Plymouth City Municipal Action Plan for Sustainable Drainage Systems

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Contents

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PLYMOUTH CITY COUNCIL

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Foreword

It is clear that the effects of climate change are real and will impact on all of us.

Plymouth City Council is investing in a series of urban regeneration schemes in the City Centre to attract more people, provide new jobs for local people and provide more homes (including affordable and social housing). As part of this regeneration a Municipal Action Plan for the retrofit of Sustainable Urban Drainage (SuDS) is required to ensure that necessary space within the City Landscape is set aside for the management of increased surface water runoff from Climate Change and to create additional headroom in the drainage network to enable development and future growth to take place.

Climate change will increase risks of urban flooding due to increasingly heavy rainfall, which overwhelms outdated drainage. Retrofitting sustainable urban drainage (SUDS) to existing urban areas, making use of the public realm to overcome a shortage of space on individual sites offers a solution. However, there is little experience of this approach, which requires new types of cooperation between municipalities and owners to overcome physical, regulatory and cultural barriers. The project will demonstrate reduced flooding while protecting or improving amenities, biodiversity, health and wellbeing, local economies and saving public money. The adoption of these approaches will increase adaptation capacity to the effects of heavy rainfall and deliver added benefits for society.

Plymouth City Council is working with EU partners to pilot sustainable drainage systems in the public realm through the Water Resilient Cities project, with funding from the European Regional Development Fund via the Interreg 2Seas Programme (see https://www.interreg2seas.eu/en/wrc)

For more information on the project and its partners please visit https://waterresilientcities.eu/

1 Introduction

This Municipal Action Plan for Plymouth City Centre sets out how Sustainable Drainage Systems (SuDS) can be incorporated into the redevelopment plans for the City Centre. SuDS are approaches to managing surface water runoff that consider flood risk, water quality (pollution), biodiversity (wildlife and plants) and amenity.

The four pillars of SuDS from the Construction Industry Research and Information Association (CIRIA) SuDS Manual (2015) are shown in Figure 1.

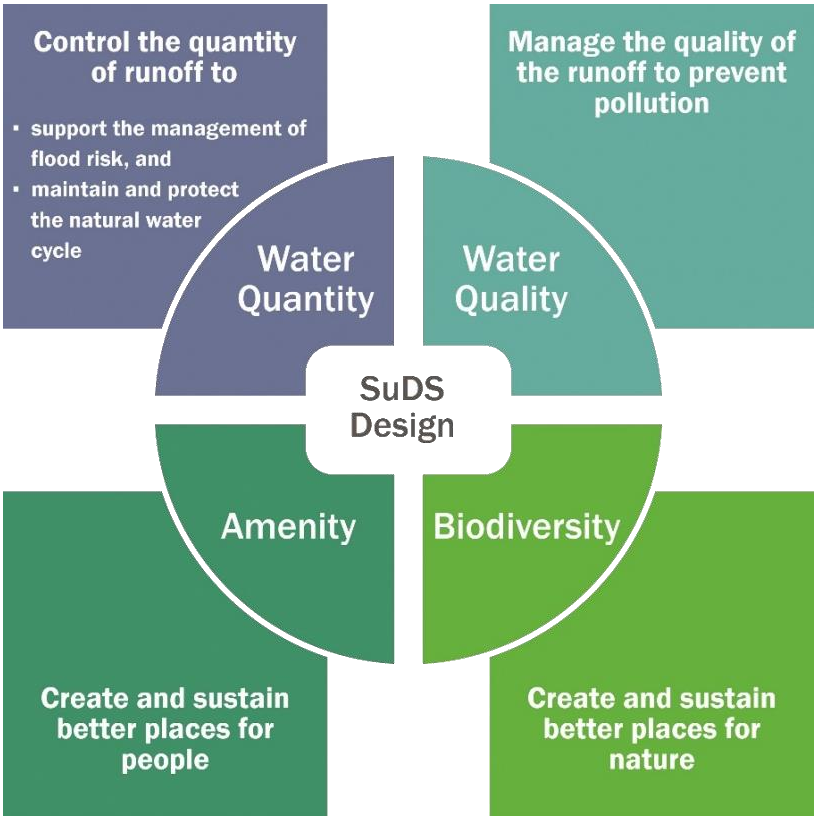

Figure 1: The Four Pillars of SuDS

In line with the Plymouth and South West Devon Joint Local Plan, Ref. https://plymswdevonplan.co.uk/policy the following symbols have been used throughout this document to identify the various benefits SuDS can provide.

Plymouth City Council are investing in a series of urban regeneration schemes in the City Centre to attract more people, provide new jobs for local people and provide more homes, including affordable and social housing.

Plymouth City Council's Local Flood Risk Management Strategy (PCC LFRMS) is the local authority document that guides the implementation of SuDS within Plymouth. The PCC LFRMS puts forward a hierarchy of SuDS technologies in order of the benefit they bring, this hierarchy is laid out in Figure 2.

Most Sustainable	SuDS Technique	Flood reduction	Pollution reduction	Landscape & wildlife benefit
	Living roofs	✓	✓	✓
	Basins and Ponds - Constructed Wetlands - Balancing Ponds - Detention basins - Retention Ponds	✓	✓	✓
	Filter Strips and Swales	✓	✓	✓
	Infiltration devices - soakaways - infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviors	✓	✓	✗
Least Sustainable	**Tanked systems** - over-sized pipes/tanks - storm cells	✓	✗	✗

Figure 2: Plymouth City Council's SuDS Hierarchy

The drivers for a strategic planned approach to delivering SuDS within the City Centre include:

- Development Growth – Increase capacity of Existing Sewerage and Drainage Network.
- Improved Water Quality of Local Bathing Beaches & Watercourses.
- Flood Risk Management.
- Improved Public Realm.
- Provide Resilience against Climate Change.
- Improve Sustainability of Water Resources.
- Carbon Reduction.

Plymouth City Council's vision for the City Centre is to create a lively and vibrant regional centre providing high quality shopping together with a range of facilities for living, working and recreation. Figure 3 shows the Council's vision for the City Centre Area which sets out land use policies and proposals to create a real 'downtown' centre that offers residents and visitors 24-hour life, with specialised shops, restaurants and pubs alongside a choice of entertainment and culture. SuDS such as tree pits and rain gardens can enhance a City's landscape by providing attractive vegetation and reducing the heat island effect of the City Centre particularly in warmer summer months.

Plymouth City Centre will be renewed and enhanced through several major new developments with support for community and trader led initiatives. The plan aims to deliver proposals that are resilient and respond to the challenges of climate change and protect local bathing waters, estuaries and watercourses from pollution, providing where appropriate improvements to flood management infrastructure, surface water drainage systems, future connections to critical drainage infrastructure, proposed district heat networks, better green spaces and provide environmental improvements.

