Appendix F

ECONOMIC ANALYSIS

BROXBOURNE BOROUGH SWMP ECONOMIC ASSESSMENT

DATE: 02 November 2016

Introduction

This Technical Note has been produced to summarise the potential construction costs and associated economic viability associated with each of the potential flood mitigation schemes identified through the detailed phase of the Broxbourne Borough SWMP.

The potential construction cost estimates have been undertaken at a strategic scale to enable the schemes to be assessed for viability, and where viable prioritised for further assessment. These cost estimates have been prepared based upon the mitigation schemes provided in Appendix E of the SWMP and the baseline modelling. At this time no post mitigation modelling has been undertaken to refine or test the performance of these options. Assumptions regarding the performance have therefore been made as part of this economic assessment, as detailed below.

The mitigation measures have been identified and their associated requirements sized using engineering judgement. For example, where this involves attenuation/relocation of flow paths the total volume has been estimated from the maximum flood extent maps, using an assessment of the area and average depth across the area to be protected.

In several hotspots the benefit areas of multiple mitigation options overlap. Understanding the combinations of these options would require further, and more detailed, modelling. Property Level Protection (PLP) has been costed for these areas to understand the baseline economic benefits of protecting these properties. The cost of PLP will likely be more than the combined cost of the recommended options, so benefit cost ratios will be pessimistic.

The potential costs associated with the mitigation options have been determined using the Environment Agency's Long Term Costing Tool[1] which has been developed for this purpose. As these costs have been estimated at a strategic scale several broad assumptions were required, these were:

- All the land required is already within public control or will be allowed to flood more frequently/to greater depths;
- No allowance has been made for working with third parties to make them aware of the risks/measures to reduce these risks;
- No infrastructure constraints exist which would require diversion or alternative construction approaches;
- Any spoil can be re-used within the site/scheme;
- Works to the highway to ensure that it functions as a preferential flow path would be limited and restricted to minor works, such as vegetation clearance, altering kerb arrangements or liaison with property owners to make minor changes to walls/fences to maintain flow routes. As such no provision has been made for this aspect. The scope of such works would need to be refined following a detailed site visit with appropriate engineers; and
- All options considered have an optimism bias of 60% added to their present value costs to allow for uncertainty; this is standard for strategic/feasibility stage of design.

[1] https://www.gov.uk/government/publications/long-term-costing-tool-for-flood-and-coastal-risk-management

These costs have allowed for design and construction with operation and maintenance (where contained within the Environment Agency's tool).

Hotspot 9 - Rye House

The Standard of Protection (SOP) assumed for this scheme is 1.33% (1 in 75 years) based on the baseline model results. The costs for providing this are detailed below:

MEASURE	ESTIMATED COST [£]
Property level protection (PLP) – 138 residential properties and 35 commercial properties, all costed as medium value properties with premium protection	£3,100,000

