LANMOR Consulting

Civil Engineers & Transport Planners

Burhill Golf Club

Flood Risk Assessment

July 2023

231719/FRA/AG/KL/01

LANMOR Consulting

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First	30/7/23	For Approval	KBL

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FIGURES

APPENDICES

1 INTRODUCTION

1.1 General

1.1.1 Lanmor Consulting Ltd has been appointed to prepare a flood risk assessment for the proposed development at Burhill Golf Club, Burwood Rd, Hersham, Walton-on-Thames KT12 4BX.

1.1.2 The location of the site is indicated below in Figure 1.1.

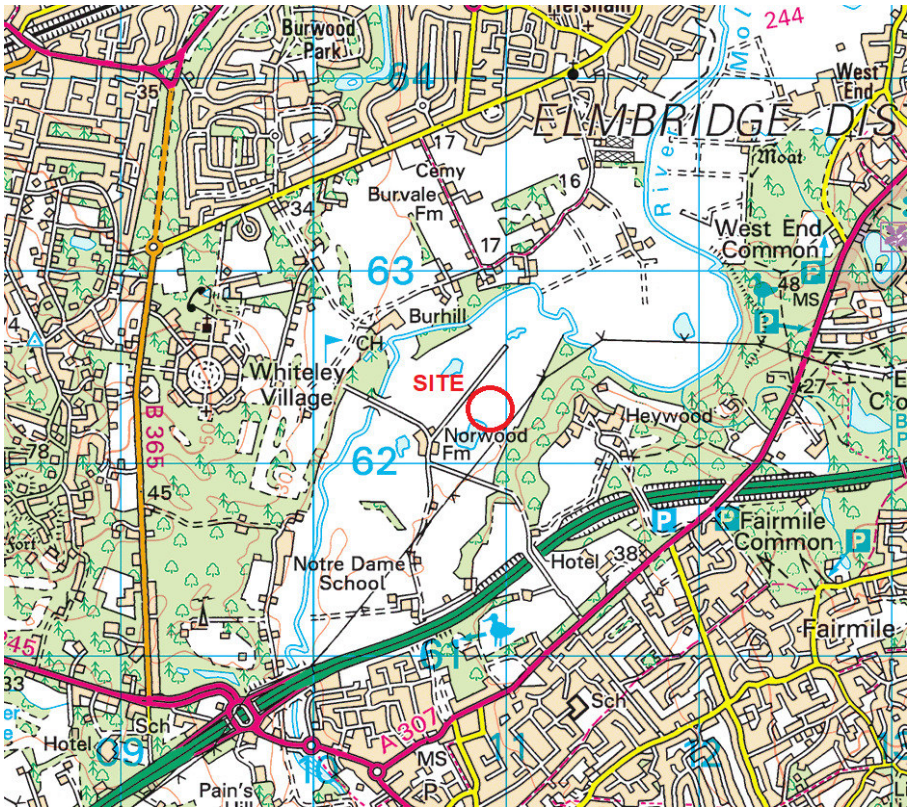

Figure 1.1 – Site Location

1.2 Scope

1.2.1 This report describes the existing site conditions, development proposals and implications of flooding on the site as described in the governments guidance document; National Planning Policy Framework (NPPF) and its technical guidance. This report will consider the following:

- Development proposals;
- Sources of flooding and flood defences;
- Flooding extents, depth and climate change predictions;
- Impact of flooding on the development;
- Dangers presented by flooding.

1.2.2 This report has been prepared in accordance with the requirements of the government's National Planning Policy Framework (NPPF) and its planning practice guidance and will demonstrate that the proposed development will be safe and will not increase the risk of flooding in the surrounding area.

2 DEVELOPMENT SITE AND GROUND CONDITIONS

2.1 Existing Site

2.1.1 The application site forms part of the Burhill Golf Course complex. The site is open and is part of the golf course but unused. It is located adjacent of the fairway of the thirteenth hole of the New Course. The general area of site is indicated in figure 2.1 below.

Figure 2.1 – Existing Site Layout

2.1.2 The existing land falls from south to north and slightly from east to west. The existing topography of the site is indicated in Figure 2.1 below. The River Mole runs from west to east, within the general Burhill club grounds the application site to the north.

2.2 Regional Geology

2.2.1 The British Geological Survey (BGS) indicates that the site is underlain by Bagshot Formation - Sand. Sedimentary bedrock formed between 56 and 47.8 million years ago during the Palaeogene period. Superficial deposits of Taplow Gravel Member – consisting of sand and gravel are also present.

2.3 Proposed Development

2.3.1 The proposed development is for the construction of new irrigation pond to the north of the current one. The pond will be partly excavated into the existing ground and bunded to provide the storage of water for the irrigation of the golf course. The pond will not receive runoff from the surrounding ground and will be fed from the existing borehole on site and pump into the pond. The pond will also have a pumped out fall to the adjacent pond which will operate when the course needs irrigating. The volume of water contained in the proposed pond will be in excess of the Reservoirs Act, so a panel engineer has been appointed to design the reservoir. Figure 2.2 below shows the proposed pond.

