

Birmingham Eastside Extension

Volume 2 Technical Appendix S: Flood Risk Assessment

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West Midlands Combined Authority

Mott MacDonald

Issue and revision record

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The consultant has followed accepted procedure in providing the services but given the residual risk associated with any prediction and the variability which can be experienced in flood conditions, the consultant takes no liability for and gives no warranty against actual flooding of any property (client's or third party) or the consequences of flooding in relation to the performance of the service. This report has been prepared for the titled project 'Birmingham Eastside Extension of the Tramline' and is for the purposes of planning approval only.

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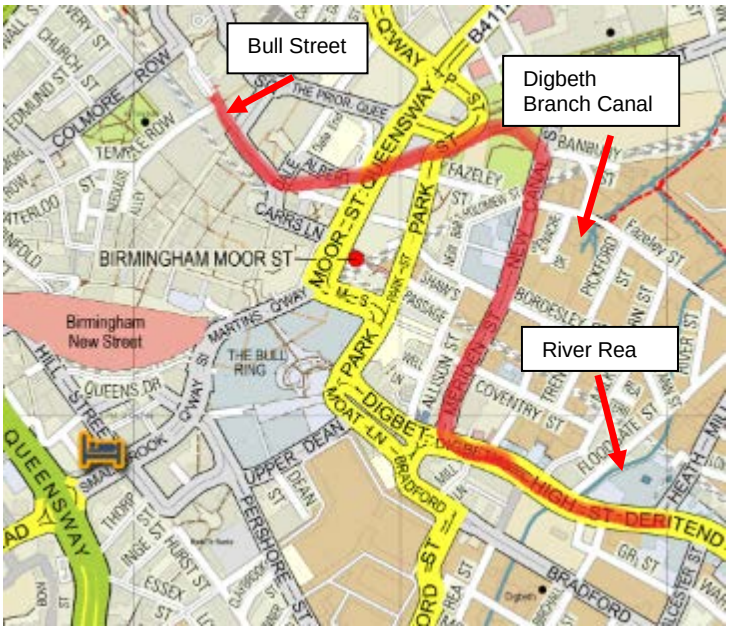
1. Introduction

1.1 Scope

Mott MacDonald has been commissioned by West Midland Combined Authority (WMCA), referred to as "the Promoter", to undertake a Flood Risk Assessment (FRA) which forms part of the Environmental Impact Assessment (EIA) for the proposed Birmingham Eastside Extension (BEE) of the Midland Metro network. The proposed route of the BEE is shown in Figure 1.1 and Appendix A.

The Environment Agency's (EA) flood map (see Appendix B) (EA, 2016) identifies that the BEE is partly located within Flood Zone 1 – land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%). However part of the BEE route that runs along High Street Deritend crosses Flood Zone 3 (>1%) and Flood Zone 2 (1% - 0.1%) of the River Rea. Footnote 20 of Clause 103 in the Planning Practice Guidance (PPG) to the National Planning Policy Framework (NPPF) states that a site-specific FRA is required for all proposals for new development in Flood Zones 2 and 3.

Figure 1.1: Approximate BEE route and main sources of fluvial risk



Source: © All Technology Copyright Streetmap EU Ltd 2016

1.2 BEE Alignment and Topography

The BEE runs within heavily developed areas in central Birmingham, see Figure 1.1. The BEE commences at the junction with BCCE at the junction of Bull Street and Corporation Street running southeast along Lower Bull Street into Albert Street. The route then crosses Moor Street Queensway at grade, continuing northeast to connect with the proposed HS2 Curzon

Street Station. The route then runs south along New Canal Street which continues into Meriden Street before turning eastwards onto High Street Deritend. From here, the BEE will run in the centre of the carriageway and terminate on High Street Deritend between Rea Street and Floodgate Street. However, the track will be constructed as far as Heath Mill Lane to allow for a tram turnback and lay over facility. Associated highway works will continue as far as Adderley Street.

The River Rea crosses the BEE at the location where it passes underneath High Street Deritend adjacent to the junction with Floodgate Street as shown in Figure 1.1. The part of the route at New Canal Street is very close to the start of the Digbeth Branch Canal.

A number of topographical surveys have been carried out at different times during the past four years. The general levels along the route are shown, approximately, in Table 1.1.

Table 1.1: Approximate BEE route levels

Location	General level (mAOD)
Bull Street	131.2
Park Street	114.6
Park Street Gardens	110.6
New Canal Street	106.4
Meriden Street	104.7
Digbeth	102.6
High Street Deritend	103.7

1.3 Consultation

The following consultations have been undertaken with the EA, STW and BCC. A record of the consultation is contained with the FRA appendices C and E and is also duplicated in ES Volume 2 Technical Appendix F: EIA Consultation Information.

The EA was consulted in April 2016 for the in 1 in 100 years and 1 in 1000 years flood levels of the River Rea which is the nearest Main River to the BEE. Responses have been received from the EA, providing the flood levels for different return periods at different locations along the River Rea in the vicinity of the Scheme Boundary. The EA also advised that there is no EA flood defence, flood storage areas and records of flooding in the vicinity of the BEE. Regarding the new climate change allowance, the EA agreed that further modelling of 50% climate change was not necessary based on the condition that there will not be any ground raising work (Appendix C).

With regards to the proposed location for the substation, the EA is further consulted on making provision to elevate the substation structure in case future projection of the flood zone taking into account the revised 50% climate change allowance shows that it is within Flood Zone 3. Reply has been received and EA confirmed that the proposals for the substation are

minor in nature and will not affect the floodplain in any case if elevated above the future climate change level. Therefore, EA have no further requirement for work to be undertaken at this stage.

In order to understand the performance of the sewer systems in the vicinity of the BEE, Severn Trent Water (STW) was consulted in January 2015 and they subsequently provided their sewer records. In April 2016, STW was also requested of the records of historical sewer flooding events within the study area. STW has confirmed that there are no records of sewer flooding in the vicinity of the BEE (Appendix D).

Due to the proximity of the BEE at New Canal Street to the start of the Digbeth Branch Canal, the Canal and River Trust was consulted. The response has been received confirming that The Canal and River Trust is not aware of any records of overtopping of this section of the waterway. However, on 13/08/1989 there was a structural failure of a pump shaft at Bowyer Street pump at location E 408423, N 286421 that led to flows from the canal through the shaft lining. The outflow was controlled by the embankment geometry (Appendix E).

Birmingham City Council (BCC) was consulted on the underground highway drainage system along the BEE route. It was advised that this information was under the management of a third-party company, Amey, who were then subsequently contacted. The highway drain information received can confirm that there is no highway drain in the vicinity of BEE.

1.4 BEE Description

The BEE involves the construction and operation of 1.7km of on street twin-tracked tramway starting from the BCCE at Bull Street/Corporation Street providing a new link to the proposed HS2 Curzon Street Station and Birmingham Coach Station, terminating at High Street Deritend to the east of Birmingham City Centre between Rea Street and Floodgate Street.

The BEE comprises four street level tram stops:

- Albert Street;
- New Canal Street - interface with HS2 Curzon Street Station;
- Meriden Street (staggered tram stop); and
- High Street Deritend (terminus).

In order to construct the BEE and to also maintain a sufficient road width for general traffic and accommodate a change in traffic patterns, the existing kerb lines will be realigned. This will provide the space for the BEE and in some locations will also reduce the number of traffic lanes for other vehicular traffic. This means all the existing gullies alongside the kerb lines would be demolished and re-provisioned.

Power will be supplied to the BEE from a new one-storey substation to be sited on a piece of land at present being occupied as an open car park close to the junction between Meriden

Street and Coventry Street. The location of this substation is very close to the edge of Flood Zone 2 based on the current EA flood map in Appendix B. With the climate change of 50% applied to the current flood level (see Section 2.2), the substation may be located within Flood Zone 2 or Flood Zone 3.

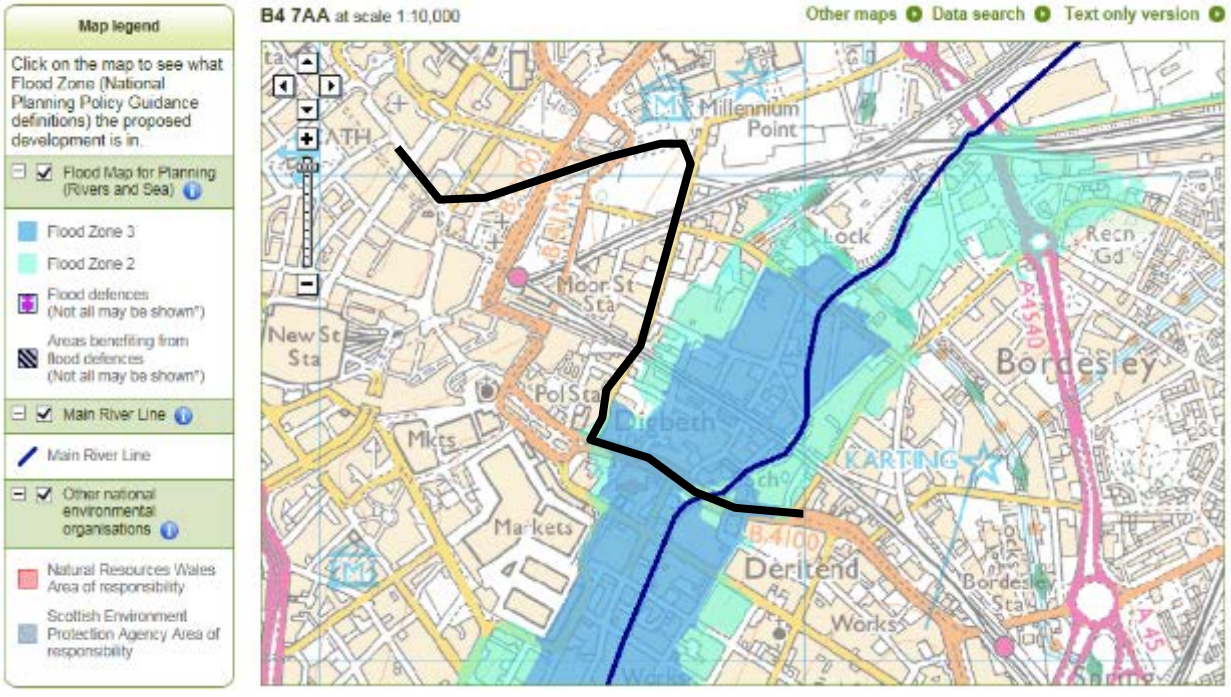
2 Fluvial Flood Risks

2.1 Assessment of the Primary Source of Flood Risk

The total length of the BEE is approximately 1.7km. Based on the current EA's flood map, the majority of the BEE, approximately 1.3km (76%), is within Flood Zone 1. The length of the section within Flood Zone 2 is approximately 1770m (10%) and the length of the section within Flood Zone 3 is approximately 240m (14%).

The current flood map does not incorporate any climate change allowance, thus by matching the flood map shown below with the topographical survey, the flood extent of each flood zones will not exactly match the flood data provided by the EA. As the EA are updating their flood zone map as shown in Appendix C, the assessment can only be based on the current flood map.

Figure 2.1: BEE route shown on the current EA flood zone map



Source: EA, 2016

The primary source of flood risk to the BEE comes from the River Rea, which crosses the southern length of the route at High Street Deritend at the terminus of the route. The River Rea cannot be seen at the street level on High Street Deritend as there are vertical walls built on both sides of the road.

As required under Chapter 10, NPPF (Government, 2012), *"inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk*

elsewhere". Further requirements relating to developments in areas at risk of flooding are stated in paragraph 100 of the NPPF.

The BEE is classified as "Essential Infrastructure" and is allowed in Flood Zone 2 and 3 subject to the Exception Test. To pass the Exception Test, there are two conditions that need to be met:

- it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and
- a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

2.2 The Climate Change Allowance

The climate change allowance applied by the EA in their analysis to obtain the 1 in 100 year flood level is based on 20% increase in the estimated flow in the river. As the BEE, classified as Essential Infrastructure, is located within the Humber River Basin, according to the new Climate Change Resilience guidance released in March 2016 (EA, 2016), the climate change allowance applicable to such a development has been increased to 50%.

By comparing the flood data of 1 in 100 year and 1 in 100 year with 20% climate change, the 1 in 100 year with 50% climate change would potentially increase the Flood Zone 3 area. The edges of the Flood Zone 2 and 3 shown in the Flood Map provided by the EA (see Figure 2.1) will migrate further on both sides, and thus the alignment along New Canal Street and Meriden Street would also be situated within these Flood Zones.

2.3 The BEE within Flood Zone 2 and 3

Figure 2.2 shows the proposed preliminary levels for the BEE alignment and the existing ground levels of the route along High Street Deritend, where the majority of the route is within Flood Zone 2 and Flood Zone 3. From topographical data, the lowest ground level is approximately 102mAOD at chainage 11580. Based on the 1 in 100 year flood level with 20% climate change, the flood depth at this location would be more than 1m.

Figure 2.2: Existing and proposed levels along High Street Deritend

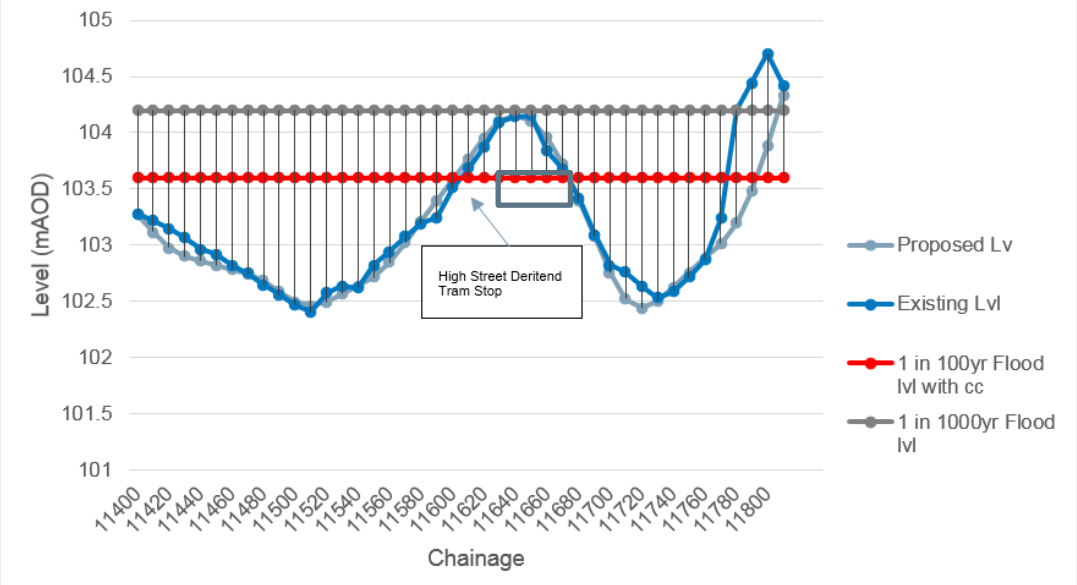


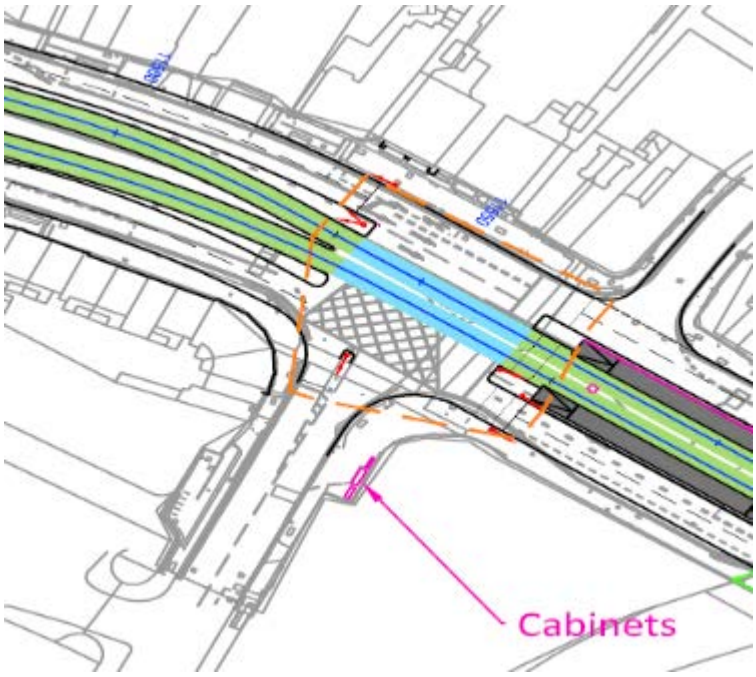
Figure 2.2 shows that the BEE alignment along High Street Deritend is below the assumed 1 in 1000 year flood level and quite a substantial section is below 1 in 100 year flood level with 20% climate change. Calculations have been made in assessing the potential depletion of flood storage within the Flood Zone 3 and Flood Zone 2 areas. Although there are areas where the proposed tramline would have a finish level above the existing road level, there are more lengths that there would be a reduction in level in the finished works. As a result, there is an increase in flood storage of approximately 103m^3 within the Flood Zone 3 area and approximately 198m^3 within the Flood Zone 2 area. The development of the BEE will therefore, not reduce the flood storage capacity and will not cause additional flood risk to adjacent areas.

Although applying a 50% allowance of climate change in estimating the flood levels will result in much higher flood levels and hence all the alignment along High Street Deritend may be submerged, the development of the tramline extension will not cause depletion of flood storage or create additional flood risk elsewhere.

The High Street Deritend terminus Tram Stop is proposed at Chainage 11620, which is located at the flood zone boundary between Flood Zone 2 and Flood Zone 3. The location of the tram stop has been carefully chosen based on consideration of the geometric alignment of the tram route, road width along High Street Deritend and its proximity to the Birmingham Central Coach Station. The current location is considered optimal based on construction and operational requirements.

Three cabinets containing electrical equipment are proposed south of High Street Deritend (see Figure 2.3), located within Flood Zone 3. The sizes of the cabinets are approximately 3m (length) x 0.9m (width) x 1.8m (height), 2m (length) x 0.4m (width) x 1.2 (height) and 2m (length) x 0.6m (width) x 1.5m (height).

Figure 2.3: Locations of the electrical cabinets



When considering the worst case scenario, with the 50% climate change allowance applied, the edges of the Flood Zone 2 migrate further into New Canal Street and Meriden Street so additional sections of the alignment will be situated within flooding area. The flood level of 1 in 100 year with 50% climate change has been assumed to be 105.5mAOD which is considered as the highest flood level possible compared to the 20% allowance of 102.9mAOD.

Figure 2.4: Existing and proposed levels along New Canal Street and Meriden Street

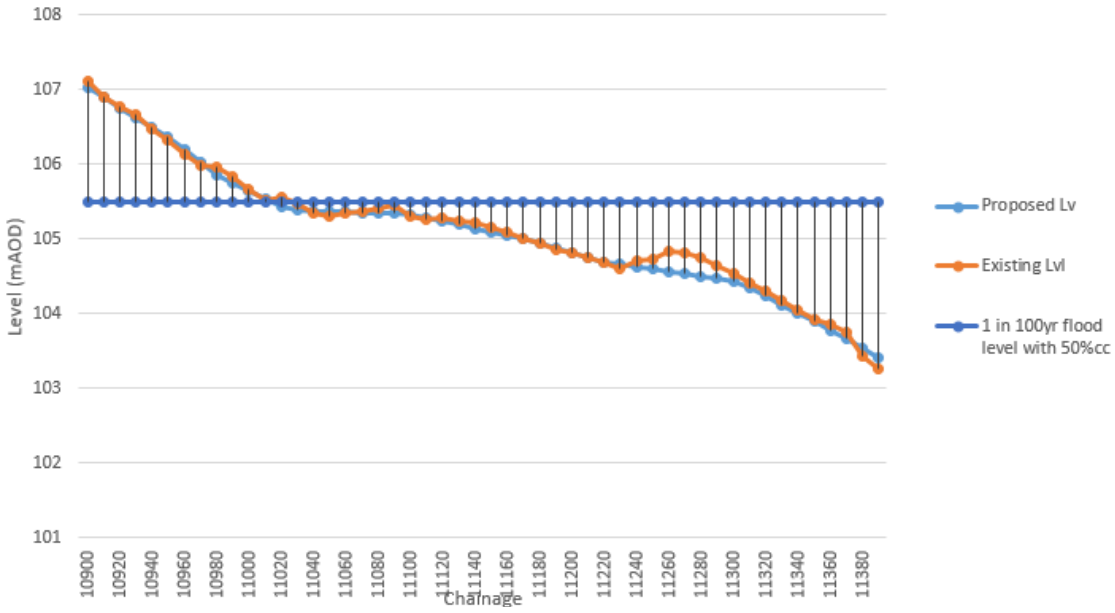


Figure 2.4 shows a similar situation to the alignment on High Street Deritend with most of the proposed alignment levels are lower than the existing ground levels. A flood storage of approximately 137m^3 will also be created. Hence, although for a 50% climate change allowance, the flood levels will be much higher and most of the route along New Canal Street and Meriden Street may be submerged, the development of the BEE still will not reduce the flood storage and will not cause additional flood risk elsewhere.

For the proposed substation close to the junction between Meriden Street and Coventry Street, the proposed site is located outside Flood Zone 2 and Flood Zone 3 based on the current EA flood mapping (see Appendix F). Understanding that with a climate change allowance of 50%, the existing Flood Zone 2 and Flood Zone 3 may be extended and could cover the proposed substation location. Should this be confirmed with any updated information at the next stage of the project, the substation structure will be elevated above the projected flood level retaining the void below as flood storage should the future flood mapping show that the site is within Flood Zone 3.

2.4 Mitigation of the Fluvial Flood Risks

There is no depletion of flood storage within Flood Zone 2 and Flood Zone 3 areas. Instead, there will be an increase in flood storage along the BEE alignment. No compensation of flood

storage is required and no additional flood risk will be caused to adjacent properties and infrastructure.

Given the operational objectives of the BEE to extend Midland Metro services to the Eastside and Digbeth area, the BEE will unavoidably be aligned through Flood Zone 2 and Flood Zone 3 along High Street Deritend (see Figure 2.1).

The High Street Deritend Tram Stop, which is subject to potential flood risk, will be specially designed to be equipped with water-proof facilities. The foundation of the tram stop should also be carefully designed to sustain the flood impact load, e.g. the hydraulic load applied to the foundation.

