



## **Southern Water**

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**Bishop's Waltham WTW**

**Flood Risk Assessment**

**5500122\_RPT\_FRA**

**11<sup>th</sup> October 2012**



A joint venture between United Utilities, Costain and MWH

**Client:** Southern Water  
**Project:** Bishop's Waltham WTW  
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## 1. INTRODUCTION

### 1.1. Background

This report provides an initial flood risk assessment for the proposed development at Bishop’s Waltham Wastewater Treatment Works (WTW). The development is to meet changes to the site’s Environment Agency (EA) Discharge Permit requiring reductions in the nutrients Phosphorus and Nitrate in the treated effluent.

Bishop’s Waltham WTW is located approximately 2km southwest of Bishop’s Waltham Town Centre, on the south bank of the River Hamble, as shown in Figure 1.

The national grid reference of the site is SU 5426 1615.

Site address: Bishop’s Waltham WTW  
Botley Road  
Bishop’s Waltham  
Southampton  
Hampshire  
SO32 1DQ

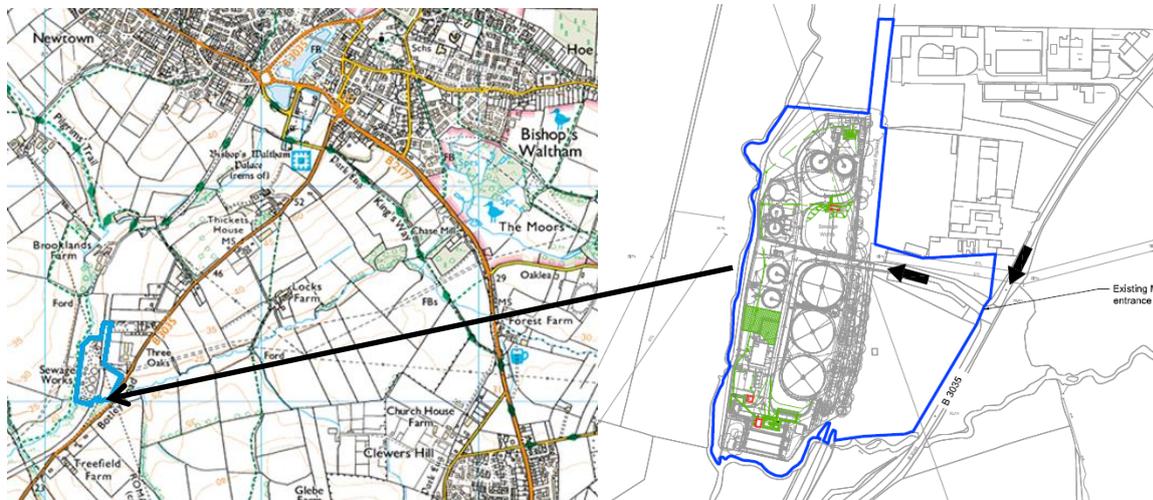


Figure 1: Location of Bishop's Waltham WTW

### 1.2. Report Purpose

The report outlines the design assessment carried out to ensure proposed developments are suitably located and resilient in relation to flood risk. The report considers both the impact on Southern Water facilities and the potential impact on local flooding by displaced water.

The Southern Water Technical Specification MED 4001, Cl 2.9.2, states:

**“2.9.2 Flooding**

*New assets shall be designed, selected and installed in such a manner to be protected from the following flood scenarios:*

- *Strategic sites/assets as identified by the Purchaser: 1-in-1000 year flood event for fluvial flooding and tidal flooding.*
- *All other sites/assets: 1-in-100 year fluvial flooding and 1-in-200 year tidal flooding*

*Particular consideration shall be given to the location of: Motor Control Centres, electrical equipment, generators and other non-submersible plant.*

*Retained assets shall be surveyed and assessed only for flood protection options to comply with the aforementioned flood scenarios. These options shall be submitted to the Purchaser for potential inclusion into any scope of works.”*

Within the 4D SEC (AMP5) Contract, Annex 6, Bishop’s Waltham WTW is not identified as a strategic site. Therefore all proposed new assets at the Bishop’s Waltham WTW are required to be protected from 1-in-100 year fluvial flooding and 1-in-200 year tidal flooding.

The EA provide flood maps on request for a specified area, which outlines the susceptibility to flooding by denoting Zones; these Flooding Zones are defined in Appendix C.

**1.3. Planning Policy Statement 25**

In addition to the requirements outlined above, the Planning Policy Statement 25 (PPS25) provides guidelines on how a risk-based approach should be taken when considering flood risks to developments. Within this approach, inappropriate development should be avoided in flood risk areas and the design and location of the development should consider the likely routes and storage of flood water and its influence downstream.

Where development is proposed in a location predicted to to be vulnerable to flooding, the development should undergo a sequential test and/or an exemption test, as explained below.