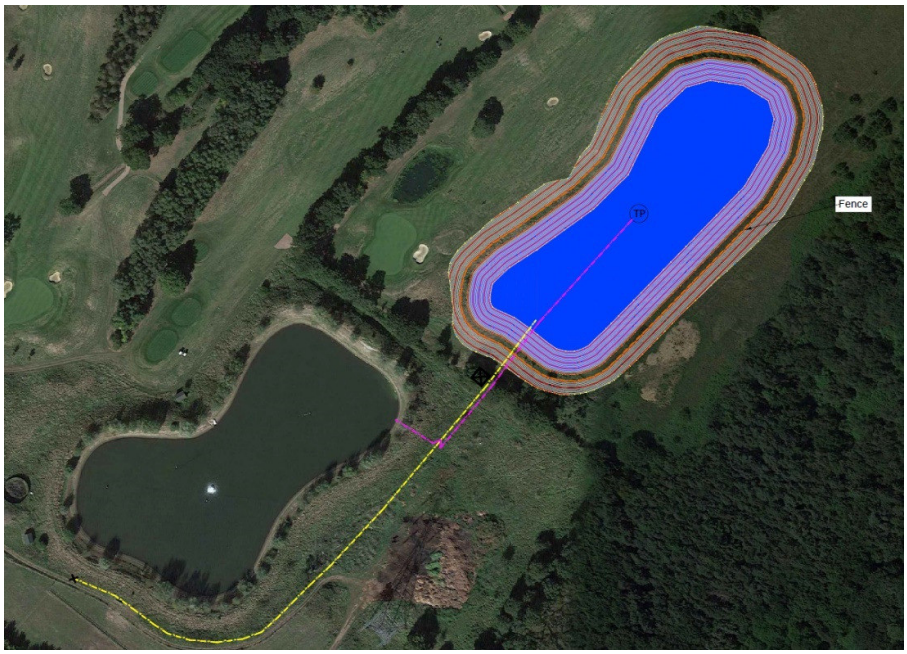

Figure 2.2 – Proposed Site Layout

2.3.2 The proposed site layout for the development has been included in Appendix A as drawing BGL230707-01

3 SOURCES OF FLOODING

3.1 Fluvial/Tidal Flooding

3.1.1 Detailed flood information was requested from the Environment Agency (EA) for the site since the EA's Flood Maps for Planning indicates the site is located in Flood Zone 2. The National Planning Policy Framework (NPPF) defines the flood zones as the following:

- Zone 1: 'Low Probability': This comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year.

- Zone 2: 'Medium Probability' – This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

- Zone 3a: 'High Probability' – This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (≥1%) or a 1 in 200 or greater annual probability of sea flooding (≥0.5%) in any year.

- Zone 3b: 'The Functional Floodplain' – This zone comprises of land where water must flow or be stored in times of flood. The SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA) including water conveyance routes.

3.1.2 The most significant source of fluvial flooding to the site comes from the River Mole to the north of the site. The EA flood map for planning indicates the application site lies entirely within Flood Zone 1. Figure 3.1 below shows the location of the site and its relationship to the flood zones in the area.

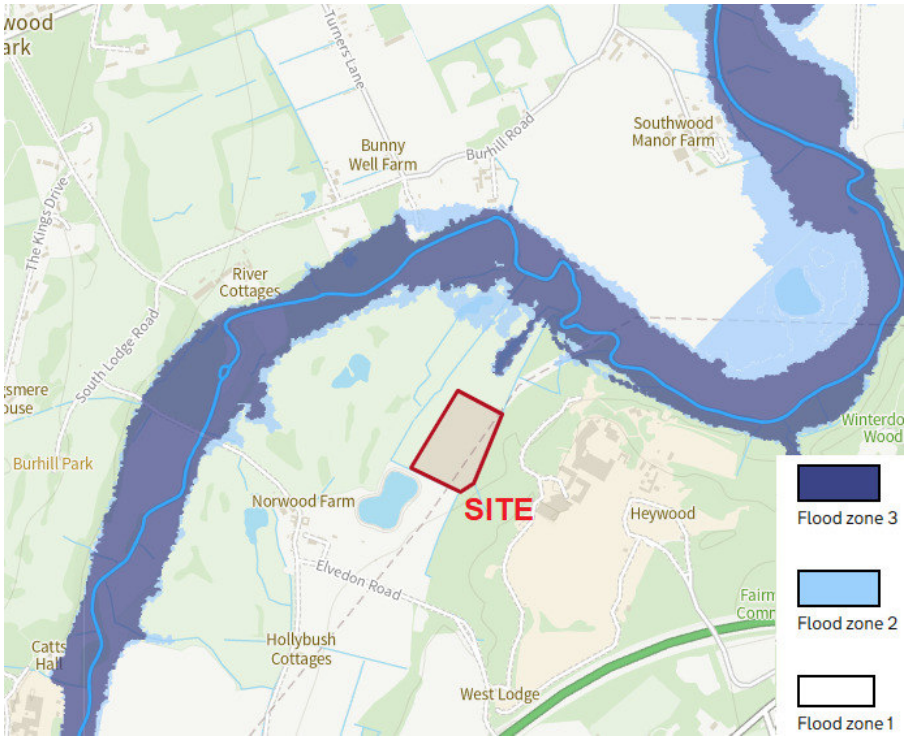

Figure 3.1 – EA Fluvial Flood Map

3.1.3 Dark blue shaded areas indicate areas within Flood Zone 3. Light blue shaded areas indicate areas within Flood Zone 2. Figure 3.1 above therefore shows that the site is located within Flood Zone 1.

3.2 Surface Water Flooding

3.2.1 The surface water flood mapping provided by the EA is the best available source of national information on surface water flooding. It is a starting point for understanding patterns and probability of surface water flooding. The EA accept that the mapping has limitations and state that "these maps cannot definitively show that an area of land or property is, or is not, at risk of flooding, and the maps are not suitable for use at an individual property level".

3.2.2 The mapping shows the site is not at risk of flooding with a probability of 1.0%, Figure 3.2 below shows the potential depth of flooding from a 1.0% probability event.

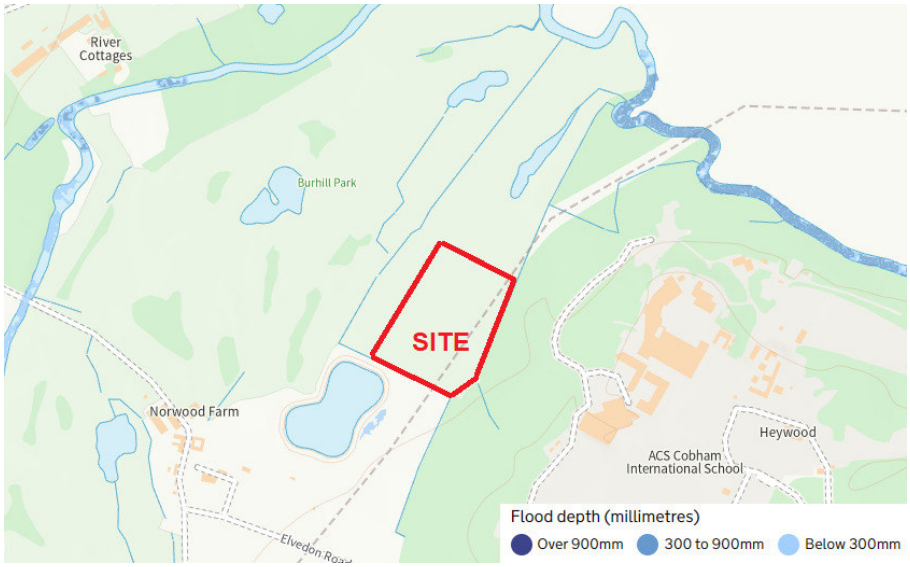

Figure 3.2 – EA Surface Water Flood Map

3.3 Groundwater Flooding

3.3.1 Groundwater flooding map Figure B5 in the Elmbridge SFRA shows the risk of groundwater flooding across the borough. This suggests that the majority of the pond is in not an area not at risk of groundwater flooding, with the northern section in an area with up to 50% risk of groundwater flooding. The SFRA groundwater flood risk map is included in Appendix B.