The operational regime will specify that during flooding events, the operation of the BEE will terminate at the Meriden Street Tram Stop, located in Flood Zone 1. An approved operational and evacuation procedure will be implemented during flooding events. The Promoter will be informed of the development of an impending flooding event such that the approved implementation procedures can be triggered.

In order to provide flood warning with sufficient time to implement the pre-defined evacuation procedures, a flood sensor could be mounted in a manhole within the surface water drainage system connected to the River Rea or directly along the river bank close to Floodgate Street. When the river water reaches a certain level, this would trigger an alarm, notifying the tram operator. A warning system would be put into operation at the Meriden Street Tram Stop to advise the public that onward eastbound tram operation has been suspended due to potential imminent flood event and advise the public to move away from the flood prone area.

In the unlikely situation, that members of the public disregard the warning system and continue to use the High Street Deritend Trams Stop, an evacuation route will be designed in order to migrate tram users safely to dry land prior to or during flood events.

The proposed substation is to be located in a piece of land currently used as an open car park close to the junction of Meriden Street and Coventry Street. This substation location might be within Flood Zone 2 or Flood Zone 3 with a climate change allowance of 50% applied. Should this be confirmed at the next stage of the project that the site is within the revised Flood Zone 3 area, the substation structure would be designed as an elevated structure retaining the void below as flood storage. The floor level will be designed at 600mm higher than the 1 in 100 year flood level with 50% climate change allowance.

For the proposed cabinets' locations, the existing level is 102.9mAOD. As the 1 in 100 year flood level plus 20% climate change is 103.5mAOD, the flood depth is 600mm. Hence the flood depletion volume for the cabinets is 0.6m*(3m*0.9m+2m*0.4m+2m*0.6m) = 2.82m^3. This is very minor compared to the flood storage created by lowering the proposed tramline level.

The proposed cabinets may be partly submerged during the 1 in 100 year flood event. During a 1 in 100 year flood level plus 50% climate change, if the flood level does reach the assumed 105.5mAOD, the cabinets would be completely submerged with a flood depletion volume of 5.6$m^{3.}$. This depletion volume is still minor compared to the flood storage being created and as such the flood storage for the cabinets has already been compensated by the alignment development. In order to avoid damage by floodwater, the equipment in the cabinets will be designed to be waterproof.

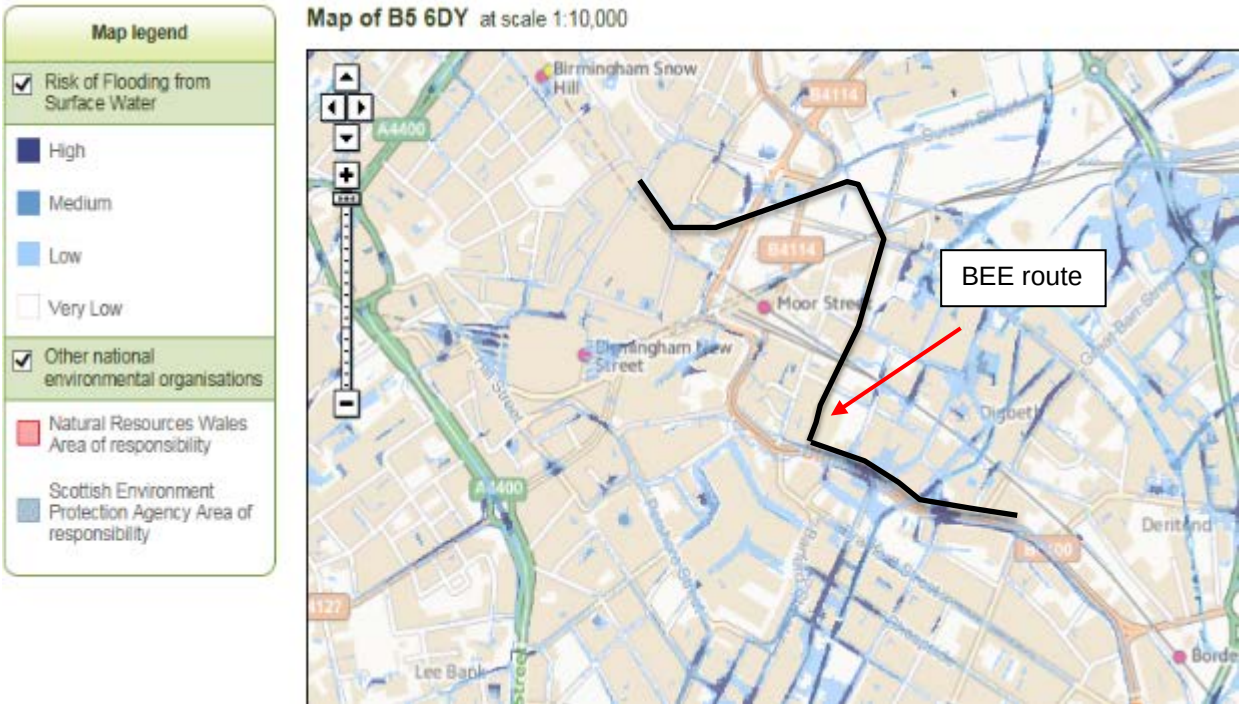
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3 Surface Water Runoff

3.1 Existing Surface Water Flood Risk

Figure 3.1 indicates the existing surface water flood risk and shows that the majority of the BEE is located within the area of low or very low risk of flooding from surface water. Some parts of the BEE route on High Street Deritend are within areas of high risk of flooding from surface water, this is due to the low levels of the road surface within these areas.

Figure 3.1: Surface water flood map



Source: EA, 2016

3.2 Additional Surface Water Flood Risk

As the BEE will run within a highly urbanised area with an existing high proportion of impermeable surface, the majority of the BEE will not cause additional surface water runoff.

The road layout in front of Hotel La Tour by Moor Street Queensway and Park Street will be changed significantly. The triangle of land in front of the hotel will be occupied by the BEE alignment, a new traffic lane and several bus stops. However this will not cause additional surface water runoff as the existing ground is impermeable. The alignment will be extended beyond Park Street into Eastside City Park. The pushed-back kerb lines and the alignment on the permeable amenity grassland will introduce additional paved area. The total impermeable area added, which includes the alignment and the pushed back kerb-line, on the amenity

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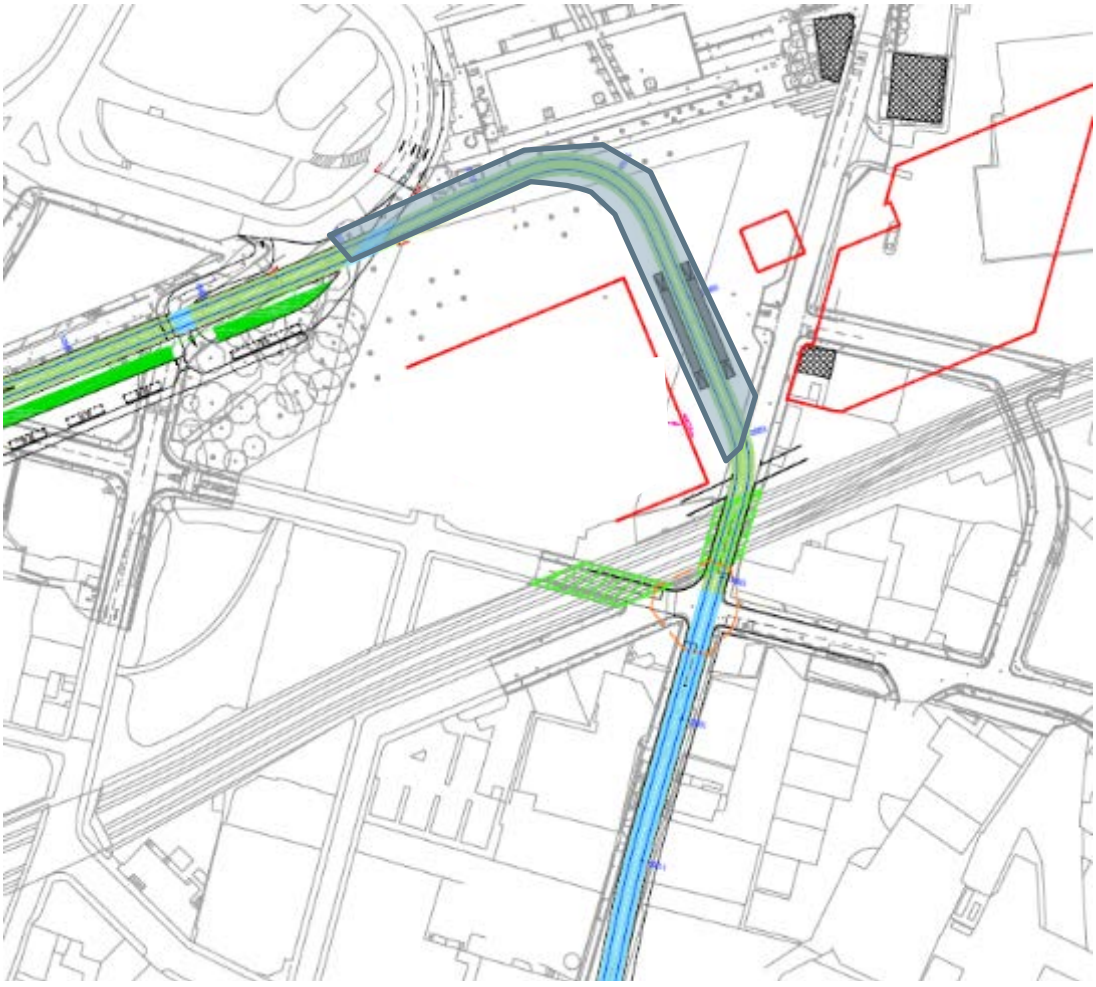
grassland associated with Eastside City Park is approximately 3580m^2 including a buffer zone of 2.5m on each side of the alignment, see Figure 3.2. In addition, there are two permeable landscaped borders proposed to the south of the alignment outside Hotel La Tour and bus stops with an area of 690m^2. The net increase in impermeable area within the Scheme Boundary is 2890m^2.

3.3 Mitigation to the Surface Water Flood Risk

As the additional paved area will be built on amenity grassland area associated with Eastside City Park (shown in Figure 3.2), the restriction on discharge flow rate will be based on Greenfield flow rate (Whitehouse, 2012) which is assumed to be 5 litre (l)/second(s)/hectare(ha) as agreed by the EA. As the additional paved area is less than one hectare and the lowest practical control limit from available attenuation facility in the market is 5l/s. A control rate of 5l/s is assumed as the discharging limit to the existing STW sewer system. The excess flow will need to be temporarily stored in a storage facility during heavy storm events to mitigate the risk of flooding from the additional surface water. Based on a preliminary estimation, the volume of the storage required is approximately 160m^3.

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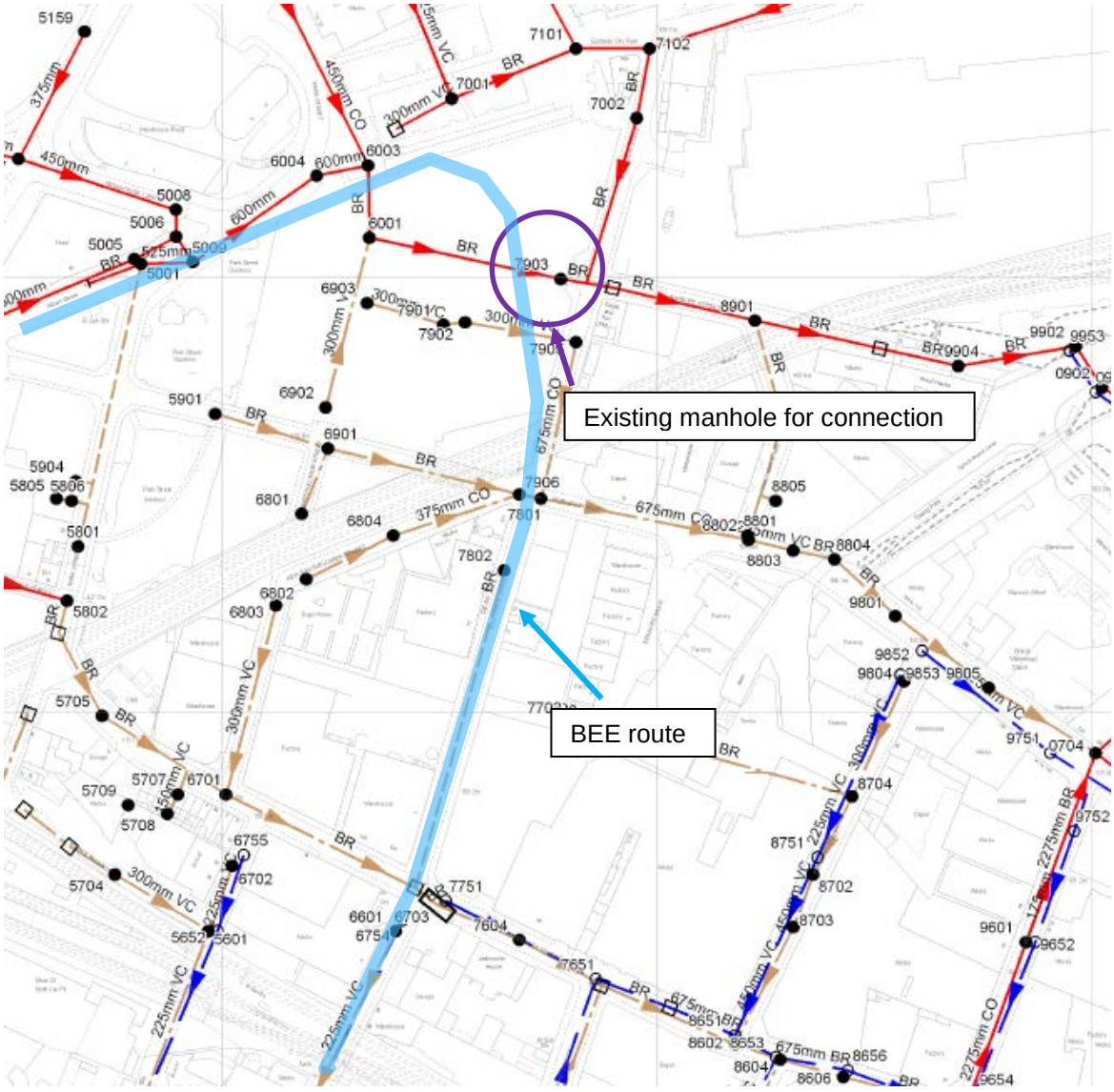
Figure 3.2: Additional impermeable surface on the greenfield – grey shaded area



As described in Chapter 5 - Drainage Strategy, the new BEE drainage system will still be discharged back to the STW system at various locations. For this area, the likely connection to the STW system would be via Manhole 7903 (see Figure 3.3 and Appendix G) subject to detailed design and agreement with STW. The storage facility will likely be in the form of an underground tank made of modular units potentially located underneath the platform of the New Canal Street Tram Stop or other areas that can facilitate future inspection and maintenance of the tank. The final location and form of the storage will be subject to detailed design.

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Figure 3.3: Sewer and Manhole Map for the Storage Tank location



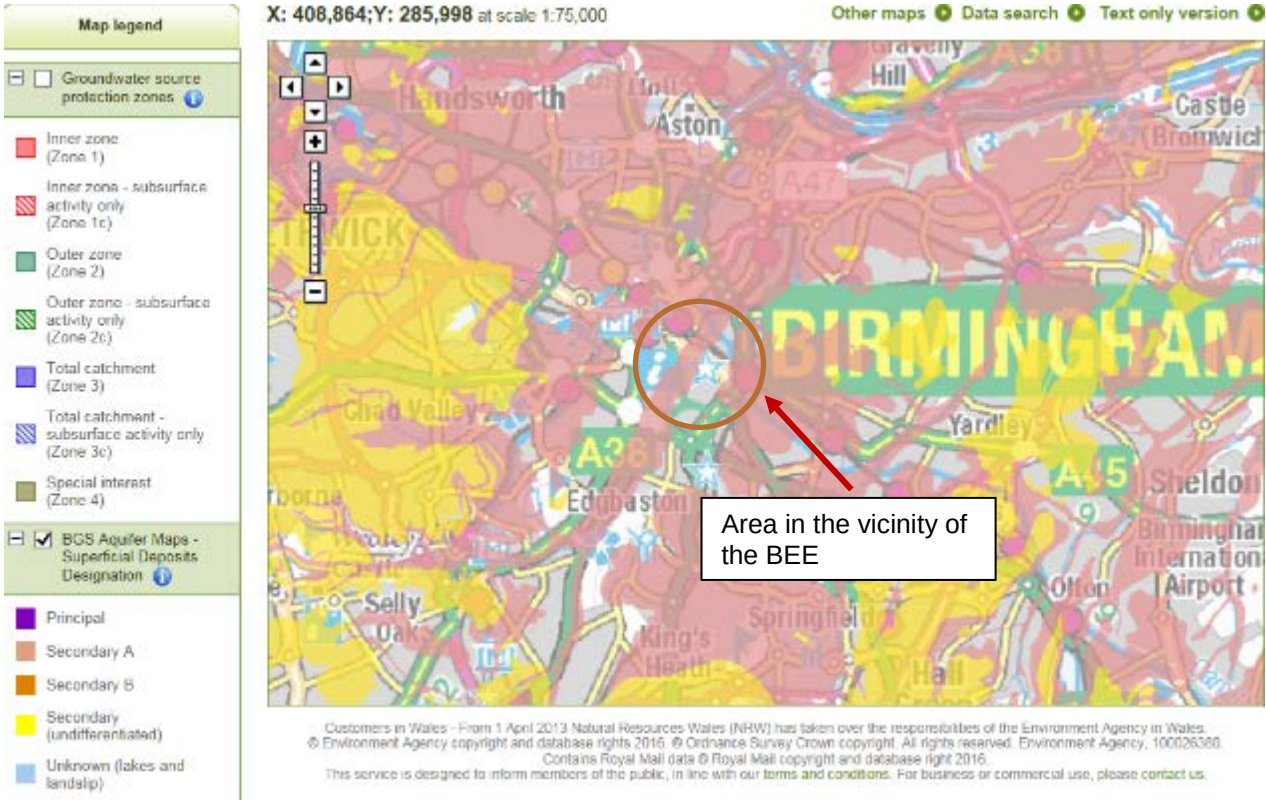
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4 Other Sources of Flood Risks

4.1 Flood Risk from Groundwater

Solid geology through the eastern half of the Scheme Boundary (Bromsgrove Sandstone Formation) is designated by the EA (EA, 2016) as being a Principal Aquifer, whilst solid geology through the western half of the Scheme Boundary (Mercia Mudstone Group) is designated as being a Secondary B Aquifer. All superficial deposits present on Scheme Boundary are designated as being Secondary A Aquifer as indicated in Figure 4.1.

Figure 4.1: BGS Aquifer Map: superficial deposit designation



Source: EA, 2016

Aquifer designation definitions are as follows:

- Principal Aquifer: layers of rock or drift deposits that have high intergranular and/or fracture permeability which usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale;
- Secondary A Aquifer: permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers; and

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- Secondary B Aquifer: predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

The EA mapping records Zone 1 Source Protection Zones immediately adjacent to the western end of the alignment at the junction of Bull Street and Corporation Street. The closest Zone 3 Source Protection Zone is approximately 200m to the west of this location, immediately to the northwest of St. Phillips Cathedral. The Source Protection Zones in the vicinity of the alignment are limited to areas underlain by solid geology of the Bromsgrove Sandstone Formation.

Groundwater monitoring data (Appendix H) has been retrieved from the BGS website (BGS, 2016) for borehole SP08NE2304, approximately 120m to the south of Adderly Street. This data highlights a significant increase in groundwater level between 1970 and 1982, and a reduced rising rate between 1982 and 1989. No groundwater level readings are available post 1989.

The highest groundwater level recorded at this borehole is approximately 98mAOD.The closest part of the BEE to this borehole is the tram turnback and layover facility which has a level of 104.2mAOD and is at the end of the tramline extension. The groundwater level increased by around 4 to 5m in 12 years' time from 1970. Due to the age of the available historical ground investigation data and the general trend in the rising groundwater level as recorded, there might be a potential risk of groundwater flooding in the future years to come. It is recommended that further monitoring of the groundwater level is to be carried out to evaluate the potential risk.

4.2 Flood Risk from Canals

The BEE does not cross the Digbeth Branch Canal, however, the start of the canal is located to the east of the alignment through New Canal Street.

Canals will potentially generate a higher flood risk when they are elevated relative to the surrounding ground. However, the levels of the Digbeth Branch Canal are lower than the surrounding ground and so it is unlikely to pose a notable flood risk to the Scheme Boundary. Therefore the flood risk to the BEE due to the canal is considered low.

4.3 Flood Risk from Reservoirs

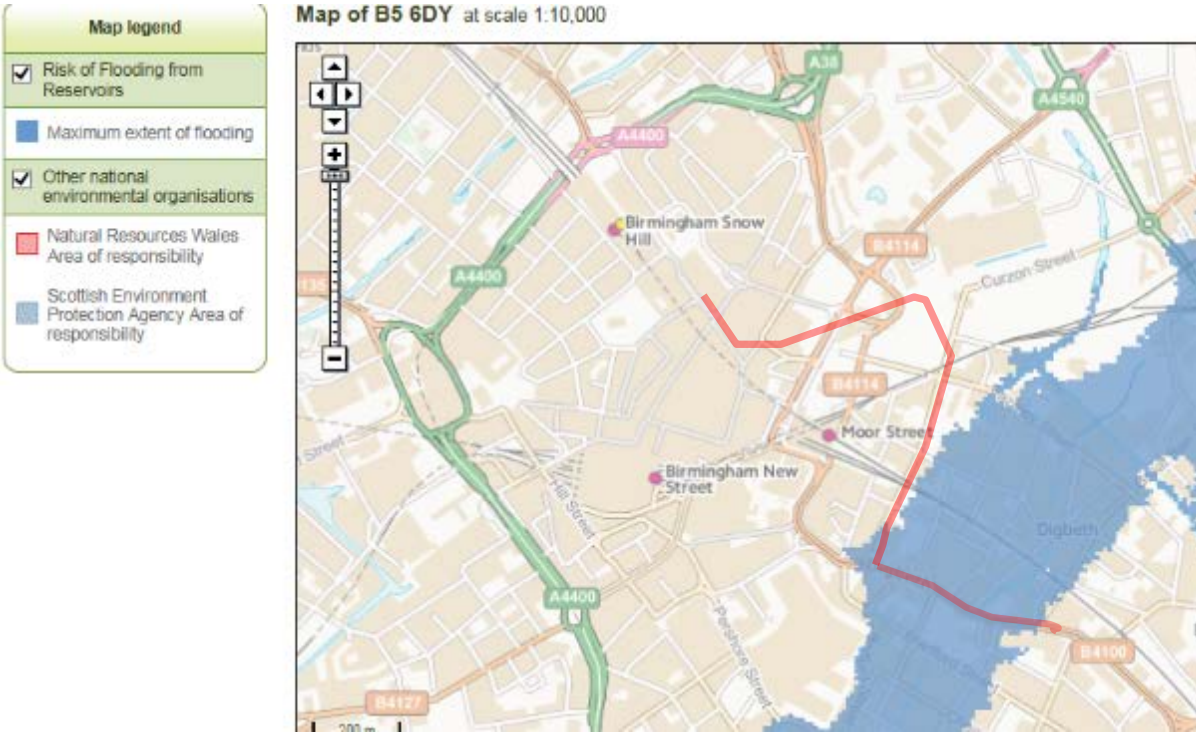
Figure 4.2 shows the maximum extent of flooding from nearby reservoirs as shown on the EA website (EA, 2016). There are four reservoirs nearby that may contribute to the risk of flooding to the BEE:

- Bartley;

- Northfield;
- Frankley Balancing Reservoir; and
- Frankley Raw Water.

