

DESIGN AND ACCESS STATEMENT

Llanishen Reservoir, Cardiff



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1.0 INTRODUCTION

Background

1.1 The site of Llanishen Reservoir is currently the subject of an undetermined application (“the Llanishen Reservoir Application”) for residential development, sailing lake, wetland area, sailing centre, wildlife centre, and associated infrastructure which is due to be considered at a public inquiry during the summer of 2011 (PINS Reference: APP/26815/A/07/2042394/WF). This Design and Access Statement is submitted as part of a Listed Buildings Consent (LBC) application prepared in association with these undetermined proposals for Llanishen Reservoir.

Purpose of the Report

1.2 This report describes and explains the design principles which have informed the LBC application. It fulfils the statutory requirements for an application for LBC to be accompanied by a design and access statement, as required by the Planning (Listed Buildings and Conservation Areas) (Amendment) (Wales) Regulations (2009 No. 1026 (W.88)).

1.3 Article 3B of the amended order sets out those matters that must be covered in a LBC design and access statement. In relation to design these are to:

- i. Explain the design principles and concepts that have been applied to the following aspects of the development:
 - Appearance;
 - Environmental Sustainability;
 - Layout, and;
 - Scale
 - ii. Demonstrate the steps taken to appraise the context of the development and how the design of the development takes that context into account in relation to its proposed use and each of the aspects listed above particularly in relation to:
 - the special architectural or historic importance of the building;
 - the particular physical features of the building that justify its designation as a listed building; and
 - the building’s setting.
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1.4 In relation to access the matters that must be explained in a design and access statement are:

- i. the policy or approach adopted as to access, including:
 - what alternative means of access have been considered; and
 - how policies relating to access in the development plan have been taken into account;
- ii. how the policy or approach adopted as to access takes account of:
 - the special architectural or historic importance of the building;
 - the particular physical features of the building that justify its designation as a listed building; and
 - the building's setting;
- iii. how any specific issues which might affect access to the building have been addressed; and
- iv. how features which ensure access to the building will be maintained.

1.5 The design and access statement included in this report satisfies the advisory requirements introduced by 'Technical Advice Note 12: Design' published by the Welsh Assembly Government (June 2009). The statement has also been produced with due regard to TAN12 guidance that a 'Design and Access Statement should be proportionate in length and complexity to the type and scale of development being proposed' (TAN12 sections A3.2, A3.7 and A3.10).

Structure of the Report

1.6 Following this introduction, the main body of this report is presented in five sections:

- Section 2 contains an appraisal of the site and its context;
- Section 3 summarises relevant planning policies at national and local levels;
- Section 4 describes and explains the proposals;
- Section 5 comprises the access statement and also covers community safety; and
- Section 6 considers environmental sustainability, as required by TAN 12: Design.

2.0 SITE CONTEXT AND CHARACTER

Location

- 2.1 The site is located in the Llanishen area of Cardiff approximately 7 kilometres north of the city centre. The application site comprises the Grade II listed structure of Llanishen Reservoir.
- 2.2 The site is close to the predominantly residential areas of Llanishen (to the south and west, Lisvane (to the north west) and Cyncoed (to the east), and sits within easy reach of a wide range of community facilities including shops, public houses; schools; places of worship; leisure and recreation facilities; nursery; surgeries and other medical facilities; and public open spaces.

The Site & Wider Development Background

- 2.3 The Llanishen Reservoir Application has had a long period of gestation, with a variety of proposals being submitted since 2000. As a result of the confirmation of the Llanishen and Lisvane Reservoir Embankments Site of Special Scientific Interest, the proposal has evolved so that the Llanishen Reservoir Application retained the entirety of the reservoir embankments with development being confined (in the main) to the reservoir basin.
- 2.4 Prior to listing in 2009, the Llanishen Reservoir Application had been considered on appeal by an Inspector appointed by the Welsh Ministers. The inspector had recommended to the Ministers that the appeal should be allowed and that planning permission should be granted. However, the Welsh Ministers dismissed the appeal and refused to grant planning permission.
- 2.5 The applicant issued statutory challenge proceedings on several grounds. The Welsh Ministers submitted to judgement without the proceedings being heard and the Ministers decision, in its entirety, was accordingly quashed by the Courts on one of the grounds raised by the applicant.
- 2.6 Subsequently, Llanishen Reservoir was listed by the Welsh Ministers, who then determined that the Llanishen Reservoir Application should be referred back to a Planning Inspector for them to reconsider the proposal in light of the listing and other changed circumstances.
- 2.7 The applicant has taken the opportunity to make variations to the Llanishen Reservoir Application to address both the listing and other issues.
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Listed Building Context

Historical Background

- 2.8 The historical background of the site is set out in detail in Appendix 2. This report details the history of the site and the development of the wider Taff Fawr Reservoir system, of which Llanishen formed a part.
- 2.9 In summary, Llanishen Reservoir was part of the Taff Fawr Reservoir scheme, being a holding reservoir close to Cardiff supplied by a gravity-fed pipe. It was completed in 1886 as a separate extension to the earlier Lisvane Reservoir of 1865. Further reservoirs in the Taff Fawr scheme include the Cantref Reservoir, completed in 1892; the Beacons Reservoir, completed in 1897 and the Lwyn-On Reservoir completed in 1926. These three reservoirs are still used for water supply to Cardiff, but Llanishen Reservoir became redundant for the purposes of supplying drinking water to Cardiff in the 1970s.

Listing Background

- 2.10 Llanishen Reservoir was first considered for listing by CADW after representations were made to it in respect of both Llanishen and Lisvane Reservoirs in 2005. CADW concluded that there was a good case for historic interest within the context of the Cardiff water supply system, which extends from the reservoirs in the Taff Valley and other locations in the Brecon Beacons. CADW concluded however that the historic importance was essentially of a local scale and that the reservoirs did not qualify for listing because they were not among the best examples in Wales.
- 2.11 Further representations were made to CADW in 2008 in regard to the listing of Llanishen Reservoir alone, focusing on the importance of the reservoir as a part of the Taff Fawr water supply scheme to Cardiff.
- 2.12 CADW took the view that their earlier approach was no longer tenable and thought there was a strong argument for listing all of the components of the Taff Fawr water supply scheme. They saw two points as standing out: the status of Cardiff as it emerged to pre-eminence during the mid-to late 19th century and the fact that this water supply scheme was not only wholly in Wales but for a Welsh Town. As a result the listing of Llanishen Reservoir was confirmed in 2009
- 2.13 The list description sets out that Llanishen Reservoir dam is listed as an integral part of the 19th century water supply system for Cardiff (Appendix 2). Together with structures associated with the impounding reservoirs in the upper Taff, the

Llanishen Reservoir represents a major Welsh engineering scheme which has survived virtually intact.

- 2.14 Whilst CADW had initially taken the view in correspondence before the listing was confirmed that the special interest in Llanishen Reservoir resided not only in the common engineering basis for all of the dams in the Taff Fawr scheme but also in the historic interest of the civil engineering project in its entirety, they later resiled from this in judicial review proceedings that followed the listing and confirmed that Llanishen Reservoir is not listed because of any special or other interest arising out of its method of construction or any technical innovation.
- 2.15 In addition, in correspondence with CADW before the listing they confirmed that Llanishen Reservoir did not possess the comparable level of architectural detail to the other reservoirs in the Taff Fawr scheme, which had evident impressive architectural interest by virtue of their scale, monumentality and quality masonry and associated features set off in a dramatic upland setting. In contrast, Llanishen Reservoir lacked equivalent visual punch with a lowland setting entailing an encircling dam with minimal associated features. CADW confirmed during the judicial review proceedings that Llanishen Reservoir was not listed for any architectural interest. The basis for listing was the historic interest of the water supply scheme as a whole.
- 2.16 It is clear that it is the dam of the reservoir which is listed (the listing name being the "Llanishen Reservoir Dam"). Other water management features are noted, and are attached to the dam, namely;
- the inlet gauge chamber – both 1880s and 1920s,
 - the control valve platform/valve tower,
 - the wash channel and spillway,
 - the culvert exits,
 - the stepped weir, and
 - the scour tunnel exit and once submerged scour inlet.
- 2.17 These and other similar fixtures are part of the listed structure. It is clear that the water within the dam is not listed, and, with the exception of the scouring inlet, the land surfaces within the reservoir do not form part of the listed building.

Accessibility

2.18 Whilst access to Llanishen Reservoir is currently restricted, in the event of development the site would have a high degree of accessibility not only by private car but also by other modes of transport, as summarised below;

Rail:

2.19 The site lies close to Llanishen Railway Station, which offers a frequent service and a quick connection to Cardiff's other stations, as well as a direct service to the Valleys and Penarth.

