3b; the impermeable areas for the masterplan were assessed on the basis of 55% of the gross development areas and the detailed micro drainage hydraulic calculations included in Appendix 3c. These calculations indicate that to achieve the flow from the proposed development of 92.5l/s; a detention pond with a standing area of 640m<sup>2</sup> will be required. The flows will be controlled using a vortex flow control and the water level will rise by some 1.881m in the 200 year event plus 20% climate change allowance. A location for the detention pond is shown on the Indicative Drainage Layout and sufficient space should be allowed within the development layout to accommodate the upper surface area of the pond of approximately 2200m<sup>2</sup>.

Allowance should also be made to accommodate the ancillary works associated with a detention pond such as the maintenance track, forebay, control manhole and draw-down facility. Detailed guidance on the arrangement of a detention pond to the standards required by Scottish Water is contained in Sewers for Scotland 2<sup>nd</sup> Edition.

### **4.4 Foul Drainage**

Scottish Water has stated (Appendix 4a) that there is sufficient capacity in the Edinburgh PFI Waste Water Treatment Works to service the demands from the development.

There are currently network issues in this area and a Drainage Impact Assessment will be required to establish if there is sufficient capacity within the existing infrastructure to accommodate the demands from the development.

Further detailed discussions with Scottish Water are required to determine the extent of any improvements and a Drainage Impact Assessment will need to be commissioned.

Within the site itself, the topography is such that a new foul water pumping station will be required to drain the whole of the site. This station will be designed to Sewers for Scotland 2<sup>nd</sup> edition and will be situated in a suitable location in relation to the residential development. The sewer records indicate an existing public sewer crossing the site and connecting to the Scottish Water Kill Burn Wastewater Pumping



Station. This sewer will be located on site and connected to the proposed drainage network.

## **5.0 Legislation & Guidance**

### **5.1 The Water Environment (Controlled Activities, Scotland) Regulations 2005**

The regulations implement the obligations of Section 20 of the Water Environment and Water Services (Scotland) Act 2003 (WEWS Act). The WEWS transposed the requirements of the Water Framework Directive into Scots Law. A section of this Act refers exclusively to activities occurring in or around a watercourse which could affect the watercourse. This is known as the Water Environment (Controlled Activities) (Scotland) Act 2005 (CAR). It is referred to as the CAR Regulations and enforces controls over the following activities:

- Activities liable to cause pollution of the water environment
- Abstraction of water from the water environment
- Discharge of water from the urban or rural areas into the water environment
- The construction, alteration or operations of impounding works in surface water or wetlands
- Carrying out of building works, engineering, or other works
  - o In inland water other than ground water or wetlands or
  - o In the vicinity of inland water or wetlands, and likely to have a significant adverse effect on the water environment
- In the Artificial recharge or augmentation of groundwater

Three types of authorisation under CAR allow for proportionate and risk-based regulation; namely:

- a) General Binding Rules (GBRs)
- b) Registration
- c) Licence

GBRs represent the lowest level of control and cover specific low-risk activity.

Registration is intended to cover low risk activities which cumulatively pose a risk to the water environment.

If site specific controls are required; and in particular, if constraints upon the activity are to be imposed, then the activity should be authorised using a licence.

Collectively, the above three forms of regulations are known as authorisations.

The Water Environment (Controlled Activities) (Scotland) Regulations 2005 state that it is an offence to discharge to any wetlands, surface water systems and ground systems without a CAR authorisation.

Surface water discharges require a licence under WEWS CAR regulations if they are draining:

- >1000 residential house
- >1000 car parking spaces
- Industrial areas
- Major roads/motorways

Discharge consent may specify conditions, which can include limits on the quantity and quality that must be met.

Since the proposals are for a residential development with less than 1000 residential houses or car parking spaces, it is expected that the runoff from the development will fall under the General Binding Rules and no licence be required under the Water Environment (Controlled Activities Regulations) (Scotland) Regulations 2005.

## **5.2 SUDs Drainage**

The Water Environmental (Controlled Activities) (Scotland) Regulations 2005 General Binding Rule 10, required sites constructed after April 2007 to be drained via Sustainable Urban Drainage Systems (SUDs).

Sustainable Drainage Systems are an alternative to conventional urban drainage systems and are developed in line with the ideals of sustainable development. The primary aim of SUDs is to mimic the natural drainage system of a site, and they are therefore, designed to minimise the impact of the development on the quality and quantity of runoff and to maximise amenity and biodiversity on the site.

The CIRIA C697 SUDs Manual (2007) states that natural drainage patterns should be followed and original ditches and streams should be retained and integrated within the design, wherever possible.

Private SUDs, connecting to the Scottish Water drainage system, should have the ownership and maintenance responsibility of the developer discussed with Scottish Water.

## **5.3 Above Ground SUDs**

Above ground SUDs provide a natural means of treating and attenuating runoff which encourage biodiversity and potential for landscaping. Although the required maintenance is frequent, it is more accessible than underground systems however, there is a potential for flytipping and misuse. Site topography and conditions can often limit the functionality of above ground systems which require a high land take. Example systems include:

- Rainwater harvesting – limited use unless filtered, is not always considered as adequate storage due to variation in usage volumes therefore, an overflow into an attenuation structure is required.
- Green Roofs – provide one level of treatment and limited attenuation storage, will require overflow and irrigation for extremes in weather to ensure vegetation survives.
- Swales – provide one level of treatment and potential attenuation, and will require check dams on steep slopes.
- Wetlands – provide one level of treatment and potentially large volumes of storage
- Ponds – depending on design, they can provide one to two levels of treatment and large volumes of storage.

## **5.4 Underground SUDs**

Underground systems can protect from misuse or vandalism, but require a greater level of maintenance and are not as easily accessed as above ground systems. The land above these systems can be used for other functions however; their use can be limited in areas of high groundwater.

- Permeable paving – provides one level of treatment and attenuation
- Filter drains – provide one level of treatment and potential attenuation, difficult to implement on steep slopes.

## **6.0 Summary and Recommendations**

### **6.1 Summary**

- The Surface water drainage layout has been developed to comply with SEPA, Local Authority and Scottish Water policies and guidelines.
- SUDs should be implemented throughout the site and should be designed to provide storage for a 1 in 200 year return period storm and attenuate flow to the equivalent greenfield runoff rate, estimated to be around 5.59 l/s/ha.
- The Surface water drainage layout assumes 55% of the total area is developed as impermeable area for the storage calculations. An indicative location for the main SUDS feature is shown but the exact size and location will be incorporated into the development proposals.
- Source Control will be implemented where the topography allows which will minimise the need for a large storage structure at the downstream end of the site.
- The connection into the Kill Burn will require approval.
- Scottish Water has confirmed there is sufficient capacity in the Edinburgh PFI Waste Water Treatment Works to service the demands from the development but there are network issues in the area and a Drainage Impact Assessment will be required to establish if there is sufficient capacity within the existing infrastructure to accommodate the demands from the development.
- Within the development a foul pumping station will be required to serve low lying areas of the site.
- An existing public combined sewer crosses the site and will require a connection to the proposed foul sewer network.

### **6.2 Recommendations**

- Soil porosity testing should be carried out to determine the soakage and infiltration rates throughout the site.
- An investigation should be undertaken to determine the extent of the existing drainage and the areas contributing to the public sewers and watercourses.
- The location of the existing public combined sewer should be determined.
- The final impermeable areas should be determined for the design of the surface water network and SUDS features.
- Further discussions with Scottish Water will be required to commission a Drainage Impact Assessment.

**APPENDIX 2a**

**Site Location  
Plan**