3.4 Sewer Flooding

3.4.1 The Elmbridge SFRA shows on figures B7 and B8 the reported incidents of internal and external sewer flooding. The maps show there have been zero floods in the postcode area from sewer flooding.

3.5 Reservoir Flooding

3.5.1 Figure 3.3 below shows the application site in relation to the extent of flooding from an incident at one of the surrounding reservoirs.

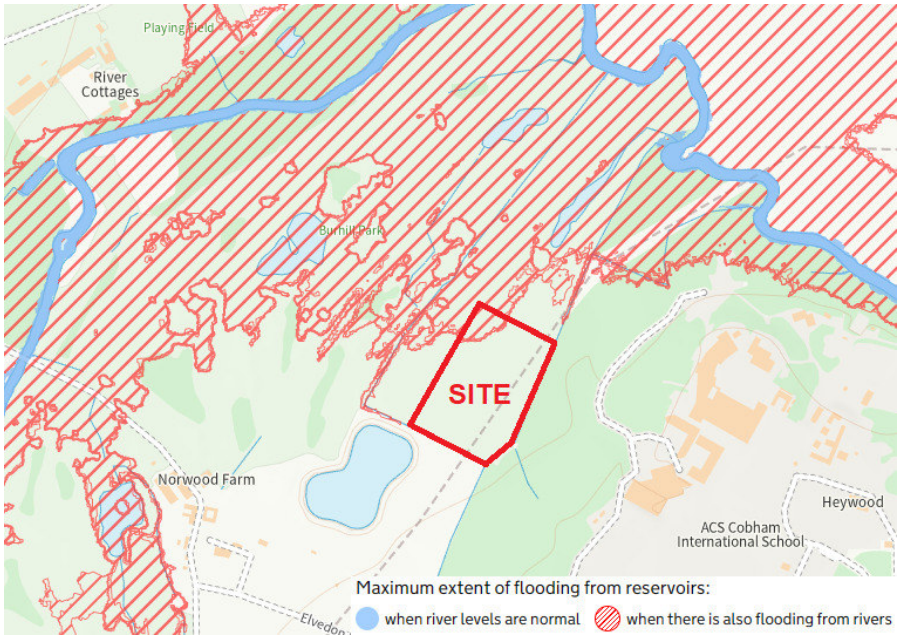

Figure 3.3 – Reservoir Flood Map

3.5.2 The reservoir mapping for the area indicates that the only a small section of the site to the northwest would be susceptible to flooding from reservoirs if there was a dam breach/failure. However this event is considered to be very low risk since the introduction of stringent reservoir safety measures. Since the 1930s reservoirs have a very good safety record. The Environment Agency states that: "England has an excellent reservoir safety record, and there have been no dam breaches resulting in the loss of life since the reservoir safety legislation was first introduced in 1930" the risk is therefore considered low.

4 MODELLED FLOOD LEVELS AND FLOODING IMPACT

4.1 Flood Probability

4.1.1 The nearest source of flooding to the site is from the River Mole, which runs around the application site to the north. The Environment Agency's "Flood Maps for Planning" shows the site to be entirely within Flood Zone 1. The probability of fluvial flooding for the site is therefore considered to be between less than 0.1%.

4.2 Climate Change Allowances

4.2.1 The Environment Agency have published updated climate change allowances. The allowance to be implemented is based on the management catchment area, flood zone and site vulnerability. The site is located within the Mole Management Catchment Area, as identified on the Department for Environment Food & Rural Affairs climate change allowances website.

4.2.2 The site lies within Flood Zone 1. The proposed development will be used for storing water, which is considered a water compactable use. Based on the "Flood Risk Assessment: Climate Change Allowance" guidance, sites in Flood Zone 1 do not need to include climate change allowances. However even if the central allowance of 12% for river flows as set out on website for climate change for the Management Catchment area is applied to the model, the site would still be free from flooding for an event with a 0.1% or less.

4.3 Impact on Flood Waters

4.3.1 As mentioned above, the nearest source of flooding to the site is from River Mole which is located directly to the north and east of the site. The proposed development seeks permission for a storage pond. The proposals will not increase the impermeable area on application site. The site is located outside of the flood extent for an event with a 1.0% probability plus a 12% allowance for climate change. Therefore, the proposals will not present any restriction to the free flow of flood waters or result in the loss of flood storage volumes for a 1.0% + 12% event.

4.4 Impact of Development

4.4.1 The proposed development is for a new storage pond to be used for the irrigation of the golf course. The elevation of the application site is 17.0m AOD to 18.5m AOD the River Mole to the north has an elevation of 12-13.0m AOD, Figure 4.1 below shows the ground elevation in the area of the application site.