Bus:

2.20 Rhyd-y-Penau Road (south of the Llanishen Reservoir site), is in close proximity to bus stops serviced by the number 51 bus – providing a circular service to eastern areas of Cardiff and the central bus station. Lisvane Road (north of the Llanishen Reservoir site), sits on the 85 and 86 bus routes, providing regular services to Heath, Llanishen, Lisvane and Cardiff City Centre.

Pedestrians and Cyclists:

2.21 Walking and cycling routes to local destinations from and through the site are good and include continuous pedestrian footway links to schools, Llanishen Railway Station, Llanishen village centre and access to the shops on Cyncoed Road.

3.0 PLANNING POLICY CONSIDERATIONS

Introduction

3.1 This section outlines the planning policy framework at both national and local levels relevant to the application, focusing in particular on those policies relating to listed buildings and design and access.

Statutory Development Plan

3.2 The statutory development plan for the area comprises:

- the South Glamorgan (Cardiff Area) Replacement Structure Plan 1991-2011, which was adopted in April 1997; and
- the City of Cardiff Local Plan 1991-2001, which was adopted in January 1996.

South Glamorgan (Cardiff Area) Structure Plan

3.3 The structure plan contains strategic land use policies for the county, a number of which are relevant to the proposed development:

- Policy B1 seeks to protect and enhance the best qualities of the built and historic environment, including listed buildings and conservation areas.
- Policy EV1 favours proposals which encourage sustainable practices that contribute to energy conservation and efficiency and which encourage the use of sustainable modes of transport.
- Policy MV13 seeks to improve safety and conditions for pedestrians and people with impaired mobility.

City of Cardiff Local Plan

3.4 The local plan presents more detailed land use policies and proposals for a wide range of topics for development in the Cardiff area for the period up to 2001. Although the plan period has lapsed, the plan remains extant and is a material planning consideration in the determination of planning applications.

3.5 The following local plan policies are considered to be relevant:

- Policy 7 (Open Space)
 - Policy 11 (Design and Aesthetic Quality)
-

- Policy 18 (Provision for Cyclists)
- Policy 19 (Provision for Pedestrians)

Emerging Development Plan

Unitary Development Plan

- 3.6 The Deposit Draft of the Cardiff Unitary Development Plan (UDP) 1996 – 2016 was published by the Council on 28 October 2003. The production of the document was however abandoned in favour of producing a Local Development Plan (LDP) as introduced under Part 6 of the Planning and Compulsory Purchase Act 2004. Accordingly, although the policies contained in the Deposit Draft UDP are material considerations the uncertainty relating to both the UDP and its intended replacement means that relatively little weight can be afforded to them.
- 3.7 Policies of relevance to the historic environment include Policy B1.1 which aims to protect and enhance the historic environment; Policy 2.51 states that due regard should be paid to the character and appearance, special interest and setting of listed buildings.

Local Development Plan

- 3.8 Having abandoned the UDP Cardiff Council have now commenced preparation of a Local Development Plan (LDP). The Deposit LDP was published for consultation in April 2009 and on 30th November 2009 the LDP was submitted to WAG for examination.
- 3.9 The LDP was withdrawn on 12th April 2010 due to concerns over the plans “soundness” and, having not been found “sound”, does not comprise a material consideration in the determination of planning applications and appeals. The Council are commencing preparation of a new LDP, however, this is at a very early stage of preparation.

National Planning Policy Guidance

Planning Policy Wales PPW

- 3.10 Planning Policy Wales (PPW) seeks to ensure that:
- sustainability is promoted through good design, and;
 - access to employment, shopping, education, health, community, leisure and sports facilities and open and green space is promoted.

3.11 In PPW more specific guidance is provided on:

- design – in paragraphs 4.10.1-16, which promotes good design and accessibility for all;
- access – in Chapter 8, which promotes access by non-car modes and states, at paragraph 8.7.3: ‘...proposed access to a development will reflect the likely travel patterns involved. It should ensure that people can reach the development, as far as practicable, by walking, cycling and public transport, as well as by car’; and

TAN 12: Design

3.12 TAN 12 was republished in June 2009, superseding the previous version, and has been used in preparing this design and access statement. The purpose of the TAN is to provide all those involved in the design of development with advice on: promoting sustainability through good design; and the preparation and validation of mandatory design and access statements. The TAN identifies key considerations and issues that should be addressed during LBC design processes

Supplementary Planning Guidance (SPG)

3.13 Relevant SPG includes:

- Access, Circulation and Parking Standards SPG, January 2010

4.0 DESIGN

Brief

4.1 This application for listed building consent is submitted in association with the wider development proposals for Llanishen Reservoir, which are currently under consideration, and is submitted to ensure that LBC can be established to allow suitable implementation of "the Llanishen Reservoir Application", should permission for that be granted at appeal.

Aspiration

4.2 Our aspiration is to achieve the sensitive redevelopment of the Llanishen Reservoir site whilst ensuring that the scale and number of interventions to the listed structure are kept to a minimum and that these do not harm its special interest.

Consultation

4.3 Consultation has been undertaken in respect of the LBC application, with Lindsay Cuddy (Team Leader, Conservation Team), Ross Cannon (Planner, Conservation Team) and Tim Walters (Senior Planning Officer) of Cardiff Council, including detailed emails and telephone conversations from 14 February 2011 and a meeting on site on the 28 February 2011. Consultation has also been undertaken with Jill Fairweather (Inspector of Historic Buildings) of Cadw.

Design Principles and Rationale

4.4 All of the alterations proposed for the listed building are set out on Drawings LB05 (a) and (b) which are included within the application package. These two drawings show the illustrative masterplan (Options A1 and D) and indicate in which locations alterations to existing features are required. The only difference between Options A1 and D relate to the south-east corner of the reservoir and the road alignment. There is no material change to the proposals as a result of this, with the exception of those relating to the south-east road entry. How this proposal has developed in consideration of key design principles is provided below:

1. Appearance

4.5 The appearance of the Llanishen Reservoir embankments depends upon the aspect from which it is viewed. It is important to note that there is currently no

- public access to its embankments. As a result, glimpsed views are only available from publicly accessible places. Furthermore, views from surrounding properties are also restricted to the external embankments of the reservoir. These are from most perspectives massive, linear, grass turfed and obviously engineered in form.
- 4.6 Equally there are only limited views of the interior revetments of the reservoir structure, as to a large extent these are shielded by the massive embankments. From the limited points where views are available the embankments also appear massive, linear and highly engineered. In contrast to the exterior, the interior embankments are stone pitched to prevent wave action from eroding the embankments. The stone pitching is in poor condition, with many more modern repairs having been carried out and with the addition of a concrete slip way and other access facilities at the north western corner which was used by a sailing centre. The appearance is utilitarian and is illustrative of the water retention function of the embankments.
- 4.7 The appearance of both the internal and external revetments of the reservoir's embankments is retained in all material respects. No changes will be made to the exterior of the reservoir embankments (other than where access to the reservoir basin is obtained). From the exterior of the reservoir to the south and west, a footpath will be installed from which publicly available views of the embankments will be able to be enjoyed. From the access points to the basin of the reservoir, the linear form and massive nature of the structure will be able to be seen. From the two accesses to the reservoir basin, a road and adjacent footpath/cycleway will follow the interior of the reservoir alongside the retained part of the southern and western stone pitched revetments. The scale, linear nature and function of the revetments will be readily apparent.
- 4.8 There are various structures around the reservoir embankments, including the original 1880's inlet, a later 1920's inlet, the original valve tower, and various outlet and scour structures. These are all functional in nature.
- 4.9 A full list of drawings submitted as part of this LBC application is contained at Appendix 3. The proposed alterations to the listed structure have been kept to the minimum, and in some cases are required for health and safety reasons.

New Road (crossing into reservoir at North-West and South-East corners)
(Drawings LB06-LB11 and LB25 and LB31)

- 4.10 A new road is proposed in order to provide access to the new development at the centre of the reservoir. The road will enter the reservoir in the north-west and

south-east corners and run along the southern and western embankments, around the sailing lake and housing plateaux. Option D does not entail a new road from the south-east corner but upgrades and utilises the existing pedestrian access (which can also be used for emergency vehicles).