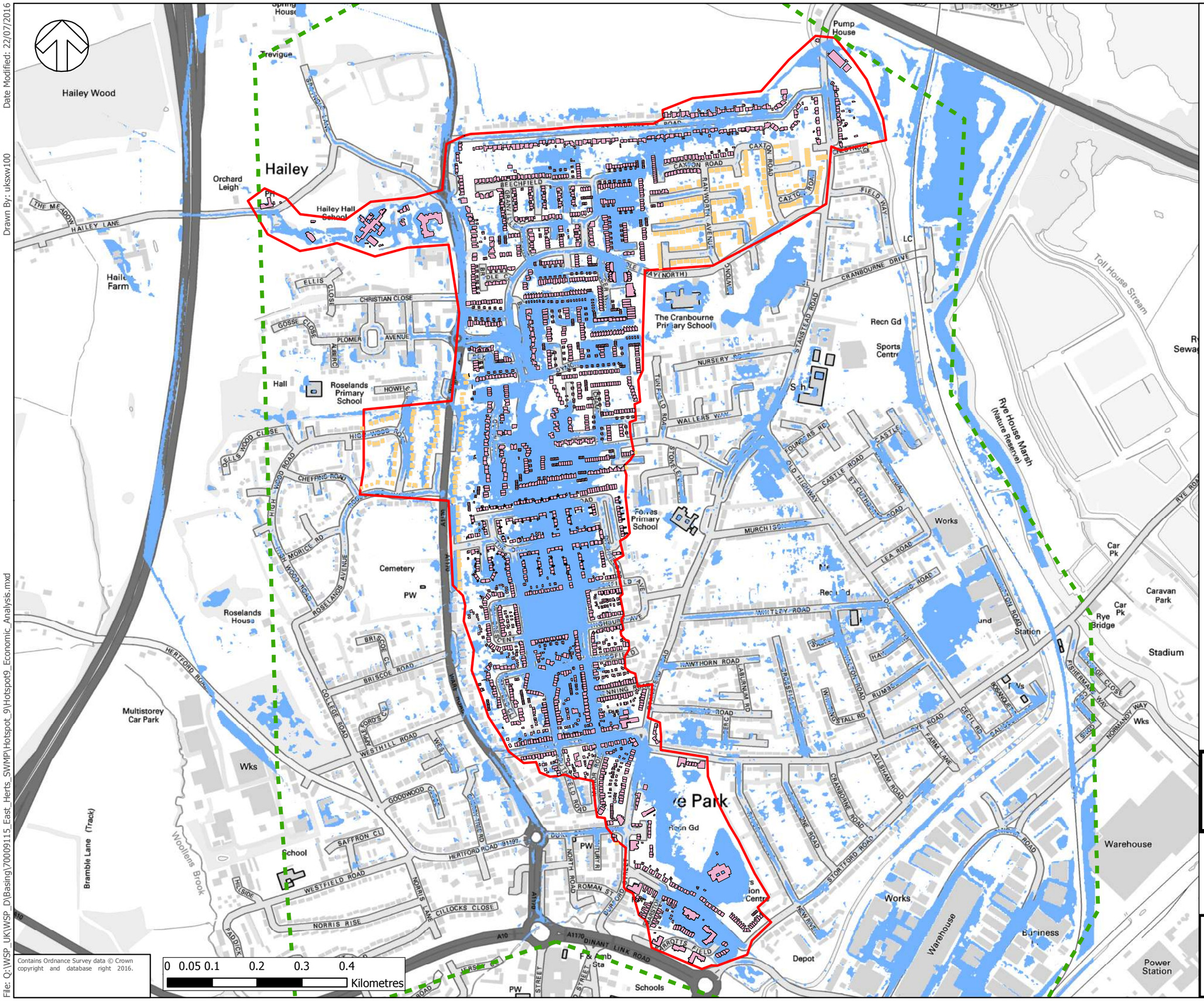
Rye House Assumptions

To provide a cost estimate for this hotspot several location specific assumptions were required, these are outlined below:

- Due to the strategic level of modelling the locations of the properties requiring PLP may change, it is assumed however, that the general number of properties stated is of the right order of magnitude.
- This is one of the hotspots where alternative mitigation measures in combination may be appropriate but further detailed modelling is required to determine the requirements and therefore the costs. The cost of PLP has therefore been utilised as an indication of the likely costs to protect this area.

Date Modified: 22/07/2016

Drawn By: uksxw100



Key

- Properties benefitting from mitigation options
- Properties to be included in economic analysis
- Model Extent
- Economic Analysis Zone

1 in 100 yr RP

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TITLE:

East Hertfordshire
Surface Water Management Plan
Hotspot 9 - Economic Analysis

FIGURE No:

FIGURE 1

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Hotspot 52 - Cheshunt

The Standard of Protection (SOP) assumed for this scheme is 3.33% (1 in 30 years) based on the baseline model results. The costs for providing this are detailed below:

MEASURE	ESTIMATED COST [£]
Church Lane (north side) - 100m^2 swale (50m long * 2m wide) and 70m long culvert (600mm dia) linking to either New River or Great Cambridge Road drainage.	£60,000
Property level protection (PLP) – 73 residential properties, all costed as medium value properties with premium protection	£700,000
Kilsmore Lane – 15m long masonry flood wall <1.2m high	£40,000

Cheshunt Assumptions

To provide a cost estimate for this hotspot several location specific assumptions were required, these are outlined below:

- Due to the strategic level of modelling the locations of the properties requiring PLP may change, it is assumed however, that the general number of properties stated is of the right order of magnitude.
- The culvert diameter was approximated; defining more accurate diameters would require further modelling.