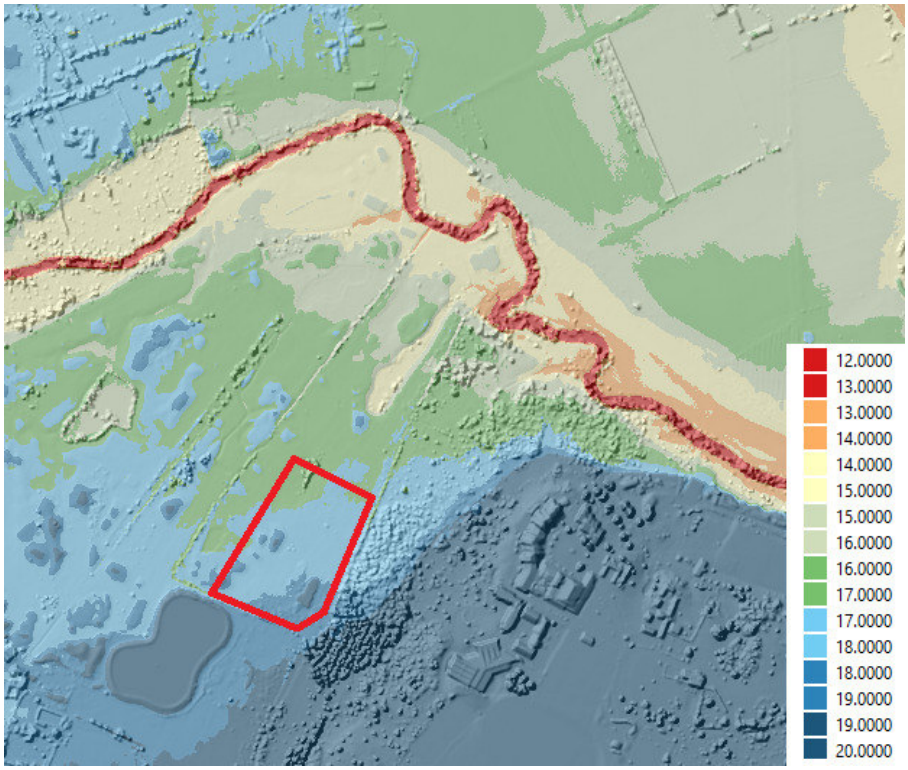

Figure 4.1 – Ground Elevations

4.4.2 The pond will not receive any runoff and will only be topped up by a pumped supply from the golf course. Therefore the water level in the pond can be carefully controlled and there will be no issue of the pond ever overflowing. However in the unlikely event that there is an issue with the pond and were the waters were to escape, the natural lie means flood waters will be forced to the north towards the River Mole.

4.4.3 Drawing 231714/FRA/01 included in Appendix A shows the potential route of flooding should there be an escape of waters from the pond. Drawing 231714/FRA/02 also included in Appendix A shows the potential route of flooding should there be an escape of waters from the pond.

4.4.4 The land to the south and east as demonstrated in figure 4.1 above is higher than the pond so any escaping waters from the pond on these sides will flow around the pond and north to the low-lying depression “water feature” directly north. The water feature runs north and connects to the River Mole, this will form the main route for flood waters from the pond in any such event.

4.4.5 Waters from the north of the pond will likely flow directly north to the low lying ground. Flood water from the west could flood the fairway of the thirteen but the ditch running along the fairway will transport some of the water flowing north to the River Mole but the majority will be flow naturally around the pond and north to the River Mole.

4.4.6 The pond is being designed by a panel engineer under the Reservoir Act. The construction will be supervised by a panel engineer, and in consequence the risk of failure will be very low. It will also be inspected at regular intervals after construction as required by the Reservoir Act. This will ensure the pond is safe for its lifetime. The risk of water escaping is considered very low, but if there is an issue, any flooding would only affect open land and no population or dwelling will be at risk.

4.5 Safe Access

4.5.1 The proposed property will be unmanned so access during flood conditions will not be required, however the site is located in flood zone 1 and is some distance from zones 2 & 3 so a safe dry access can be provided at all times.

5 DEVELOPMENT VULNERABILITY AND SEQUENTIAL TEST

5.1 Development Vulnerability Classification

5.1.1 The proposed development is for the construction of irrigation pond which is considered a water compatible use under Annex 3 of the NPPF and Planning Practice Guidance.

5.2 Sequential Test

5.2.1 The purpose of the sequential test is to assess locations and direct development to areas at less risk of flooding. The NPPF suggests that Regional Planning Bodies and Local Planning Authorities should ensure their spatial strategies include a broad consideration of flood risk. Strategic Flood Risk Assessments (SFRA) refine information on the probability of flooding, taking all sources of flooding and the impacts of climate change into account. They provide the basis for applying the sequential test.

5.2.2 This assessment and the data provided by the EA demonstrates the site is located within Flood Zone 1, so satisfies the requirements of the sequential test to allocate sites to low flood risk areas. Table 3 of the NPPF: “Flood risk vulnerability and flood zone incompatibility” shows that water compatible uses are acceptable in flood zone 1 and that the exception test is not required.

6 SUMMARY AND CONCLUSION

6.1.1 The proposed application seeks approval for the construction of a new pond to storge water for irrigating the golf course. The pond will not receive runoff from the surrounding ground but be topped up by pumped supply from the golf course. The water level in the pond will therefore be controlled so it will not be overfilled, it will also be registered under the Reservoir Act so will be inspected regularly which will ensure it is safe for its lifetime.

6.1.2 The site is located within Flood Zone 1 as shown in the Flood Map provided by the EA and the proposals will not restrict or result in the loss of flood storage volumes from a 1.0% + 12% allowance. The pond is considered to safe and will not allow the escape of water from it but if there was an issue the only areas likely to be affected will be unhabituated areas of open land.

6.1.3 For the reasons set out above, the proposed development is considered suitable for development, as there will be no negative impact on the flood plain, flow paths, or flood storage volumes; therefore, we see no reason why the proposal should be refused on the grounds of flooding.

APPENDIX A

BGL230707-01– Proposed Site Layout

Topsoil strip	3,452m³
Cut/Fill	13,585m³
Reservoir Base	16.16m AOD
Max Water Level	19.86m AOD (overflow)
Crest Height	20.46m AOD
Crest width	4m
Total capacity	30,594m³
Capacity AGL (15.99)	21,851m³
Internal slope	1 in 3
External slope	1 in 3

A

B

36.69

34.46

33.85

33.77

33.79

33.75

34.06

B

A

34.95

High Voltage Transmission Line
(lowest & closest)

0 1 2 3 4 5 6 7 8 9 10 15 25 50 100

scale bar - metres

Agripower Contractors Est. 1964

rev	detail	by	date
-	-	-	-

notes

project title

Burhill Golf Club
Additional Reservoir

drawing title

Proposed Reservoir
Levels & Location

drawing no.