- 4.11 The construction of the new road over the north-western point of the former reservoir embankment will necessitate a new earth bank over the stone revetment, which will be preserved in situ apart from the removal of 0.5m depth of coping at the top, across the width of the new road, to allow the road to pass into the development at the same height as the top of the bank. The same treatment will be used for the south-eastern road entry point.
- 4.12 The road will continue around the interior of the reservoir at the toe of the stone revetments. The road will be supported by a retaining wall when passing the new sailing lake to the north (Drawing LB25). The new road will, in some areas, necessitate the covering of parts of the listed embankments, this includes part of the spillways to the south of the two inlets on the western side of the reservoir and two grills (over the original decanting outlets) to the north of the valve tower on the southern side of the reservoir. The road will rest on these features and not cut them.
- 4.13 The road will cover some elements of the listed embankments but the massive nature of the engineered structures will still be appreciated and visible. The overall character and appearance of the embankments will remain intact.
- 4.14 Indicative details for the requirement of drainage off the road and away from the embankments is provided on Drawing LB31. This demonstrates the possible layout of the proposed drainage. This level of detail is able to be agreed by condition to a LBC. Similarly, the interface of the new road and the stone revetments will be sensitively handled in order to protect the listed structure and ensure appropriate drainage and stability. One option is to use a geotextile style membrane between the new road and the existing revetment. The membrane would be secured to the revetment through the removal of a line of stone sets. This detail can also be secured by condition of to a LBC.

Railings (*LB12-LB14*)

- 4.15 New fencing will be installed preventing direct access to the embankments, the stone pitching of the internal revetments and the sensitive ecology of the external revetments will be installed. This will be of a sympathetic design, as detailed in Drawing LB14). The current fencing along the top of the embankments, erected

for health and safety reasons, will be removed. This fencing is utilitarian and its removal will significantly enhance the appearance of the reservoir embankments.

1880s and 1920s Inlets (*Drawings LB15-LB22*)

- 4.16 The original 1880's and later 1920's inlet structures will be filled with sand and turfed to avoid danger to persons accessing the adjacent SSSI, This will preserve the character and appearance of these structures whilst reducing the risk of accidents. The levels of the fill have been determined by the front (interior facing) level of the inlet and so it will not obscure the upper parts of the inlets, which are defined by stone capped walls. In particular the white glazed bricks visible in the 1920s inlet will remain visible above the line of the grass capping, preserving the visible contrast between the two inlets.

Valve Tower (*Drawings LB23, LB29-LB30*)

- 4.17 Two of the decanting outlet grilles on the southern embankment north of the valve tower will be covered by the road encircling the southern and western inner revetments, but a third (immediately below the valve tower) and a fourth (on the western embankment) will be retained. A new overflow for the sailing lake will be incorporated through one of the decanting outlet grilles, utilising the scour tunnel, channel and valve tower, which will remain undisturbed. Submitted drawings LB29 and LB30 show the minimal alterations to the pipework within the valve tower. This will have no impact on the character or appearance of the listed embankments and enables the existing infrastructure to be bought back into use as part of the new scheme within minimal alteration. The opening of the decanting outlet to accommodate the new pipe will be filled with sand to enable the new pipe to fit into the existing tunnel.

Other features

- 4.18 The scour entrance arch on the bottom of the reservoir, which is dressed in stone will remain in place, submerged in the new sailing lake and continuing to operate as the scour for the lake.
- 4.19 The Venturi meter house, located to the west of the embankment is currently in a semi-derelict state. The building is 20th century and shown in drawings dating to 1948 (reproduced in Appendix 4.15 of Appendix 1). This building will be repaired as part of the proposals using appropriate materials and in line with the historic drawings and as such is not detailed in proposed drawings. During consultation

Cardiff Council and Cadw confirmed that this approach was appropriate and acceptable.

- 4.20 The embankments will continue to be regularly maintained, in a similar way to the way they are presently, with arrangements in place for the funding and management of the embankments by the Wildlife Trust for South and West Wales. This will not result in any changes to the appearance of the embankments.
- 4.21 The only material difference to the appearance of the reservoir embankments will come from the permanent removal of water from the basin of the reservoir and the construction of housing within the basin, around a centralised sailing lake. Whilst the reservoir is currently drained down, following an inspection for reservoir engineering safety purposes, it is uncertain whether the lake will be required to be refilled. However, if compared against a full reservoir, change in appearance will be evident. Such change will be mitigated by the provision of the sailing lake within the development which will provide context to the function of the reservoirs embankments. The location of the sailing lake alongside the southern embankment (only separated from it by a road on a new embankment along the inner revetment) will mean that the southern embankment is still seen in the context of a water setting. The appearance from the road itself along the southern embankment and from around and within the sailing lake will therefore be in the context of the embankments original water retention function.
- 4.22 Such change in appearance must be balanced against the significant benefits that the proposal brings. At present there is no public access (other than by way of trespass) to the surrounds of the embankments and no ability to interpret Llanishen Reservoir in the context of either the whole Taff Fawr scheme or its water supply function for Cardiff. Public access to the surroundings of the reservoir and the improved ability to interpret the embankments and its features are significant benefits that must be weighed in the balance in assessing the significance of any change in appearance.

2. Layout

- 4.23 The layout of the development has been defined by the extent of the encircling reservoir embankments. The substantive parts of the development are specifically kept wholly within (with the exception of two access points which cross the embankments) the reservoir basin, in order to ensure the retention of and ability to appreciate the reservoir embankments.

- 4.24 The site layout has also been configured to ensure good linkages to surrounding open spaces, which are currently under utilised. In regard to public open space, significant improvement to access to these public open spaces is anticipated and is highly desirable.
- 4.25 Mr Vivian Chapman QC, appointed by the Council to report in regard to an application for Town and Village Green status for the Nant Fawr Meadows, which forms a part of the surrounding public open space, considered that the typical recreational user of the meadows was a local person, walking from his or her home to the meadows, often with children or dogs. He did not consider that the meadows would have attracted many visitors from elsewhere in Cardiff, where there are many alternative public open spaces and which is close to much open countryside. He did not consider that the Nant Fawr Corridor (a series of loosely connected open spaces, of which both Llanishen Reservoir and the meadows form a part) itself would have drawn many visitors to the meadows from outside of Cyncoed.
- 4.26 It is anticipated that the layout of the development proposal and the linkages to the public open space will improve accessibility by the community to both the open space provision on site (including the listed embankments of the reservoir) and to the surrounding open spaces of the Nant Fawr Corridor. This will be achieved by the attractions of all of the facilities within the site, including the listed embankments themselves, the new sailing lake, the wetlands, the sailing centre and the wildlife education centre. These facilities within the development are a significant attraction to visitors, who will be much better placed to be able to access and enjoy the surrounding mosaic of open spaces from the site than at present. It is anticipated that these visitors will come from a wider area than the surrounding suburbs of Llanishen, Cyncoed and Lisvane. This will be a substantial benefit of development.

3. Scale

- 4.27 As described earlier the reservoir embankments are massive in scale. The works to the embankments and all of the associated features have been kept to an absolute minimum in order to accommodate the development. In the context of the entire structure the number, extent and dimensions of any interventions in the listed structure are minimal and they do not harm its special interest.
- 4.28 In regard to the reservoirs surroundings, the housing and infrastructure to be developed within the reservoir has been lowered within the basin of the reservoir in order to avoid any change to the appearance from external viewpoints. The

result is that there will be a lack of visual access to the housing development from anywhere other than within the reservoir basin or the two access points to the development. The extent and dimensions of the housing within the reservoir is therefore proportionate and will not interfere with the ability to appreciate the massive scale of the embankments.

5.0 MOVEMENT AND ACCESS

Movement and Access Policies

5.1 Consideration has been given to the policies of the statutory development plan, which currently comprises the City of Cardiff Local Plan (adopted January 1996) and the South Glamorgan (Cardiff Area) Replacement Structure Plan (adopted April 1997). Relevant policies are summarised in the planning policy section of this statement.

Approach to Sustainable Access.

5.2 The scheme is founded on the principles of sustainable development, as evidenced by:

- a desire to deliver a high quality scheme;
- appropriate conservation/preservation of listed structure;
- sustainable urban location;
- readily accessible on foot and by modes other than the private car, and;
- close to a wide range of community facilities

Principles of Sustainable Access

5.3 The principles of inclusive access for the development are set out below:

1. Public Transport

5.4 A choice of public transport modes – rail as well as bus – is readily available from the site.

2. Pedestrian/Cycle Access

5.5 The site is easily accessible on foot and by cycle and provides good linkages to surrounding public open space which is currently underutilised.