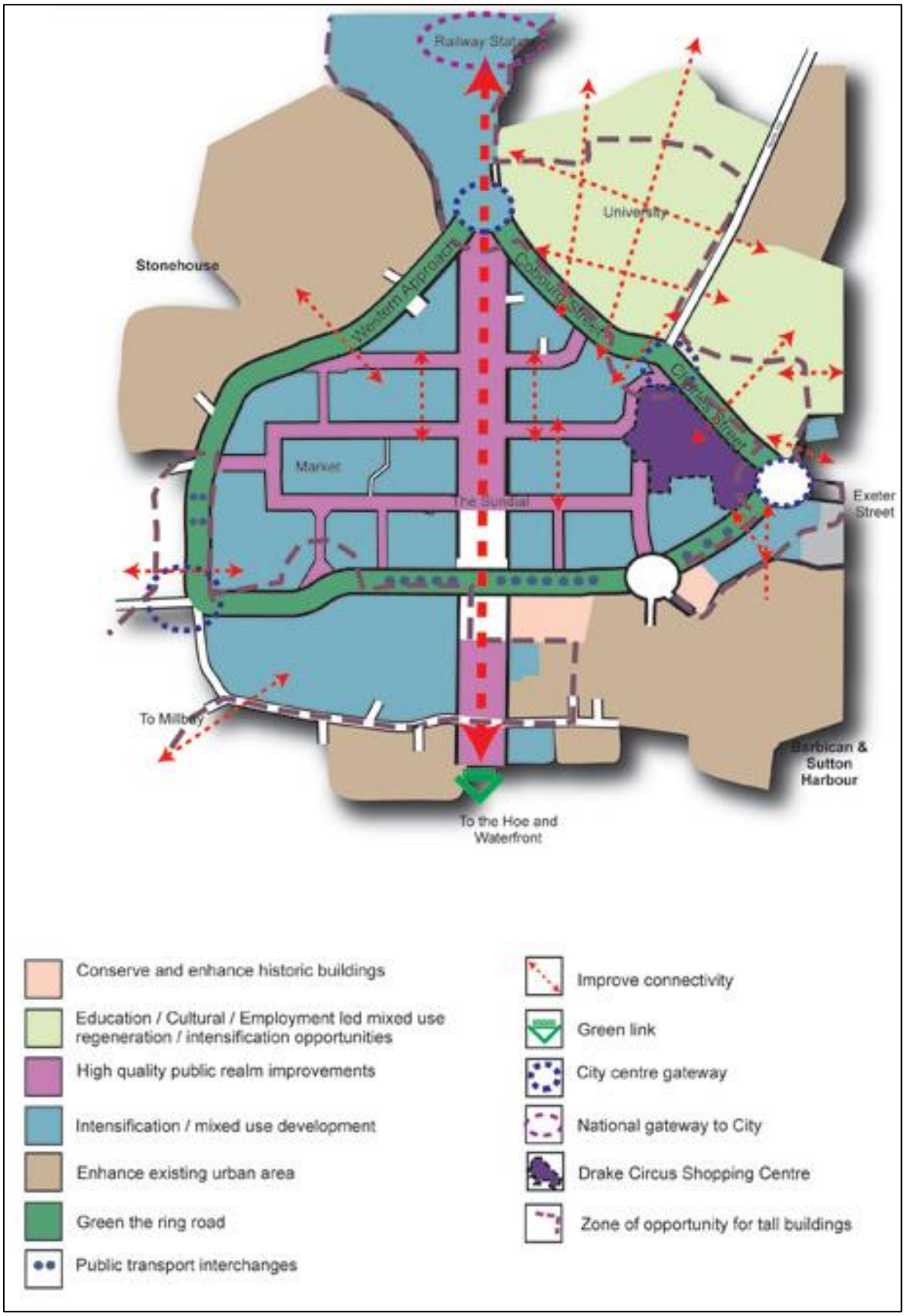

Figure 3: Plymouth City Council's Vision for the City Centre Area

The British Geological Survey for SuDS, highlights that the following constraints to the implementation of SuDS are present in certain areas of the city centre:

- High groundwater levels in Union Street, the Octagon roundabout and St. Peter's School areas;
- Made ground in the same areas above and also in the Millbay Docks area;
- Poor bedrock permeability across the entire catchment from North Cross to Millbay Docks;
- Landslides;
- Running sands;
- In south of the catchment (in and around Hoe Park), there is a high geohazard posed by soluble rocks.

The areas mentioned above may therefore be unsuitable for traditional SuDS solutions which rely on infiltration to the ground, but there may be opportunities for water retaining type SuDS which do not rely on infiltration to the ground e.g. Green Roofs, Green Walls, Raingardens, Open Ponds and the less desirable traditional underground tank solutions.

2 The Case for SuDS

2.1 Development Growth

The current population of the whole of Plymouth is estimated to be about 270,000. The City has a target reaching 300,000 residents by 2031 but is currently failing to reach the growth figures required to achieve this. In 2016, the Council committed to delivering 5,000 new homes for local people by 2021. The Adopted Plymouth and South West Devon Joint Local Plan includes a strategic objective to deliver growth in Plymouth's City Centre and Waterfront Growth Area. The aim is to realise the potential of the City Centre and Waterfront Growth Area as a regionally significant growth hub. The plan highlights that within the Plymouth Policy Area at least 19,000 new homes, of which 4,550 should be affordable are to be provided between 2014 and 2034.

A large proportion of the City Centre is currently served by a combined drainage system where both surface water runoff and foul sewage share the same pipe network. These flows drain to South West Water's (SWW's) Plymouth Central Sewage Treatment Works (STW) at Cattedown via a large 2.4 metre diameter deep tunnel beneath the City Centre before been lifted by pumps for treatment. The tunnel system was completed in the early 1990s and was designed to cope with expected population growth over a 25-year design horizon. This means that the existing system has no more headroom to accommodate increases in flows without increasing the risk of flooding and pollution.

Plymouth Central STW currently serves a population of about 100,000 which is expected to increase by a further 10,000 by 2045. The remaining population outside the central area of Plymouth is currently served by other STWs at Camelshead, Ernesettle and Marsh Mills. When the capacity of the sewerage system is exceeded, combined sewer overflows (CSOs) provide an emergency relief to reduce the risk of sewer flooding, but these assets also have the potential to cause pollution issues.

2.2 Improved Water Quality of Local Bathing Beaches & Watercourses

Environment and Greenspace

The occasional operation of CSOs has the potential to impact on the quality of local bathing waters and local watercourses. These assets are permitted and regulated by the Environment Agency (EA) and regulatory drivers such as the EU Bathing Water Directive (BWD) and the Water Framework Directive (WFD) ensure that necessary standards are achieved. However, achieving these standards with climate change and increased development presents significant challenges to South West Water (SWW).

Combined sewers carry both wastewater and surface water flows, which usually means CSOs are necessary to safely discharge excess flows during periods of extreme rainfall to prevent flooding of properties. There are several methods for reducing the detrimental impact of CSO discharges, including the use of screens, scumboards, hydrodynamic vortex separators and/or weirs to prevent solid and visible contaminants from polluting local environments. Some CSOs have associated storage tanks to capture the most polluted 'first flush' from a storm and limit the number of spills to an acceptable level depending on the amenity of the receiving water. The 'first flush' will contain deposits from road surfaces, gully pots and settled deposits in sewers with slack gradients. There is a large storm storage facility complimented by UV disinfection treatment at Plymouth Central Sewage Treatment Works which reduces both frequency and impact of CSO discharges. Other storm storage tanks which serve the City can also be found at Sutton harbour, Westhoe and Millbay.

The WFD seeks the achievement of good ecological status for all water bodies and is driving a wide programme of investment to improve water bodies. It requires all relevant authorities to use their powers and duties towards this end. The EA has led a comprehensive programme of environmental quality assessment which has identified waters that require action. The EA also regularly samples designated bathing waters for bacterial contamination (from sewage and from farmland runoff). All water bodies in Plymouth require some action but bathing water quality presents a particular challenge. The Tamar Estuaries European Marine Site is particularly sensitive.

There have been changes to the BWD which sets higher standards for Plymouth's designated bathing beaches at East and West Hoe shown in Figure 4. Based on the official Bathing Water Data Explorer records for Plymouth, in dry periods the sewage and surface water drainage infrastructure are adequate. However, in wet periods, the frequent operation of CSOs causes unacceptable quantities of untreated combined storm sewage to enter the coastal waters.

Figure 4: Plymouth's Bathing Beaches at East and West Hoe

Furthermore, EA investigations and modelling of Plymouth marine waters has shown that reduced water quality at Plymouth Hoe East and West is associated with pollution discharges from local urban drainage at The Hoe / Cattewater. The pollution mainly arises from CSOs during wet weather and from the flushing out of the surface water drainage system.

Climate change predictions indicate that the frequency and intensity of short duration rainfall events will increase and hence the frequency of CSO spills are likely to increase too.

Part of the central catchment is low lying and close to the sea, therefore it may be prone to saline infiltration (the ingress of sea water into the sewerage system). Saline infiltration within the catchment has caused significant process issues for SWW at Plymouth Central STW. As such, SWW have invested significantly over the last 5 years to identify and reduce saline infiltration through rehabilitation. Where these reductions in saline flows are quantifiable, they will be taken into account in the modelling of the sewerage system and planned investment to reduce CSO spills.

Flood Reduction

Surface water separation and the provision of SuDS within the City Centre will play a key part in improving water quality particularly at Plymouth Hoe East and West Bathing Beaches. Whilst both beaches have achieved “Excellent” water quality sampling results since 2015, there have been a small number of periods where high bacterial loads have been sampled. Reduced levels of surface water runoff entering the combined system will reduce the frequency, volume and duration of CSO spills from Plymouth Central STW and potentially at West Hoe. SuDS solutions already being proposed by an Integrated Urban Drainage Management project in the City include a large open pond at Derry’s Cross Roundabout to store surface water runoff. This area is ideal for such a pond as the roundabout is surrounded by a busy road which will prevent the public from accessing the pond. The pond could also be surrounded by vegetation which would also have the benefit of providing a habitat for insects and bird life. The pond could be maintained to have a minimum depth of water which would also provide a valuable aquatic habitat for amphibians and other fauna and flora.

2.3 Flood Risk Management

Flood Reduction

There are no major rivers flowing through the City Centre and the majority of the City Centre is well above the mean high-water spring tide level, there is minimal risk of coastal flooding. Areas immediately adjacent the sea like the Barbican are at risk localised coastal flooding. However, in respect to flooding the largest risk in the City is flooding from direct rainfall runoff and flooding from the network of drains and sewers beneath the city once their capacity has been exceeded. This risk is referred to as Surface Water Flood Risk. Heavy rainfall will could also lead to surface water flooding from sewers when their capacity is exceeded.