BGL230707-01

drawing status: planning

revision: ---

date	scale	drawn	checked
7.7.23	1:500 A1	JA	GL

client

Burhill Golf &
Leisure Ltd

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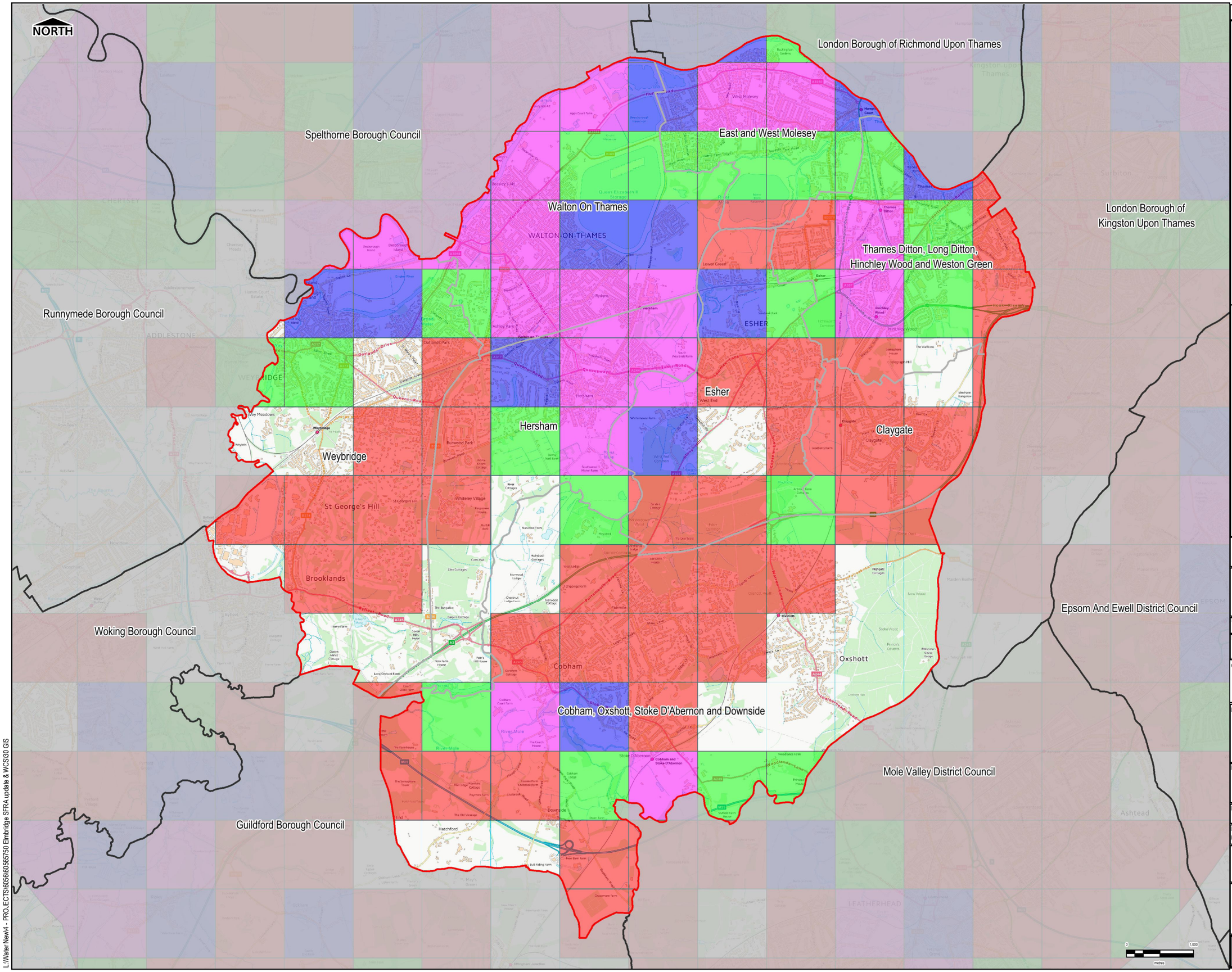
Broomfield Farm, Rignall Road
Great Missenden, Bucks HP16 9PE
01494 866776
info@agripower.co.uk - www.agripower.co.uk

APPENDIX B

Figure B5 – Groundwater Flood map



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE AND IS SUBJECT TO AMENDMENT

LEGEND

- Elmbridge BC boundary
- Settlement Area boundary
- Local Planning Authority boundary

Areas Susceptible to Groundwater Flooding

- < 25%
- >= 25% <50%
- >= 50% <75%
- >= 75%
- Not considered to be prone to groundwater flooding

Notes

1. Areas Susceptible to Groundwater Flooding (AStGWF) is a strategic scale map showing where groundwater flooding could occur on a 1km square grid. It shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater flooding could occur. The susceptible areas are represented by one of four categories showing the proportion of each 1km square that is susceptible to groundwater emergence. It does not show the likelihood of groundwater flooding occuring.
2. The absence of values for any grid square means that no part of that square is identified as being susceptible to groundwater emergence.
3. The map identifies areas where further investigation is needed to assess whether groundwater flooding may affect property or infrastructure.
4. This data shown is the Environment Agency dataset 'Areas Susceptible to Groundwater Flooding.
5.Further information on Groundwater Flooding can be found within Section 2.3 of the Level 1 SFRA

Intended Use

The 1:50 000 scale digital map data is generalised and the geological interpretation should be used only as a guide to the geology at a local level, not as a site-specific geological plan based on detailed site investigations.

This map is intended to provide a strategic overview of susceptibility to groundwater flooding and should not be used to assess flood risk for individual properties.