For details of the reservoirs refer to Appendix I.

Figure 4.2: Map showing risk of flooding from reservoirs



Source: Environment Agency: Map showing Risk of Flooding from Reservoirs

The shading in blue on Figure 4.2 shows the area that could be flooded if the reservoirs were to fail and release the water they hold. As shown on Figure 4.2, the red line being the BEE route, the south end of Meriden Street and High Street Deritend would be flooded during a reservoir failure. The extent of the flood shows a similar extent to the flood zone map (Figure 2.1) due to the low ground level of this area.

However, it should be noted that reservoir flooding is extremely unlikely to happen and Figure 4.2 shows the worst case scenario.

http://pims01/pims/llisapi.dll?func=ll&objId=2093544175&objAction=browse&viewType=1

5 Drainage Strategy

5.1 Existing Drainage System

The sewer network in the vicinity of the BEE contains gravity combined sewer, foul sewer and surface water sewer, see Appendix J. From Bull Street to Park Street, the sewers are combined sewers with diameters varying between 375mm and 600mm and generally at 6.5m below ground. Foul sewers with diameters ranging from 225mm to 300mm are located from the park field to New Canal Street. There is a small section of foul sewer within the green field that has a diameter of 675mm. On Meriden Street, there are no combined sewers. Both foul sewer (brick construction) and surface water sewer (diameter 225mm) exist 3.5m below ground. Two surface water sewers are present one on each side of High Street Deritend with diameters varying from 375mm to 1050mm, 2.7m below ground. These continue to High Street Deritend and discharge into the River Rea. Three surface water sewers run along High Street Deritend from east to west with diameters increasing from 225mm to 375mm, 1.85m below ground and discharging into the River Rea. There is also a 750mm diameter combined sewer, 5.5-7m beneath the ground and crossing the River Rea, probably located below the river bed. This combined sewer starts at Stone Yard, crosses High Street Deritend and the River Rea, and turns right to Milk Street and continues further north.

5.2 Proposed Drainage System

The existing road alignments and configurations will be changed in order to create sufficient space for accommodating the alignment and leaving sufficient width and space for general traffic and pedestrians. Thus the existing kerb lines along the BEE route will be re-aligned accordingly. The existing kerb lines along Bull Street and High Street Deritend will be pushed back approximately 0.5m on each side of the road. New gullies will be provided and upgraded to the latest design standard. Kerb drains might be required at some locations if considered more appropriate.

From Bull Street to Albert Street, the existing STW combined sewer is at a significant depth below ground (6.5m) and it is impractical to connect the individual new gullies into it. Therefore, a new highway drain system will be designed to pick up the flow from the new gullies. On New Canal Street and the southern end of Meriden Street, there are no surface water sewers or combined sewers that the gullies can be connected to. Although there are surface water sewers at the beginning of Meriden Street, the depth of sewer is 3.5m below ground and it is impractical to connect the newly proposed gullies into it. Hence new highway drains will be designed along this part of the route to pick up the surface water flow from gullies. The proposed highway drain systems could be connected to the existing STW sewer at the existing manholes with locations to be confirmed in the detailed design. The connection locations and discharge flow rates will be subject to agreement with STW and will be secured through protective provisions with STW that form part of the draft Order (add cross reference). The new gullies on High Street Deritend could be connected to the existing STW surface water sewers as they are at a relatively shallower level.

The storage tank to control the discharge rate of the additional surface water generated by the increased impermeable area at the Park Street location will be located close to the manhole 7209 (invert level 104.0mAOD) in the existing green field. The flow will be discharged into the STW combined brick constructed sewers of unknown size. The location of the storage tank will be determined after consultation with STW and BCC and will be secured through protective provisions with STW that form part of the draft Order (add cross reference).

6 Conclusion

6.1 Fluvial Flood Risk

The current flood map indicates that majority of the BEE is within Flood Zone 1 – the area of lowest flood risk (less than 1 in 1000 annual probability of river flooding). The section of the BEE that runs through some sections of High Street Deritend is located in Flood Zone 2 and 3 – the area with the risk of having between a 1 in 100 and 1 in 1000 annual probability of river flooding in any year. It is understood that the current flood map has not taken climate change allowance into account. The flood zones will likely extend to cover Meriden Street and possibly New Canal Street if the latest 50% climate change allowance (within the Humber River Basin) is applied.

Although BEE lies partly in Flood Zone 2 and partly in Flood Zone 3, as it is classified as "Essential Infrastructure", according to the NPPF, it should be allowed to be within these high risk flood zone areas subject to passing the Exception Test.

Where the BEE runs through Flood Zone 2 and Flood Zone 3 (including the potential Meriden Street and New Canal Street areas), the alignment would not deplete any flood storage and instead would create additional flood storage as the average level of the tramline would be reduced compared to the existing level. Even taking into account the cabinets proposed within Flood Zone 2 and Flood Zone 3, there is still a considerable increase in flood storage volume. Thus there is no requirement to compensate for flood storage and no additional flood risk will be caused to adjacent properties and infrastructure.

The proposed substation is located within Flood Zone 1 according to the current available EA flood map, however it may situated within Flood Zone 2 or 3 if 50% climate change is applied. To avoid creating flood depletion within flood zones, the substation structure would be designed as an elevated structure retaining the void below the potential flood level.

The section of the tramline including the proposed stop(s) within the high risk flood area will cease to operate during flood events and a warning system will be provided for advising WMCA and tram users under this situation. The tramline infrastructure will also be designed with appropriate flood resilience measures. All these measures should enable the proposed tramline to pass the "Exception Test".

6.2 Climate Change Allowance

By comparing the flood data of 1 in 100 year and 1 in 100 year with 20% climate change, the 1 in 100 year with 50% climate change would potentially increase the Flood Zone 3 extent, and thus the BEE along New Canal Street and Meriden Street might be situated within it as well. However, it should make no difference to other mitigation measures. If the flood event did affect the section of the tramline along Meriden Street, this section of the tramline would also need to be suspended during the flood events. Correspondingly the stop at Meriden

1 http://pims01/pims/llisapi.dll?func=ll&objId=2093544175&objAction=browse&viewType=1

Street would also be designed with flood resilience measures. No flood storage depletion would occur along this section of the alignment as there is also a reduction in finish levels within the BEE corridor. Based on this, it is not considered that further modelling for assessing the 50% climate change is necessary for this project and the climate change of 20% can be adopted for projecting the 50% climate change for the assessment.

6.3 Surface Water Flood Risk

The majority of the BEE is located within highly urbanised areas and hence there will not be additional surface water generated. The BEE will cross amenity grassland associated with Eastside City Park near Park Street and create additional impermeable area. The corresponding additional surface water will be stored in a storage tank during storm events and discharged to the STW combined sewer at a control rate of 5l/s. The location of the storage tank is subject to consultation with STW and BCC during the detailed design stage.

6.4 Sewer Flood Risk

There are different surface water, combined and foul water sewers in the vicinity of the BEE. They are of different diameters, at different depths and of different construction. These sewers might be overloaded during storm events. STW have been consulted for the historical flooding records of these sewers and has confirmed that there were no records of sewer flooding in the vicinity of the BEE.

6.5 Canal and Service Reservoir Flood Risk

Flood risk from other sources (canal and reservoir failure) is low and will not cause any concern.

6.6 Groundwater Flood Risk

There might be a potential risk of groundwater flooding considering the trend of increase in groundwater level in the historical records. Hence it is recommended that further monitoring of the groundwater level is to be carried out to evaluate the potential risk.

6.7 Flood Risk Mitigation

Flood risk mitigation measures include:

- all tram facilities within high risk flood zone areas will be designed with appropriate flood resilience measures;
- vulnerable equipment inside substation and cabinets will be located above the flood risk level or made waterproof;
- tram operation will be suspended within high flood risk areas during flood events;

- flood sensor will be used to alert tram users before/during flood event to evacuate to safe areas; and
- tram operator will be informed and tram drivers will be trained to handle flood events and operate the trams safely during flooding.

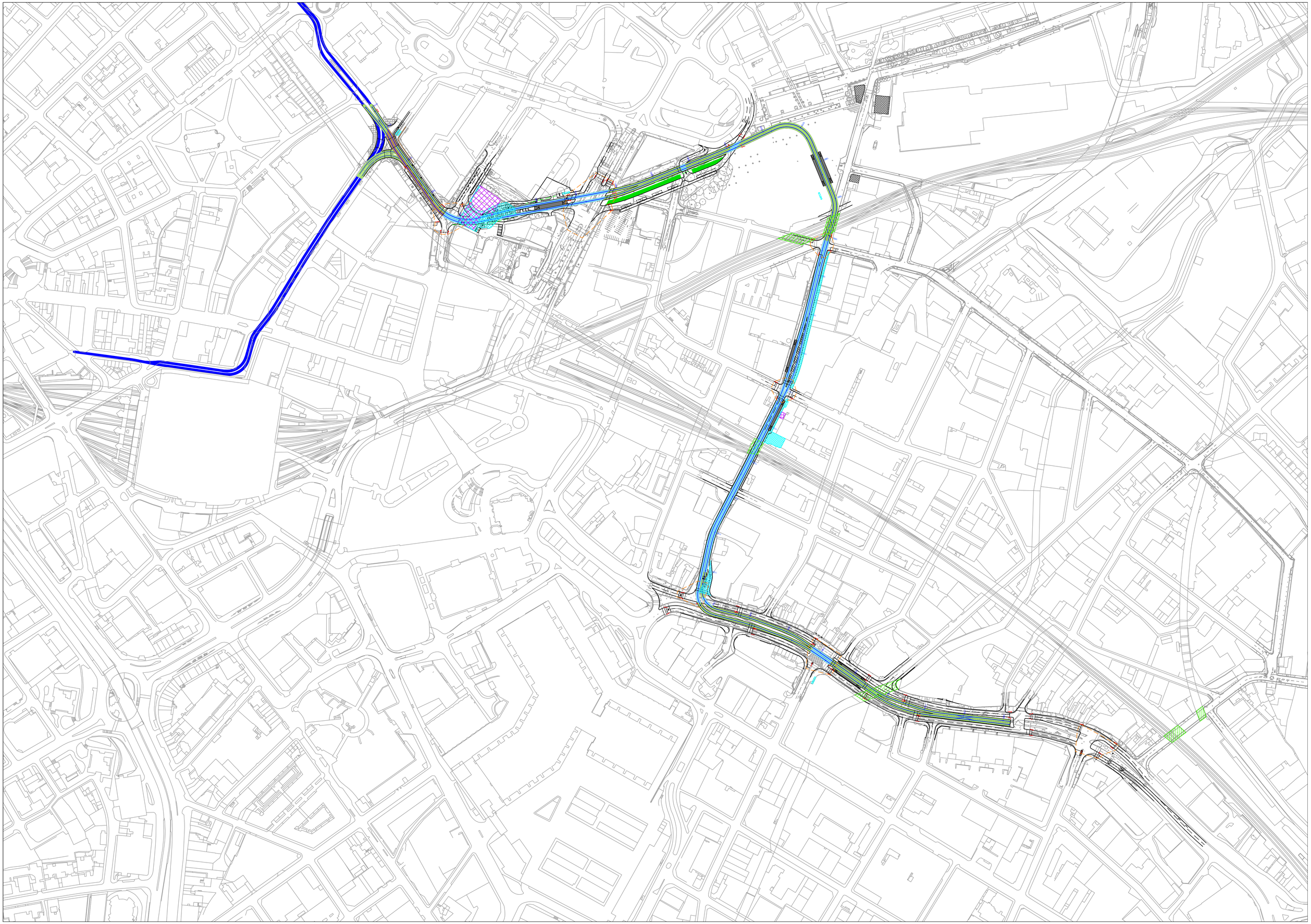
Subject to the implementation of the above mitigation measures and agreement with the EA, BCC and STW, that the BEE is considered acceptable based on drainage and flood risk consideration.

3 http://pims01/pims/llisapi.dll?func=ll&objId=2093544175&objAction=browse&viewType=1

Appendices

Appendix A. Birmingham Eastside Extension Alignment Plan

http://pims01/pims/llisapi.dll?func=ll&objId=2093544175&objAction=browse&viewType=1



Appendix B. Flood Zone Maps

http://pims01/pims/llisapi.dll?func=ll&objId=2093544175&objAction=browse&viewType=1

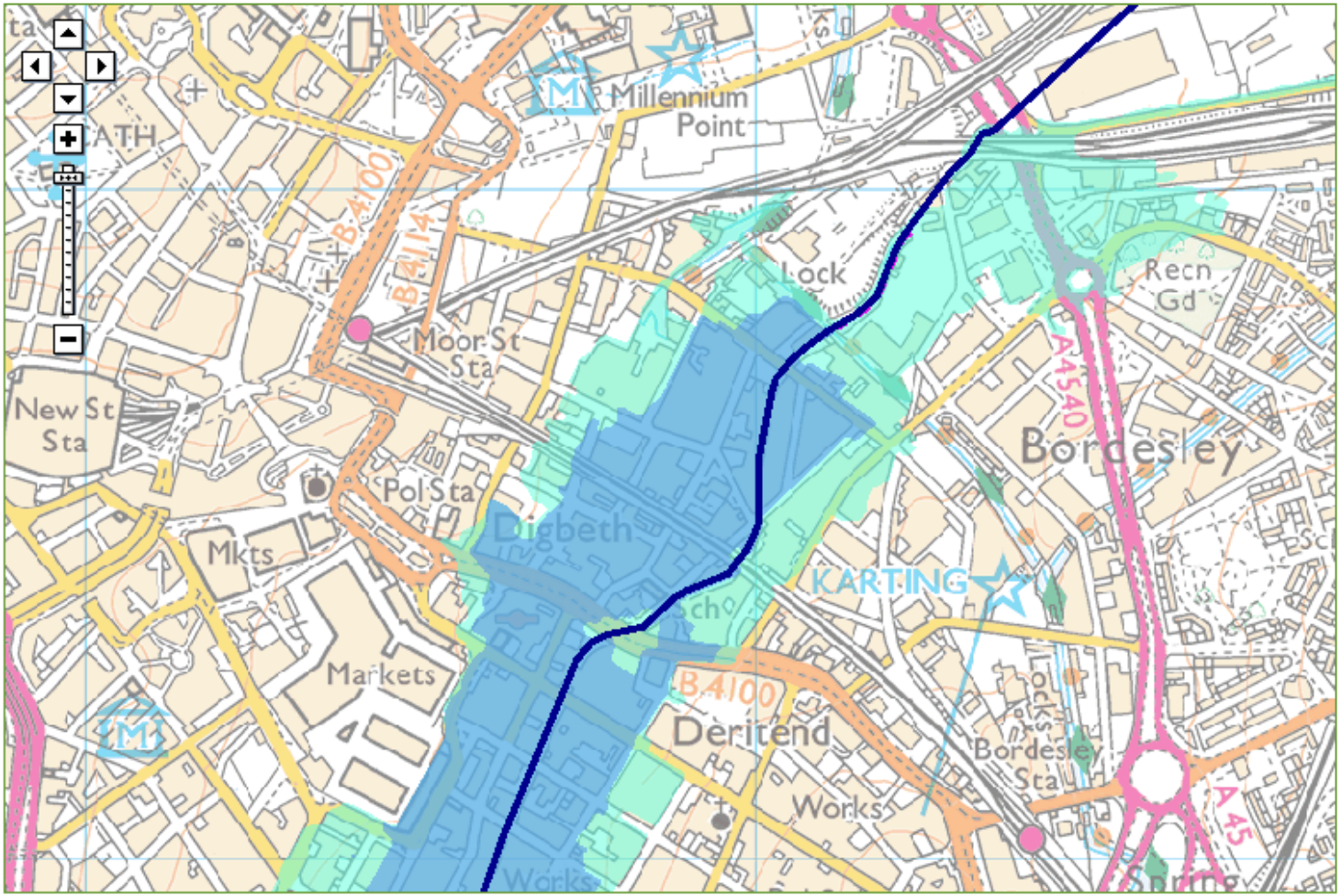
B4 7AA at scale 1:10,000

Other maps | Data search | Text only version

Map legend

Click on the map to see what Flood Zone (National Planning Policy Guidance definitions) the proposed development is in.

- [x] Flood Map for Planning (Rivers and Sea)
  - Flood Zone 3
  - Flood Zone 2
  - Flood defences (Not all may be shown*)
  - Areas benefiting from flood defences (Not all may be shown*)
- [x] Main River Line
  - Main River Line
- [x] Other national environmental organisations
  - Natural Resources Wales Area of responsibility
  - Scottish Environment Protection Agency Area of responsibility



Appendix C. Correspondence with the Environment Agency

MMD/300207/HS30/DOC/0000/1045/A July 2016

http://pims01/pims/llisapi.dll?func=ll&objId=2093544175&objAction=browse&viewType=1

Hi Mengshu,

I have been passed your e-mail below and asked to respond. We apologise for the delay in getting back to you.

Having reviewed the information submitted we would not consider that further modelling needs to be undertaken to assess the impact of the new 50% climate change allowance. However, this is only if there are to be no ground raising works whatsoever.

Obviously, if the new allowance was considered the extent and depth of flooding may increase. Nevertheless, if ground levels aren't being raised there will be no loss in floodplain storage as a result of this development and therefore no increase in flood risk elsewhere.

Where levels are being lowered, you may need to consider the impact on both fluvial and pluvial flood flow routes.

We agree with the need for some form or flood warning / evacuation plan. Thank you for confirming the track would be closed if / when flooding occurs.

You may also wish to speak to Birmingham City Council regarding any surface water drainage requirements.

Thanks,

John Dingley

From: He, Mengshu [mailto:Mengshu.He@mottmac.com]
Sent: 11 May 2016 16:15
To: SWWMcustomers
Cc: Chung, Terry; Meek, Lorna J; Searson, Christopher M; Pong, Rebecca
Subject: RE: Our Ref. 10156 - Eastside of Central Birmingham

Dear Diane,

Thank you for your reply and the provided flood levels.

Although the proposed tramline extension lies partly in Flood Zone 2 and partly in Flood Zone 3, as it should be classified as "Essential Infrastructure", according to the NPPF, it should be allowed to be within these high risk flood zone areas subject to passing the Exception Test.

Our assessment so far conducted suggests that with the average reduction in finish level compared to the existing level within the tramline corridor, there will be an increase in flood storage within both the Flood Zone 2 and 3 areas. The section of the tramline including the proposed stop within the high risk flood area will cease to operate during flood events and a warning system is being considered for advising the tram operator and users under this situation. The tramline infrastructure will also be designed with appropriate flood resilience measures. We believe it could pass the Exception Test.

On climate change allowance, for this area in the Humber Basin, the new recommendation is 50% for essential infrastructures in Flood Zone 3 area. Based on the provided flood levels at node point 9005 (at High Street Deritend),

1 in 100yr – 102.26
1 in 100yr + 20% cc – 103.7
1 in 1000yr – 104.24

it is likely that the flood level for 1 in 100yr + 50% will increase above 104 or even 105mAOD. Taking the worst situation, Flood Zone 3 might extend to Meriden Street. However, this should make no difference to the mitigation measures and only the length of the tramline that will be put into temporary suspension would be longer if the flood event did affect the section of the tramline along Meriden Street. No flood storage depletion would occur along this section of tramline corridor as there is also a reduction in finish levels within the tramline corridor. Based on this, we do not consider the further modelling for assessing the 50% climate change is necessary for this project.

The above will be elaborated in detail in the Flood Risk Assessment report but we would be grateful if you could provide your initial comment on this principle of assessment.

Thank you!
Kind Regards,

Mengshu He
MEng (Hons)
Graduate Civil Engineer

Mott MacDonald

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Consultants of the Decade
10TH ANNIVERSARY
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Mott MacDonald
GLOBAL CONSULTANT OF THE DECADE
2003-13

Dear Mengshu He

Please find attached our reply to your enquiry.

In addition we would be really grateful if you could spare five minutes to help us improve our service. Please click on the link below and fill in our survey – we use every piece of feedback we receive.

http://www.smartsurvey.co.uk/s/EnvironmentAgencyCustomerSurvey/?a=SWWM

Kind Regards

Diane Edwards

Customers & Engagement Officer

02030 252977 (Internal 52977)
swwmcustomers@environment-agency.gov.uk
Environment Agency, 9 Wellington Crescent, Fradley Park, Lichfield, Staffordshire, WS13 8RR

We do not inherit the earth from our ancestors, we borrow it from our children.

Dear Officer,

We are working on an Environmental Impact Assessment (EIA) for the Birmingham Eastside Extension of the tramline in the Birmingham town centre. Please see the attached plan for the proposed alignment of the tram route extension. The route of the extension is predominantly within Flood Zone 1, with some parts of the extension route on the South side crossing Zone 3 and Zone 2 adjacent to the River Rea. The closest post code for this route is B5 6DY. As requested in NPPF with such condition, we are preparing a Flood Risk Assessment (FRA) as part of the EIA.