3. Community Accessibility

5.6 The site is not currently accessible to members of the public. However, it sits within easy reach of a wide range of community facilities including shops, public houses; schools; places of worship; leisure and recreation facilities; nursery; surgeries and other medical facilities; and public open space. Those facilities are

located in Llanishen, Lisvane and Cyncoed and although closely located are physically separated by the lack of permeability through the site at present.

4. Access for Disabled Persons

- 5.7 Disabled access has been considered during formulation of proposal design. The result of this has been to ensure compliance with all relevant disabled access legislation.

Community safety

- 5.8 Proposals have been designed to provide a high quality public realm with due consideration of the principles of "secured by design", e.g. overlooked open, public and private spaces to ensure surveillance.

6.0 ENVIRONMENTAL SUSTAINABILITY

Relevant Policies

6.1 Technical Advice Note 12: Design (Welsh Assembly Government, June 2009) promotes environmentally sustainable design solutions and requires that environmental sustainability shall be one of the issues to be addressed in a design and access statement.

Site Appraisal

6.2 TAN 12 (at paragraph 4.7) notes that an appraisal of an area's natural resources is a prerequisite to providing environmentally sustainable design solutions, recognising both site constraints and site opportunities. It states that the appraisal should focus on "...site assets and resources such as the development form, soils and geology, slope/topography, drainage, landscape, solar and wind energy as well as wildlife, biodiversity and natural habitats..."

6.3 Section 2 of this report presents an appraisal of the site and its context, which meets the requirements of TAN 12. For the purposes of considering environmental sustainability, the site appraisal is summarised in the following table.

Factors	Appraisal
Topography	The basin of the reservoir straddles a very shallow valley, albeit that the area is generally flat
Hydrology	The area is not at risk of flooding, the majority of the site being protected by the embankments of the Llanishen Reservoir.
Cultural Heritage	The site includes a Grade II listed building – the Llanishen Reservoir embankments and associated structures. The archaeology of the basin of the reservoir is currently being investigated. There are no SAMs and the site does not lie within registered historic landscape.
Ecology	On-site ecology and habitats have been assessed and it is concluded that development will have a beneficial impact.

Trees	The condition and amenity value of trees have been assessed. Very few trees will be removed and there will be significant new planting with the development
Land Use	The LBC application site comprises the area of listing within the Llanishen Reservoir site. The reservoir is redundant and represents an inefficient use of land.

Objectives and Design Responses

6.4 The objectives for environmental sustainability are identified (in TAN 12) as:

- Achieving efficient use and protection of natural resources;
- Enhancing biodiversity; and
- Designing for change.

6.5 The development proposal accords with the above principals in all respects. The reservoirs listed embankments and the majority of associated features are to a large extent retained and the ability of people to visit and interpret will be substantially improved. The design and layout of the development respects all of the sensitive ecology in the site. The development, along with management proposals that are offered, which are secured by way of planning obligation, will result in significant improvements to biodiversity. The development proposals result from the redundancy of Llanishen Reservoir for water supply purposes and represent an innovative and sympathetic reuse of the area in an efficient manner. A balance of public access, community facilities, enhanced recreation opportunities and preservation of natural, and heritage resources with housing development has been achieved in the proposals.

Design Solutions

6.6 TAN 12 identifies a series of headings under which design solutions should be assessed. These and their application to the proposal are set out in the table below.

Design Solution	Application to the Site
Landscape/townscape character/setting	Development is designed to integrate into the character of its setting by setting the development down inside the interior of the listed embankments, preserving views of the embankments

	from the outside. The alterations to the embankments preserve the overall massive character of the embankments by being minimal in nature and sensitive to the features.
Biodiversity and Local Environment	Standard 'best-practice' will ensure that construction methods do not have a significant detrimental impact on the local environment.
Promoting a successful relationship between public and private space	The post development scenario provides for a clear definition between both private and public space with the embankment and associated structures situated within the public realm allowing public appreciation and interpretation.
Energy Efficiency / Carbon Reduction	The development will comply with Level 3 of the Code for Sustainable Homes which requires energy efficiency and carbon reduction measures to be used. In addition, the sustainability of the site in terms of transportation is second to none and will mean a step change in propensity to use a car as the primary means of travel to and from work.
Conservation of the Built Environment	The reservoir embankments form a redundant part of the built environment. The development inside the reservoir embankments is an innovative means of reusing them in an efficient and socially responsible manner. The special interest of the listed embankments will be preserved and not harmed. The overall appreciation of the built environment will be greatly improved as a result of the ability to open up the site to the public and allow views across the interior of the reservoir.
Sustainable Materials	The development will comply with Level 3 of the Code for Sustainable Homes which requires use of sustainable materials
Water	Sustainable Urban Drainage measures will be instigated to ensure water quality in the sailing lake and wetland.
Waste Management	Waste management will ensure Cardiff's commitments to recycling and reduce landfill are supported. There will be a neutral cut and fill balance for earthmoving operations within



	the site
Climate Resilience	Construction will meet standards required by legislation
Sustainable Building Standards	Compliance with policy standards



Appendix 1: Historical Background Report

APPENDIX 1

Historical Background

Llanishen Reservoir, Cardiff



Prepared by: Jonathan Edis Limited

Ref: JEL/58

March 2011

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1.0 INTRODUCTION

- 1.1 This technical appendix provides the baseline for the Heritage Chapter of the ES, and has been prepared by Jonathan Edis Limited on behalf Western Power Distribution Limited.
- 1.2 The subject of this appendix is primarily the Llanishen Reservoir, completed in 1886, which lies to the north east of Cardiff, centred at NGR ST 18725 81712 (Appendix 1). The impounding bank of the reservoir and its associated water management structures are listed grade II. Immediately to the north is the earlier and smaller Lisvane Reservoir, completed in 1865. Although the Lisvane reservoir still supplies water for industrial purposes, the Llanishen reservoir has not supplied drinking water since the 1970s. It is now in the ownership and management of Western Power Distribution Limited.
- 1.3 The purpose of this appendix is to explain the historical background of the site and to provide a brief summary of the principal features of the reservoir. The phasing of the Lisvane and Llanishen reservoirs is also examined. Information has been obtained from documents previously collected during the process of listing. In addition, a number of the primary sources have been re-examined to provide as definitive a history as possible. A full list of sources is provided at the end of this appendix.
- 1.4 Information about the early history of the site is derived from an examination of evidence in the Glamorgan and Gwent Archaeological Trust Sites and Monuments Record (SMR), the Glamorgan Record Office, and other published and unpublished sources. The more recent history of the site is documented in a range of archives including the British Library, the National Monuments Record and documentary information provided by the client.
- 1.5 In discussing the various periods of past activity, this technical appendix has adopted the standard timeframe definitions set out below:

Prehistoric

Palaeolithic	450,000 – 12,000 BC
Mesolithic	12,000 – 4,000 BC
Neolithic	4,000 – 1,800 BC
Bronze Age	1,800 – 600 BC
Iron Age	600 BC – AD 43

Historic

Roman	AD 43 – 410
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Saxon/ Early	AD 410 – 1066
Medieval	
Medieval	AD 1066 – 1485
Post Medieval	AD 1485 – 1800
Modern	AD 1800 – present day (for the purposes of this report the 'Modern' period has been subdivided)

- 1.6 During 2010 the Llanishen Reservoir was drained of its water, revealing the bed and inner banks (Appendix 5.1 and 5.2), and structures associated with water management and past land use.
- 1.7 Site inspections were carried out by Jonathan Edis during clear, frosty weather on 26 November and on 9 and 10 December 2010. Karl Hulka, an expert on the archaeology of modern water management systems, attended the site inspections on 9 and 10 December. There have been subsequent visits by Liz Stephen and Karl Hulka, including a visit with officers of Cadw and Cardiff Council on 28 February 2011, during the time of the preparation of the Heritage Chapter of the ES and the updating of this baseline appendix.
- 1.8 In the appendices to this report a red line has been used to define the outline of the Llanishen reservoir on overlays. This is because red is a clear colour for this purpose – it is not in any way connected with the red line boundary used in planning applications. Throughout this document “the site” refers to the Llanishen reservoir as defined by the red line, unless otherwise indicated.

2.0 THE SITE PRIOR TO 1861

Geology and Topography

- 2.1 The area on which the Llanishen and Lisvane reservoirs are situated is on the coastal plain which falls gently to the south, away from the Craig Llanishen and Craig Llysfaen escarpments in the north. The reservoirs are set in narrow belt of open ground defined, for the most part, by the suburban housing of Llanishen to the west, Lisvane to the to the north and Cyncoed to the south and east, with the land to the north east forming a corridor of open fields extending out to the wider countryside beyond.
- 2.2 The British Geological Survey identifies the underlying geology as the Senni Beds, Lower Old Red Sandstone deposits of the Devonian period. These were laid down in shallow, meandering fluvial channels with seasonal flow under a semi-arid climate. Underlying these is the Early Devonian St Maughans Formation of inter-bedded purple, brown and green sandstones and red mudstones, giving way to Bishop's Frome ('Psammosteus') Limestone. The drift geology is formed principally of sandy silt produced through the weathering of the underlying rock and more recently through agricultural activity.