2.3.1 Existing Drainage Systems

As well as combined sewers, there are separate surface water and foul only public sewers. In theory, surface water sewers only carry surface water and foul sewers only carry wastewater flows, but cross-contamination can occur as a result of groundwater infiltration and sewer misconnections. Figure 5 shows the existing public sewerage system serving the City Centre which is maintained by SWW.

The traditional method of dealing with surface water runoff has been to direct flows below ground into a network of large diameter sewers. New development areas have separated surface water and foul sewerage systems, but older Cities like Plymouth have a legacy of surface water draining into one combined sewerage system.

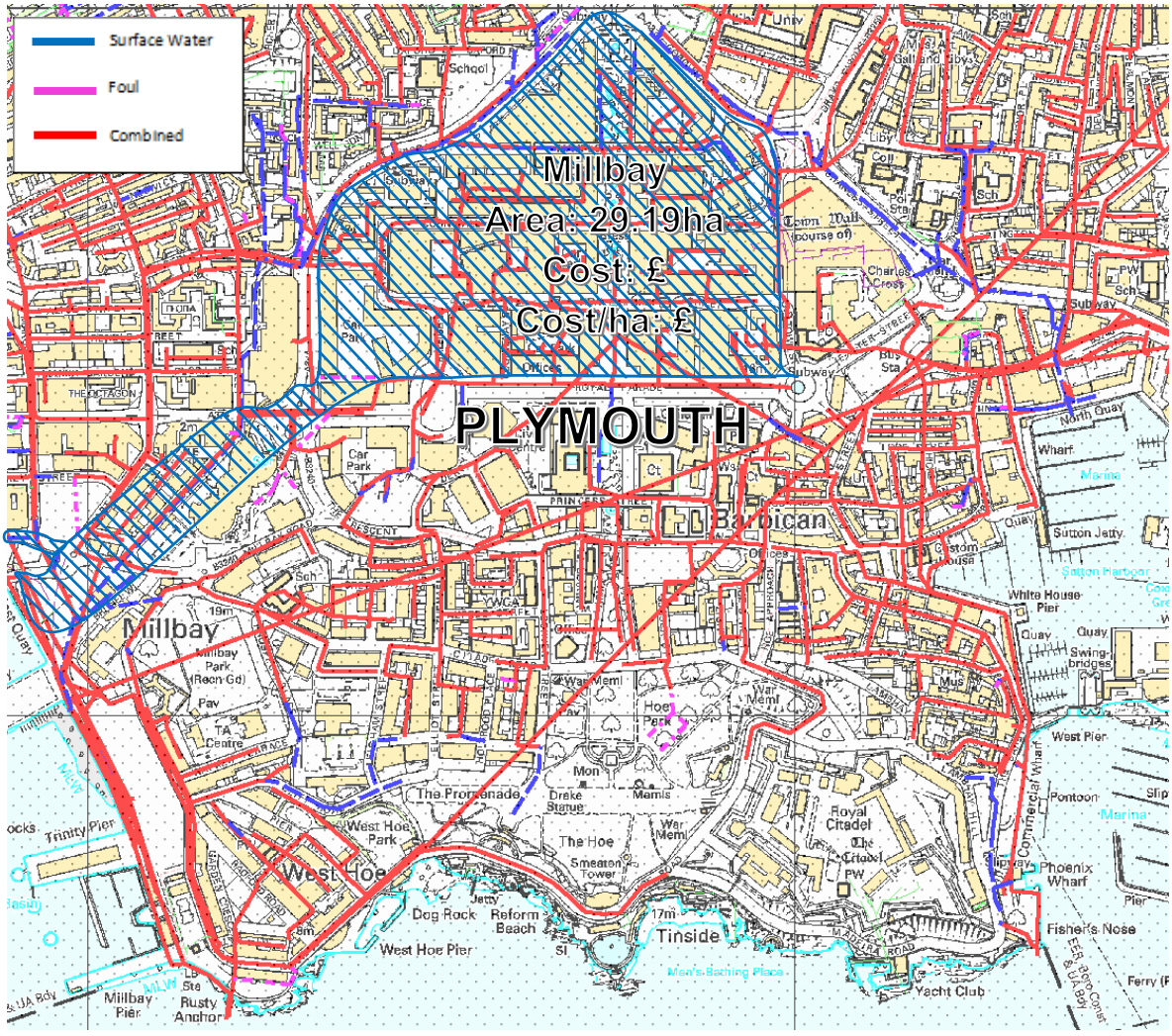

Figure 5: Existing Public Sewer Network in Plymouth City Centre (Shaded Blue Area Denotes Potential Area for Surface Water Separation)

2.3.2 Surface Water Flooding Causes

Surface water, or stormwater, is produced as a result of draining rainwater from permeable and impermeable surfaces such as roofs, highways, and soft landscaping. Wastewater or foul flows are produced by domestic and industrial water users discharging from toilets, sinks, baths and industrial processes to the sewer network. Surface water flows can usually be safely discharged to watercourses, although separators are sometimes used to collect and hold contaminants from these discharges at sensitive sites. Surface water discharges from new development sites are limited to the 1 in 10-year (+ 40% allowance for climate change in Critical Drainage Areas) return period Greenfield Runoff rate i.e. the runoff which would have occurred before the site was developed to reduce the risk of downstream flooding. Wastewater flows on the other hand require treatment at a wastewater treatment works to remove contaminants before they can be safely discharged to watercourses, estuaries or the sea.

2.3.3 Surface Water Flood Risk

The EA has identified areas within Plymouth where the drainage system is known to be close to or over its hydraulic capacity limit. These critical drainage areas are highlighted in red in Figure 6. In these locations, the EA sets higher standards of surface water management for new developments.

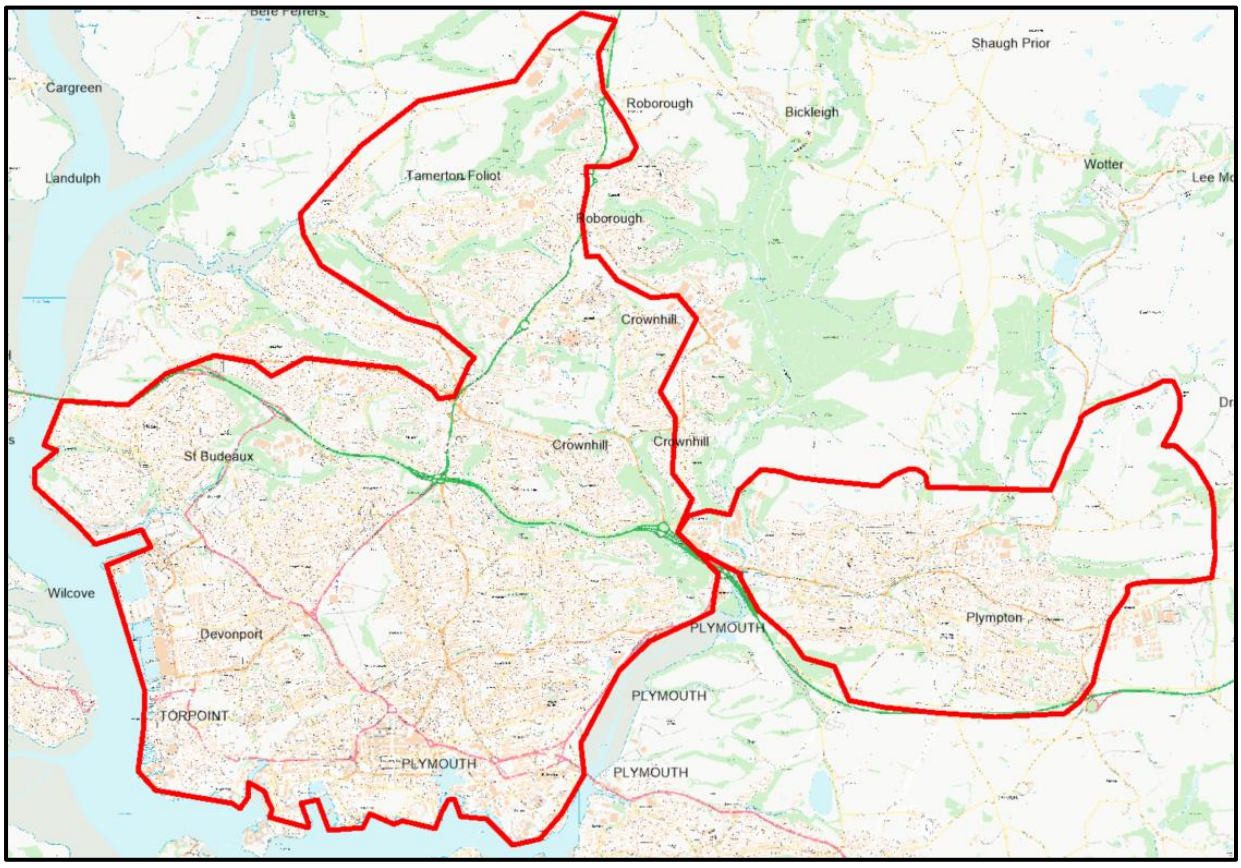

Figure 6: EA Critical Drainage Areas in Plymouth

Figure 7 shows the EA Surface Water Flood Risk Map for the City Centre. This map shows a potential flood flow path through the City Centre from a North Easterly to South Westerly direction in line with the topography as shown on the plan and long section in figure 8. Figure 8 also shows the bowl in the Union Street area where the EA flood risk maps indicate the highest risk.

Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding. Because of this, the EA show the highest risk within 20m of a specific location on their Surface Water Flood Risk Maps, such as an individual property. This means reports for neighbouring properties may show different levels of risk.

National flood risk mapping indicates that there are 925 properties at risk of flooding in Plymouth from the sea or main rivers, and an additional 3,291 properties at risk from surface water flooding.

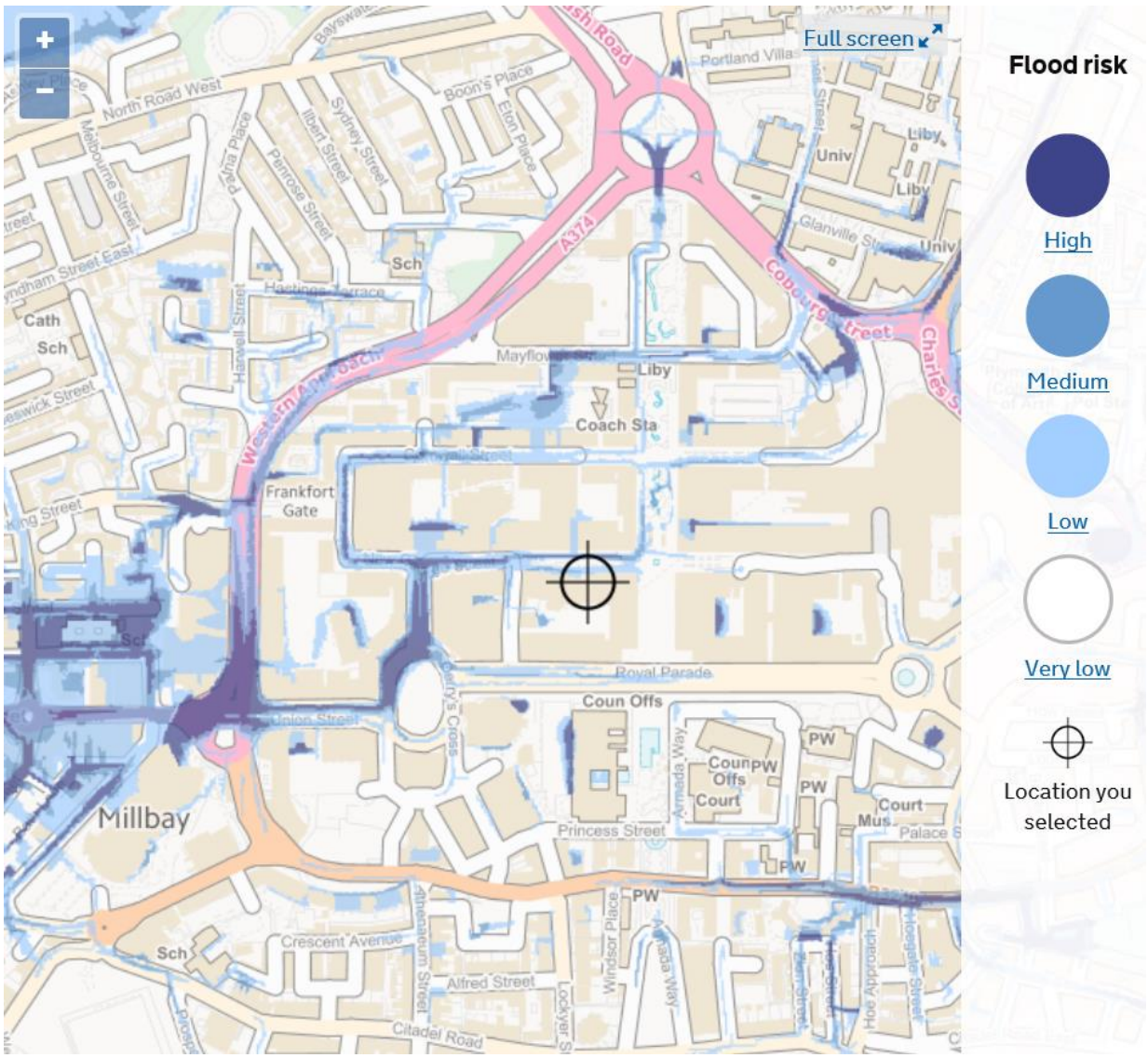

Figure 7: EA Surface Water Flood Risk Map

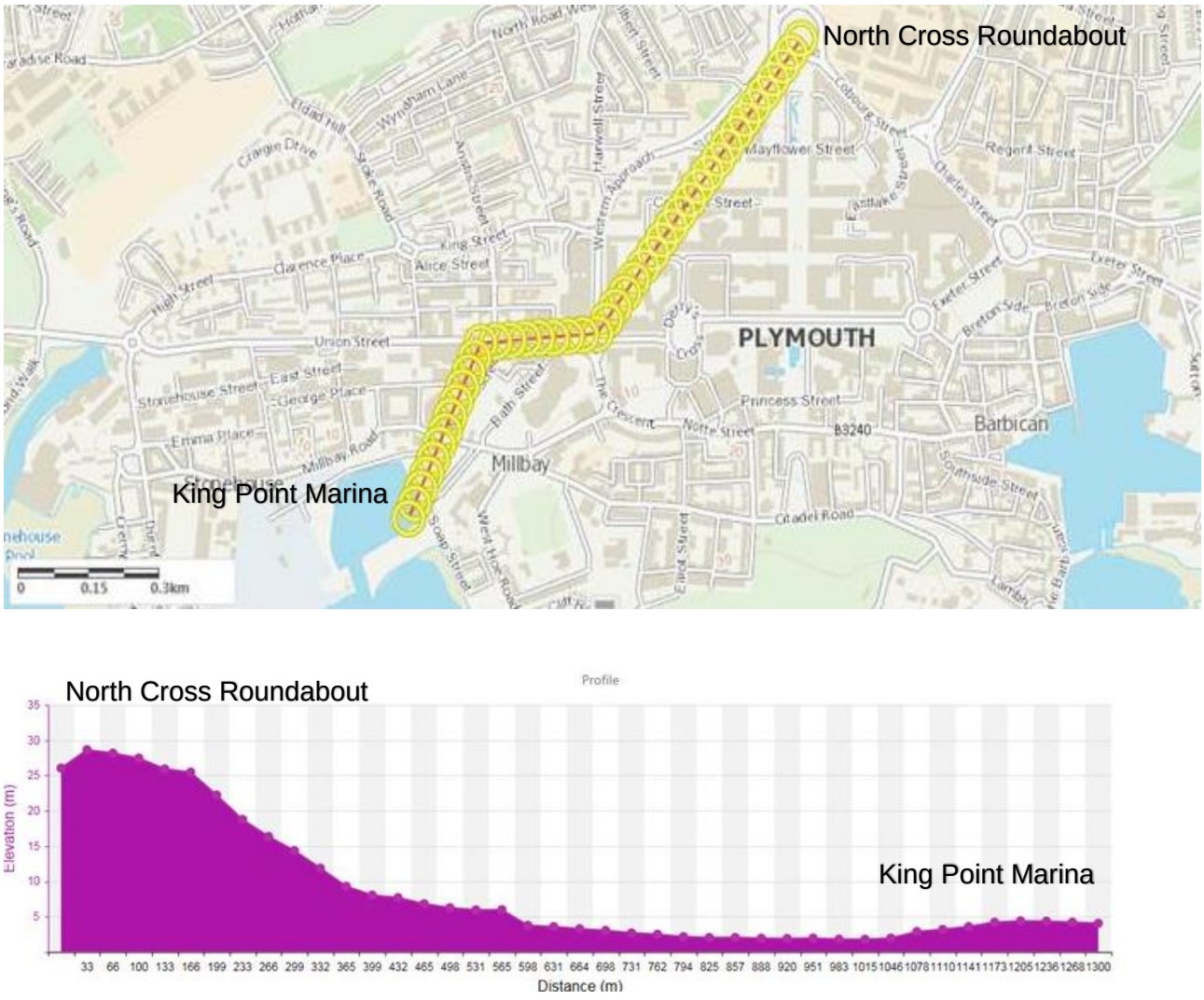

Figure 8: Plan and Long Section showing the decrease in ground elevations from North Cross Roundabout to King Point Marina, Millbay