We would like to request for the flood levels of the section of the River Rea (1 in 100yr, 1 in 100yr plus cc and 1 in 1000yr) within the attached plan area from you and any past flood events for this site.

We look forward to hearing from you.

Thank you very much!
Kind Regards

Mengshu He
MEng (Hons)
Graduate Civil Engineer

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GLOBAL CONSULTANT OF THE DECADE
2003-13

Mengshu He
35 Newhall Street
Birmingham
B3 3PU

Our Ref: 10156

Your Ref:

Date: 10 May 2016

Dear Mengshu He

Request for information:- Flood level data Eastside of Central Birmingham

Thank you for your enquiry which was received on 14 April.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Flood Risk

- Our published flood map which provides a general estimate of the **likelihood** of flooding across England & Wales, shows the site to lie partly within an area which may have an annual chance of flooding greater than or equal to 1% (i.e. a 1 in 100 chance) and partly in an area with annual chance of flooding of between 0.1% from rivers, ignoring the presence and effect of flood defences.

- **Flood Zone 3** is the high risk zone and is defined for mapping purposes by the Agency's Flood Zones. This refers to land where the indicative annual probability of flooding is **1 in 100 years** or less from river sources (i.e. it has a 1% or greater chance of flooding in any given year).

- ***Flood Zone 2*** *is the low to medium risk zone and is defined for mapping purposes by the Agency's Flood Zones. This refers to land where the indicative annual probability of flooding is between a 1 in 100 and* ***1 in 1000 years*** *from river flooding (1% -0.1%).*

Modelled Levels
The nearest main river is the River Rea.

There are modelled levels taken from the South Birmingham Hazard Mapping 2010 enclosed for the nearest node points to the site (see the Flood Map). However, please note that we are in the process of re-modelling and updating our modelling for this watercourse. We cannot at this stage provide a release date for the revised modelling which is imminent and is likely to be late summer if not sooner

and advise the levels provided may be subject to change. We would recommend that you keep in touch with us before submitting a Flood Risk Assessment to ensure that the flood levels are still valid.

Flood Defences
There are no Environment Agency flood defences affecting this site. You may wish to contact the Local Authority to obtain further information regarding localised flooding from drains, culverts and small watercourses

Flood Storage Areas
There are no flood storage areas affecting this site.

Record of Flooding
Following examination of our records of Historic Flooding (see explanation below) we have no record of flooding in the area. This does not mean that the area of the property / site has never flooded, only that we do not currently have records of flooding in this area.

You may also wish to contact your local authority or internal drainage board, to see if they have other relevant local flood information.

What are our records of Historic Flooding?

Our records of Historic Flooding show the extents of known flooding from rivers, the sea, and groundwater. It cannot show all the flooding that may ever have occurred – we can only show flooding where we have adequate records. So, just because an area of land is shown outside the extents of our recorded flooding does not mean it has never flooded. As more data on historic flooding comes to light, and as flood incidents occur, then we will record this where we have adequate information to do so.

Surface Water Flood Map
Managing the risk of flooding from surface water is the responsibility of Lead Local Flood Authorities. The 'risk of flooding from surface water' map has been produced by the Environment Agency on behalf of government, using information and input from Lead Local Flood Authorities.

It is not possible to say for certain what the flood risk is but we use the best information available to provide an indication so that people can make informed choices about living with or managing the risks. The information we supply does not provide an indicator of flood risk at an individual site level. Further information can be found on the Environment Agency's website,

http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=ufmfsw#x=357683&y=355134&scale=2

Climate Change

In the flood risk data supplied the allowance for climate change is based on the 1% annual probability flood including an additional 20% increase on peak flows to account for climate change impacts, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still

appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

Please refer to the Open Government Licence which explains the permitted use of this information.

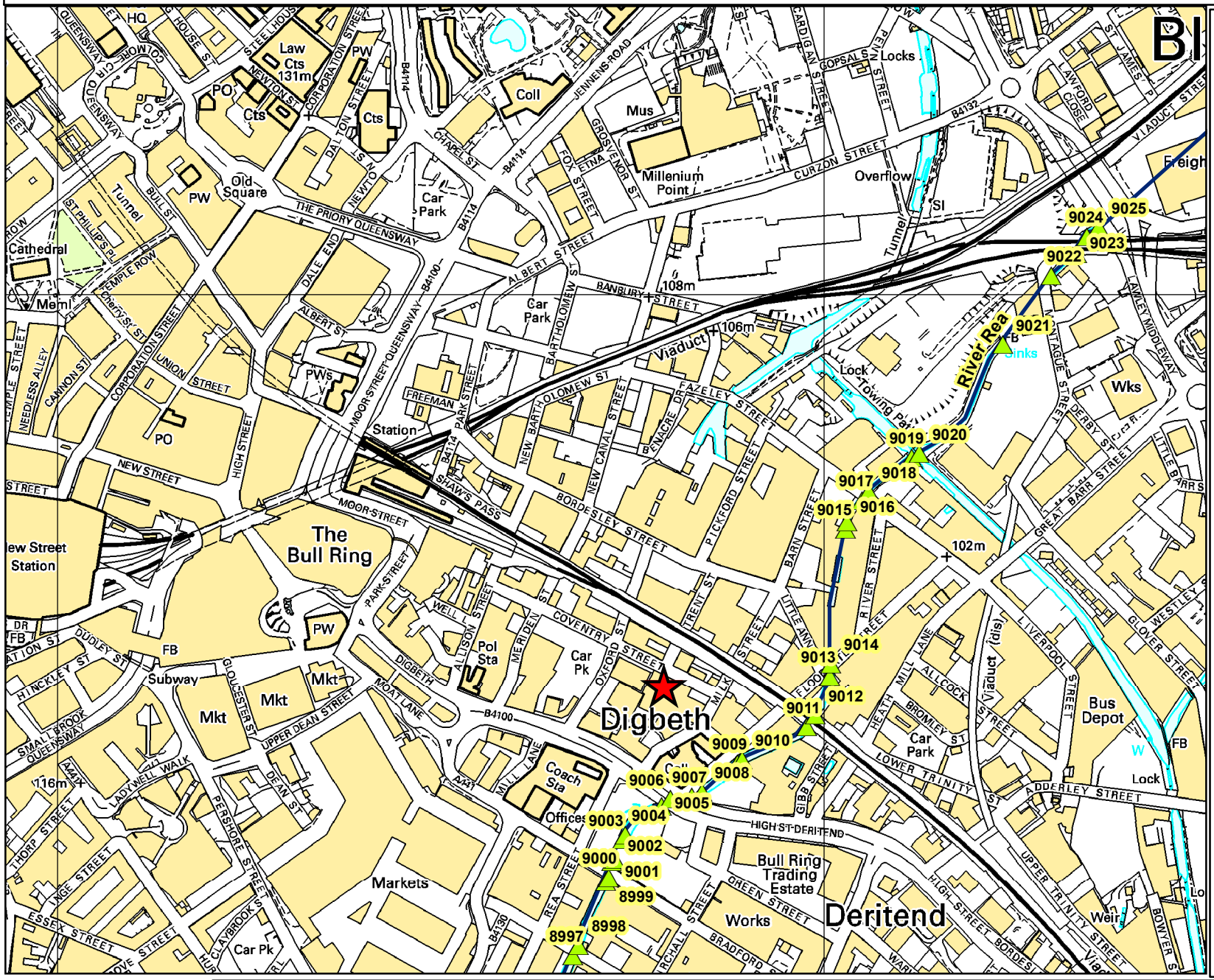
Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Yours sincerely

Diane Edwards
Customers & Engagement Officer
Staffordshire, Warwickshire & West Midlands

For further information please contact the Customers & Engagement team on
02030 253140 / 02030 252958 / 02030 252977
Direct e-mail:- SWWMcustomers@environment-agency.gov.uk

Node Point Map Centred on Digbeth. Ref. RFI 10156 Prepared 03 May 2016



Environment Agency

Legend

- Node Point
- Main Rivers
- Approximate area of interest

N W E S

Scale 1:10,000

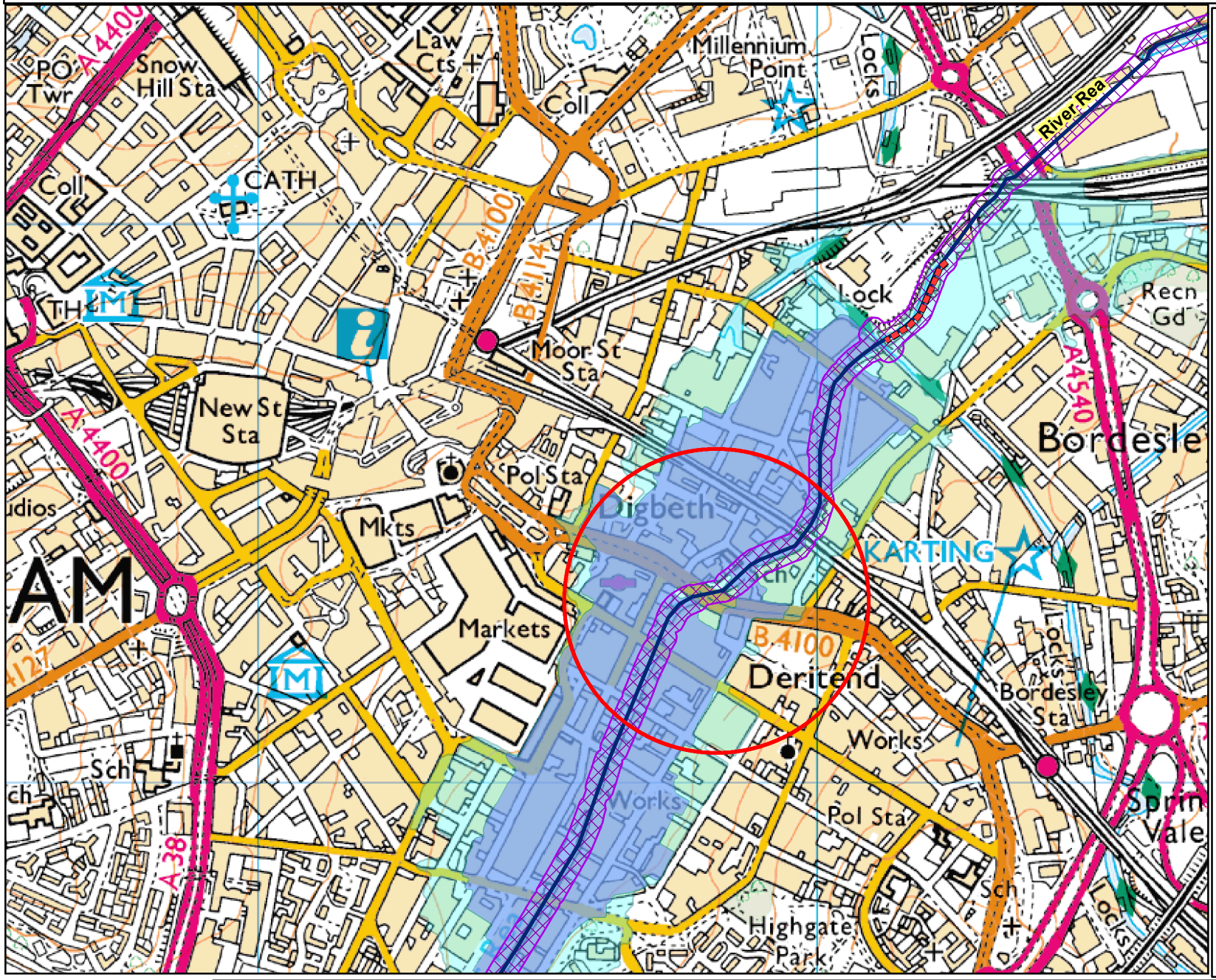
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Modelled Levels for River Rea

			Levels (mAOD) Return Period (yrs)												
			Undefended		Defended										
Ref	NodePoint (ea003_Model_)	Model	UD 1:100	UD 1:1000	1:5	1:10	1:20	1:50	1:75	1:100	1:100cc	1:200	1:1000	X	Y
8999	REA01_00149	South Birmingham Hazard Mapping 2010	103.58	104.98	100.15	100.38	100.57	102.59	103.21	103.65	104.55	104.51	104.93	407715	286234
9000	REA01_00150		103.16	104.86	100.15	100.38	100.57	102.3	102.81	103.25	104.39	104.34	104.81	407719	286239
9001	REA01_00151		103.16	104.82	100.06	100.3	100.53	102.43	102.81	103.25	104.35	104.3	104.77	407723	286259
9002	REA01_00152		102.54	104.53	100.06	100.3	100.53	101.71	102.22	102.65	104.01	103.95	104.48	407727	286263
9003	REA01_00153		102.60	104.53	100	100.3	100.62	101.78	102.28	102.71	104.02	103.96	104.49	407737	286288
9004	REA01_00154		102.09	104.28	100	100.3	100.62	101.28	101.8	102.22	103.71	103.65	104.23	407740	286295
9005	REA01_00155		102.13	104.3	100.09	100.46	100.76	101.38	101.85	102.26	103.7	103.64	104.24	407788	286332
9006	REA01_00156		102.13	104.21	100.09	100.46	100.76	101.38	101.85	102.17	103.56	103.5	104.15	407799	286341
9007	REA01_00157		102.13	104.2	100.04	100.43	100.73	101.36	101.84	102.16	103.56	103.49	104.15	407827	286345
9008	REA01_00158		102.13	104.12	100.04	100.43	100.73	101.36	101.84	102.16	103.43	103.36	104.07	407841	286351
9009	REA01_00159		102.06	104.07	99.81	100.24	100.57	101.26	101.77	102.1	103.38	103.31	104.02	407887	286388
9010	REA01_00160		102.06	103.95	99.81	100.24	100.57	101.26	101.77	102.1	103.22	103.15	103.89	407893	286393
9011	REA01_00161		101.94	103.97	99.42	99.74	100.08	101.03	101.63	101.99	103.19	103.12	103.91	407977	286436
9012	REA01_00162		101.94	103.87	99.42	99.74	100.08	101.03	101.63	101.99	103.01	102.93	103.79	407988	286451

9013	REA01_00163	South Birmingham Hazard Mapping 2010	101.99	103.91	99.34	99.83	100.2	101.14	101.68	102.03	103.06	102.98	103.84	408008	286501
9014	REA01_00164		101.49	103.79	99.32	99.78	100.05	100.81	101.21	101.55	102.76	102.66	103.71	408009	286518
9015	REA01_00165		101.33	103.76	98.93	99.47	99.72	100.61	101.05	101.38	102.61	102.49	103.67	408028	286693
9016	REA01_00166		100.48	103.45	98.93	99.46	99.72	100.08	100.26	100.54	101.87	101.67	103.41	408030	286703
9017	REA01_00167		100.56	103.41	99.04	99.59	99.86	100.23	100.34	100.6	101.79	101.63	103.37	408049	286731
9018	REA01_00168		100.23	103.1	99.02	99.5	99.72	99.98	100.08	100.28	101.12	100.95	103.05	408058	286742
9019	REA01_00169		100.43	102.94	99.27	99.74	99.97	100.24	100.28	100.47	101.2	101.06	102.9	408114	286787
9020	REA01_00170		99.86	101.65	98.94	99.23	99.45	99.74	99.76	99.89	100.4	100.3	101.57	408124	286792
9021	REA01_00171		99.39	101.23	98.51	98.78	99	99.28	99.29	99.41	99.93	99.82	101.15	408233	286934
9022	REA01_00172		99.00	100.44	98.13	98.39	98.61	98.9	98.9	99.03	99.39	99.35	100.42	408296	287024
9023	REA01_00173		98.89	100.4	97.87	98.2	98.45	98.76	98.78	98.91	99.29	99.25	100.37	408330	287053
9024	REA01_00174		98.89	100.4	97.87	98.2	98.45	98.76	98.78	98.91	99.29	99.25	100.37	408343	287075
9025	REA01_00175		98.82	100.23	97.91	98.19	98.42	98.7	98.72	98.85	99.2	99.17	100.21	408358	287087

Flood Map Centred on Digbeth. Ref. RFI 10156 Prepared 03 May 2016



Environment Agency

Legend

- Defences
- Main Rivers
- Bank Top ePlanning Tool
- Flood Zone 3
- Flood Zone 2
- Approximate area of interest

N W E S

Scale 1:10,000

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From: Ross, Martin [mailto:martin.ross@environment-agency.gov.uk]
Sent: 31 August 2016 10:10
To: He, Mengshu <Mengshu.He@mottmac.com>
Subject: RE: Our Ref. 12369 (Reply due: 23 May) - Eastside of Central Birmingham (update on the substation loctaion)

Good Morning,

The proposals for the substation are minor in nature and will not affect the floodplain in any case if elevated above the future climate change level. Therefore, we have no further requirement for work to be undertaken at this stage.

Regards,

Martin

Martin Ross
Planning Specialist
Sustainable Places
Staffordshire, Warwickshire and West Midlands

01543 405047 (Internal 722 – 5047)
martin.ross@environment-agency.gov.uk
Environment Agency, 9 Wellington Crescent, Fradley Park, Lichfield, Staffordshire, WS13 8RR

From: Dingley, John
Sent: 25 August 2016 14:38
To: Ross, Martin <martin.ross@environment-agency.gov.uk>
Subject: FW: Our Ref. 12369 (Reply due: 23 May) - Eastside of Central Birmingham (update on the substation loctaion)

From: He, Mengshu [mailto:Mengshu.He@mottmac.com]
Sent: 24 August 2016 11:42
To: Dingley, John <john.dingley@environment-agency.gov.uk>
Cc: Chung, Terry <Terry.Chung@mottmac.com>
Subject: FW: Our Ref. 12369 (Reply due: 23 May) - Eastside of Central Birmingham (update on the substation loctaion)

Hi John,

Further to our email correspondence below, I am giving an update that the substation location has been changed to the attached location. It has been relocated further north on Meriden Street and

closer to the edge of Flood Zone 2 and 3. The design principle for the substation has remained the same as stated in the previous email.

We are looking forward to your comment and any feedback.
Thanks
Kind Regards,
Mengshu

Mengshu He
MEng (Hons)
Graduate Civil Engineer

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Consultants of the Decade
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2003-13

From: He, Mengshu
Sent: 19 August 2016 09:39
To: 'Dingley, John' <john.dingley@environment-agency.gov.uk>
Cc: Chung, Terry <Terry.Chung@mottmac.com>
Subject: RE: Our Ref. 12369 (Reply due: 23 May) - Eastside of Central Birmingham

Hi John,

Good Morning, hope I find you well!

Further to our email correspondence below, there are some changes made on the BEE scheme. One of them is the relocation of the proposed substation in Meriden Street to a piece of land where at present is an open car park. The attached sketch shows the new proposed location for the substation in relation with the existing projected Flood Zones. The site is just outside Flood Zone 2 and Flood Zone 3.

Understanding that with a climate change allowance of 50%, the existing Flood Zone 2 and Flood Zone 3 may be extended and could cover the proposed substation location. To deal with this uncertainty, we propose to make provision in the future design of the substation that the structure

will be elevated above the projected flood level retaining the void below as flood storage should the future flood mapping show that the site is within Flood Zone 3.

We would be grateful if you could advise if this approach is acceptable to you to handle this uncertainty without the requirement of carrying out any flood modelling at this stage.

Kind Regards,
Mengshu

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Appendix D. Correspondence with Severn Trent Water

MMD/300207/HS30/DOC/0000/1045/A July 2016
http://pims01/pims/llisapi.dll?func=ll&objId=2093544175&objAction=browse&viewType=1

Mengshu

Further to your email below with the list of road names in Birmingham.

I can confirm there is currently no recorded of any incidents or the identification of any risk of hydraulic flooding in these areas.

Disclaimer - If an area has experienced flooding within the last 3 months it may not have appeared on the flooding risk register yet due to ongoing investigation.

Paul Baisden
Flooding Technician
Flooding Performance Team
paul.baisden@severntrent.co.uk
Mobile - 07810 154824
Office - 01902 793756

From: He, Mengshu [mailto:Mengshu.He@mottmac.com]
Sent: 24 May 2016 10:56
To: Baisden, Paul <Paul.Baisden@severntrent.co.uk>
Cc: Chung, Terry <Terry.Chung@mottmac.com>
Subject: RE: Historical records of sewer flooding for Birmingham Eastside Extension

Dear Paul,

Thank you very much for providing us the information!

We would be very grateful if you could further look into the sewer flooding records for the following roads/area:

- Bull Street
- The end of Albert Street
- Queensway
- Park Street
- The Garden area between Park Street and New Canal Street
- New Canal Street
- Meriden Street
- Digbeth
- High Street Deritend

Thank you very much!
Kind Regards,

Mengshu He
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Graduate Civil Engineer

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From: Baisden, Paul [mailto:Paul.Baisden@severntrent.co.uk]
Sent: 24 May 2016 10:46
To: He, Mengshu <Mengshu.He@mottmac.com>
Cc: Chung, Terry <Terry.Chung@mottmac.com>
Subject: RE: Historical records of sewer flooding for Birmingham Eastside Extension

Mengshu

I have checked the risk of flooding register for the post code B5 6DY and have found there is no recorded incidents or the risk of of hydraulic flooding in this area.
However if you require to look at further areas could you please supply a list of post codes or road names.

Paul Baisden
Flooding Technician
Flooding Performance Team
paul.baisden@severntrent.co.uk
Mobile - 07810 154824
Office - 01902 793756

From: He, Mengshu [mailto:Mengshu.He@mottmac.com]
Sent: 24 May 2016 10:39
To: Baisden, Paul <Paul.Baisden@severntrent.co.uk>
Cc: Chung, Terry <Terry.Chung@mottmac.com>
Subject: FW: Historical records of sewer flooding for Birmingham Eastside Extension

Dear Paul,

Good Morning!

We have sent an email on 19th of April requesting for the sewer flooding records for the central Birmingham area where Eastside Extension of the tramline is proposed. Please find the attached email for more information.

For us to assess the potential flood risk associated with sewer flooding, I would be grateful if you could provide us with any historical records of sewer flooding in the vicinity of the proposed route.

If you need any further information on this scheme, please let us know.

We look forward to hearing from you.