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Key

- Properties benefitting from mitigation options
- Model Extent
- Economic Analysis Zone
- Properties to be included in Economic Analysis

0 0.05 0.1 0.2 0.3 0.4 Kilometres

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TITLE:

East Herts
Surface Water Managament Plan
Hotspot 52 - Economic Analysis

FIGURE No:

FIGURE 2

Hotspot 55 - Cozens Lane East

The mitigation measures could be implemented to provide a 1.33% SOP (1 in 75 years). The cost for providing this are detailed below:

MEASURE	ESTIMATED COST [£]
Property level protection (PLP) – 412 residential properties and 3 commercial properties, all costed as medium value properties with premium protection	£4,000,000
Railway embankment – Increase the capacity of 4 culverts	£380,000
Railway embankment – Add 3 new 50m long culverts under the embankment	£300,000

Cozens Lane East Assumptions

To provide a cost estimate for this hotspot several location specific assumptions were required, these are outlined below:

- The Culverts, both the upgrades and the new, were costed as having 900mm diameters. The diameter was approximated; defining more accurate diameters would require more accurate modelling.
- Some of the culverts would require new openings under the Network Rail embankment. No cost has been added to the option to represent the complexity of works on a railway embankment or the cost of liaising with Network Rail. Ponding water at the toe of the embankment could cause long term stability issues however so it may be in Network Rails' interest to discuss the potential options.
- Due to the strategic level of modelling the locations of the properties requiring PLP may change, it is assumed however, that the general number of properties stated is of the right order of magnitude.

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Key

- Properties benefitting from mitigation options
- Model Extent
- Economic Analysis Zone
- Properties to be included in Economic Analysis

1 in 100 yr RP

0 0.1 0.2 0.4 0.6 0.8 Kilometres

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TITLE:

East Hertfordshire SWMP
Hotspot 55 - Economic Analysis

FIGURE No:

FIGURE 3

Hotspot 62 - Rosedale North / Flamstead End

The Standard of Protection (SOP) assumed for this scheme is 3.33% (1 in 30 years) based on the baseline model results. The costs for providing this are detailed below:

MEASURE	ESTIMATED COST [£]
Rosedale Way – 320m^2 of swale (160m long, 2m wide) along the western side of Rosedale Way.	£12,000
Flamstead End Road – Drain upgrade, 100m long drain upgrade – costed as a 100m culvert	£100,000

Rosedale Assumptions

To provide a cost estimate for this hotspot several location specific assumptions were required, these are outlined below:

- It was not possible to confirm the exact characteristics of the swale or the diameter for the drain upgrade. Therefore approximate values were used as defining more accurate diameters would require more accurate modelling.

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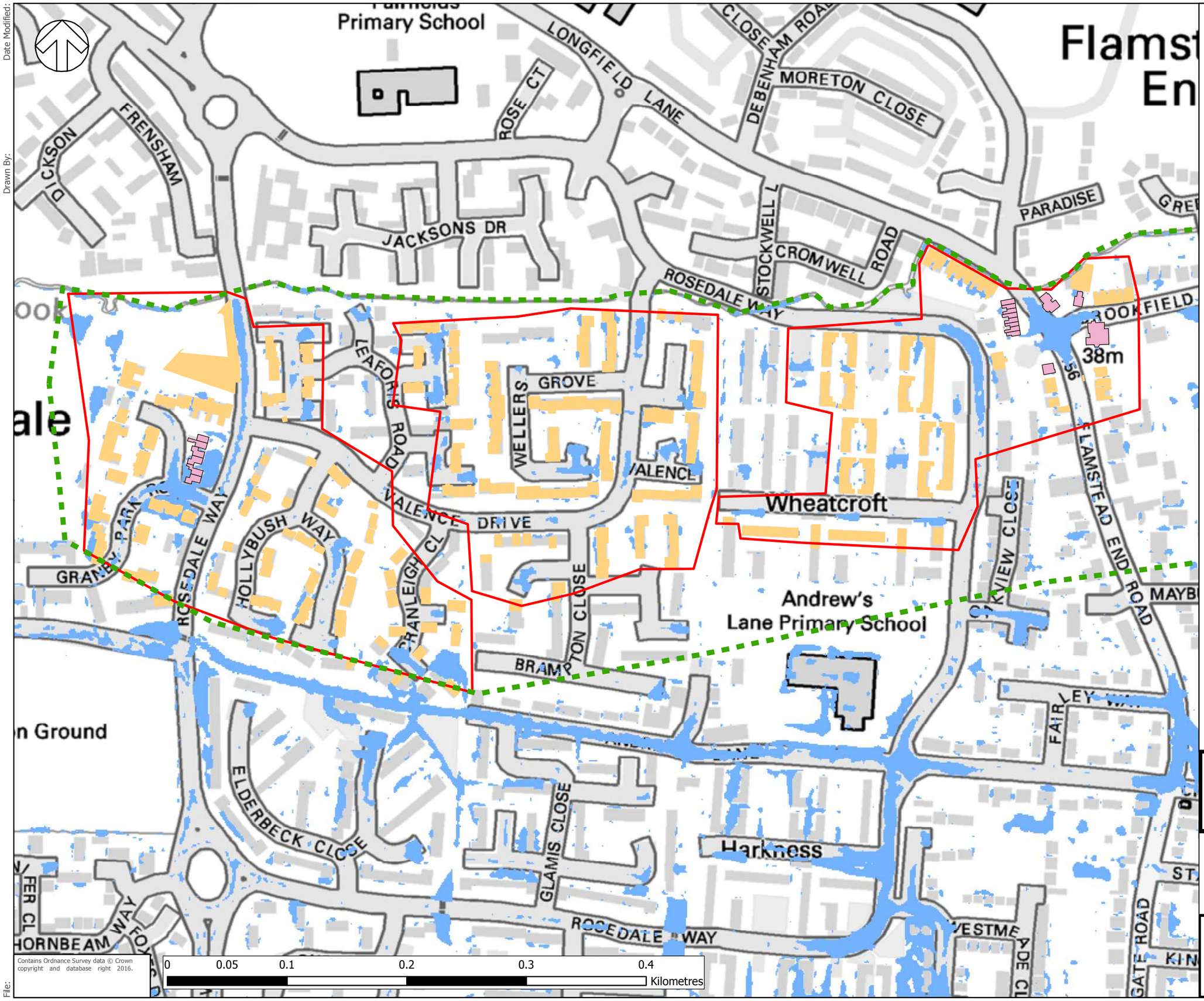