Neolithic

- 2.3 The Glamorgan and Gwent Archaeological Trust SMR, and sources from the Glamorgan Record Office and unpublished documents indicate that although there are no recorded archaeological remains within the boundary of the site, archaeological finds have been uncovered in the vicinity. A Neolithic axe head is recorded as being uncovered to the south of the site at NGR ST 190 811 (SMR Primary record No. [PRN] 01521s) – that is, within 500m of the site. A short distance further down the Nant Fawr valley, two more axe heads were recovered at NGR ST189803 (SMR PRN 01520s) and NGR ST191804 (SMR PRN 01371s). A modern map showing the distribution of these finds is at Appendix 2. Finds of this type and date are not as uncommon in this area as they would be in many other places, with axe heads of a similar period being recovered at Dinas Powys and Ystradowen, both to the west of Cardiff. Such finds demonstrate that this lowland coastal belt was favoured by the Neolithic people of South Wales.

Bronze and Iron Age

- 2.4 The later prehistoric periods are less well represented in the vicinity of the study area, and only one find spot has been identified, namely a Bronze Age barbed and

tanged arrowhead, located 1.12km to the southwest of the site at ST177809 (SMR PRN 00612s).

- 2.5 However, this not to say that the later prehistoric periods are not well represented in the wider area. An Iron Age hill fort survives at Dinas Powys to the west of Cardiff, and numerous find spots and sites from these periods spread across the coastal plain, suggesting the continuation of occupation in this area following on from the Neolithic presence.

Roman

- 2.6 There are no Roman find spots within the site, but fragments of ceramic cinerary urns of the Romano-British period were found in 1883, embedded in loose stones 0.6m underground when excavating for the foundations of a conservatory on the east side of Tsfewlands – within the vicinity of the site.
- 2.7 No other Romano-British finds spots are recorded within a half kilometre radius of the reservoir. However, the occupation of the wider area during the Roman period is indicated by a number of finds, listed below. A modern map showing the distribution of these finds can be found at Appendix 3.
- i. A crock containing approximately 800 brass Roman coins was found over 1km to the southeast of the development area at NGR ST196811 (SMR PRN 00611s).
 - ii. The metalling of a possible Roman Road was identified at NGR ST 202817 (SMR PRN 00812.0s).
 - iii. A coin hoard was discovered during building works at Coed y Gloriau, NGR ST199813 (SMR PRN 00815s). This hoard comprised at least 1094 Antoniniani in a grey jar.
 - iv. A small Roman pottery kiln, of possible 3rd century date, was situated at Llanederyn, NGR ST199813 (SMR PRN 00894s).
 - v. Roman coarse ware shards were found at NGR ST191819 (SMR PRN 01372s)
- 2.8 The presence of such artefacts is indicative of settled Roman occupation in the area with the focus apparently being on the high ground to the east, and on the south-east facing slopes of the Nant Glandulas.

Saxon, Medieval and Post Medieval

- 2.9 No post-Roman or Saxon finds have been found within the study area. The first phase of the Norman Conquest divided this area of South Wales between demesne manors of the marcher lords of Glamorgan and the territories of their followers (GCH iii, 1971).
- 2.10 The medieval period is unlikely to be represented by significant structures other than those immediately associated with surviving farms in the vicinity of the study area. Three churches, at Llanishen and Lisvane, a spring and a Grange at Llanishen, date to the medieval period. This suggests that the core of medieval settlement lies within or under the modern conurbations at Llanishen and Lisvane.
- 2.11 It is therefore likely that Llanishen was settled during the medieval period although the site itself is likely to have been in outlying woods or fields, or in uncultivated waste away from the core settlement.

Early 19th century

- 2.12 By 1800 the land was enclosed and divided into arable and pastoral fields abutted by marshy and wooded areas beside the Nant Fawr stream, which divided the parishes of Llanishen to the west and Lisvane to the east. A hand-drawn parish map dating to c.1800 attests to this situation. This map is held in the Glamorgan Record Office (record number P/55/8) and is not available for copying or reproduction.
- 2.13 Clear information is, however, available on the Ordnance Surveyor's Drawing of 1812, held at the British Library (Appendix 4.1). This map is detailed enough to provide an indication of the land use within and around the site. The map shows the villages of Llanishen and Lisvane along with the network of winding roads which connect the small hamlets and villages of the surrounding countryside. The meandering course of the Nant Fawr can be made out running north-south through the centre of the site, dividing it into woodland on the west bank and a series of large fields on the east bank.
- 2.14 The Tithe Map (Appendix 4.2) and apportionment document of 1845 add detail to the earlier map and shows the area under both arable and pastoral regimes, divided between various owners and tenants. Areas of scrub and woodland are clearly marked. The large area of woodland, shown on the 1812 map occupying the whole of the western part of the reservoir site, has been considerably reduced in size to form Gwern-y-Bendy, with the cleared area given over to enclosed

fields. To the east of the Nant Fawr, a further area of woodland is shown in the south-east of the reservoir site, with the remainder covered by fields.

- 2.15 No structures are shown within the site on the 1845 map or on any earlier maps, but in 1845 two structures are named within the wider area, both small and discrete from other buildings and both set against the edge of the stream. At this time the western side of the Nant Fawr formed part of Warn Farm, leased from the Marquess of Bute by Ainsley William. The eastern side formed part of Rhydy Lydyn, also leased from the Marquess of Bute by Edward Mathews. The fields within the reservoir area comprised a mixture of arable, pasture and rough grazing.
- 2.16 The draining of the water from the reservoir has revealed that boggy parts of the site were drained in the mid-19th century. The lines of land drains can now be seen in the south-west corner of the reservoir itself, within the three largest fields visible on the 1845 map, and there are some broken land drains on the surface. These were probably installed in the 1870s, after the construction of the Lisvane reservoir and shortly before the acquisition of the site for the Llanishen reservoir. Activity associated with the construction of both reservoirs in the period c.1860 to c.1886 is also visible within the site, and it is to this phase of land use that the report now turns.

3.0 THE ESTABLISHMENT OF THE RESERVOIRS

Lisvane Reservoir

- 3.1 Cardiff's massive growth in the 19th century is well documented. Coal production and industrial expansion caused the population to grow from 2,000 to 80,000 between 1800 and 1880. Inevitably, there was an ever-increasing demand for clean and reliable sources of water to supply both industry and domestic markets.
- 3.2 Across Britain the industrial age had brought about over-crowding and poor conditions within the urban centres, and in 1848 the situation had become sufficiently severe for a Royal Commission to be appointed specifically to report on the health and social conditions of these areas. The Commission was also concerned with the widespread cholera epidemics that swept through these large industrial towns throughout the 1830s, 1840s and 1850s.
- 3.3 The Royal Commission made many recommendations, but above all identified the need to provide the burgeoning population with clean drinking water and efficient sewage systems. Private companies were encouraged to provide the infrastructure for these, and in return were permitted to charge for the services provided. In 1853 the Cardiff Waterworks Act led to the establishment of the Cardiff Waterworks Company, based in Bristol. In 1859 this company was itself the subject of a Bill to allow it to supply Cardiff with water through:
- the acquisition of land at Lisvane as the site of a reservoir;
 - the consent to take water from four streams - the Nant Dulas, Nant Fawr, Llanishen Brook and Roath Brook along with the River Ely and all tributaries to the above;
 - and the undertaking of all necessary building and construction works to form the reservoir, to tap the watercourses supplying the reservoir and to supply water to the town.
- 3.4 Lisvane Reservoir and its associated infrastructure was completed in 1865, with an original capacity of 60 million gallons of water (over 272,000m³). This was increased in 1880 by the raising of the impounding banks, to a new capacity of 80 million gallons (over 364,000m³). In its finished form the Lisvane Reservoir covered an area of 20 acres. The topographical relationship between the reservoir and the town of Cardiff allowed water to be conveyed via a gravity-fed system of cast iron pipes, initially to three filter beds to the south, and from there

on to the town where it supplemented the existing supplies being pumped from the River Taff.