Thank you very much!
Kind Regards,
Mengshu He

From: He, Mengshu
Sent: 19 April 2016 09:53
To: 'net.dev.west@severntrent.co.uk' <net.dev.west@severntrent.co.uk>
Cc: Chung, Terry <Terry.Chung@mottmac.com>
Subject: Historical records of sewer flooding for Birmingham Eastside Extension

Dear Officer,

We are working on an Environmental Impact Assessment (EIA) for the Birmingham Eastside Extension of the tramline in the Birmingham town centre. Please see the attached plan for the proposed alignment of the tram route extension. Birmingham New Street Station (as annotated on the sketch) is located to the west of the proposed route extension. The closest post code for this route is B5 6DY. The proposed extension is going through a heavily urbanised area which according to the sewer records contains a mixture of foul, surface water and combined sewers. For us to assess the potential flood risk associated with sewer flooding, I would be grateful if you could provide us with any historical records of sewer flooding in the vicinity of the proposed route.

If you need any further information on this scheme, please let us know.

We look forward to hearing from you.

Thank you very much!
Kind Regards,

Mengshu He
MEng (Hons)
Graduate Civil Engineer

Mott MacDonald

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Appendix E. Correspondence with the Canal & Rivers Trust

2 MMD/300207/HS30/DOC/0000/1045/A July 2016
9 http://pims01/pims/llisapi.dll?func=ll&objId=2093544175&objAction=browse&viewType=1

From: He, Mengshu
Sent: 04 May 2016 10:01
To: 'enquiries.westmidlands@canalrivertrust.org.uk' <enquiries.westmidlands@canalrivertrust.org.uk>
Subject: Birmingham Eastside Extension Canal Network Queries

Good Morning,

We are working on an Environmental Impact Assessment (EIA) for the Birmingham Eastside Extension of the tramline in the Birmingham town centre. Tom Roberts, who is my colleague, has sent you an email regarding to the WebTAG stage 2 appraisal in January of last year 2015 when there were two options for the extension of the route, in the email attached.

We have finalised the route choice this year, please see the attached plan for the proposed alignment of the tram route extension. Birmingham New Street Station (as annotated on the sketch) is located to the west of the proposed route extension. The closest post code for this route is B5 6DY. The proposed extension is going through Meriden Street which is very close to the end of the Digbeth Branch Canal. I would be grateful if you could provide us any comments on the proposed route with regard to the Canal.

If you need any further information on this scheme, please let us know.

We look forward to hearing from you.

Thank you very much!
Kind Regards,

Mengshu He
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10TH ANNIVERSARY
Mott MacDonald
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2003-13

From: Roberts, Tom
Sent: 07 January 2015 12:21
To: 'enquiries.westmidlands@canalrivertrust.org.uk' <enquiries.westmidlands@canalrivertrust.org.uk>
Cc: Chung, Terry <terry.chung@mottmac.com>; Downes, William A (William.Downes@mottmac.com) <William.Downes@mottmac.com>; Searson, Christopher M <chris.searson@mottmac.com>
Subject: Birmingham Eastside Extension Canal Network Queries

Good Afternoon,

I am currently undertaking a WebTAG Stage 2 appraisal on behalf of Centro for the Birmingham Eastside Extension, a new Metro line that is proposed to run from Adderley Street to Corporation Street. There are currently two proposed routes, known as the Fazeley Street Option and the High Street Deritend Option (please see the plan attached). I wanted to ask if there are any comments you wished to make with regard to the canal network in the area.

High Street Deritend Option

This option will not cross over the canal network.

Fazeley Street Route Option

Starting from the East of the route, this option runs parallel to the Grand Union Canal Digbeth branch at an approximate distance of 50m before crossing at the Typhoo basin.

Any surface runoff produced from addition paved areas along the scheme will be drained to BCC highway/STW sewers and discharged into the River Rea, therefore it is envisaged that no additional flows will enter the canal network following the construction of the scheme.

If you wish to discuss this further please do feel free to give me a call.

Many thanks,

Tom Roberts MEng (Hons)
Graduate Civil Engineer

Mott MacDonald

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Canal & River Trust

30th August 2016

Mengshu He
Mott MacDonald
35 Newhall Street
Birmingham
United Kingdom
B3 3PU

Our Ref WZ-002 / MW 30/8/16
Your Ref

Dear Mengshu

RE: FLOOD RISK ASSESSMENTS WZ-002 BIRMINGHAM EASTSIDE EXTENSION

Further to your e-mail dated 22nd August I have checked our records and spoken to the Supervisor responsible for this stretch of waterway and I can confirm the following:

- The Canal & River Trust is not aware of any records of overtopping of this section of the waterway.
- On 13/08/1989 there was a structural failure of a pump shaft at Bowyer Street pump at location E 408423, N 286421 that led to flows from the canal through the shaft lining. The outflow was controlled by the embankment geometry.

For further advice on flood risk assessments I have included some generic guidance (see appendix A).

Please note that the Canal & River Trust is unable to comment on the flood risk to individual properties or developments and interpretation of the information provided in this letter is your responsibility.

I trust this is satisfactory, however if you do require any further information please do not hesitate to contact me.

Yours sincerely

Mr Michael Wheeler B.Eng(Hons) I.Eng ACIWEM
Water Engineer (South)

London Waterways
Canal & River Trust Docklands 420 Manchester Road London E14 9ST
T 0303 040 4040 **E** enquiries.london@canalrivertrust.org.uk www.canalrivertrust.org.uk
Patron: H.R.H. The Prince of Wales. Canal & River Trust, a charitable company limited by guarantee registered in England and Wales with company number 7807276 and registered charity number 1146792, registered office address First Floor North, Station House, 500 Elder Gate, Milton Keynes MK9 1BB

Appendix A - **Guidance Note for Flood Risk Assessments**

The main incidents of uncontrolled loss of water from our waterways are overtopping and breaching as a result of inundation from adjacent water courses, vandalism or structural failure.

Canal & River Trust maintains water levels using reservoirs, feeders and boreholes, and thereafter manages the water by transferring it within the canal system. The level of the water in canals is normally determined predominantly by the level and size of weirs. Water levels in river navigations are affected by the flow in the river and will fluctuate more widely than canals.

When surface water enters our waterways, the level of the water rises. Eventually the water level will reach a point where it discharges from our waterways through control structures. Where the capacity of these control structures is exceeded, overtopping may result.

Breaches which may lead to flooding can occur on our waterways. There can be a number of causes for these including: culvert collapse, animal burrowing and overtopping. Canal & River Trust operates a comprehensive asset management system which enables us to manage the risks of such events occurring.

Breaches occur on average at a rate of three per year over the whole of the Canal & River Trust owned canal network (that's over 2,000 miles of canal).

Appendix F. Proposed Substation Location shown on EA Flood Map

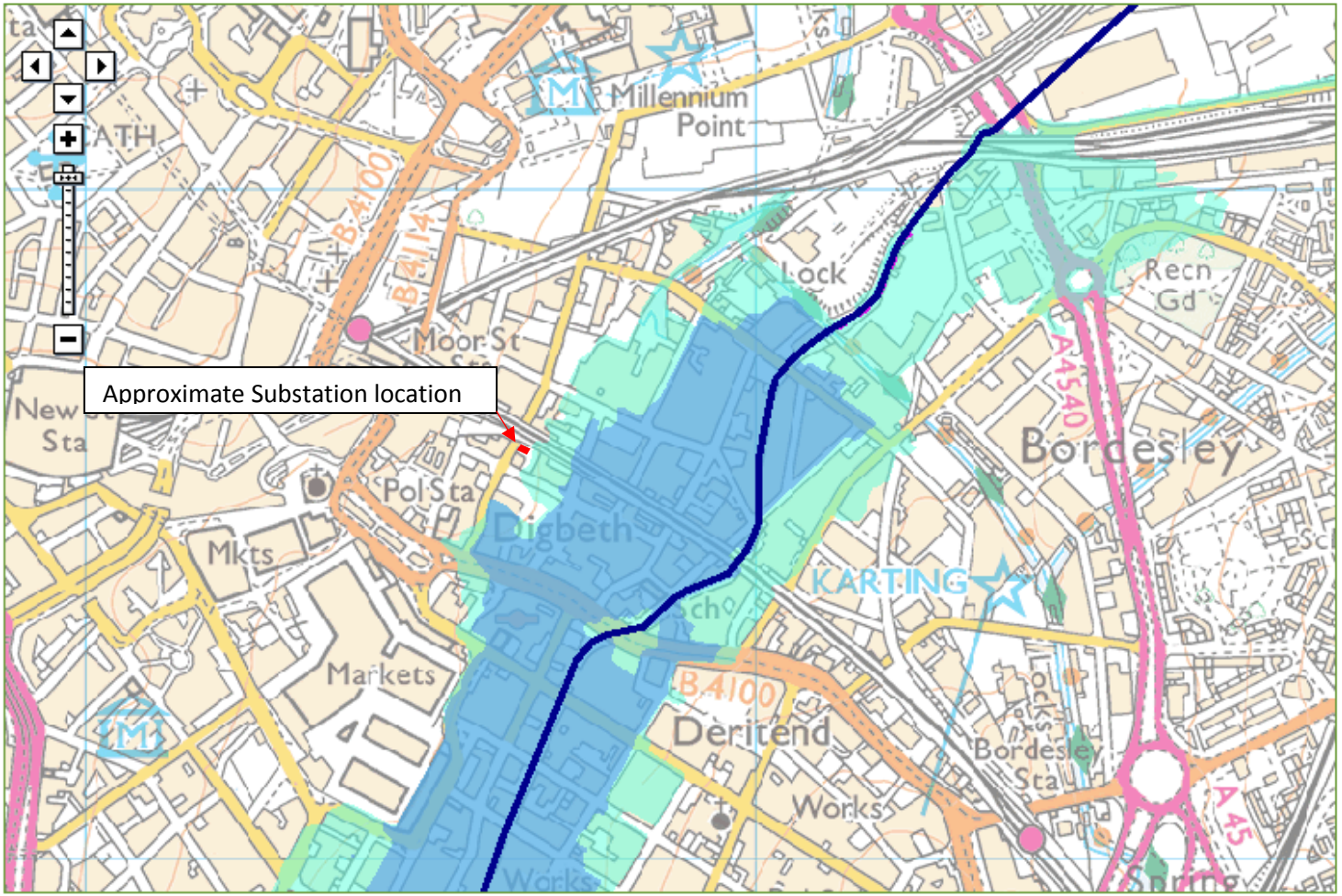
B4 7AA at scale 1:10,000

Other maps | Data search | Text only version

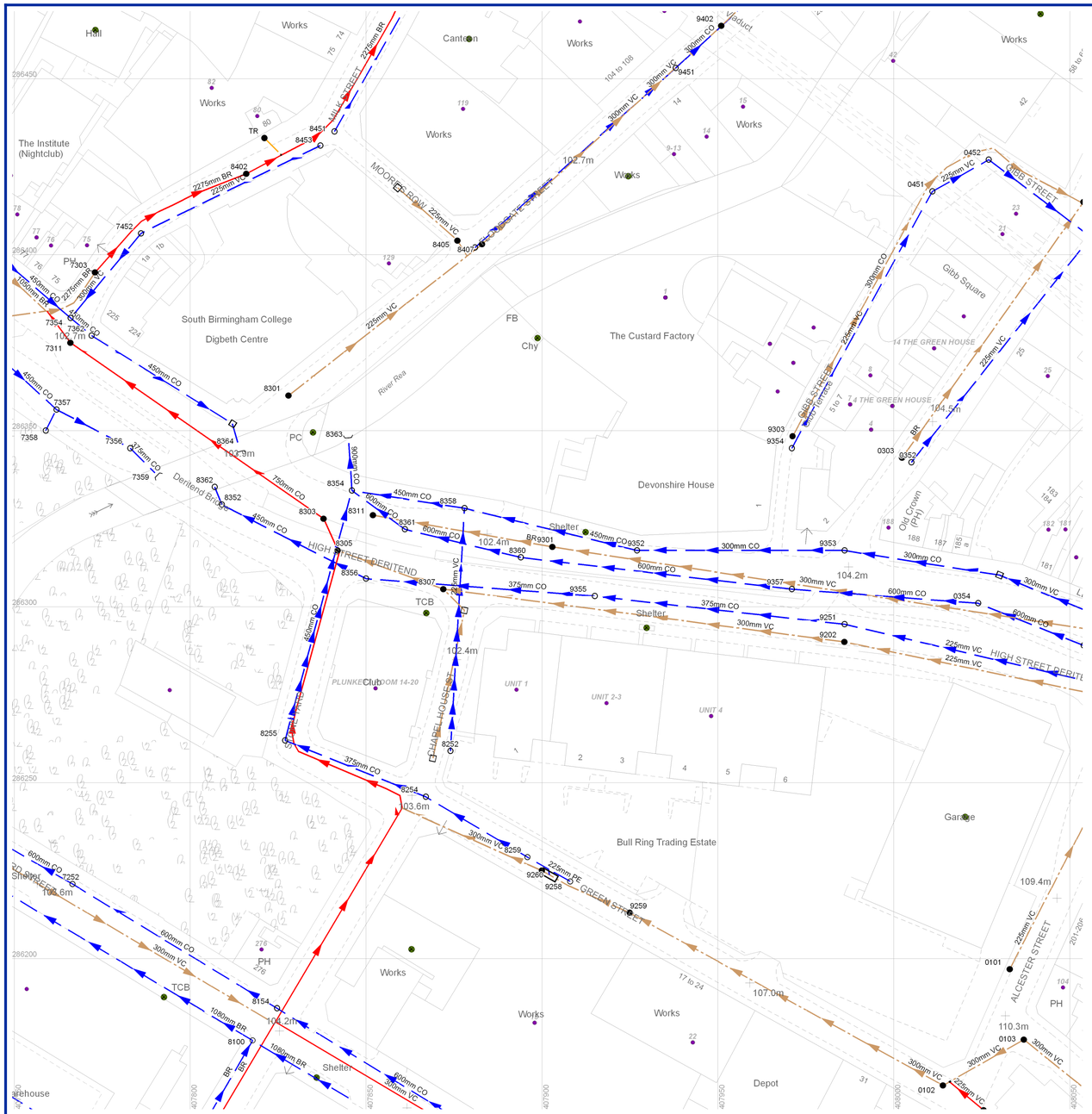
Map legend

Click on the map to see what Flood Zone (National Planning Policy Guidance definitions) the proposed development is in.

- [x] Flood Map for Planning (Rivers and Sea)
  - Flood Zone 3
  - Flood Zone 2
  - Flood defences (Not all may be shown*)
  - Areas benefiting from flood defences (Not all may be shown*)
- [x] Main River Line
  - Main River Line
- [x] Other national environmental organisations
  - Natural Resources Wales Area of responsibility
  - Scottish Environment Protection Agency Area of responsibility



Appendix G. Severn Trent Water Manhole Schedule



Sewer Node Data

REFERENCE	COVER LEVEL	INV LEVEL UPSTR	INV LEVEL DOWNSTR	PURP	MATL	SHAPE	MAX SIZE	MIN SIZE	GRADIENT	YEAR LAID
SP07867252	nil	nil	100.55	S	CO	C	600	nil	0.00	nill
SP07867303	102.72	96.68	96.66	C	BR	C	2275	nil	2619.00	nill
SP07867311	nil	nil	nil	C	CO	C	750	nil	0.00	nill
SP07867354	102.78	100.24	100.24	S	CO	C	450	nil	0.00	nill
SP07867356	103.85	99.25	nil	S	CO	C	375	nil	0.00	nill
SP07867357	nil	nil	99.29	S	CO	C	450	nil	0.00	nill
SP07867358	nil	nil	nil	S	VC	C	150	nil	0.00	nill
SP07867362	102.85	100.23	100.14	S	CO	C	450	nil	524.11	nill
SP07867452	nil	nil	100.28	S	VC	C	300	nil	0.00	nill
SP07868100	nil	nil	nil	S	BR	C	1080	nil	0.00	nill
SP07868154	104.30	102.22	nil	S	CO	C	600	nil	0.00	nill
SP07868252	nil	nil	100.97	S	VC	C	225	nil	0.00	nill
SP07868254	103.56	101.41	101.10	S	CO	C	375	nil	138.97	nill
SP07868255	103.19	101.09	100.54	S	CO	C	450	nil	133.64	nill
SP07868258	104.34	101.16	nil	F	VC	C	300	nil	0.43	nill
SP07868259	104.28	101.66	101.41	S	nil	C	nil	nil	137.02	nill
SP07868301	103.80	100.76	99.72	F	VC	C	225	nil	67.13	nill
SP07868303	104.34	96.97	nil	C	CO	C	750	nil	0.00	nill
SP07868305	103.48	97.96	97.17	C	CO	C	600	nil	12.47	nill
SP07868307	103.24	98.91	98.06	F	VC	C	300	nil	37.59	nill
SP07868352	103.93	99.49	nil	S	CO	C	450	nil	0.00	nill
SP07868354	103.51	100.52	nil	S	CO	C	900	nil	0.00	nill
SP07868356	103.27	99.78	99.56	S	CO	C	450	nil	209.41	nill
SP07868358	102.49	100.87	100.52	S	CO	C	450	nil	92.54	nill
SP07868360	102.52	100.93	100.74	S	CO	C	600	nil	178.74	nill
SP07868361	103.49	100.73	100.55	S	CO	C	600	nil	103.33	nill
SP07868402	102.99	96.65	96.46	C	BR	C	2275	nil	402.26	nill
SP07868405	nil	nil	nil	F	VC	C	225	nil	0.00	nill
SP07868407	102.87	99.71	98.78	F	VC	C	300	nil	98.95	nill
SP07868451	103.11	101.10	100.58	S	VC	C	225	nil	88.73	nill
SP07868453	103.07	101.12	nil	S	VC	C	225	nil	0.00	nill
SP07868456	102.91	101.09	100.40	S	VC	C	300	nil	110.86	nill
SP07869202	104.46	101.16	98.93	F	VC	C	300	nil	51.56	nill
SP07869251	104.52	101.75	100.26	S	CO	C	375	nil	47.95	nill
SP07869258	104.64	101.76	101.68	S	PE	C	225	nil	83.50	2008
SP07869259	105.24	101.70	101.38	F	CO	C	525	nil	178.81	2008
SP07869301	102.44	98.47	98.16	F	BR	E	1050	750	167.06	nill
SP07869303	nil	nil	100.08	F	CO	C	300	nil	0.00	nill
SP07869352	102.74	101.18	100.89	S	CO	C	450	nil	173.97	nill
SP07869353	104.20	102.11	101.20	S	CO	C	300	nil	64.84	nill
SP07869354	103.60	102.09	101.67	S	VC	C	225	nil	198.19	nill
SP07869355	102.76	100.22	99.79	S	CO	C	375	nil	151.60	nill
SP07869357	103.97	101.84	100.95	S	CO	C	600	nil	87.10	nill
SP07869402	101.88	98.77	98.48	F	CO	C	375	nil	219.93	nill
SP07869451	101.99	100.39	99.73	S	CO	C	300	nil	121.18	nill
SP08860101	nil	nil	104.54	F	VC	C	225	nil	0.00	nill
SP08860102	110.40	106.49	102.04	F	VC	C	300	nil	22.83	nill
SP08860103	110.37	107.15	106.54	F	VC	C	300	nil	40.03	nill
SP08860256	106.66	104.26	103.35	S	CO	C	600	nil	35.51	nill
SP08860303	nil	nil	100.24	F	BR	E	525	375	0.00	nill
SP08860352	104.37	102.92	101.95	S	VC	C	225	nil	84.37	nill
SP08860354	105.37	103.35	101.86	S	CO	C	600	nil	35.67	nill
SP08860408	103.82	100.08	nil	F	BR	E	700	570	0.00	nill
SP08860451	103.12	101.64	101.59	S	VC	C	225	nil	367.20	nill
SP08860452	103.39	101.57	101.49	S	VC	C	225	nil	455.00	nill
nil	nil	nil	nil	F	VC	nil	nil	nil	0.00	nill

- Abandoned Sewer
- Private Combined Gravity Sewer
- Private Foul Gravity Sewer
- Private Surface Water Gravity Sewer
- Public Combined Gravity Sewer
- Public Foul Gravity Sewer
- Public Surface Water Gravity Sewer
- Trunk Combined Gravity Sewer
- Trunk Foul Use Gravity Sewer
- Trunk Surface Water Gravity Sewer
- Combined Use Pressurised Sewer
- Foul Use Pressurised Sewer
- Surface Water Pressurised Sewer
- Highway Drain
- Combined Lateral Drain (SS)
- Foul Lateral Drain (SS)
- Surface Water Lateral Drain (SS)
- Cable, Earthing
- Cable Junction
- Cable, Optical Fibre/Instrumentation
- Cable, Low Voltage
- Cable, High Voltage
- Cable, Other
- Housing, Building
- Housing, Kiosk
- Disposal Site
- Sewage Treatment Works
- Housing, Other
- Pipe Support Structure
- Sewage Pumping Facility
- Sewer Facility Connection Inlet / Outlet
- Blind Shaft
- Combined Use Manhole
- Flushing Chamber
- Foul Use Manhole
- Grease Trap
- Head Node
- Hydrobrake
- Lamphole
- Outfall
- Overflow
- Penstock
- Petrol Interceptor
- Sewer Chemical Injection Point
- Sewer Junction
- Sewerage Air Valve
- Sewerage Hatch Box Point
- Sewerage Isolation Valve
- Soakaway
- Surface Water Manhole
- Vent Column
- Waste Water Storage
- Culverted Watercourse
- Pre-1937 Properties

MATERIALS

AC	- ASBESTOS CEMENT
BR	- BRICK
CC	- CONCRETE BOX CULVERT
CI	- CAST IRON
CO	- CONCRETE
CSB	- CONCRETE SEGMENTS (BOLTED)
CSU	- CONCRETE SEGMENTS (UNBOLTED)
DI	- DUCTILE IRON
GRC	- GLASS REINFORCED CONCRETE
MAC	- MASONRY IN REGULAR COURSES
MAR	- MASONRY RANDOMLY COURSED
PE	- POLYETHLENE
PF	- PITCH
PP	- POLYPROPYLENE
PSC	- PLASTIC STEEL COMPOSITE
PVC	- POLYVINYL CHLORIDE
RPM	- REINFORCED PLASTIC MATRIX
SI	- SPUN (GREY) IRON
XXX	- OTHER

CATEGORIES

W	- WEIR
C	- CASCADE
DB	- DAMBOARD
SE	- SIDE ENTRY
FV	- FLAP VALVE
BD	- BACK DROP
S	- SIPHON
HD	- HIGHWAY DRAIN
S104	- SECTION 104