**1.3.1. The Sequential Test**

The Sequential Approach should be used in areas known to be at a risk of flooding to determine if the development can be relocated to an alternative location with a lower risk of flooding. In the case of Wastewater Treatment Works the location of development is often dictated by existing infrastructure and land availability. Therefore the Sequential Test can be applied to demonstrate how the risk is mitigated.

The report must demonstrate that where development cannot reasonably be located within Flood Zone 1 areas then the vulnerability of the development is low enough to develop on Flood Zone 2 or 3. Appendix D displays the relevant tables for the Sequential Test, which classify the vulnerability of the site.

**1.3.2. The Exception Test**

If the vulnerability and location of the development dictate that the sequential test will be failed, the exception test provides an opportunity to prove that the wider sustainability benefits outweigh the risk and that the development can take place. The Exception Test is

only appropriate for use when there are large areas in Flood Zones 2 and 3a, where the Sequential Test alone cannot deliver acceptable sites.

Therefore, the exception test should be reserved from uncommon situations where development is necessary and the sequential test cannot be passed. Due to the sustainability and environmental benefits that WTWs bring however, it is likely that the exception test can be passed if the advantages of the development are clearly defined and reasonable mitigations against flooding are taken.

## **2. PROPOSED DEVELOPMENT**

### **2.1. Existing Works**

The Bishop’s Waltham WTW site covers a total area of approximately 49,600m<sup>2</sup>. The main existing structures at the site are: an Inlet Works, Primary Settlement Tanks, Storm Tanks, Secondary Percolating Filters, Humus Tanks, Sludge Tanks, Sand Filters and an Administration/control building. The existing site layout and topography is shown in Appendix A.

The site slopes gently from north down to the south and from east down to the west, with typical site levels being roughly 23mAOD in the northeast corner lowering to about 18.5mAOD in the southwest corner. Normal site access is through the main entrance on the eastern edge of the site.

### **2.2. Description of the Proposed Land Use**

The proposed development entails the construction of new process units and supporting infrastructure on the existing operational wastewater treatment works site. The site layout of the proposed works is shown in Appendix B.

Elements of the proposed works require planning approval. These items are as follows:

- Ferric Dosing Kiosk for bulk storage and dosing equipment (Lintott 6E-30K package plant) - 9.7m x 4.0m x 4.05m high.
- Phosphate monitoring kiosk - 1.65m x 1.65m x 2.9m high.
- Compressor kiosk to house replacement air compressors for existing site sand filters- 5.0m x 5.0m x 3m high.
- Methanol, MCC and pump kiosk to provide pump and motor control centre for new methanol plant – 7.0m x 5.0m x 3.0m high.

The four kiosks will have a combined floor area of approximately 101.5m<sup>2</sup>.

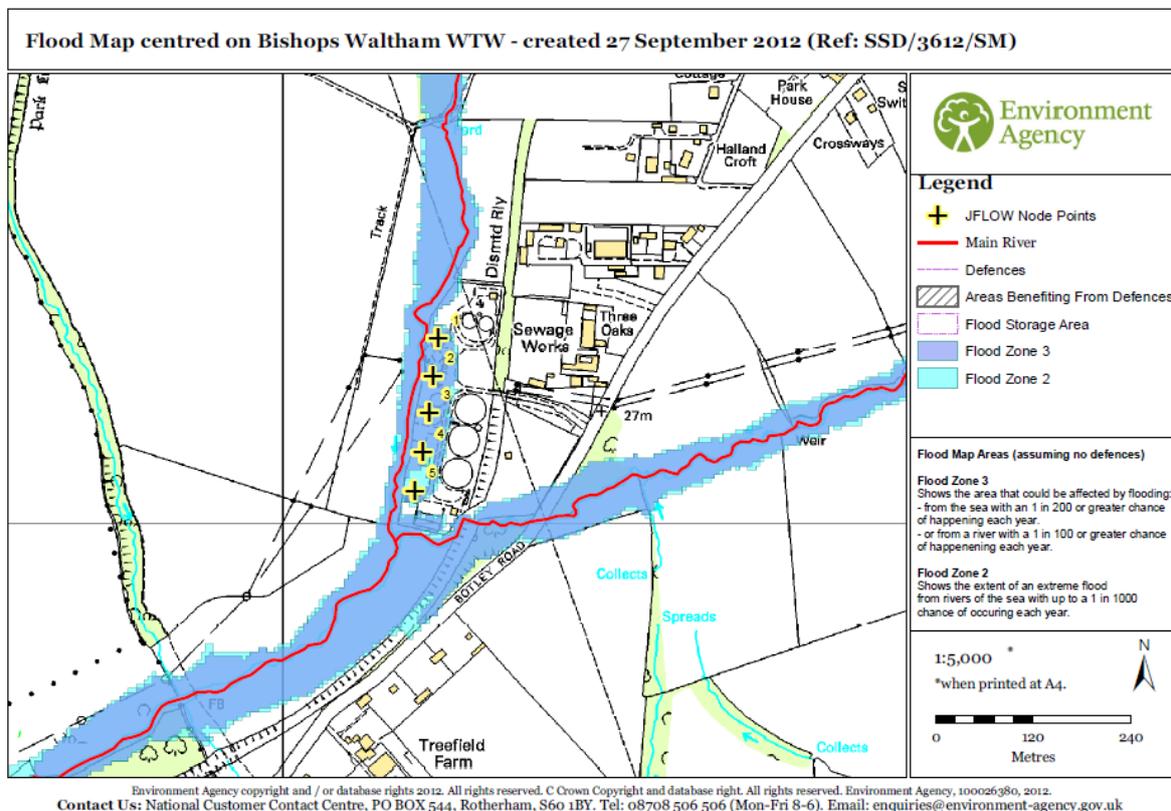
The remainder of the works are to be carried out under Southern Water’s Permitted Development rights and these include;