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: Elmbridge Borough Council

Project Title: Elmbridge Borough Council Strategic Flood Risk Assessment

Drawing Title: Areas Susceptible to Groundwater Flooding

Drawn	Checked	Approved	Date
HB	SL	SK	September 2018

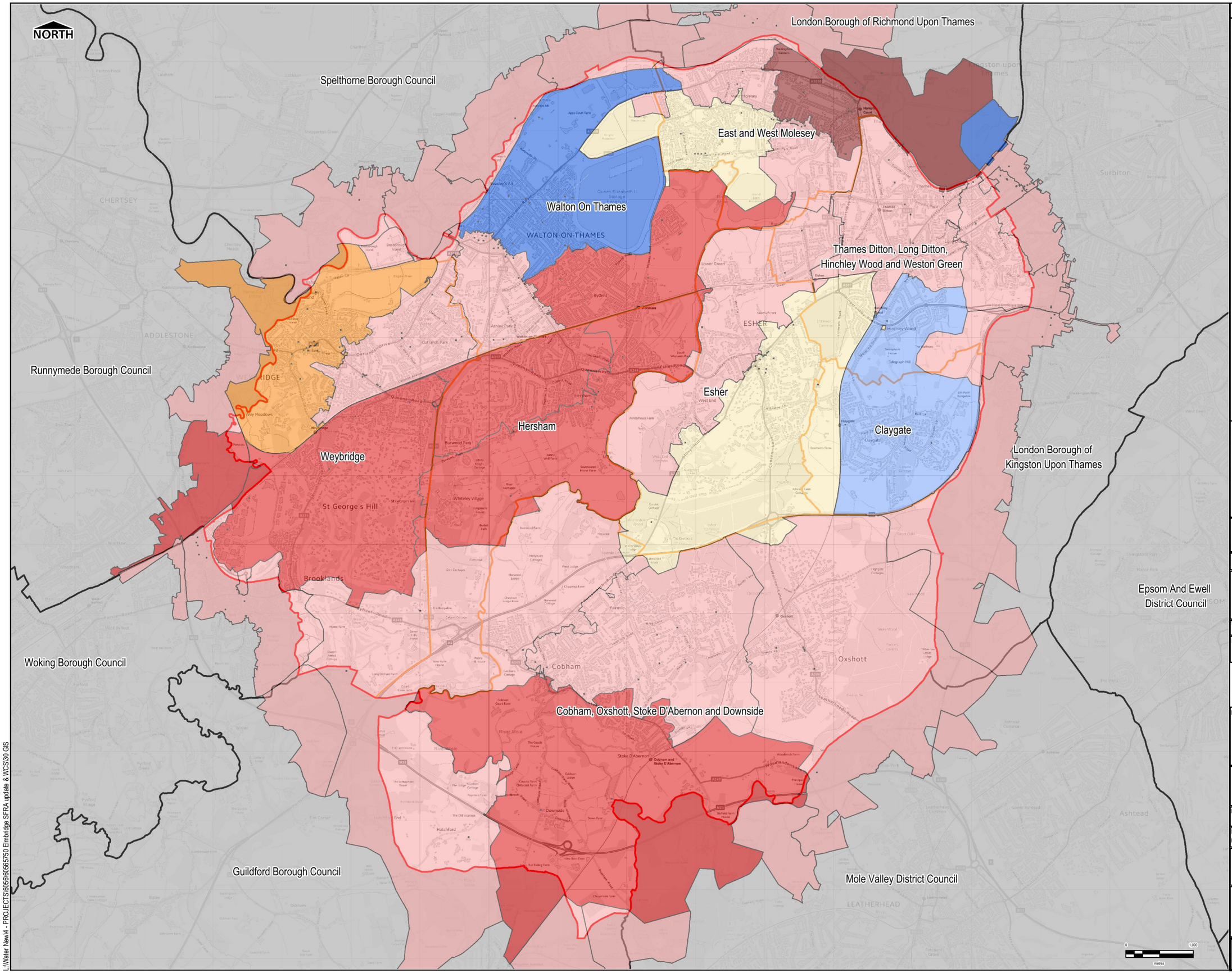
Internal Project No.	Scale at A3
60565750	1:50,000

AECOM Infrastructure & Environment UK Limited
Midpoint
Alencon Link
Basingstoke
RG21 7PP
Telephone 01256 310300

Drawing Number	Rev
FIGURE B5	01

L:\Water New\4 - PROJECTS\60565\60565750 Elmbridge SFRA update & WCS\30 GIS

Figure B7 – Internal Sewer Flood Map



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Elmbridge BC boundary
- Local Planning Authority boundary
- Settlement Area boundary
- Post Code Sector Boundary

No. of TWUL Sewer Records by postcode

- 0
- 1
- 2
- 3
- 4
- 5
- 28

Notes

1. TWUL has supplied records of sewer flooding for the Borough through their DG5 register on the total number of properties affected by and at risk of sewer flooding based on historic flooding. This data has been displayed using the 4 digit postcode boundaries in the Borough.

Intended Use

This map is intended to provide a strategic overview of historic sewer flooding and should not be used to assess flood risk for individual properties

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: Elmbridge Borough Council ... bridging the communities ...