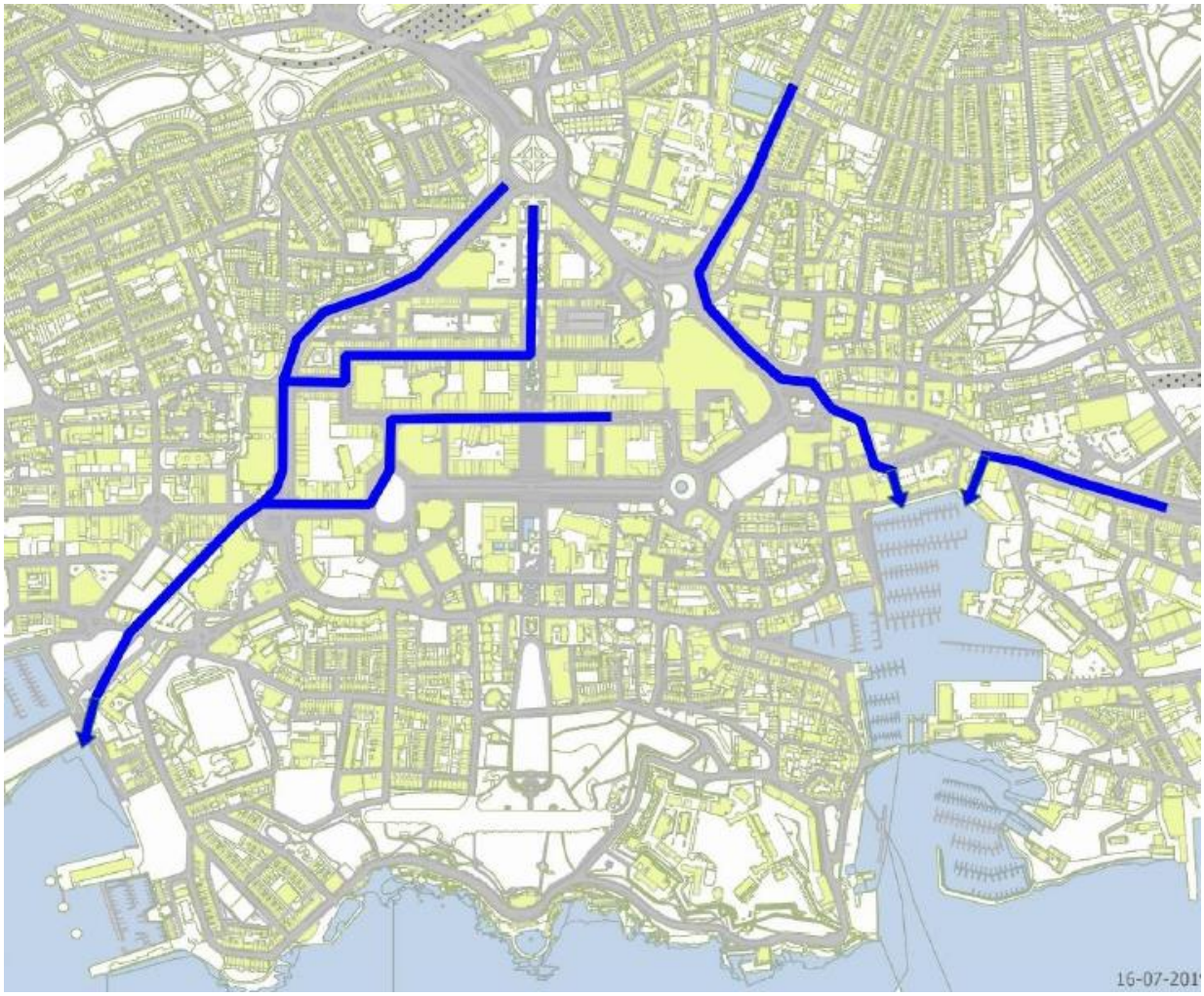

Figure 9: Strategic Surface Water Drainage Corridors Through the City Centre

2.3.4 Flooding History

Figure 10 shows a plan of reported flooding frequency in the City Centre.

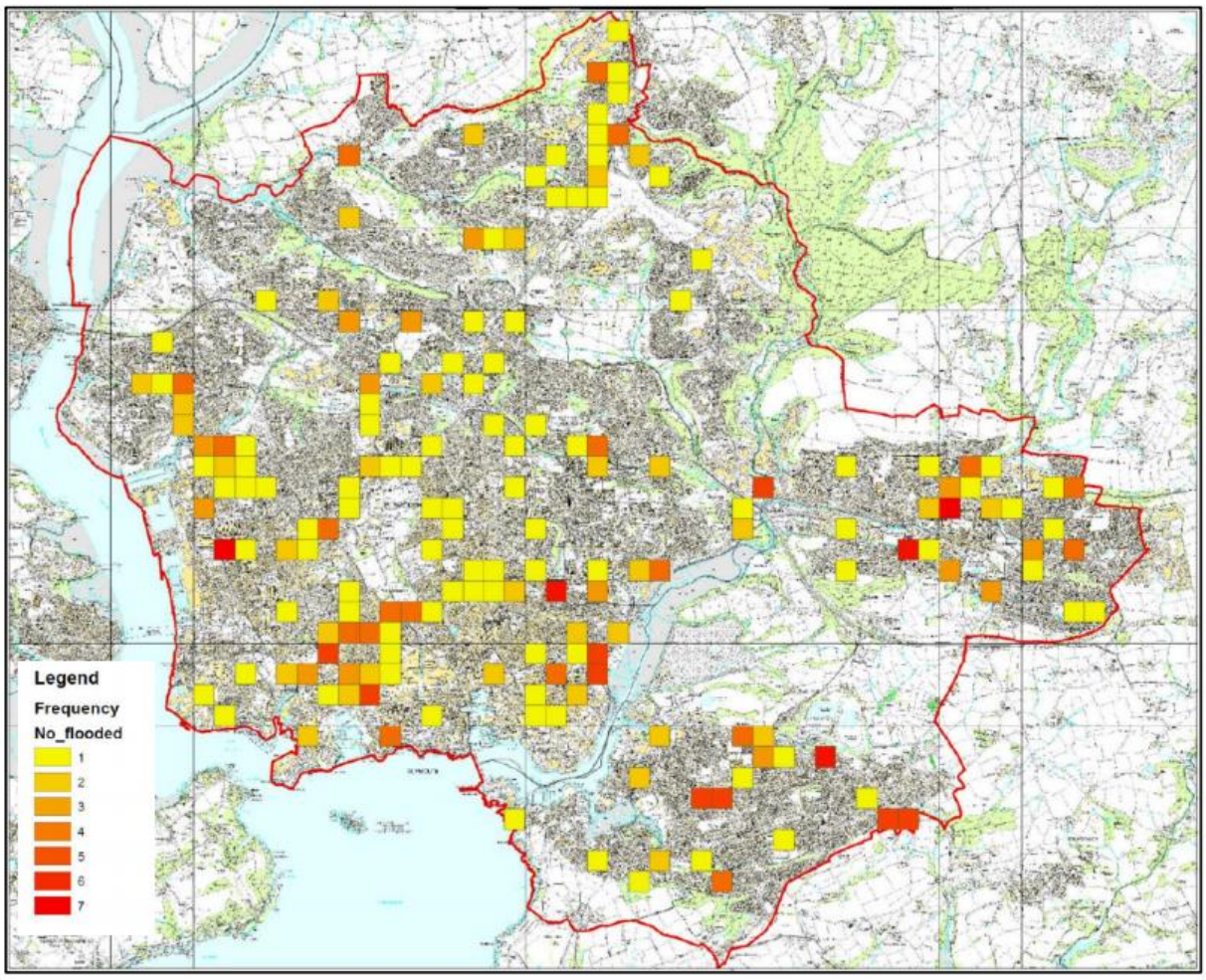

Figure 10: Locations of Reported Flooding from the 2017 Local Flood Risk Management Strategy

Significant surface water flooding has been reported in the following locations since 2012:

Table 1 – Summary of Reported Flooding Incidents

Location	Dates
Junction of Western Approach / Union Street	29th August 2012, 24th November 2012, 25th July 2013, 3rd October 2013
Millbay Road	11th October 2012
Frankfort Gate	21st / 22nd November 2012, 24th November 2012.
Courtenay Street	21st / 22nd November 2012
Kings Street Nr. Former Toys R Us	14th December 2012, 21st March 2013, 25th July 2013, 14th February 2014

Figure 11 shows the local disruptive impact of surface water flooding on local roads which in this case were closed by the police.

Figure 11: EA Highway Flooding in Kings Street Adjacent to the Former Toys R Us Building

2.3.5 Plymouth Central Integrated Urban Drainage Modelling

The Plymouth Integrated Urban Drainage Modelling (IUDM) study which the Council is progressing with SWW, the EA, consultants Pell Frischmann, and contractors NMCN have developed a robust hydraulic model of the City Centre which includes the modelling of overland flood flow paths when the capacity of the current drainage system is exceeded. This model has now been used to test various scenarios and options with the aim of delivering the most cost-effective solutions to reduce flood and pollution risk in the City Centre and facilitate growth.