- 3.5 The first map to show the Lisvane Reservoir is the 1875 Ordnance Survey Map (Appendix 4.3). This also shows the railway line on the extreme left hand side along with the various boundaries, water courses and roads within the immediate vicinity. Comparison of this map and the 1845 tithe map indicates that the area had not changed significantly, the principal difference being the establishment of the filter beds and associated 'Filter Cottage' set in an angular meander immediately to the west of the Nant Fawr. The filter beds are collectively surrounded by a rectangular bank with a series of sluices and 'water plugs' arranged along the west side, presumably marking the line of the water main from the reservoir. To the north of this is a larger structure, also set against the western side of the Nant Fawr and surrounded on the other three sides by a series of rectangular enclosures. Neither the building nor the enclosures are identified on the map although it is possible that they represent the accommodation and allotments for some of the labourers who constructed the reservoir.
- 3.6 Cardiff continued to grow at a significant rate during the latter half of the 19th century, and by 1878 the demand for water outstripped the capacity of the Lisvane reservoir. The Cardiff Waterworks Company applied to parliament to allow it to construct an additional reservoir – the Llanishen reservoir - adjacent to and south of the existing Lisvane reservoir. However, Cardiff Corporation considered the capacity of the proposed Llanishen Reservoir to be inadequate for the anticipated growth of the town, and challenged the parliamentary bill. In due course it was agreed that the Corporation would purchase the Cardiff Waterworks Company, along with their assets - including the existing Lisvane Reservoir and its associated infrastructure - for a sum of £300,000. They then set about identifying the town's current and future needs for water in the foreseeable future.
- 3.7 In order to achieve this objective, the corporation employed engineer John Avery Branton Williams to assess both the needs of the town and to propose ways of meeting those needs. Williams resigned his position as Borough Engineer for Cardiff in 1879 to become the waterworks engineer on the Lisvane/Llanishen project. The following year he was commissioned to survey the surrounding area and "to prepare a report forthwith of every source yielding an abundant supply of fresh water available for Cardiff and within a reasonable distance thereof.....for a period of at least 40 years hence."

- 3.8 In 1881 Williams submitted a 23 page report which put forward two main schemes. The first, known as the Aber Valley Scheme involved the construction of a high level collection reservoir at Nant Cwm Parc, supplying a new low level reservoir adjacent to Lisvane Reservoir (Llanishen) via cast iron pipes.
- 3.9 The second scheme, known as the Taff Fawr Scheme was put forward with four options, the last of which involved the construction of high level reservoirs at Crew Isaf in the Brecon Beacons. This would collect water from the Taff Fawr catchment area, from where it would be carried in a 24" cast iron main, 29 miles to the low level reservoirs at Lisvane and Llanishen. From there the water would be passed through sand filters before being supplied to the town. This scheme was hugely expensive, and after considerable debate the renowned civil engineer, John F. Bateman, was called in to pass judgement on the various proposals.
- 3.10 Williams' two preferred schemes were more costly than building two high level storage reservoirs because of the additional expense of building a low level reservoir at Llanishen. This required impounding banks on three sides, instead of simply damming a steep sided valley - but both schemes benefitted in two key respects. First, the low level reservoir adjacent to Lisvane Reservoir already had consent in principle under an Act of Parliament passed in 1878, and second, the low level storage solution allowed for greater future expansion. In the end, Bateman agreed that Williams' preferred Taff Fawr scheme was the most appropriate solution to Cardiff's water problem and this was duly adopted by the Corporation.
- 3.11 Once the decision had been made to adopt the Taff Fawr Scheme, the Corporation sponsored a Bill in parliament in 1883 to allow for the construction of the reservoirs and infrastructure, along with the necessary borrowing of funds, estimated to be in the region of £250,000 for the construction of the high level reservoir (known as Cantref Reservoir), along with all the connecting infrastructure down to Llanishen. The Cardiff Corporation Act received royal assent on 7 August 1884 and Williams set about providing detail to the various elements of his proposal. The first phase was the low level reservoir at Llanishen, which was begun in 1884.
- 3.12 The project was divided into six contracts, of which Llanishen Reservoir was Contract No. 1. Tenders from 14 contractors were opened in December 1883 with that of Hill Brothers of High Wycombe being accepted at a value of £52,554 13s 3d and a completion date of mid-1886. 78 acres belonging to Lord Bute at

Llanishen were purchased at a cost of £10,000, along with a smaller parcel of land from Mrs Lewis for part of the pipeline corridor from the Brecon Beacons.

- 3.13 However, construction work did not go smoothly, and by June 1884 it was noted by the corporation that Hill Brothers were not performing satisfactorily. In July of that year they were served with formal notice of breach of contract, and J.A.B Williams, as waterworks engineer was instructed to “take the necessary precautions for ensuring that none of the plant provided by Messers Hill Bros. is removed from the land of the Corporation.” On 18 July 1884 Hill Brothers filed for bankruptcy and suggested that the Corporation “should fund the capital and themselves complete the work with the late contractors as servants.” Following an independent valuation of the plant and materials on site, the Corporation advertised for tenders to complete the works. Mr Walker was duly awarded the contract and by early 1885 was reported to be making good progress with 380 men working on the project. This rose to 428 men by March of the same year.
- 3.14 At this time the contract for the cast iron pipe connecting the high level reservoir to Llanishen was revised, increasing the diameter of the pipe to 29” so as to allow an additional 1 million gallons of water a per day to be delivered to Llanishen. The reason for this was the sale of water by the Corporation to outlying districts such as Penarth, a venture which would raise an estimated £5,000 annually. By May 1885 the number of workmen had increased to 540 and the clay puddle trenches along the three sides of the reservoir were being constructed.
- 3.15 Some of the original design drawings for the reservoir at Llanishen survive, signed by Williams himself. These illustrate key elements of the structure, and a selection is included in Appendix 3. The impounding bank was constructed with a clay wall at the core, set on a concrete (puddle) filled trench, to provide a waterproof barrier. The wall is supported by embanked earth which is in turn faced with dry stone screen (known as pitching) set between a lower kerb of rough hewn stone and an upper mortared masonry kerb which forms the rim of the reservoir. In several places the reservoir embankment was extended into the underlying strata with the angle of the pitching continued down to the cut base. Here the edge of the cut was protected from erosion by loosely placed rock. This sequence is shown in several of the cross sections through the embankment, including one which is taken in the centre of the dividing embankment between Lisvane and Llanishen. This clearly illustrates the differing profile of the two reservoirs, along with the structural components of the embankments and facings (Appendix 4.4 and 5.3). The detail of the freestanding embankments is shown at

Appendix 4.5, and a plan of the reservoir is shown at Appendix 4.6 indicating the locations of full cross sections (Appendix 4.7).

- 3.16 The plan at Appendix 4.6 is interesting in a number of respects. First, it shows alterations to the pre-existing Lisvane Reservoir so as to rearrange its intake from the Nant Fawr to be fed instead from the 29" main coming from the high level storage reservoir. The drawing also shows the re-routing of the Nant Fawr into a "bye channel", along with the inlet to the new Llanishen reservoir from the 29" main, situated in the north-west corner of the new embankment (Appendix 5.4). The old course of the Nant Fawr is shown meandering through the base of the reservoir, past the filter beds and running down towards the southern embankment, where a new channel diverts it to the east into a structure labelled as "inlet to scouring culvert". This in turn runs a short distance to the east, labelled as an "open culvert", before turning to the south and running beneath the decanting culverts and valve shaft.
- 3.17 The valve shaft is one of the most recognisable features of the reservoir, appearing in photographs from the Second World War period, with then Water Inspector, John Ernest Stevens standing between the valve gauges (Appendix 5.5). The structure formed one of the key components of the reservoir, regulating the outlet flow from the three-stage decanting culverts, and it appeared in numerous contemporary drawings as the design was revised. The latest drawing is shown at Appendix 4.8 and is believed to represent the structure as is currently exists. The three tier decanting culverts (Appendix 5.6) could be opened independently, depending on the level of water in the reservoir, and from these culverts water from the reservoir flowed into the valve shaft. In the base of the shaft were two outlet pipes, one of 26" and the other of 18", which could also be opened or closed independently to control the flow to the mains leading to the filter beds and to Cardiff. In addition to the two supply pipes, a third pipe acts as a bypass system to allow water to be discharged back into the Nant Fawr via a culvert which opens to the south of the reservoir (Appendix 5.7) where it flows along an open channel before rejoining the stream (Appendix 5.8).
- 3.18 The reservoir was completed in the autumn of 1886, only slightly later than originally anticipated, and in time to receive the winter rain directly from the Nant Fawr - the high level reservoir and connecting pipework having not yet been completed. The reservoir was thus able to supply Cardiff through the excessively dry summer of 1887. The total cost of the reservoir was £64,280¹.