SHAPE

C	- CIRCULAR
E	- EGG SHAPED
O	- OTHER
R	- RECTANGLE
S	- SQUARE
T	- TRAPEZOIDAL
U	- UNKNOWN

PURPOSE

C	- COMBINED
E	- FINAL EFFLUENT
F	- FOUL
L	- SLUDGE
S	- SURFACE WATER

TABULAR KEY

A. Sewer pipe data refers to downstream sewer pipe.

B. Where the node bifurcates (splits) X and Y indicates downstream sewer pipe.

C. Gradient is stated a 1 in...

All Private Sewers are shown in magenta
All section 104 sewers are shown in green
All Sewers that have been transferred to Severn Trent Water after the 1st October 2011, but have not been surveyed and confirmed by Severn Trent Water are shown in orange

N W E S

SEVERN TRENT WATER

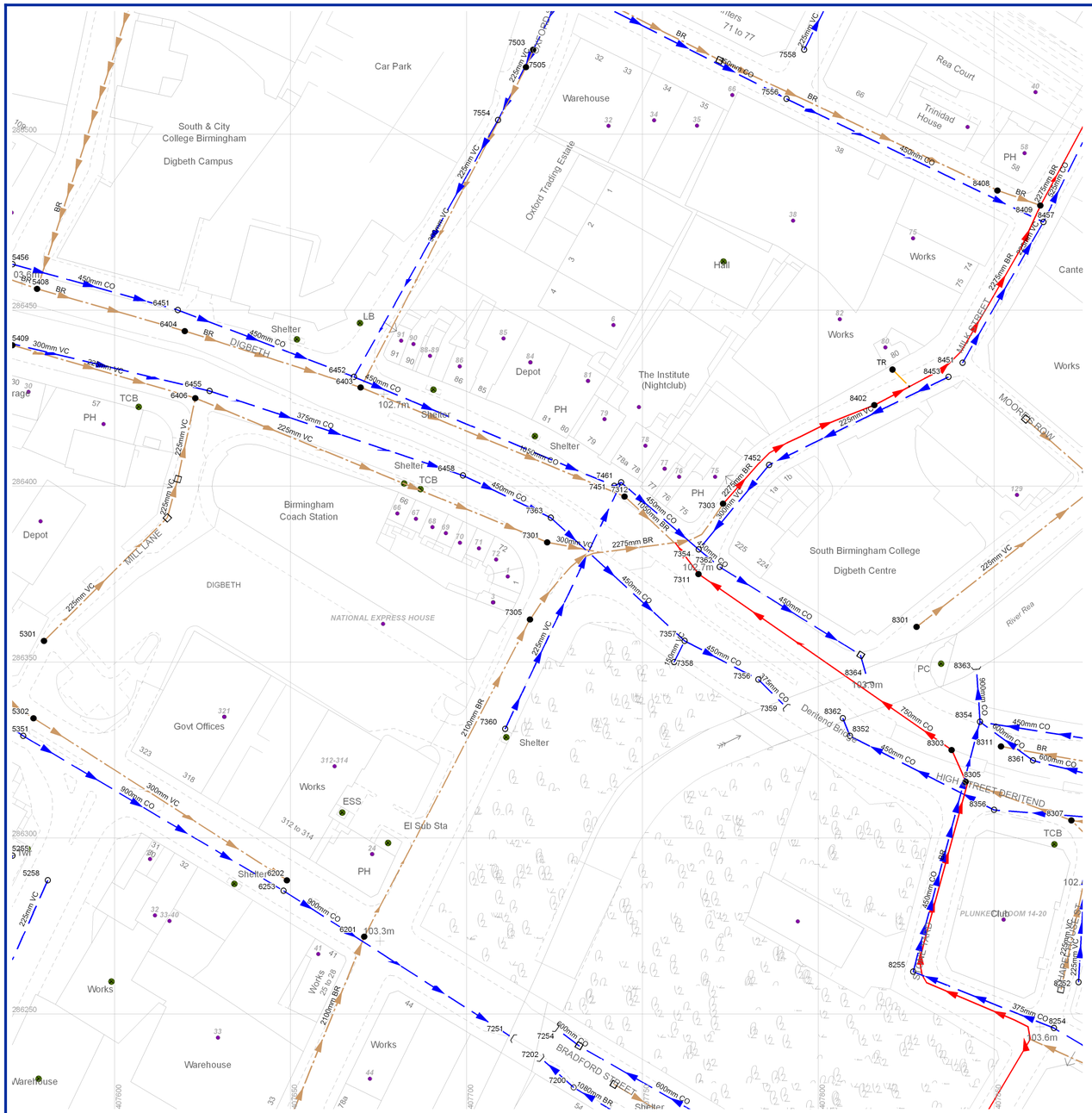
Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD (TABULAR)

O/S Map scale: 1:750
Date of issue: 20.04.16
Sheet No. 1 of 1

This map is centred upon:
O / S Grid reference:
x : 407901
y : 286313

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3. On **1 October 2011** most private sewers and private lateral drains in Severn Trent Water's sewerage area, which were connected to a public sewer as at 1 July 2011, transferred to the ownership of Severn Trent Water and became public sewers and public lateral drains. A further transfer takes place on 1 October 2012 (date to be confirmed).
Private pumping stations, which form part of these sewers or lateral drains, will transfer to the ownership of Severn Trent Water on or before 1 October 2016.
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Sewer Node

Sewer Pipe Data

REFERENCE	COVER LEVEL	INV LEVEL UPSTR	INV LEVEL DOWNSTR	PURP	MATL	SHAPE	MAX SIZE	MIN SIZE	GRADIENT	YEAR LAID
SP07865255	107.60	103.30	103.20	S	CO	C	450	nil	148.70	nill
SP07865258	104.04	101.86	100.61	S	VC	C	225	nil	64.82	nill
SP07865301	104.01	101.63	100.31	F	VC	C	225	nil	37.50	nill
SP07865302	104.44	101.59	99.29	F	VC	C	300	nil	37.15	nill
SP07865351	104.43	101.46	101.15	S	CO	C	900	nil	277.71	nill
SP07865408	nil	nil	99.55	F	BR	E	1350	850	0.00	nill
SP07865409	103.81	102.45	nil	F	VC	C	225	nil	0.00	nill
SP07865456	103.53	100.77	100.75	S	CO	C	450	nil	2438.00	nill
SP07866201	103.40	97.12	nil	F	BR	C	2100	nil	0.00	nill
SP07866253	103.34	101.14	nil	S	CO	C	900	nil	0.00	nill
SP07866403	nil	nil	96.97	F	CO	C	1050	nil	0.00	nill
SP07866404	103.09	99.55	nil	F	BR	E	1350	850	0.00	nill
SP07866406	nil	99.62	98.91	F	VC	C	225	nil	152.23	nill
SP07866451	103.05	100.72	100.34	S	CO	C	450	nil	140.76	nill
SP07866452	102.69	100.32	100.28	S	CO	C	450	nil	2005.75	nill
SP07866455	nil	nil	99.77	S	CO	C	375	nil	0.00	nill
SP07866458	102.55	99.76	99.60	S	CO	C	450	nil	173.31	nill
SP07867200	nil	nil	nil	S	BR	C	1080	nil	0.00	nill
SP07867301	102.28	98.91	nil	F	VC	C	300	nil	0.00	nill
SP07867303	102.72	96.68	96.66	C	BR	C	2275	nil	2619.00	nill
SP07867305	nil	nil	96.68	F	BR	C	2275	nil	0.00	nill
SP07867311	nil	nil	nil	C	CO	C	750	nil	0.00	nill
SP07867312	102.39	96.97	nil	F	BR	C	1050	nil	0.00	nill
SP07867354	102.78	100.24	100.24	S	CO	C	450	nil	0.00	nill
SP07867356	103.85	99.25	nil	S	CO	C	375	nil	0.00	nill
SP07867357	nil	nil	99.29	S	CO	C	450	nil	0.00	nill
SP07867358	nil	nil	nil	S	VC	C	150	nil	0.00	nill
SP07867360	nil	nil	100.60	S	VC	C	225	nil	0.00	nill
SP07867362	102.85	100.23	100.14	S	CO	C	450	nil	524.11	nill
SP07867363	102.55	99.59	nil	S	CO	C	450	nil	0.00	nill
SP07867451	102.46	100.28	100.28	S	CO	C	450	nil	0.00	nill
SP07867452	nil	nil	100.28	S	VC	C	300	nil	0.00	nill
SP07867461	102.46	100.27	100.25	S	CO	C	450	nil	1453.50	nill
SP07867503	103.12	100.80	100.32	F	VC	C	225	nil	11.23	nill
SP07867505	103.14	100.31	nil	F	VC	C	300	nil	0.00	nill
SP07867554	103.26	101.30	100.77	S	VC	C	225	nil	157.98	nill
SP07867556	102.46	100.70	99.89	S	CO	C	450	nil	99.95	nill
SP07867558	102.34	100.88	100.27	S	VC	C	225	nil	108.51	nill
SP07868252	nil	nil	100.97	S	VC	C	225	nil	0.00	nill
SP07868254	103.56	101.41	101.10	S	CO	C	375	nil	138.97	nill
SP07868255	103.19	101.09	100.54	S	CO	C	450	nil	133.64	nill
SP07868301	103.80	100.76	99.72	F	VC	C	225	nil	67.13	nill
SP07868303	104.34	96.97	nil	C	CO	C	750	nil	0.00	nill
SP07868305	103.48	97.96	97.17	C	CO	C	600	nil	12.47	nill
SP07868307	103.24	98.91	98.06	F	VC	C	300	nil	37.59	nill
SP07868352	103.93	99.49	nil	S	CO	C	450	nil	0.00	nill
SP07868354	103.51	100.52	nil	S	CO	C	900	nil	0.00	nill
SP07868356	103.27	99.78	99.56	S	CO	C	450	nil	209.41	nill
SP07868361	103.49	100.73	100.55	S	CO	C	600	nil	103.33	nill
SP07868402	102.99	96.65	96.46	C	BR	C	2275	nil	402.26	nill
SP07868408	nil	nil	96.46	F	BR	E	1050	750	0.00	nill
SP07868409	102.80	96.46	95.80	C	BR	C	2275	nil	124.32	nill
SP07868451	103.11	101.10	100.58	S	VC	C	225	nil	88.73	nill
SP07868453	103.07	101.12	nil	S	VC	C	225	nil	0.00	nill
SP07868457	102.83	99.89	nil	S	CO	C	525	nil	0.00	nill
nil	nil	nil	nil	F	VC	nil	nil	nil	0.00	nill

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- Private Combined Gravity Sewer
- Private Foul Gravity Sewer
- Private Surface Water Gravity Sewer
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- Public Surface Water Gravity Sewer
- Trunk Combined Gravity Sewer
- Trunk Foul Use Gravity Sewer
- Trunk Surface Water Gravity Sewer
- Combined Use Pressurised Sewer
- Foul Use Pressurised Sewer
- Surface Water Pressurised Sewer
- Highway Drain
- Combined Lateral Drain (SS)
- Foul Lateral Drain (SS)
- Surface Water Lateral Drain (SS)

- Cable, Earthing
- Cable Junction
- Cable, Optical Fibre/Instrumentation
- Cable, Low Voltage
- Cable, High Voltage
- Cable, Other
- Housing, Building
- Housing, Kiosk
- Disposal Site
- Sewage Treatment Works
- Housing, Other
- Pipe Support Structure
- Sewage Pumping Facility
- Sewer Facility Connection Inlet / Outlet

- Blind Shaft
- Combined Use Manhole
- Flushing Chamber
- Foul Use Manhole
- Grease Trap
- Head Node
- Hydrobrake
- Lamphole
- Outfall
- Overflow
- Penstock
- Petrol Interceptor

- Sewer Chemical Injection Point
- Sewer Junction
- Sewerage Air Valve
- Sewerage Hatch Box Point
- Sewerage Isolation Valve
- Soakaway
- Surface Water Manhole
- Vent Column
- Waste Water Storage
- Culverted Watercourse
- Pre-1937 Properties

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AC	- ASBESTOS CEMENT
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CSB	- CONCRETE SEGMENTS (BOLTED)
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PE	- POLYETHLENE
PF	- PITCH
PP	- POLYPROPYLENE
PSC	- PLASTIC STEEL COMPOSITE
PVC	- POLYVINYL CHLORIDE
RPM	- REINFORCED PLASTIC MATRIX
SI	- SPUN (GREY) IRON
XXX	- OTHER

CATEGORIES

W	- WEIR
C	- CASCADE
DB	- DAMBOARD
SE	- SIDE ENTRY
FV	- FLAP VALVE
BD	- BACK DROP
S	- SIPHON
HD	- HIGHWAY DRAIN
S104	- SECTION 104

SHAPE

C	- CIRCULAR
E	- EGG SHAPED
O	- OTHER
R	- RECTANGLE
S	- SQUARE
T	- TRAPEZOIDAL
U	- UNKNOWN

PURPOSE

C	- COMBINED
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N W E S

SEVERN TRENT WATER

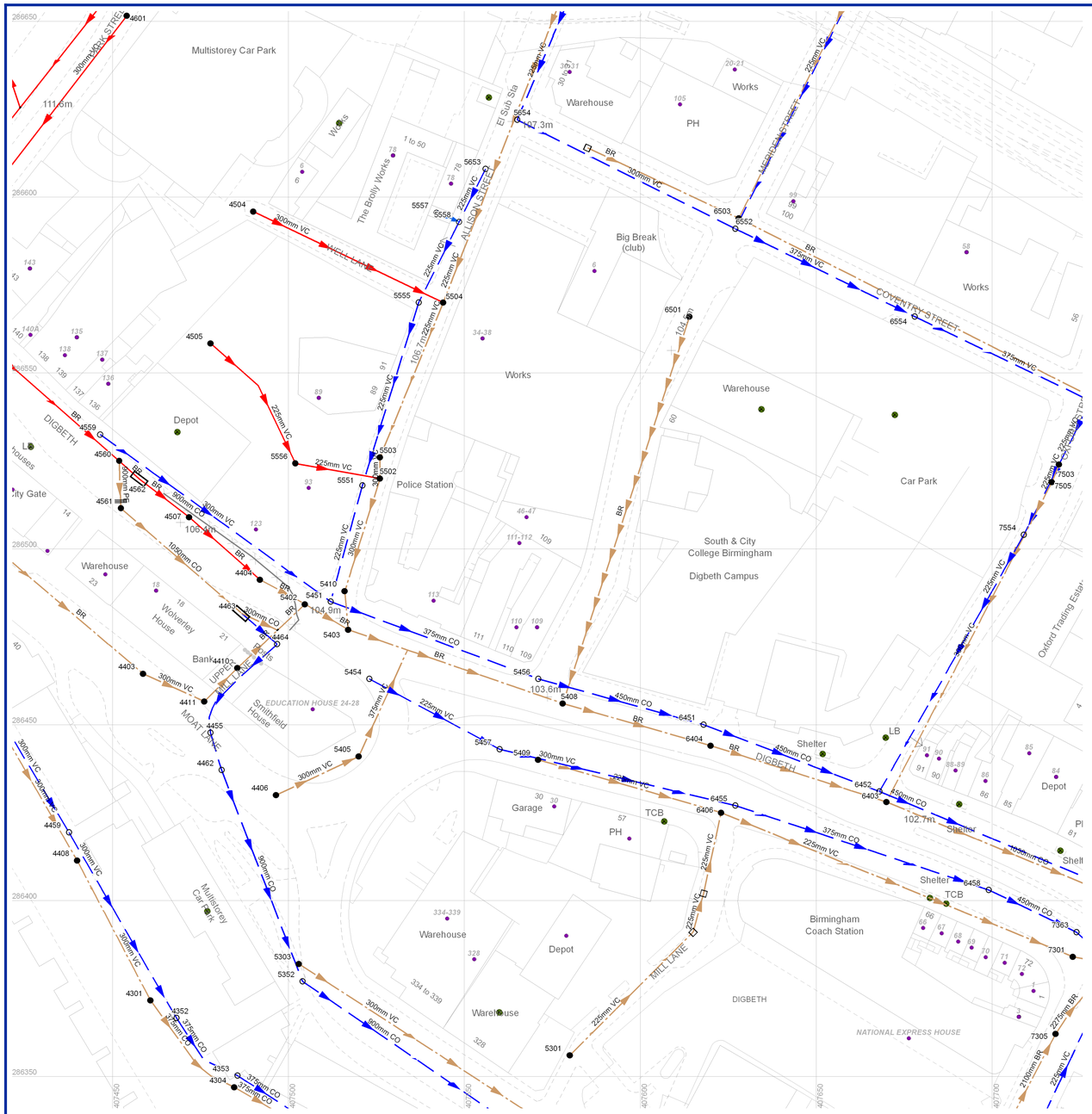
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Asset Data Management
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Sewer Node / Sewer Pipe Data

REFERENCE	COVER LEVEL	INV LEVEL UPSTR	INV LEVEL DOWNSTR	PURP	MATL	SHAPE	MAX SIZE	MIN SIZE	GRADIENT	YEAR LAID
SP07864301	106.68	103.28	103.19	F	CO	C	375	nil	389.11	nill
SP07864304	106.67	103.19	103.08	F	CO	C	375	nil	886.73	nill
SP07864352	106.66	103.49	103.39	S	CO	C	375	nil	247.40	nill
SP07864353	106.68	103.36	103.31	S	CO	C	375	nil	2035.40	nill
SP07864403	107.74	103.54	102.78	F	VC	C	300	nil	25.14	nill
SP07864404	nil	nil	nil	F	BR	E	1425	825	0.00	nill
SP07864406	106.35	103.01	101.11	F	VC	C	300	nil	13.66	nill
SP07864408	106.74	104.09	103.29	F	VC	C	300	nil	56.14	nill
SP07864410	106.04	102.24	nil	F	BR	E	700	520	0.00	nill
SP07864411	106.88	102.76	102.25	F	VC	C	300	nil	26.20	nill
SP07864455	106.74	102.20	101.93	S	CO	C	900	nil	41.00	nill
SP07864459	106.73	104.19	103.51	S	VC	C	300	nil	89.75	nill
SP07864462	106.53	101.91	101.93	S	CO	C	900	nil	0.00	nill
SP07864464	105.37	102.84	102.42	S	CO	C	900	nil	79.00	nill
SP07864504	nil	nil	103.13	C	VC	C	300	nil	0.00	nill
SP07864505	nil	nil	nil	C	VC	C	225	nil	0.00	nill
SP07864507	106.43	102.15	nil	C	BR	E	1350	830	0.00	nill
SP07864559	nil	nil	102.24	S	VC	C	300	nil	0.00	nill
SP07864560	107.20	103.95	103.46	F	PE	C	900	nil	19.80	2004
SP07864560	107.20	105.43	103.31	C	BR	E	1350	830	3.65	nill
SP07864561	106.86	103.46	102.89	F	CO	C	1050	nil	83.16	2004
SP07864601	111.50	107.67	nil	C	VC	C	300	nil	0.00	nill
SP07865301	104.01	101.63	100.31	F	VC	C	225	nil	37.50	nill
SP07865303	106.65	103.32	101.61	F	VC	C	300	nil	51.58	nill
SP07865352	106.74	101.90	101.46	S	CO	C	900	nil	192.91	nill
SP07865402	nil	nil	nil	F	BR	E	1425	825	0.00	nill
SP07865403	nil	nil	nil	F	BR	R	1450	840	0.00	nill
SP07865405	105.35	101.11	nil	F	VC	C	375	nil	0.00	nill
SP07865408	nil	nil	99.55	F	BR	E	1350	850	0.00	nill
SP07865409	103.81	102.45	nil	F	VC	C	225	nil	0.00	nill
SP07865410	104.62	100.53	nil	F	VC	C	300	nil	0.00	nill
SP07865451	104.58	102.40	100.79	S	CO	C	375	nil	39.11	nill
SP07865454	nil	nil	100.74	S	VC	C	225	nil	0.00	nill
SP07865456	103.53	100.77	100.75	S	CO	C	450	nil	2438.00	nill
SP07865457	103.98	100.73	nil	S	VC	C	300	nil	0.00	nill
SP07865502	nil	nil	100.55	F	VC	C	300	nil	0.00	nill
SP07865503	105.87	101.78	nil	F	VC	C	300	nil	0.00	nill
SP07865504	106.72	103.12	101.79	F	VC	C	225	nil	35.74	nill
SP07865551	105.66	103.46	102.54	S	VC	C	225	nil	37.18	nill
SP07865555	106.73	104.69	103.47	S	VC	C	225	nil	44.60	nill
SP07865556	nil	nil	nil	C	VC	C	225	nil	0.00	nill
SP07865557	nil	nil	nil	S	VC	C	150	nil	0.00	2007
SP07865558	nil	105.66	104.70	S	VC	C	225	nil	44.26	nill
SP07865653	107.10	105.66	104.70	S	VC	C	225	nil	44.26	nill
SP07865654	107.29	104.93	102.24	S	VC	C	300	nil	25.77	nill
SP07866403	nil	nil	96.97	F	CO	C	1050	nil	0.00	nill
SP07866404	103.09	99.55	nil	F	BR	E	1350	850	0.00	nill
SP07866406	nil	99.62	98.91	F	VC	C	225	nil	152.23	nill
SP07866451	103.05	100.72	100.34	S	CO	C	450	nil	140.76	nill
SP07866452	102.69	100.32	100.28	S	CO	C	450	nil	2005.75	nill
SP07866455	nil	nil	99.77	S	CO	C	375	nil	0.00	nill
SP07866458	102.55	99.76	99.60	S	CO	C	450	nil	173.31	nill
SP07866501	nil	nil	nil	F	BR	E	675	525	0.00	nill
SP07866503	nil	nil	97.90	F	BR	E	1050	750	0.00	nill
SP07866552	104.89	101.84	nil	S	VC	C	375	nil	0.00	nill
SP07866554	nil	nil	101.29	S	VC	C	375	nil	0.00	nill
SP07867301	102.28	98.91	nil	F	VC	C	300	nil	0.00	nill
SP07867305	nil	nil	96.68	F	BR	C	2275	nil	0.00	nill
SP07867363	102.55	99.59	nil	S	CO	C	450	nil	0.00	nill
SP07867503	103.12	100.80	100.32	F	VC	C	225	nil	11.23	nill
SP07867505	103.14	100.31	nil	F	VC	C	300	nil	0.00	nill
SP07867554	103.26	101.30	100.77	S	VC	C	225	nil	157.98	nill