- New methanol plant in fenced area with adjacent bunded delivery area.
- Ferric shower for emergency washing in case of ferric exposure.
- Tanker bay for ferric kiosk with drive over bunds and containment kerbing linked to an underground chemical interception chamber, which in turn drains to the works return pumping station.
- Modifications to existing hardstanding to allow access for methanol tankers.
- Temporary Construction Compound for the duration of works.
- Underground pipework modifications within the site.

### 3. ANALYSIS OF FLOODING RISK

#### 3.1. EA Flood Data

The online EA flood map for the area shows the site is within a Flood Risk Zone, therefore EA flood prediction information has been obtained. Figure 1 shows the EA map and the node points for which predicted flood levels have been provided. The western edge of the site is within Flood Zones 2 and 3.



**Figure 2: Environment Agency Flood Zone Map for SU 5426 1615. (Supplied by the Environment Agency on 27<sup>th</sup> September 2012)**

Table 1 shows results for the five node points provided by EA analysis using the JFLOW modelling system which calculates the water depths during flood events. The results can then be applied to the site topographic levels to indicate flood levels. (NOTE: the EA provided Flood Water Surface Levels as part of their JFLOW data; however the 4Delivery topographic levels show that the EA data is incorrect and therefore resultant Flood Water Surface Levels are calculated by applying EA Flood Depths to 4D Topographic site levels.)

Table 1: Water Depths & Levels for Bishop’s Waltham 5 node points (Data supplied from the Environment Agency on 27<sup>th</sup> September 2012)

Point	Water Depth mAOD		Site Levels (mAOD)	Flood Water Surface Level (mAOD)	
	100 Year Depth (Flood Zone 3)	1000 Year Depth (Flood Zone 2)	4D Topographic site levels	100 Year Depth (Flood Zone 3)	1000 Year Depth (Flood Zone 2)
1	0.05	0.19	18.68	18.73	18.87
2	0.15	0.31	18.8	18.95	19.11
3	0.27	0.42	18.71	18.98	19.13
4	0.05	0.16	18.8	18.85	18.96
5	0.04	0.1	18.76	18.8	18.86

Table 1 shows that the predicted flood levels vary from location to location with the deepest flood level for the site predicted to occur at Point 3 (0.27m for 1:100 year event).

### 3.2. Southern Water Design Levels

As stated in Section 1.2, Bishop’s Waltham is not a strategic site and therefore the appropriate Southern Water design criteria is the 1-in-100 year fluvial flood level. Assuming a conservative case that flooding at any location will not exceed the maximum depth predicted (0.27m depth as calculated for Point 3), this design level can be complied with by ensuring that equipment vulnerable to flooding should be sited above 18.98mAOD. Further resilience has been built into the design by using the floor level of the existing Motor Control Centre at the site (19.5m AOD) as the floor slab top level for the proposed developments. This ensures the existing flood resilience of the site will therefore remain the same.

### 3.3. Sequential Test

Table D.2 in the PPS25 classes wastewater treatment works as ‘less vulnerable’ if pollution control measures are in place, allowing such development within Flood Zones 1, 2 and 3a but not within Flood Zone 3b.

Data is not currently available to split Flood Zone 3 in this location into areas a and b, although The Partnership for Urban South Hampshire Strategic Flood Risk Assessment (PUSH SRFA) indicates that in this situation it should be assumed all of Flood Zone 3 is 3b. This would effectively preclude this development.

Examining the proposed development pragmatically it would appear perverse to prevent the development of minor additions to an existing wastewater treatment works based on this approach. The facts of the case are that the flood depths calculated for this location are relatively minor and can easily be accommodated by providing slight elevations to floor slabs. Mechanical and electrical equipment which would be susceptible to damage during flooding would be located well above such floor levels.