¹ Hill, A. (c. 2005)

- 3.19 Llanishen continued to be fed by the Nant Fawr for the following five years until the first high level Cantref Reservoir was completed, following legal difficulties with the contractor. The second high level reservoir was begun in 1893. Known as the Beacons Reservoir, it was built higher upstream on a site designated in the 1884 Act, and was completed on 30 September 1897.
- 3.20 The first map to show Llanishen Reservoir is the 1900 O.S. map (Appendix 4.9). This illustrates the full extent of the new reservoir and its embankments along with the bye channel around the western side, the outflow culvert from the southern side and a keepers' cottage (since demolished) on the south-east corner. To the north-west of the reservoir, the expansion of Llanishen can be seen in the form of housing spreading along the Lisvane Road.
- 3.21 The 1920 O.S map (Appendix 4.10) shows a similar arrangement, but this is the first to show fish ponds on the south side of the Llanishen reservoir. These are thought to have been constructed c.1909 to breed fish which were then used to stock the reservoirs.
- 3.22 In 1910 work began on a third high level storage reservoir, to be known as the Llwyn On reservoir. Work was delayed because a new Act was required to accommodate a larger reservoir than had been envisaged in the Act of 1884, and because of the onset of war in 1914. The Llwyn On reservoir was completed in 1926.
- 3.23 Alterations were made to Llanishen reservoir in the late 1920s or early 1930s, including the addition of a new inlet (Appendix 4.11) with a Cipoletti Weir to allow for accurate flow rate measurements. The inlet was situated on the south-west side of the embankment and consisted of a white-glazed brick tank (Appendix 5.9) fed by a 29" inlet pipe (Appendix 5.10). Unlike the original inlet, this did not feature a well crafted spillway down the incline of the embankment. Instead, the facing of the bank was thickened and extended down to the bed of the reservoir where it fanned out to protect the immediate area from erosion by the incoming water (Appendix 5.11). The screening chamber associated with the new inlet was constructed in the bank behind the tank, creating a projecting terrace in that area. The plan showing the new inlet also provides comprehensive detail of the reservoir bed, suggesting that it was fully drained in order to build the spillway. At this time the scouring culvert is shown as covered (Appendix 5.12) although the style and form of the current inlet structure clearly shows that it dates from c.1886.

- 3.24 A battered terrace or platform of material is also apparent in the c.1930 drawings, in the extreme south-east of the reservoir bed (see Appendix 5.13). The shelf is certainly an original feature of c.1886 because the stone steps on the stone revetment land on top of the surface. Its western edge and top surface are faced with stone of two different types, probably indicating two phases in which it was stabilised to prevent erosion and creation of unwanted silt.
- 3.25 During 1931-1932 a new access road was constructed from Rhyd-y-penau Road up to the south side of the reservoir (Appendix 4.12) and in 1935 a new access road and bridge was built over the Nant Fawr in the north-west leading to the current car park between the two reservoirs (Appendix 4.13).
- 3.26 The 1946 O.S. map (Appendix 4.14) shows these inter war modifications and also gives a sense of the gradual urbanisation of the wider area. Shortly after 1945 a new Venturi meter well and well house were constructed over the principal inlet main (Appendix 4.15) although the roof has subsequently been removed and the windows and doors blocked (Appendix 5.14).
- 3.27 During the later part of the 20th century the reservoir was also used for sailing and other water sports, and alterations were made in the north-west corner to facilitate this use, including the insertion of a concrete launching slip (Appendix 5.15) and a ramp and floating jetty to allow access to the boats (Appendix 5.16).

4.0 CURRENT CONDITION

- 4.1 The structure of Llanishen Reservoir has been altered in a number of respects. Although the outside face of the impounding bank is in good order, the inner facing of the embankment is pitted with numerous holes in the original fabric where the dry stone protection has been lost, removed or replaced (Appendix 5.17 and 18).
- 4.2 Many of the dressed stone features have been modified or damaged, and some of the coping stones to the upper kerb or rim are loose or missing entirely, particularly in areas where late twentieth century interventions have been carried out, areas such as the ramp and the boat launching slip and quay (see Appendix 5.15 and 16). Other 20th century changes include an inflow pipes cased in concrete (Appendix 5.19).
- 4.3 Original structures of quality include the flight of steps on the inner south east embankment (Appendix 5.20), which have sharply tooled gradations to mark the water level, and the bye channel with its finely dressed weirs (Appendix 5.21) and skilfully built open channels.
- 4.4 In addition to human activity, the effects of time, water and other natural influences have played a part in causing damage. Constant submersion for over 100 years has severely corroded the metal grilles on the inlet and outlet conduits and the upper part of the inner lining is dotted with tree roots whilst the outside of the embankment has undergone some damage from burrowing animals.
- 4.5 Now that the reservoir has been largely drained it is apparent that in parts, the pre-1884 ground surface survives largely intact. This is demonstrated by the numerous tree stumps in the north-east quadrant in particular, felled prior to or during construction of the reservoir in the 1880s but preserved in a waterlogged state (Appendix 5.22). Further evidence comes from the preserved river channel of the Nant Fawr (Appendix 5.23), the brick lined bases to the former Lisvane filter beds of c.1865 (Appendix 5.24), the brick floor surfaces (Appendix 5.25) and the infilled linear cut features (Appendix 5.26), all of which indicate that in certain areas, particularly the central southern and eastern parts of the reservoir bed, the ground has undergone little reduction from its pre-reservoir level.
- 4.6 However, the section drawings from 1884 clearly show that in some areas, particularly around the northern, eastern and western edges, some truncation has taken place. The drawing at Appendix 6 has attempted to identify areas where

this surviving pre-1880s ground surface is most likely to be encountered. There are a number of areas where the potential exists for the preservation of below ground archaeological deposits which will need to be considered in any future areas of ground disturbance. However, no evidence of any pre-Victorian man made structures was noted during the site visits.

- 4.7 In order to assess the archaeological potential of the site, a programme of archaeological investigation has been agreed with the relevant authorities, including a series of boreholes and test pits. The purpose of this investigation is to minimise intrusion into areas of potential archaeology, while maximising the information that can be obtained. The process of consultation is described more fully in the main Heritage Chapter in the ES, and the interim results of fieldwork, which began on 28 February 2011 (only a few days before the submission of this ES) will be supplied in the form of Supplementary Environmental Information (SEI) as soon as they are available.

5.0 CONCLUSIONS

- 5.1 The Llanishen reservoir was completed in the 1880s as an extension to the Lisvane reservoir of 1865. Supplied by reservoirs in the Brecon Beacons that were completed in stages between the 1890s and the 1920s, Llanishen was a response to the demand for domestic water as Cardiff expanded rapidly in the Victorian period. It ceased to supply water in the 1970s, and is now drained and redundant.
- 5.2 Now that the water has been drained it is possible to see the full extent of the Victorian structures and the pre-1880s land surface. The banks and stone revetments and their associated structures such as the scouring channels and by channels can be readily seen and appreciated in much the same form as they would have appeared at the time of construction. The historic significance of the structure, which is listed grade II, is now laid bare and can be seen and interpreted in a way not previously possible.
- 5.3 The site can be shown to have a generally low archaeological potential for past (pre-Victorian) periods of human activity although local find spots in the vicinity suggest a low to moderate potential for the Neolithic and Roman periods. If this potential exists within the site itself, it may be revealed in the fieldwork under way at the time of writing and completing this report. As described above and in the main Heritage Chapter of the ES, any results of the fieldwork and any assessment of archaeological potential will be published as soon as possible in the form of SEI under Regulation 19 of the EIA Regulations.