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SEVERN TRENT WATER

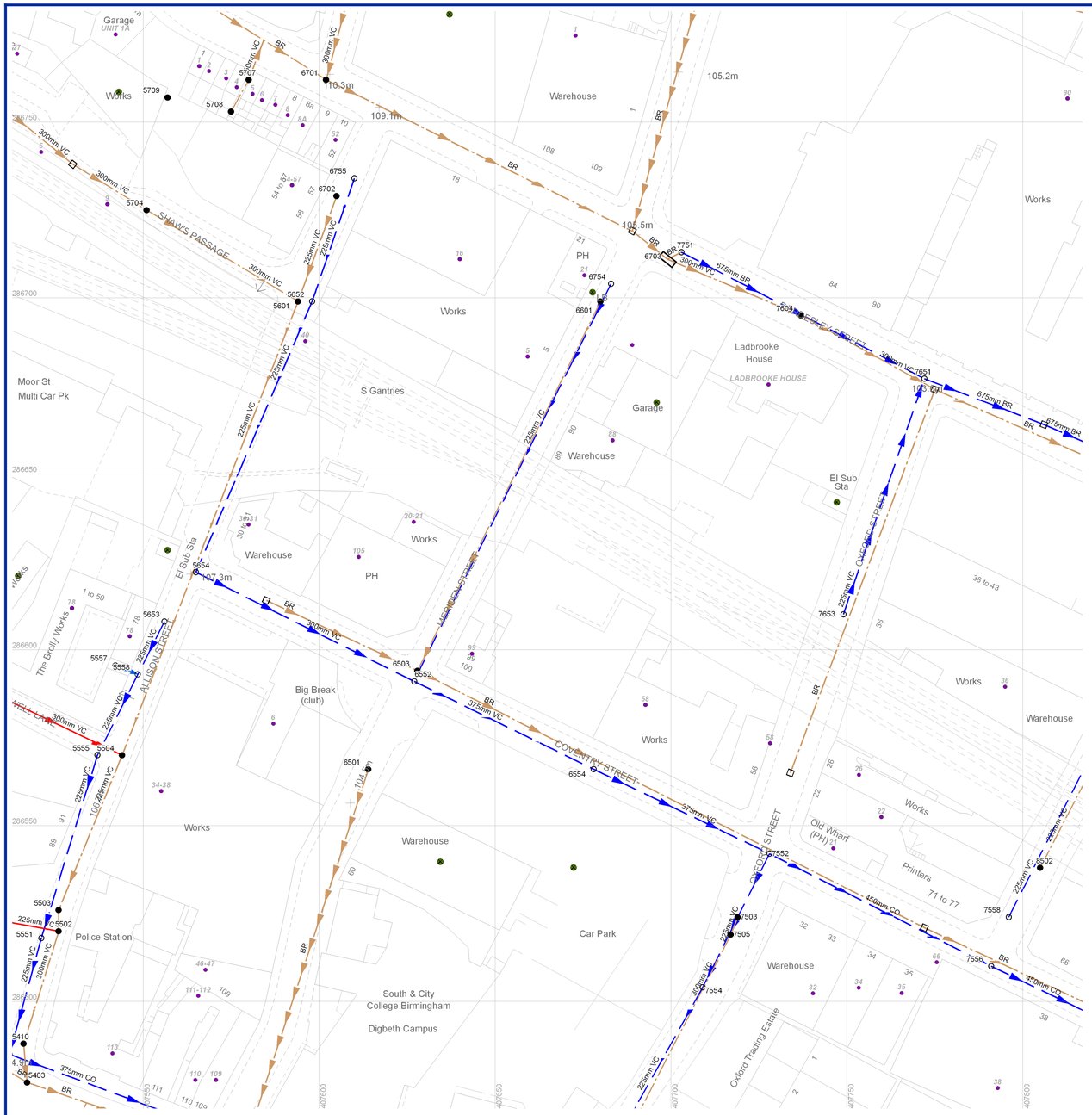
Severn Trent Water Limited
Asset Data Management
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Coventry
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Telephone: 0845 601 6616

SEWER RECORD (TABULAR)

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SP07865410	104.62	100.53	nil	F	VC	C	300	nil	0.00	nill
SP07865502	nil	nil	100.55	F	VC	C	300	nil	0.00	nill
SP07865503	105.87	101.78	nil	F	VC	C	300	nil	0.00	nill
SP07865504	106.72	103.12	101.79	F	VC	C	225	nil	35.74	nill
SP07865551	105.66	103.46	102.54	S	VC	C	225	nil	37.18	nill
SP07865555	106.73	104.69	103.47	S	VC	C	225	nil	44.60	nill
SP07865557	nil	nil	nil	S	VC	C	150	nil	0.00	2007
SP07865558	nil	105.66	104.70	S	VC	C	225	nil	44.26	nill
SP07865601	108.16	105.24	103.13	F	VC	C	225	nil	65.57	nill
SP07865652	108.06	105.78	104.94	S	VC	C	225	nil	99.73	nill
SP07865653	107.10	105.66	104.70	S	VC	C	225	nil	44.26	nill
SP07865654	107.29	104.93	102.24	S	VC	C	300	nil	25.77	nill
SP07865704	109.63	107.21	105.26	F	VC	C	300	nil	25.77	nill
SP07865707	111.29	108.97	nil	F	VC	C	150	nil	0.00	nill
SP07865708	110.92	109.55	108.97	F	VC	C	150	nil	17.76	nill
SP07866501	nil	nil	nil	F	BR	E	675	525	0.00	nill
SP07866503	nil	nil	97.90	F	BR	E	1050	750	0.00	nill
SP07866552	104.89	101.84	nil	S	VC	C	375	nil	0.00	nill
SP07866554	nil	nil	101.29	S	VC	C	375	nil	0.00	nill
SP07866601	nil	nil	nil	F	nil	C	nil	nil	0.00	nill
SP07866701	110.09	106.04	101.12	F	BR	E	1050	750	19.73	nill
SP07866702	108.76	105.98	105.26	F	VC	C	225	nil	44.38	nill
SP07866754	105.36	103.75	101.85	S	VC	C	225	nil	66.38	nill
SP07866755	108.74	106.93	105.79	S	VC	C	225	nil	32.46	nill
SP07867503	103.12	100.80	100.32	F	VC	C	225	nil	11.23	nill
SP07867505	103.14	100.31	nil	F	VC	C	300	nil	0.00	nill
SP07867552	103.03	101.63	101.31	S	VC	C	225	nil	132.78	nill
SP07867552	103.03	101.28	100.70	S	CO	C	450	nil	121.83	nill
SP07867554	103.26	101.30	100.77	S	VC	C	225	nil	157.98	nill
SP07867556	102.46	100.70	99.89	S	CO	C	450	nil	99.95	nill
SP07867558	102.34	100.88	100.27	S	VC	C	225	nil	108.51	nill
SP07867604	nil	nil	99.12	F	VC	C	300	nil	0.00	nill
SP07867651	102.96	99.77	99.69	S	BR	C	675	nil	455.00	nill
SP07867653	102.63	101.03	100.29	S	VC	C	225	nil	95.73	nill
SP07867751	nil	nil	99.78	S	BR	C	675	nil	0.00	nill
SP07868502	102.14	98.64	98.63	F	VC	C	225	nil	5859.00	nill

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PVC	- POLYVINYL CHLORIDE
RPM	- REINFORCED PLASTIC MATRIX
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XXX	- OTHER

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W	- WEIR
C	- CASCADE
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FV	- FLAP VALVE
BD	- BACK DROP
S	- SIPHON
HD	- HIGHWAY DRAIN
S104	- SECTION 104

SHAPE

C	- CIRCULAR
E	- EGG SHAPED
O	- OTHER
R	- RECTANGLE
S	- SQUARE
T	- TRAPEZOIDAL
U	- UNKNOWN

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N W E S

SEVERN TRENT WATER

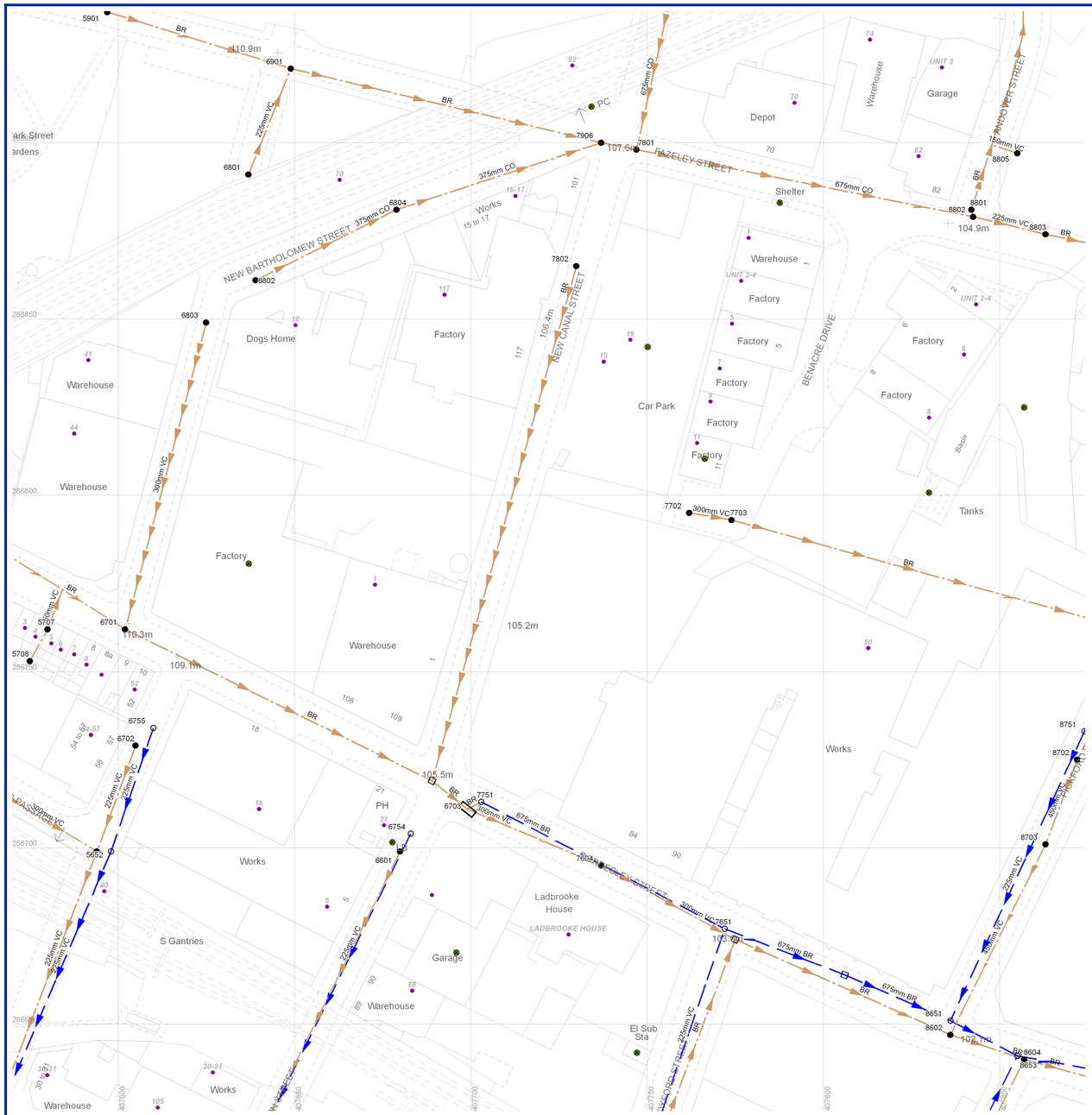
Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD (TABULAR)

O/S Map scale: 1:750
Date of issue: 20.04.16
Sheet No. 1 of 1

This map is centred upon:
O / S Grid reference:
x : 407664
y : 286625

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Sewer Node / Sewer Pipe Data

REFERENCE	COVER LEVEL	INV LEVEL UPSTR	INV LEVEL DOWNSTR	PURP	MATL	SHAPE	MAX SIZE	MIN SIZE	GRADIENT	YEAR LAID
SP07865601	108.16	105.24	103.13	F	VC	C	225	nil	65.57	nill
SP07865652	108.06	105.78	104.94	S	VC	C	225	nil	99.73	nill
SP07865707	111.29	108.97	nil	F	VC	C	150	nil	0.00	nill
SP07865708	110.92	109.55	108.97	F	VC	C	150	nil	17.76	nill
SP07865901	nil	nil	108.50	F	BR	E	525	375	0.00	nill
SP07866601	nil	nil	nil	F	nil	C	nil	nil	0.00	nill
SP07866701	110.09	106.04	101.12	F	BR	E	1050	750	19.73	nill
SP07866702	108.76	105.98	105.26	F	VC	C	225	nil	44.38	nill
SP07866754	105.36	103.75	101.85	S	VC	C	225	nil	66.38	nill
SP07866755	108.74	106.93	105.79	S	VC	C	225	nil	32.46	nill
SP07866801	113.28	110.74	108.51	F	VC	C	225	nil	14.49	nill
SP07866802	112.47	108.90	106.24	F	CO	C	375	nil	16.81	nill
SP07866803	112.59	108.94	106.09	F	VC	C	300	nil	31.58	nill
SP07866804	109.89	106.22	103.73	F	CO	C	375	nil	24.51	nill
SP07866901	110.68	108.56	103.46	F	BR	E	530	400	18.24	nill
SP07867604	nil	nil	99.12	F	VC	C	300	nil	0.00	nill
SP07867651	102.96	99.77	99.69	S	BR	C	675	nil	455.00	nill
SP07867702	nil	nil	nil	F	VC	C	300	nil	0.00	nill
SP07867703	nil	nil	100.11	F	BR	R	450	375	0.00	nill
SP07867751	nil	nil	99.78	S	BR	C	675	nil	0.00	nill
SP07867801	106.75	102.74	101.48	F	CO	C	675	nil	77.28	nill
SP07867802	nil	nil	101.12	F	BR	E	675	525	0.00	nill
SP07867906	107.14	103.40	102.75	F	CO	C	675	nil	15.69	nill
SP07868602	nil	nil	97.41	F	BR	E	1050	825	0.00	nill
SP07868604	102.23	97.40	97.35	F	BR	E	1050	825	601.60	nill
SP07868651	102.40	99.39	99.31	S	BR	C	675	nil	268.38	nill
SP07868653	102.24	99.30	nil	S	BR	C	675	nil	0.00	nill
SP07868702	103.00	99.28	nil	F	VC	C	450	nil	0.00	nill
SP07868703	nil	nil	nil	F	VC	C	450	nil	0.00	nill
SP07868751	103.04	100.96	99.90	S	VC	C	225	nil	85.26	nill
SP07868801	nil	nil	nil	F	BR	E	1050	750	0.00	nill
SP07868802	104.91	101.47	nil	F	CO	C	525	nil	0.00	nill
SP07868802	104.91	101.47	101.33	F	VC	C	225	nil	150.71	nill
SP07868803	105.57	101.33	nil	F	BR	E	980	450	0.00	nill
SP07868805	104.91	102.81	nil	F	VC	C	150	nil	0.00	nill

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SI	- SPUN (GREY) IRON
XXX	- OTHER

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CATEGORIES

W	- WEIR
C	- CASCADE
DB	- DAMBOARD
SE	- SIDE ENTRY
FV	- FLAP VALVE
BD	- BACK DROP
S	- SIPHON
HD	- HIGHWAY DRAIN
S104	- SECTION 104

SHAPE

C	- CIRCULAR
E	- EGG SHAPED
O	- OTHER
R	- RECTANGLE
S	- SQUARE
T	- TRAPEZOIDAL
U	- UNKNOWN

TABULAR KEY

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PURPOSE

C	- COMBINED
E	- FINAL EFFLUENT
F	- FOUL
L	- SLUDGE
S	- SURFACE WATER

N W E S

SEVERN TRENT WATER

Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD (TABULAR)

O/S Map scale: 1:750
Date of issue: 20.04.16
Sheet No. 1 of 1

This map is centred upon:
O / S Grid reference:
x : 407722
y : 286781

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Sewer Node Data

Sewer Pipe Data

REFERENCE	COVER LEVEL	INV LEVEL UPSTR	INV LEVEL DOWNSTR	PURP	MATL	SHAPE	MAX SIZE	MIN SIZE	GRADIENT	YEAR LAID
SP07866801	113.28	110.74	108.51	F	VC	C	225	nil	14.49	nill
SP07866802	112.47	108.90	106.24	F	CO	C	375	nil	16.81	nill
SP07866803	112.59	108.94	106.09	F	VC	C	300	nil	31.58	nill
SP07866804	109.89	106.22	103.73	F	CO	C	375	nil	24.51	nill
SP07866901	110.68	108.56	103.46	F	BR	E	530	400	18.24	nill
SP07866902	111.44	108.44	nil	F	VC	C	300	nil	0.00	nill
SP07866903	111.39	107.43	nil	F	VC	C	300	nil	0.00	nill
SP07867801	106.75	102.74	101.48	F	CO	C	675	nil	77.28	nill
SP07867802	nil	nil	101.12	F	BR	E	675	525	0.00	nill
SP07867901	nil	nil	nil	F	VC	C	300	nil	0.00	nill
SP07867902	nil	nil	105.17	F	VC	C	300	nil	0.00	nill
SP07867903	108.16	104.04	102.44	C	BR	E	1050	750	15.21	nill
SP07867905	107.69	105.17	102.75	F	CO	C	675	nil	30.48	nill
SP07867906	107.14	103.40	102.75	F	CO	C	675	nil	15.69	nill
SP07868801	nil	nil	nil	F	BR	E	1050	750	0.00	nill
SP07868802	104.91	101.47	nil	F	CO	C	525	nil	0.00	nill
SP07868802	104.91	101.47	101.33	F	VC	C	225	nil	150.71	nill
SP07868803	105.57	101.33	nil	F	BR	E	980	450	0.00	nill
SP07868804	nil	nil	nil	F	BR	E	980	450	0.00	nill
SP07868805	104.91	102.81	nil	F	VC	C	150	nil	0.00	nill
SP07868901	nil	nil	100.60	C	BR	E	1050	750	0.00	nill
SP07876001	nil	nil	104.06	C	BR	E	1050	750	0.00	nill
SP07876003	nil	nil	nil	C	BR	E	1060	750	0.00	nill
SP07876004	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07877001	nil	nil	nil	C	BR	E	1060	750	0.00	nill
SP07877002	109.33	103.75	nil	C	BR	E	1060	750	0.00	nill
SP07877101	nil	nil	103.91	C	BR	E	1060	750	0.00	nill
SP07877102	109.82	103.86	103.77	C	BR	E	1060	750	361.78	nill

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SEWER RECORD (TABULAR)

O/S Map scale: 1:750
Date of issue: 20.04.16
Sheet No. 1 of 1

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Sewer Node / Sewer Pipe Data

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SP07864801	121.63	116.94	116.47	C	VC	E	1350	825	30.45	nill
SP07864802	120.73	116.44	115.87	C	VC	E	1350	830	20.65	nill
SP07864803	120.77	115.84	nil	C	BR	E	1350	830	0.00	nill
SP07864905	nil	nil	nil	C	nil	C	nil	nil	0.00	nill
SP07864908	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07864910	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07864911	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07865801	nil	nil	110.66	F	nil	C	nil	nil	0.00	nill
SP07865805	117.20	116.60	115.84	F	VC	C	100	nil	9.30	nill
SP07865806	116.93	115.78	nil	F	VC	C	150	nil	0.00	nill
SP07865901	nil	nil	108.50	F	BR	E	525	375	0.00	nill
SP07865904	117.01	115.69	nil	F	VC	C	100	nil	0.00	nill
SP07866801	113.28	110.74	108.51	F	VC	C	225	nil	14.49	nill
SP07866802	112.47	108.90	106.24	F	CO	C	375	nil	16.81	nill
SP07866804	109.89	106.22	103.73	F	CO	C	375	nil	24.51	nill
SP07866901	110.68	108.56	103.46	F	BR	E	530	400	18.24	nill
SP07866902	111.44	108.44	nil	F	VC	C	300	nil	0.00	nill
SP07866903	111.39	107.43	nil	F	VC	C	300	nil	0.00	nill
SP07867901	nil	nil	nil	F	VC	C	300	nil	0.00	nill
SP07867902	nil	nil	105.17	F	VC	C	300	nil	0.00	nill
SP07874008	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07874009	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07874102	123.69	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07874105	nil	117.64	117.35	C	VC	C	225	nil	96.93	nill
SP07875001	114.24	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07875005	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07875006	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07875007	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07875008	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07875009	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07875106	nil	nil	110.73	C	VC	C	450	nil	0.00	nill
SP07875108	117.48	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07875158	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07875159	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07876001	nil	nil	104.06	C	BR	E	1050	750	0.00	nill
SP07876003	nil	nil	nil	C	BR	E	1060	750	0.00	nill
SP07876004	nil	nil	nil	C	nil	nil	nil	nil	0.00	nill
SP07876103	114.82	110.72	nil	C	CO	C	450	nil	0.00	nill
SP07876106	114.66	111.11	nil	C	VC	C	225	nil	0.00	nill
SP07876155	nil	nil	111.45	S	VC	C	225	nil	0.00	nill
SP07877001	nil	nil	nil	C	BR	E	1060	750	0.00	nill

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- Sewerage Hatch Box Point
- Sewerage Isolation Valve
- Soakaway
- Surface Water Manhole
- Vent Column
- Waste Water Storage
- Culverted Watercourse
- Pre-1937 Properties

MATERIALS

AC	- ASBESTOS CEMENT
BR	- BRICK
CC	- CONCRETE BOX CULVERT
CI	- CAST IRON
CO	- CONCRETE
CSB	- CONCRETE SEGMENTS (BOLTED)
CSU	- CONCRETE SEGMENTS (UNBOLTED)
DI	- DUCTILE IRON
GRC	- GLASS REINFORCED CONCRETE
MAC	- MASONRY IN REGULAR COURSES
MAR	- MASONRY RANDOMLY COURSED
PE	- POLYETHLENE
PF	- PITCH
PP	- POLYPROPYLENE
PSC	- PLASTIC STEEL COMPOSITE
PVC	- POLYVINYL CHLORIDE
RPM	- REINFORCED PLASTIC MATRIX
SI	- SPUN (GREY) IRON
XXX	- OTHER