The study is subdivided into several discrete drainage areas in and around the City of Plymouth and it is the Western Approach IUDM study which focuses on the City Centre.

The model was developed as part of the IUDM study built on an earlier model developed by SWW as part of a programme of CSO improvements in the City Centre. This latest flood risk model was enhanced and re-verified with key public surface water sewers and urban water courses. Light Detection and Ranging (LiDAR) ground model data and river channel survey data was imported to create a fully integrated 2D model. This model allows overland flood routes around buildings and other obstructions such as walls to be accurately predicted.

Figure 12 shows the detailed model predicted flood mapping during an extreme 1 in 30 year return period rainfall event:

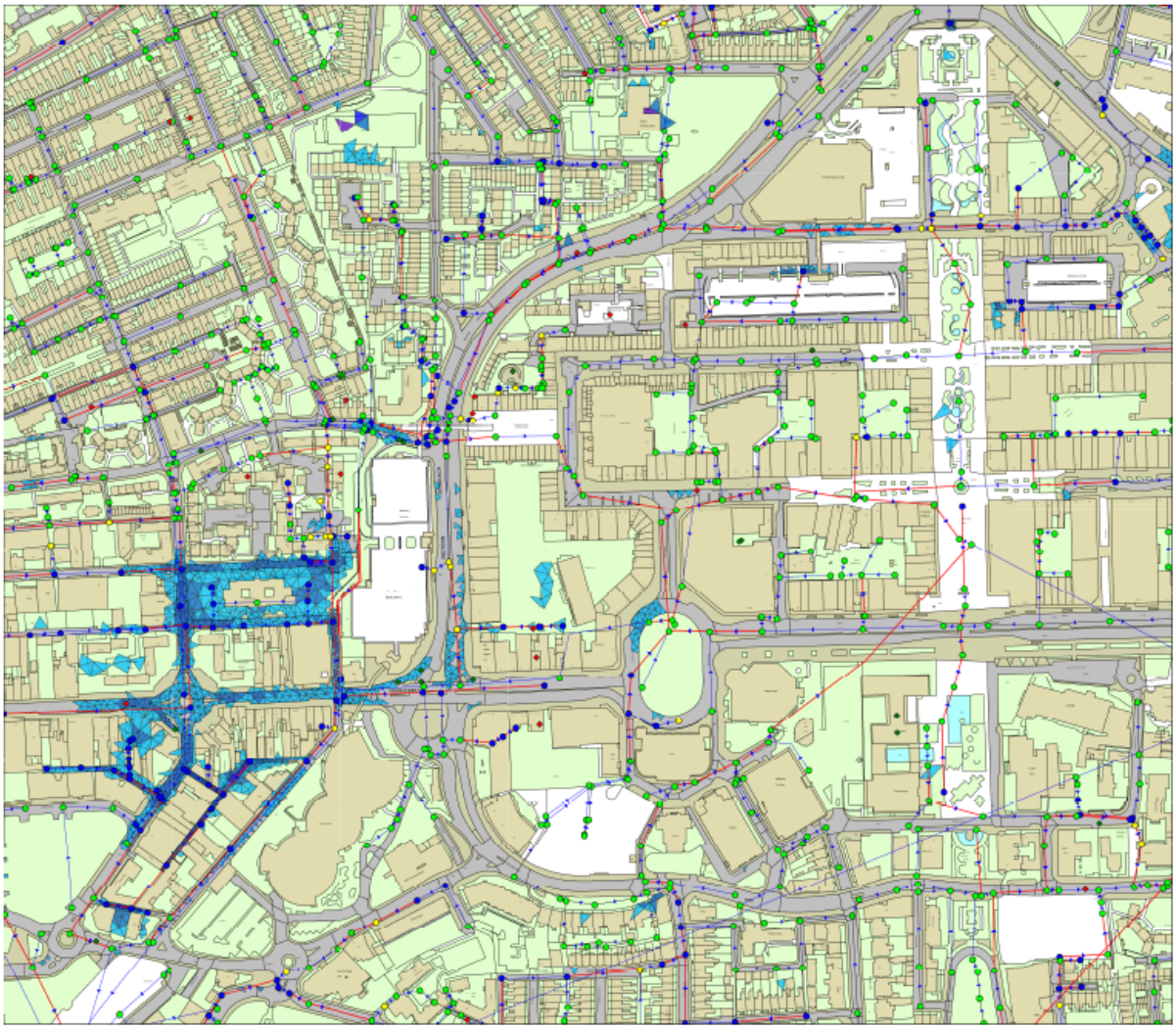

Figure 12: Latest IUD Model Predicted 1 in 30 Year Flooding in the City Centre

The IUDM study has identified a number of high-level strategic options and recommendations to improve the City's resilience to flooding and pollution in the Western Approach area including:

Flood Reduction

- Frequent inspection and maintenance of high priority sewers in the city centre to ensure hydraulic capacity is not hindered by deposited silt, tree roots, fat bergs etc. or any structural defects such as broken pipes, deformed pipes, intruding connections etc.
- Provision of new surface water flow paths from the City Centre to a new open storage pond at Derry's Cross Roundabout.
- Provision of a real-time control system to optimise the open storage and to allow excess storm water to discharge to the existing surface system when spare capacity exists.
- Provision of a new surface water pumping station at Millbay to discharge storm flows up to a maximum of 3,000 litres per second during storm events.

The latest preferred strategic option for the City Centre is illustrated in Figure 13.

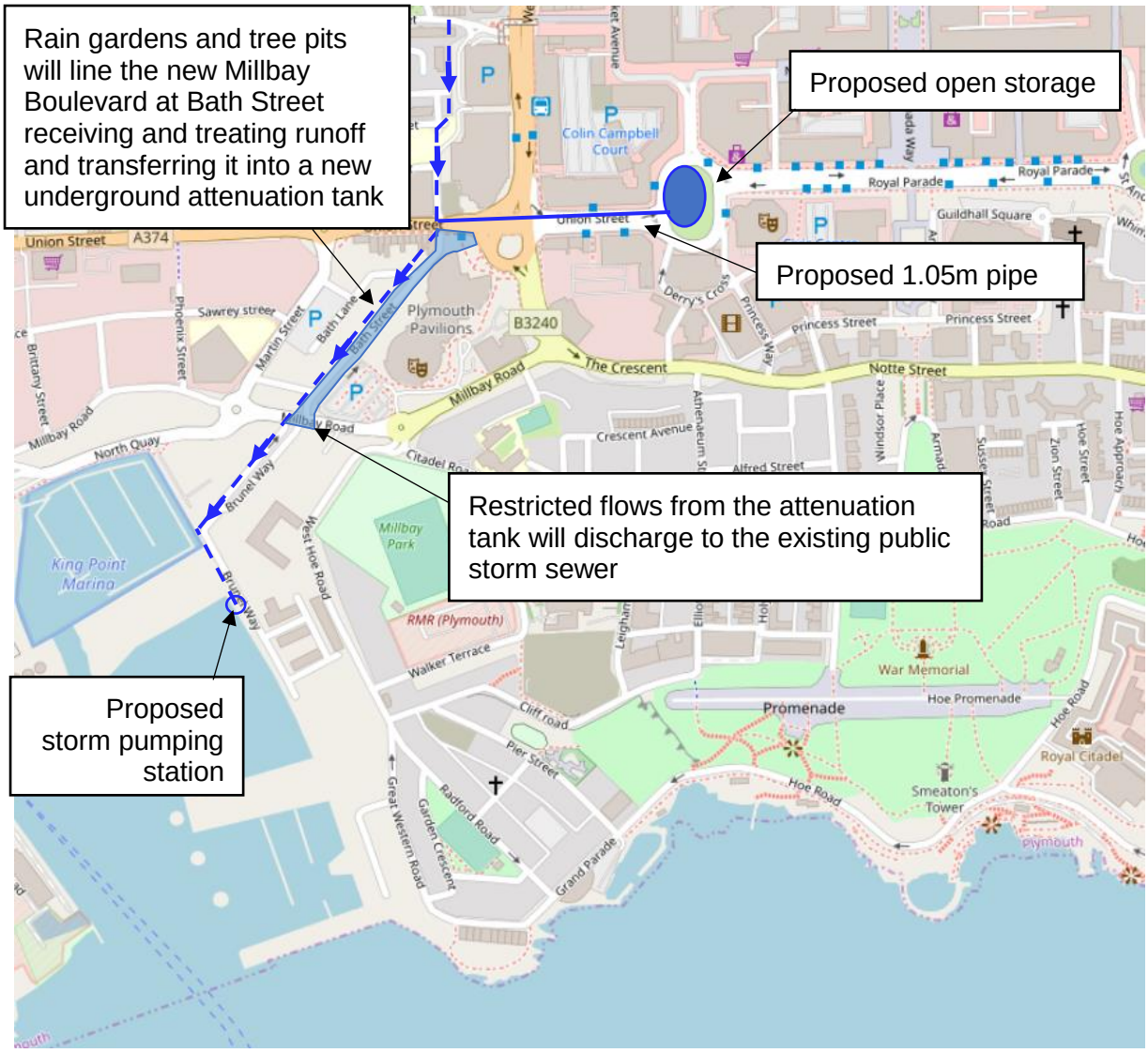

Figure 13: Proposed New Surface Water Pumping Station at Millbay and Open Storage Pond at Derry's Cross Roundabout

The concept design for an open pond in the Derry's Cross Roundabout is illustrated in Figure 14.