Key

- Properties benefitting from mitigation options
- Model Extents
- Econmic Analysis Zone
- Properties to be included in economic analysis

1 in 100 yr RP

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TITLE:

East Herts
Surface Water Management Plan
Hotspot 62 - Economic Analysis

FIGURE No:

FIGURE 4

Hotspot 63 - Rosedale South / Flamstead End

The Standard of Protection (SOP) assumed for this scheme is 3.33% (1 in 30 years). The costs for providing this are detailed below:

MEASURE	ESTIMATED COST [£]
Property level protection (PLP) – 45 residential properties and 8 school properties (St Mary's High School), all costed as medium value properties with premium protection	£750,000

Rosedale South Assumptions

To provide a cost estimate for this hotspot several location specific assumptions were required, as outlined below:

Due to the strategic level of modelling the locations of the properties requiring PLP may change, it is assumed however, that the general number of properties stated is of the right order of magnitude.

Date Modified:

Drawn By:

File:

Rosedale

Lea Mount

Rosedale Recreation Ground

Pavilion

Recreation Ground

Nurseries

Wheatcroft

Andrew's Lane Primary School

Harkness

McGredy

Football Ground

Goffs School

Recreation Ground

Colesgrove Manor

South Lodge

Halstead Hill House

Nursery

Nurseries

Bonneygrove Primary School

Cemetery

PW

ANDREW'S LANE

LEA MOUNT

GRANBY PARK

ROSEDALE WAY

HOLLYBUSH WAY

LEAFORIS ROAD

WELLERS GROVE

VALENCE DRIVE

FRANLEIGH CL

BRAMPTON CLOSE

ELDERBECK CLOSE

GLAMIS CLOSE

FAIRLEY

LAMSTEAD END ROAD

CHURCHGATE ROAD

HORNBEAM WAY

FOXES DR

HUNTERS REACH

BUSHBARNS

CLAREMONT

GOFFS LANE

B156

ROMAN ROAD

FRANKLIN AVENUE

FRANK MARTIN COURT

BAKERS ROAD

RIPLEY WAY

LORDSHIP ROAD

CROMWELL AVENUE

GREENDALE CLOSE

BONNEY GROVE

WINDSOR CLOSE

BURY GREEN ROAD

HALSTEAD HILL

Theobalds

38m

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0 0.1 0.2 0.4 0.6 0.8 Kilometres

Key

- H63_benefit properties
- H63_properti... economics
- Model Extent
- Economic Analysis Zone
- **1 in 100 yr Flood Extent**

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TITLE:

East Herts
Surface Water Management Plan
Hotspot 63 - Economic Analysis

FIGURE No:

FIGURE 5