CATEGORIES

W	- WEIR
C	- CASCADE
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SE	- SIDE ENTRY
FV	- FLAP VALVE
BD	- BACK DROP
S	- SIPHON
HD	- HIGHWAY DRAIN
S104	- SECTION 104

SHAPE

C	- CIRCULAR
E	- EGG SHAPED
O	- OTHER
R	- RECTANGLE
S	- SQUARE
T	- TRAPEZOIDAL
U	- UNKNOWN

PURPOSE

C	- COMBINED
E	- FINAL EFFLUENT
F	- FOUL
L	- SLUDGE
S	- SURFACE WATER

TABULAR KEY

A. Sewer pipe data refers to downstream sewer pipe.

B. Where the node bifurcates (splits) X and Y indicates downstream sewer pipe.

C. Gradient is stated a 1 in...

All Private Sewers are shown in magenta
All section 104 sewers are shown in green
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N W E S

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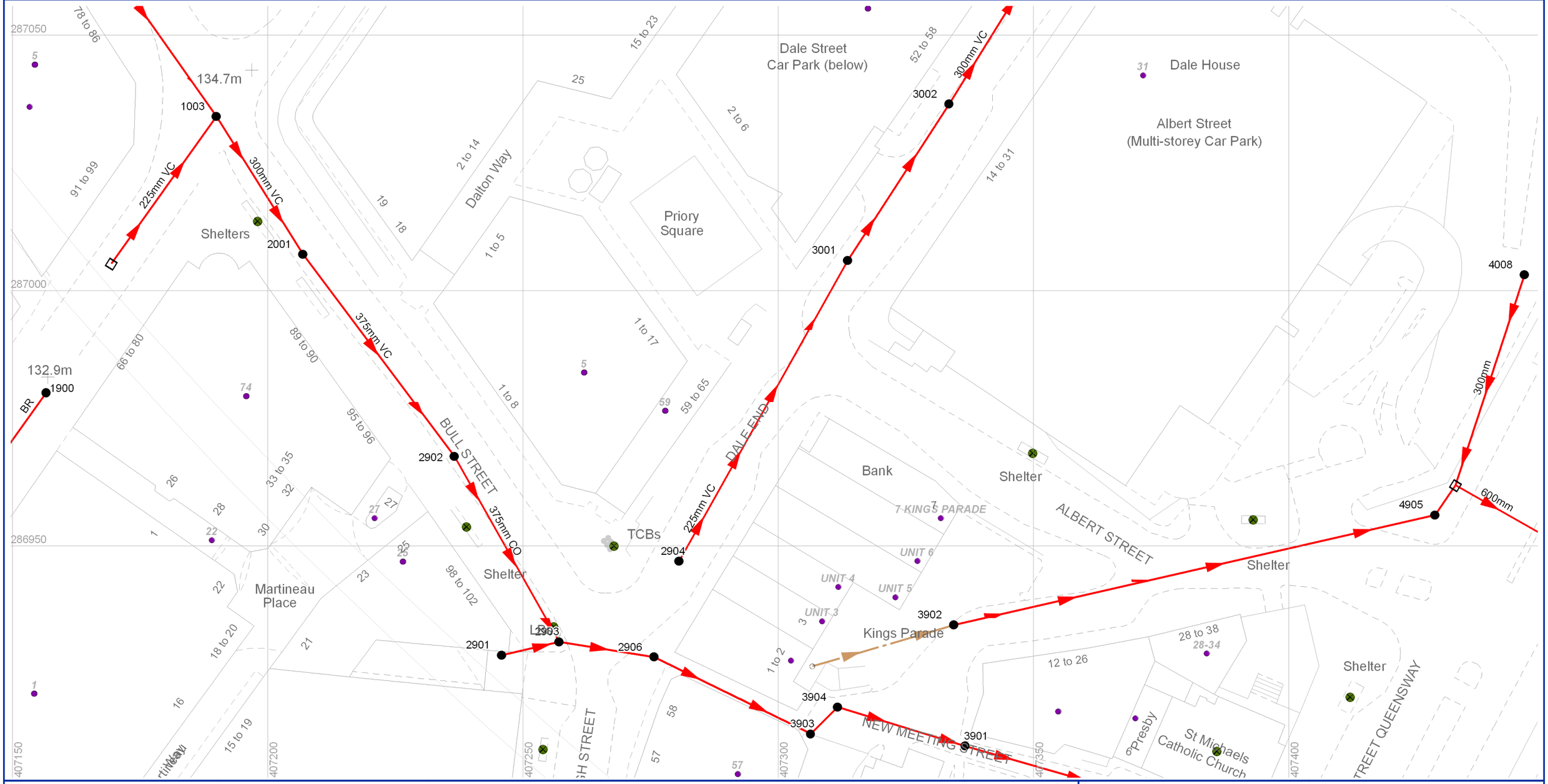
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Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD (TABULAR)

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Date of issue: 20.04.16
Sheet No. 1 of 1

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- Combined Lateral Drain (SS)
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- Culverted Watercourse
- Cable, Earthing
- Cable Junction
- Cable, Optical Fibre/Instrumentation
- Cable, Low Voltage
- Cable, High Voltage
- Cable, Other
- Housing, Building
- Housing, Kiosk
- Disposal Site
- Sewage Treatment Works
- Housing, Other
- Pipe Support Structure
- Sewage Pumping Facility
- Sewer Facility Connection Inlet / Outlet

- Blind Shaft
- Combined Use Manhole
- Flushing Chamber
- Foul Use Manhole
- Grease Trap
- Head Node
- Hydrobrake
- Lamphole
- Outfall
- Overflow
- Penstock
- Petrol Interceptor

- Sewer Chemical Injection Point
- Sewer Junction
- Sewerage Air Valve
- Sewerage Hatch Box Point
- Sewerage Isolation Valve
- Soakaway
- Surface Water Manhole
- Vent Column
- Waste Water Storage
- Pre-1937 Properties

MATERIALS

-	- NONE
AC	- ASBESTOS CEMENT
BR	- BRICK
CC	- CONCRETE BOX CULVERT
CI	- CAST IRON
CO	- CONCRETE
CSB	- CONCRETE SEGMENTS (BOLTED)
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PSC	- PLASTIC STEEL COMPOSITE
PVC	- POLYVINYL CHLORIDE
RPM	- REINFORCED PLASTIC MATRIX
SI	- SPUN (GREY) IRON
ST	- STEEL
U	- UNKNOWN
VC	- VITRIFIED CLAY
XXX	- OTHER

SHAPE

C	- CIRCULAR
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O	- OTHER
R	- RECTANGLE
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CATEGORIES

W	- WEIR
C	- CASCADE
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SE	- SIDE ENTRY
FV	- FLAP VALVE
BD	- BACK DROP
S	- SIPHON
HD	- HIGHWAY DRAIN
S104	- SECTION 104

N W E S

SEVERN TRENT WATER

Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
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Telephone: 0845 601 6616

SEWER RECORD

O/S Map scale: 1:750

Date of issue: 20.04.16

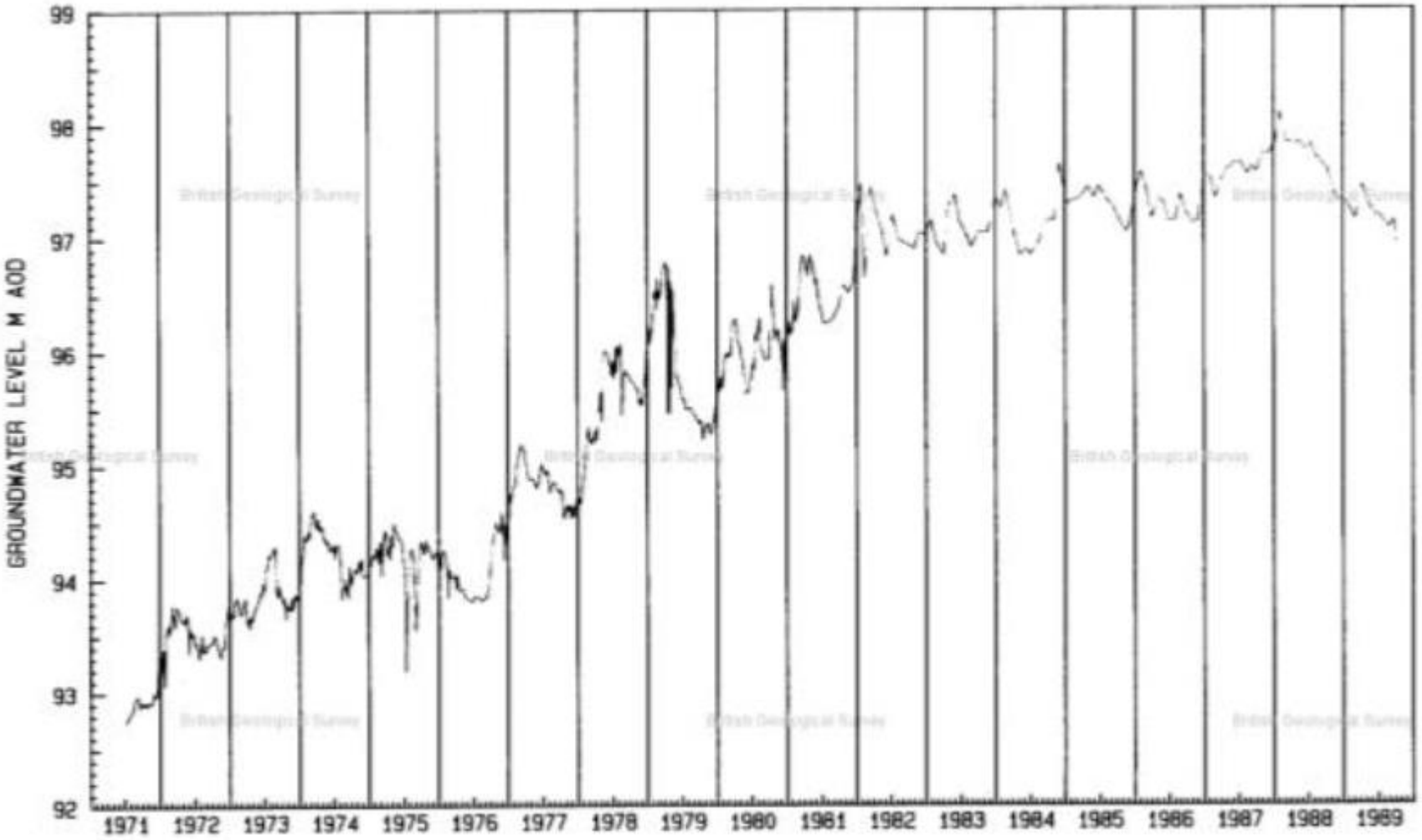
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Appendix H. Groundwater Historical Monitoring Data Plot


GROUNDWATER LEVEL M AOD
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Appendix I. Detailed Information on nearby Reservoirs

3 MMD/300207/HS30/DOC/0000/1045/A July 2016
3 http://pims01/pims/llisapi.dll?func=ll&objId=2093544175&objAction=browse&viewType=1

Risk of Flooding from Reservoirs for X:407717, Y:286403

Below are the reservoirs that could affect this area.

Bartley				
Risk Designation: To be determined We define a reservoir as high risk, if peoples' lives would be in danger as a result of an uncontrolled release of water from the reservoir.				
Reservoir Owner: Severn Trent Water Authority				
Reservoir location (grid reference): 413099, 285973	**Area:** Environment Agency - Staffordshire, Warwickshire and West Midlands	**Local Authority:** Birmingham	**Additional Comments:** If you have questions about local emergency plans for this reservoir you should contact the named Local Authority	View map

Northfield				
Risk Designation: To be determined We define a reservoir as high risk, if peoples' lives would be in danger as a result of an uncontrolled release of water from the reservoir.				
Reservoir Owner: Severn Trent Water Authority				
Reservoir location (grid reference): 400138, 279253	**Area:** Environment Agency - Staffordshire, Warwickshire and West Midlands	**Local Authority:** Worcestershire	**Additional Comments:** If you have questions about local emergency plans for this reservoir you should contact the named Local Authority	View map

Frankley Balancing Reservoir				
Risk Designation: To be determined We define a reservoir as high risk, if peoples' lives would be in danger as a result of an uncontrolled release of water from the reservoir.				
Reservoir Owner: Environment Agency				
Reservoir location (grid reference): 400068, 277850	**Area:** Environment Agency - Staffordshire, Warwickshire and West Midlands	**Local Authority:** Birmingham	**Additional Comments:** If you have questions about local emergency plans for this reservoir you should contact the named Local Authority	View map

Frankley Raw Water				
Risk Designation: To be determined We define a reservoir as high risk, if peoples' lives would be in danger as a result of an uncontrolled release of water from the reservoir.				
Reservoir Owner: Severn Trent Water Authority				
Reservoir location (grid reference): 400413, 280287	**Area:** Environment Agency - Staffordshire, Warwickshire and West Midlands	**Local Authority:** Birmingham	**Additional Comments:** If you have questions about local emergency plans for this reservoir you should contact the named Local Authority	View map

Further information

Reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in England, we ensure that reservoirs are inspected regularly and essential safety work is carried out.

However, in the unlikely event that a reservoir dam failed, a large volume of water would escape at once and flooding could happen with little or no warning. If you live or work in an area that could be affected, you should plan in advance what you would do in an emergency. You may need to evacuate immediately. Consider where you would go to safety, and be ready to follow the advice of emergency services.

To find out about local emergency plans, contact the local authority listed above. Be aware that they may not be able to give you any specific information immediately as developing reservoir emergency plans is a new responsibility.

If you would like to see information on how deep the water could get or how fast it could flow

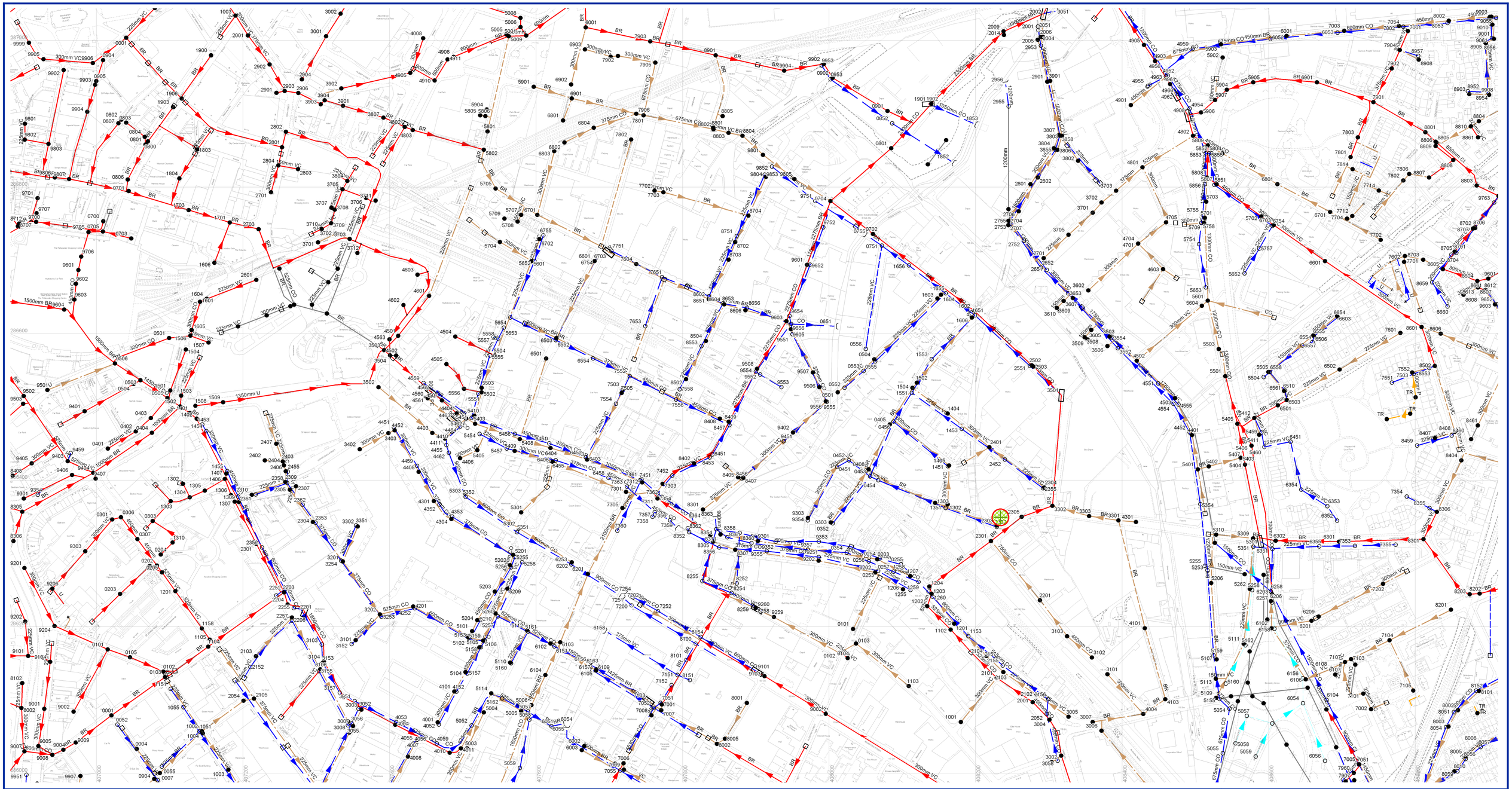
- View the estimates of the depth of flooding from reservoirs for this area.
- View the estimates of the speed of flooding from reservoirs for this area.

This area may be at risk from other types of flooding.

- Check your risk of flooding from rivers and sea.
- Check your risk of flooding from surface water.

Appendix J. Map of Existing Severn Trent Water Pipeline System

3 MMD/300207/HS30/DOC/0000/1045/A July 2016
4 http://pims01/pims/llisapi.dll?func=ll&objId=2093544175&objAction=browse&viewType=1



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- Hydrobrake
- Lamphole
- Outfall
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- Penstock
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- Sewerage Air Valve
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- Sewerage Isolation Valve
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- Surface Water Manhole
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- Culverted Watercourse
- Pre-1937 Properties

CATEGORIES

W	- WEIR
C	- CASCADE
DB	- DAMBOARD
SE	- SIDE ENTRY
FV	- FLAP VALVE
BD	- BACK DROP
S	- SIPHON
HD	- HIGHWAY DRAIN
S104	- SECTION 104

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N
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SEVERN TRENT WATER

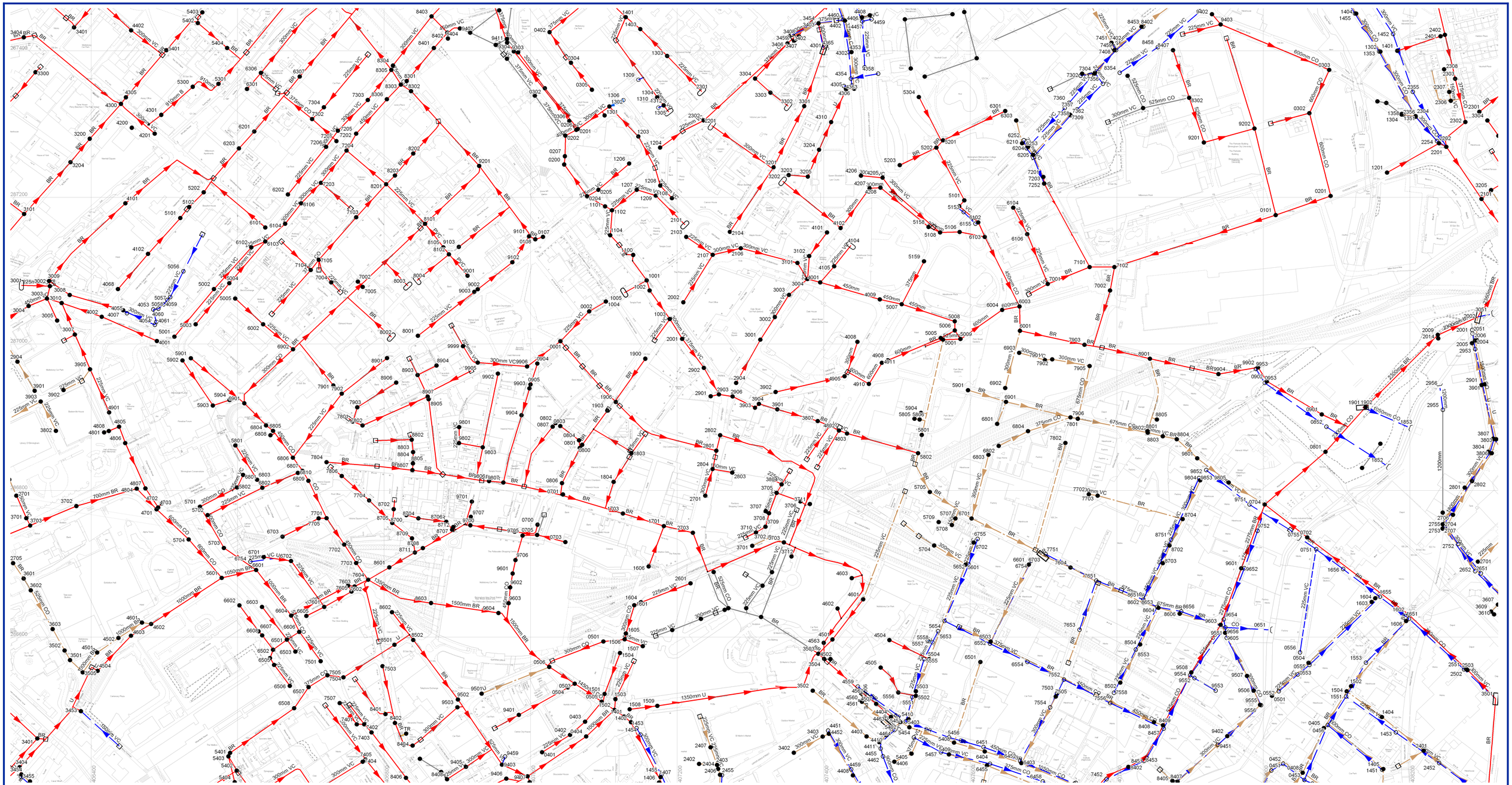
Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0845 601 6616

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CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD

O/S Map scale: 1:2500
Date of issue: 16.10.14

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