The proposed developments are adjacent to other structures and therefore will make no significant difference to floodwater flows across the site.

#### 4. DESIGN IMPLICATIONS

The design implications for the scheme are essentially to position all items of development in Flood Zone 1 or to build floor slabs to be above predicted Flood Water Surface Levels.

The implications for the proposed development are defined below.

##### 4.1. Proposed Layout

The proposed layout is shown on the drawings in Appendix B to this report. To comply with Southern Water’s Specification (MED4001) and PPS25 the works has been designed as follows:

###### Ferric Dosing Plant

The Ferric Dosing Plant has been designed to avoid the flood zone areas of the site and consequently will not be susceptible to flooding, according to EA data.

###### Phosphate Measuring Kiosk

The Phosphate Monitoring Kiosk is to be located on a concrete slab with a top level of 19.5 mAOD.

###### Compressor Kiosk

The Compressor Kiosk is to be located on a concrete slab with a top level of 19.5 mAOD.

###### Methanol, MCC & Pump Kiosk

The Methanol, MCC & Pump Kiosk is to be located on a concrete slab with a top level of 19.5 mAOD.

###### Methanol Dosing Plant

The methanol dosing plant has been designed to avoid the flood zone areas and consequently will not be susceptible to flooding according to EA data.

###### Other Permitted Development

All other work on the site is permitted development of hard standing/pipework etc, largely at or below ground level and so will not affect flood storage. Flood risk has been considered in the design to avoid the flood susceptible area of the site where possible or be resilient.

##### 4.2. Surface Water Drainage

New roads and areas of hardstanding shall be adequately drained to prevent accumulation of surface water. The new drainage system shall maintain distinction between ‘clean’ (surface water) and ‘dirty’ (contaminated surface water) areas. Surface water from ‘Clean’ areas shall be discharged to land. Surface water, run-off or wash-down water from ‘dirty’ areas will be collected and discharged into the treatment process. Any potential spillage from chemical or fuel delivery enclosures will be captured within bunded enclosures and discharged into the treatment process.

#### **4.3. Land Drainage Consent**

No works are proposed within 8m of the nearest watercourse, therefore no Land Drainage Consent from the EA will be required.

#### **4.4. Pollution Control**

The risk of pollution is unchanged by the proposed development.

#### **5.0 Conclusion**

The proposed development is minor in scale and classed as ‘less vulnerable’ to flooding. It must be placed within the existing site and geographically associated with existing processes to carry out its function. During design, flood risk was assessed and where possible parts of the development were located outside the flood risk area. Those units which have to be within the flood risk area have been provided with floor levels above the predicted flood levels and which match the existing site Motor Control Centre floor level. The flood resilience of the site is therefore maintained.

The new developments are minor in footprint and adjacent to existing structures. Therefore, they will not have a significant effect on floodwater flows across the site.

The flood risk to the new development and its potential effects on flood events are considered acceptable.

## **APPENDIX A**

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### Existing Site Layout & Topographic Survey

See Files:    BW\_Flood\_Risk\_App\_A\_Sheet1\_of\_3  
                  BW\_Flood\_Risk\_App\_A\_Sheet2\_of\_3  
                  BW\_Flood\_Risk\_App\_A\_Sheet3\_of\_3

## **APPENDIX B**

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### Proposed Site Layout

See File: BW\_Flood\_Risk\_APP\_B\_Site\_Layout

## APPENDIX C

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### Flood Zones as defined by the PPS25

Flood zone	Annual probability of flooding
1:00 Low Probability	Less than 1 in 1000 year (<0.1%) for river or sea flooding
2:00 Medium Probability	Between 1 in 1000 year (0.1%) and 1 in 100 year (1%) for river flooding or Between 1 in 1000 year (0.1%) and 1 in 200 year (0.5%) for sea flooding
3a: High Probability	1 in 100 year (1%) or greater for river flooding or 1 in 200 year (0.5%) or greater for sea flooding
3b: The Functional Floodplain	Land where water has to flow or be stored in the times of flood. There is not a strict definition of annual probability of flooding in this zone, but 1 in 20 year (5%) or greater should provide a starting point for consideration.

## APPENDIX D

### The Sequential Test

Table D.3<sup>23</sup>: Flood Risk Vulnerability and Flood Zone ‘Compatibility’

Flood Risk Vulnerability classification (see Table D2)		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table D.1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✗	Exception Test required	✓
	Zone 3b ‘Functional Flood plain’	Exception Test required	✓	✗	✗	✗

Key:

✓ Development is appropriate

✗ Development should not be permitted

NOTE: Flood Vulnerability can be found in the PPS25 Table D.2. Sewage Treatment Works are classified as “Less Vulnerable” if adequate pollution control measures are in place.