Project Title: Elmbridge Borough Council Level 1 Strategic Flood Risk Assessment

Drawing Title: Recorded Incidents of Internal Sewer Flooding

Drawn	Checked	Approved	Date
HB	SL		September 2018

Internal Project No.	Scale at A3
60565750	1:50,000

AECOM Infrastructure & Environment UK Limited
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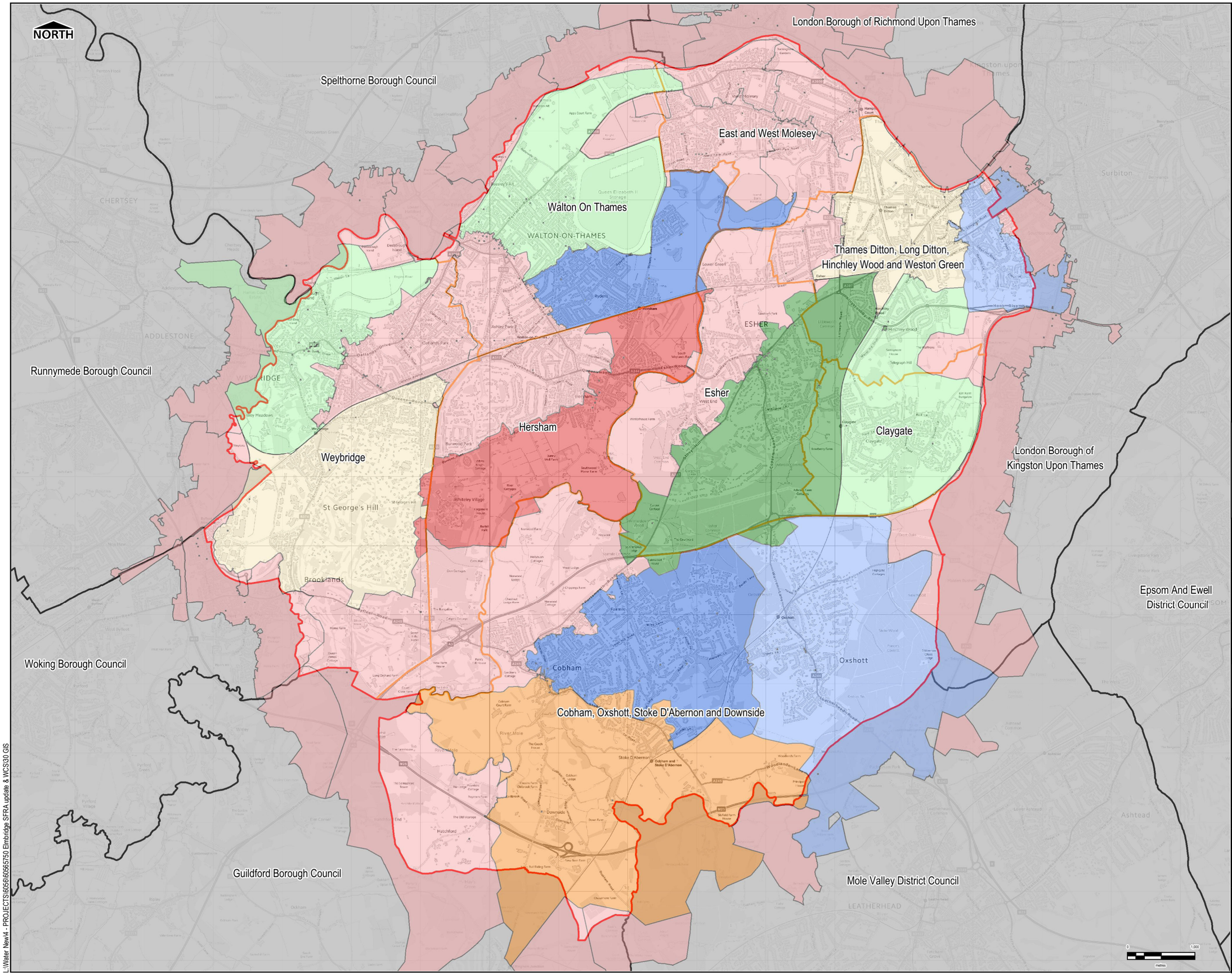
Basingstoke
RG21 7PP
Telephone 01256 310300

Drawing Number	Rev
FIGURE B7	01

L:\Water New\4 - PROJECTS\60560\60565750 Elmbridge SFRA update & WCS\30 GIS

Figure B8 – External Sewer Flood Map



L:\Water New\4 - PROJECTS\60556\60565750 Elmbridge SFRA update & WCS\30 GIS

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Elmbridge BC boundary
- Local Planning Authority boundary
- Settlement Area boundary
- Post Code Sector Boundary

No. of TWUL Sewer Records by postcode

- 0
- 1
- 2
- 3
- 4
- 6
- 7
- 18

Notes

1. TWUL has supplied records of sewer flooding for the Borough through their DG5 register on the total number of properties affected by and at risk of sewer flooding based on historic flooding. This data has been displayed using the 4 digit postcode boundaries in the Borough.

Intended Use

This map is intended to provide a strategic overview of historic sewer flooding and should not be used to assess flood risk for individual properties.

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: Elmbridge Borough Council ... bridging the communities ...

Project Title: Elmbridge Borough Council Level 1 Strategic Flood Risk Assessment

Drawing Title: Recorded Incidents of External Sewer Flooding

Drawn	Checked	Approved	Date
HB	SL		September 2018

Internal Project No.	Scale at A3
60565750	1:50,000

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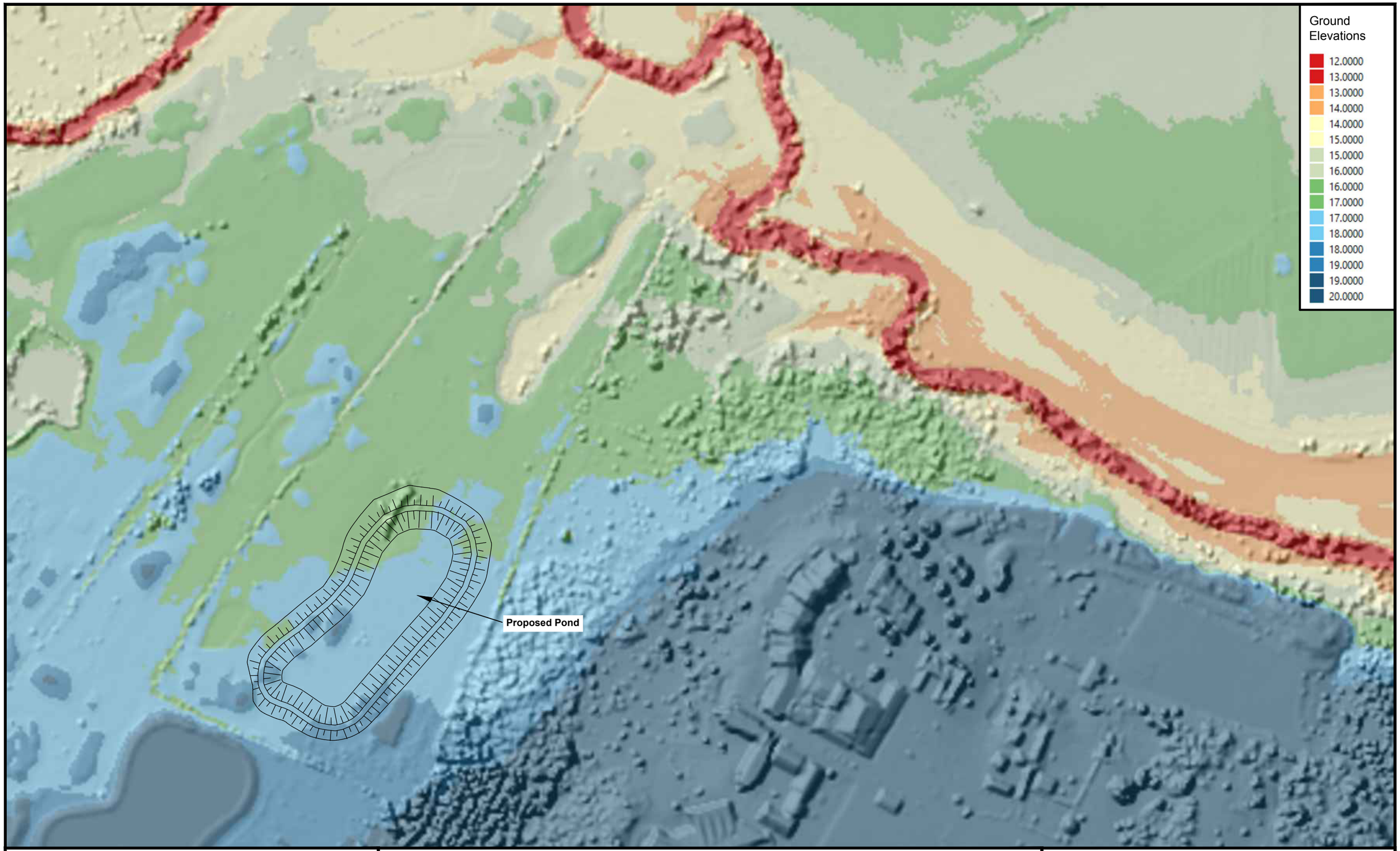
Basingstoke
RG21 7PP
Telephone 01256 310300