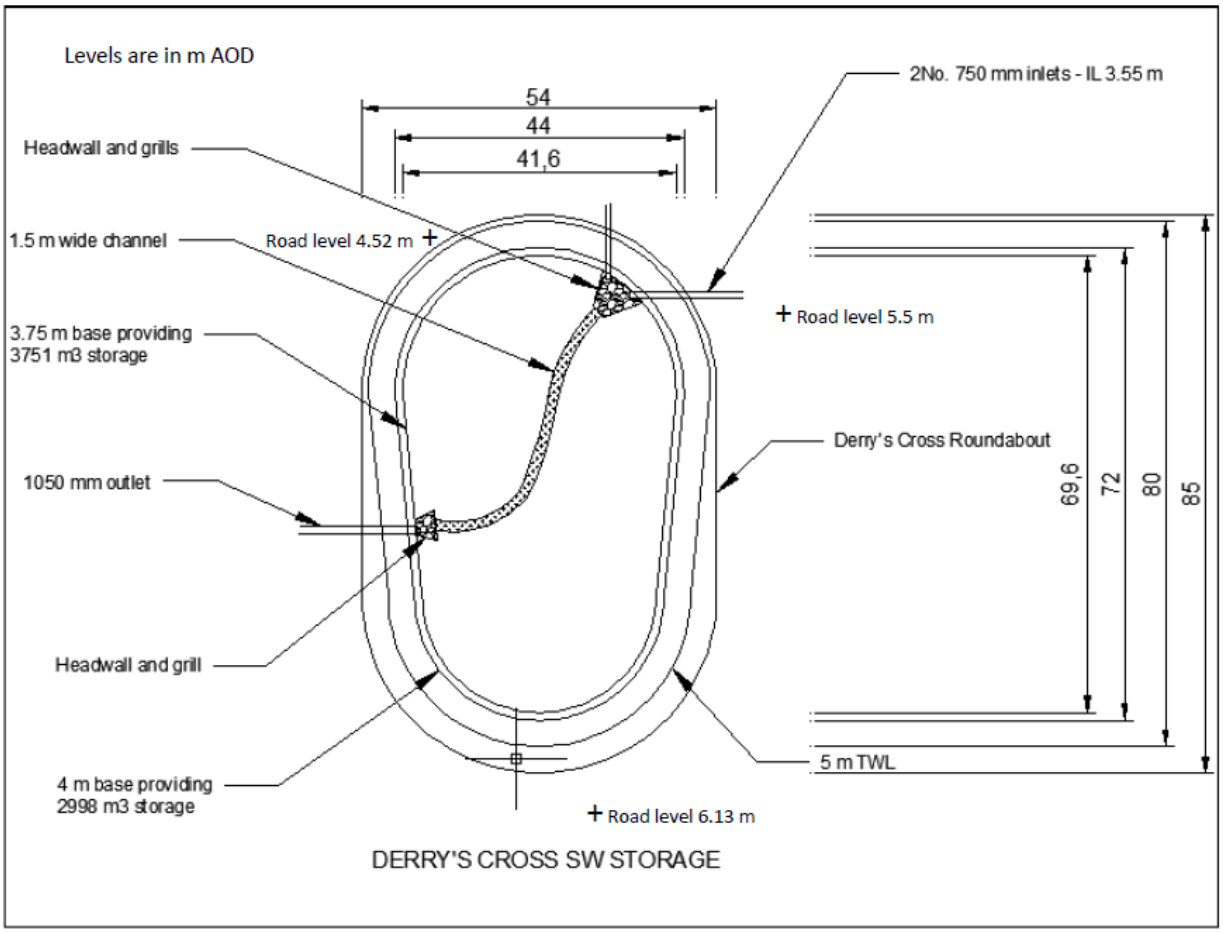

Figure 14: Proposed Open Pond Surface Water Storage Facility on Derry's Cross Roundabout

2.4 Improved Public Realm

Plymouth suffered at least seven devasting air raids in the 2nd World War between March and April 1941 which destroyed its medieval City Centre. Between September 1941 and September 1943 'A Plan for Plymouth' was prepared by Town Planner Sir Patrick Abercrombie along with City Engineer James Paton Watson.

Like the previous 'A Plan For Plymouth', 'Better Places Plymouth' is an initiative to transform the very heart of the City Centre, renewing and rejuvenating its open spaces and pedestrian areas to create a better place in which to shop, work, visit and enjoy. Vibrant streetscapes and inviting public spaces will bring life, activity and commerce back to the City Centre, making the area look and feel more attractive to shoppers and visitors supporting improved trading and encouraging inward investment.

Local Community

Improving the public realm is a key part of the Plymouth City Council Masterplan. The plan recognises that the City Centre's public realm is fundamentally about people and city life.

This priority theme has two main parts to it. The first part is about establishing a clear hierarchy of public spaces and streets, something that reflects the original 'A Plan for Plymouth' but also

reflects the identity and the future ambition for Plymouth. The second part is about function and about how the public realm will support and promote every aspect of city life in a busier and more densely populated City Centre of the future.

SuDS will be an important part of improving the public realm in the City Centre. The strategic planting of street trees with engineered tree pits will ensure trees thrive in the City Centre's urban environment as well as providing much needed stormwater management. Well designed and strategically located raingardens throughout the City Centre will also improve the public realm. These SuDS features as well as reducing surface water runoff rates and cleaning runoff, will help to reduce urban heat islands, provide habitats for wildlife and reduce net carbon.

Plymouth City Council have been engaging with SWW, the EA and local consultants Pell Frischmann as part of an Integrated Urban Drainage Management project. As part of this work a fully integrated 2D model of the entire Plymouth City Centre drainage network has been produced and strategic solutions to reduce flood risk in vulnerable areas of the City Centre has been developed. One of the proposals is to utilise Derry's Cross Roundabout as an open water surface water storage pond. Due to the roundabout being surrounded by a busy highway it makes for a safe site to locate such a feature. A minimum depth of water could be maintained in the pond which has the potential to provide a much needed wildlife habitat in the City Centre.

In tandem with this work Plymouth City Council have been a lead partner in an EU Funded Water Resilient Cities project. The project aims at improving the adaptive capacity of cities to heavy rainfall by demonstrating how SUDS can be retrofitted in public areas normally constrained by existing uses and infrastructure (above or below ground), or 'historic environment' protection. The project will demonstrate reduced flooding while protecting or improving amenities, biodiversity, health and wellbeing, local economies and saving public money. The adoption of these approaches will increase adaptation capacity to effects of heavy rainfall and deliver added societal benefits.

Plymouth City Council are already delivering schemes which retrofit SUDs systems into the urban environment, most of these are public realm enhancement schemes, but all provide multiple benefits to the environment and the people of Plymouth. Some of these schemes have been done with the assistance of the EU Interreg Water Resilient Cities Programme funding and are trialling various SuDs products to see how they perform. These projects include Market Way just to the west of that and at Millbay Boulevard. The Council has also been working within the planning system with developers at other sites in the city to put trees into streets capturing surface water and channelling this into tree pits to achieve infiltration, attenuation and the irrigation of trees.

Plymouth City Council is also planning through its Better Places programme of public realm enhancements to deliver further projects with similar multiple benefits firstly at Old Town Street/ New George Street to the west of the city centre later in 2020 and in the Civic Square outside the Civic Centre in 2021 -22. The Council hopes to enhance Armada Way, the iconic north-south city centre boulevard in the future and link all these schemes up with works down Royal Parade to Derry's Cross and then to the Millbay Boulevard providing a connected network for SUDs, but at the same time delivering to a network of district heating and natural infrastructure which will have significant benefits for the city and its people. This will help support the planned change of uses in the city centre which Plymouth's Joint local Plan seeks, aiming to generate a more vibrant public realm attracting footfall and residential living as well as supporting the existing and new office, retail developments and developing a strong evening economy.