BIBLIOGRAPHY AND SOURCES CONSULTED**Repositories Consulted**

British Library

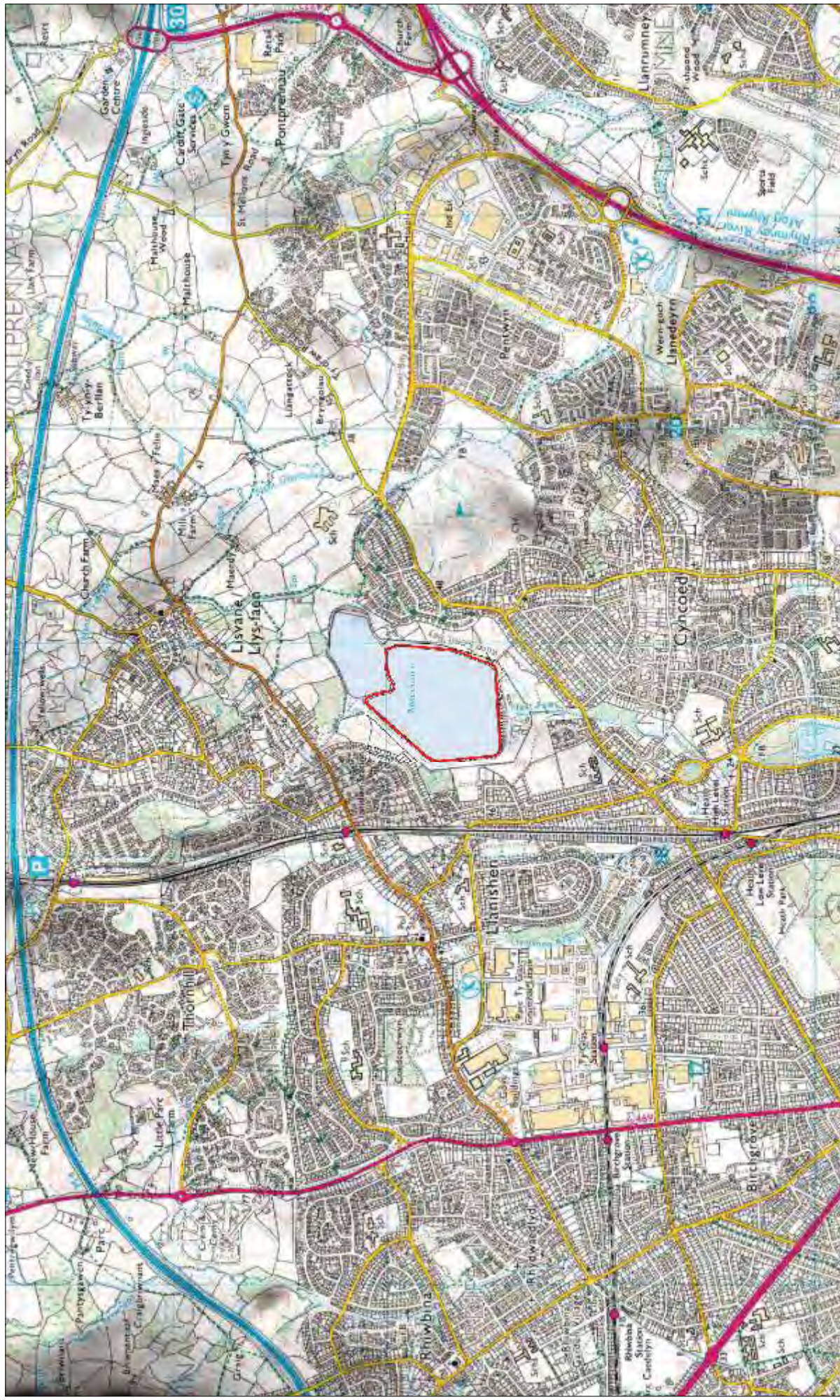
Primary Sources

1812	Ordnance Surveyors Drawings	-
1845	Tithe Map (Llanishen, Lisvane, Lanedern)	-
1875	Ordnance Survey Map	25"
1900	Ordnance Survey Map	25"
1920	Ordnance Survey Map	6"
1946	Ordnance Survey Map	6"

Secondary Sources

	<i>1859 Parliamentary Bill – Cardiff Water Works</i>	
CADW (2005)	<i>Assessment of Lisvane and Llanishen Reservoirs</i>	Unpublished
Dick, A. (2008)	<i>Representations to CADW on the architectural and historical interest of Llanishen Reservoir, Cardiff</i>	RPS
Dick, A. (2009)	<i>Witness Statement of Andrew Dick</i>	Unpublished
Hill, A. (2005)	<i>The Historical importance of the Lisvane and Llanishen reservoirs in the rapid expansion of Cardiff in the nineteenth century – a case for listing</i>	Unpublished
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Williams, J. (1881)	<i>Report on the Water Supply of the Borough and District (Cardiff)</i>	Daniel Owen, Howell and Co.

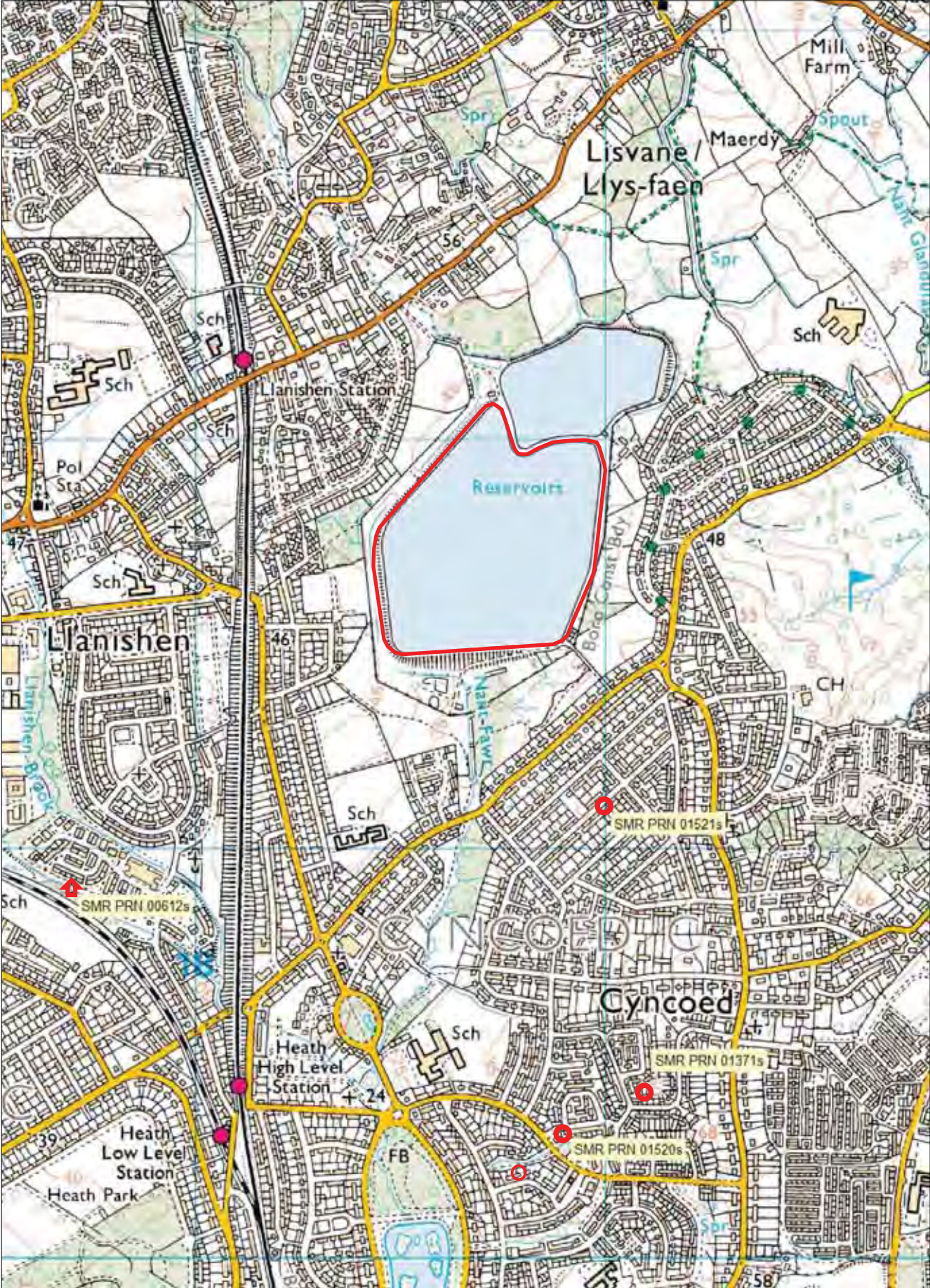
Appendix 1: Site location map



NOTE: Red line in this Technical Appendix indicates the line of embankment for Llanishen Reservoir only.

Appendix 1: Site location

Appendix 2: Distribution Neolithic finds within 1Km of the site centre



NOTE: Red line in this Technical Appendix indicates the line of embankment for Llanishen Reservoir only.

Appendix 2: Distribution of prehistoric finds within 1km of the site centre

Appendix 3: Distribution Roman finds within 1Km of the site centre



NOTE: Red line in this Technical Appendix indicates the line of embankment for Llanishen Reservoir only.

Appendix 3: Distribution of Roman finds within 1km of the site centre