Drawing Number	Rev
FIGURE B8	01

APPENDIX C

Drawing 231714/FRA/01 – Proposed Pond Layout



Burhill
Golf Course

Burhill Golf Course
Hersham

Existing Ground
Elevations

SCALE	DRAWN BY	PRJ No.	DWG No.
1:2500	KL	231714	231714/FRA/01

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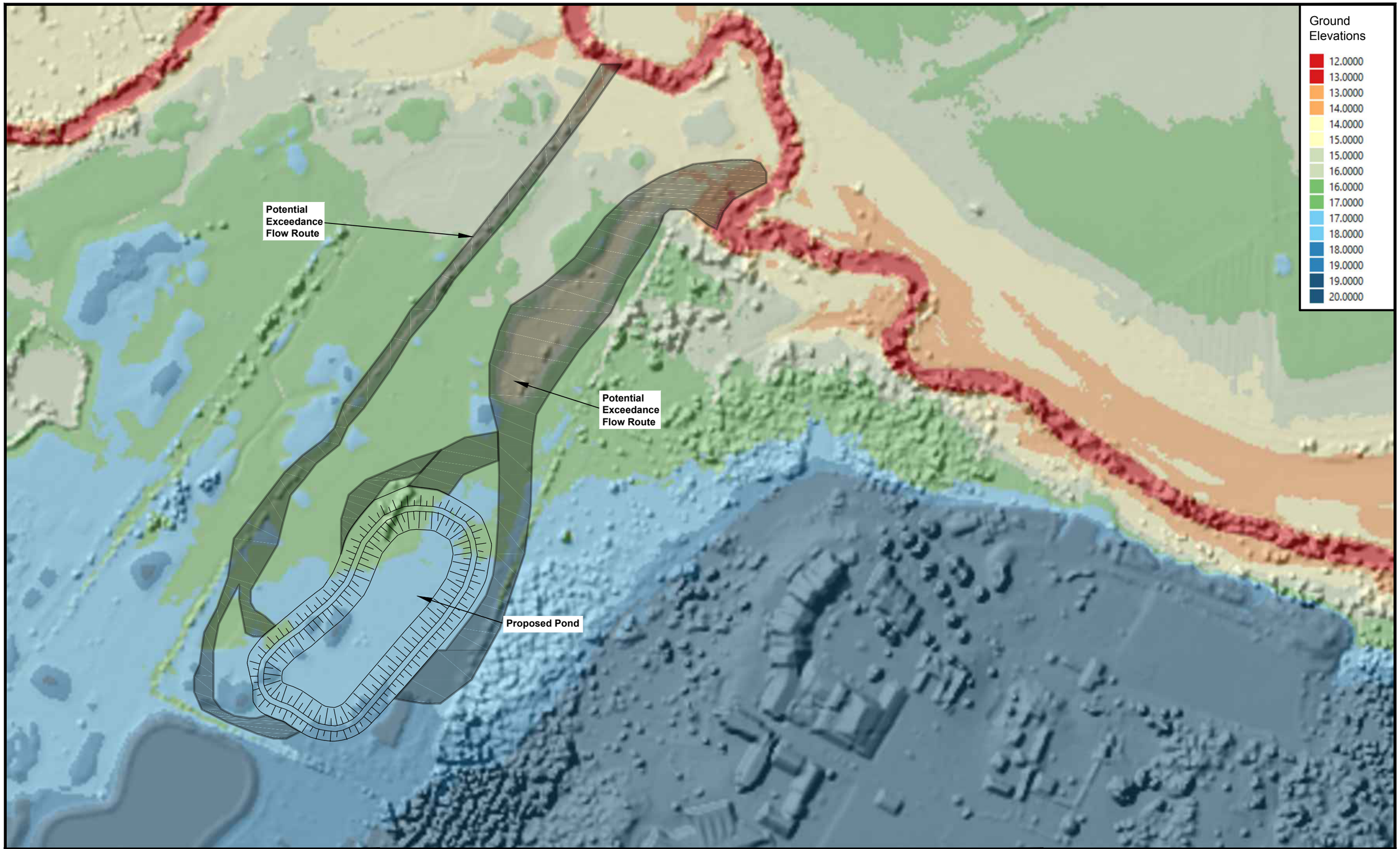
Drawing 231714/FRA/02 – Route of Flooding From Pond



Burhill Golf Course

Burhill Golf Course
Hersham

Potential Exceedande Flow Routes

SCALE	DRAWN BY	PRJ No.	DWG No.
1:2500	KL	231714	231714/FRA/02

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