Old Town Street – New George Street East

Millbay Boulevard

Civic Square

Figure 15: Visualisations of planned SuDs in Central Plymouth

It is critical to ensure that such projects are connected with an overarching vision for a city's future development and that the community are engaged. Plymouth City Council aim to encourage a greater diversity of uses within the public realm to attract and support new residential, office and evening economy uses in the city centre which will connect and show off the city's best assets.

Local Community

2.5 Provide Resilience for Climate Change

The latest Climate Change predictions indicate that the frequency and intensity of short duration rainfall events will increase, and sea levels will rise. This will increase the risk of flooding and the frequency of CSO spills.

Solutions to reducing flood risk in the City Centre have taken into account potential increases in rainfall intensities due to climate change and also projected increases in sea level. Large scale provision of SuDS throughout the City will further protect the City from the worst impacts of Climate Change.

2.6 Improve Sustainability of Water Resources

SuDS can help to recharge groundwater supplies and capture rainwater for re-use purposes. The recharge of groundwater supplies is not relevant to Plymouth City Centre as the water supply comes predominantly from Dartmoor. However, where practical, the Council will promote and encourage developers to provide rainwater capture methods, so water can be re-used for toilet flushing and other uses.

2.7 Carbon Reduction

Plymouth City Council have declared a climate emergency and are currently working with partners to be carbon neutral by 2030.

The traditional approach to address flood risk issues is to provide storm storage in the drainage / wastewater network either with larger pipes or strategically located storage tanks. These solutions however usually rely of large amounts concrete which requires significant quantities of cement. The cement industry is one of the primary producers of Carbon Dioxide, a potent greenhouse gas. In order for the Council to maintain its commitment to becoming carbon neutral by 2030, they are keen to promote more sustainable solutions which require less concrete.

The Council is already doing a range of things to help make Plymouth carbon neutral. These include reducing Plymouth's carbon footprint by decreasing carbon emissions, becoming more energy efficient, investing in renewable energy and taking action to offset carbon emissions, such as planting trees. Delivering public realm improvements in the City Centre provides an opportunity for the Council to co-ordinate a number of initiatives such as reducing flood risk with the provision of SuDS and providing the City with a District Heating System. Co-ordinating these initiatives at the same time will reduce disruption to local businesses and residents and will provide cost savings in respect to monetary value and carbon usage.

3 SuDS Already in The City Centre

In 2018, Plymouth's first SuDS pilot study was implemented with new tree pits provided as part of a mixed use development in the city centre. These were part of an EU funded Water Resilient Cities project. These features keep storm water out of the sewers, as well as providing a good growing environment for the trees. SuDS features such as these will form part of a strategy to improve storm water drainage in the city centre by being retrofitted where space for new drainage is limited.

Figure 16: Plymouth City Council's First SuDS Pilot Site at Market Way and Mayflower Street

4 Funding Opportunities for SuDS

The Council as lead partner in the EU Water Resilient Cities project has attracted and distributed £7.7M of funding to its 5 partner European cities as well as receiving a share to target the retrofitting of SuDs in the City. Further opportunities for SuDS can be explored and included in flood alleviation or urban regeneration schemes as part of planning requirements.

Economy

The Better Places Plymouth programme has already identified SuDS retrofitting opportunities, such as rain gardens, in New George Street, Old Town Street and Armada Way South. Three area drainage studies have also been commissioned by the Plymouth City Council (PCC) to find additional opportunities in the Civic Square, Royal Parade and Millbay Boulevard.

Health and Wellbeing

Funding is also available through the Flood Defence Grant in Aid (FDGiA) scheme, which is the funding from central government for managing flood risk in England. To apply for this grant, the flood risk management authorities have to draw up plans for the flood alleviation works that they believe are needed. The applications are submitted to the EA, which then creates a priority list of the eligible projects. This work is currently being undertaken in the City Centre as part of the final phase of the Integrated Urban Drainage management project in Western Approach.

Where possible SuDS are being promoted which, as well as providing many wider benefits also compliment the Council's 'Better Places' initiative which aims to transform the city centre attracting more shoppers, businesses and improving the lives of local residents.

Health and Wellbeing

Funding is also available from investment planned by SWW over the next 5 years where they aim to reduce surface water runoff volumes entering the combined sewerage system. The main driver for this is to reduce storage needed at Plymouth Central Sewage Treatment Works to ensure the local beaches continue to comply with stringent bathing water quality standards.

Regeneration programmes should not be the only way forward for the delivery of SuDS. To make the investment in sustainable drainage techniques more viable for existing private, commercial and industrial properties, it may be worth considering incentivising actions by discounts or incentives for those customers. Discounts on water bills can be achieved if properties do not discharge surface water into South West Waters network. This, of course, can be limited only to the catchment area that contributes to flooding, such that the incentives can be worthwhile and appealing to customers.

Economy

Local Community

5 Wider Benefits of SuDS and Linkages with Other Initiatives

The most relevant benefit for the provision of SuDS in Plymouth City Centre will be the reduction in flood risk particularly in areas like Union Street where frequent flooding has caused disruption to local residents and businesses as well as affecting traffic movements around the City.

However, provision of SuDS in the City could have a number of other benefits including improving local air quality, increasing biodiversity with the provision of habitats, reduction in the heat island effects known to occur in City Centres and improved water quality to local bathing waters and watercourses.

Where possible the SuDS solutions to drain the City Centre will link with other Council initiatives particularly the proposed District Heating Scheme in the City Centre. District heating is a system of distributing heat generated in a centralised location through a system of insulated pipes for residential and commercial water and / or space heating. Figure 17 below shows details of the proposed scheme.

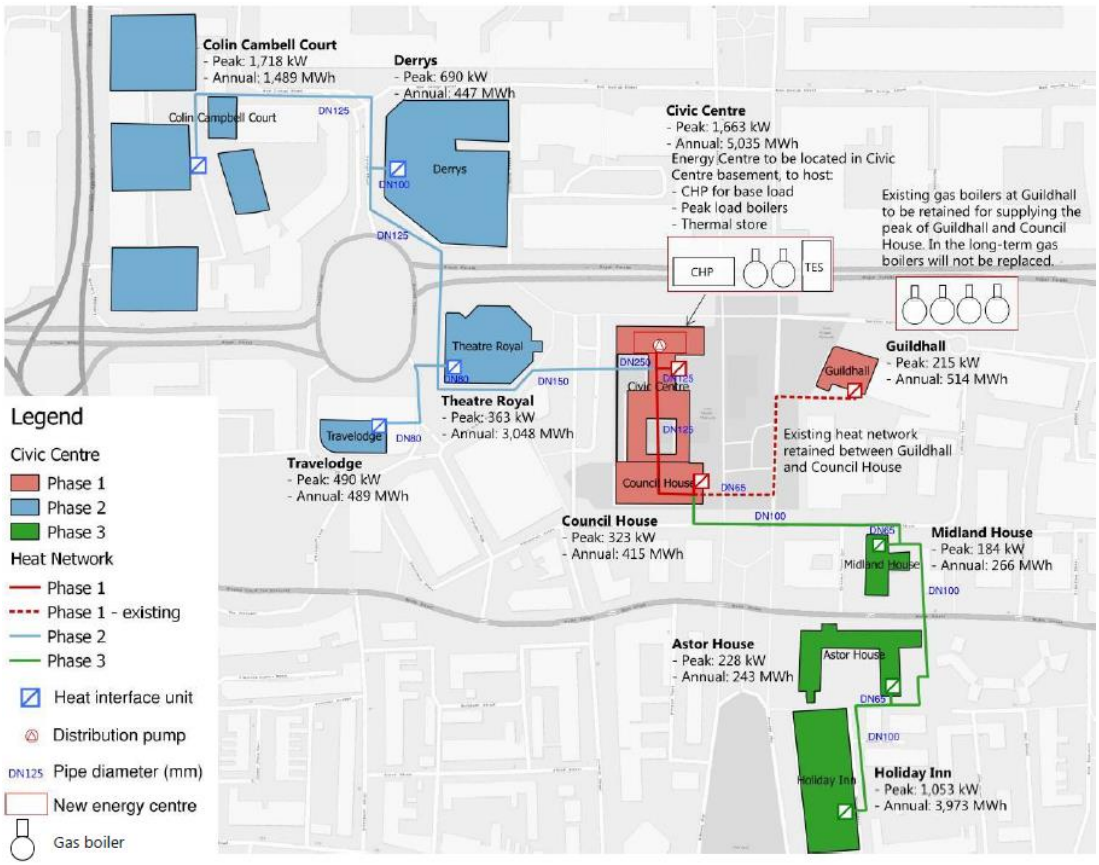

Figure 17: Plymouth City Council's Proposed District Heating Scheme

Implementing SuDS at the same time as schemes such as this, together with public realm enhancements and embedding green infrastructure improvements will reduce disruption to local residents and businesses, but there may be opportunities to save costs if district heating pipes can be laid in the same trenches as the new surface water drainage pipes taking runoff to the proposed pond at Derry's Cross.


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