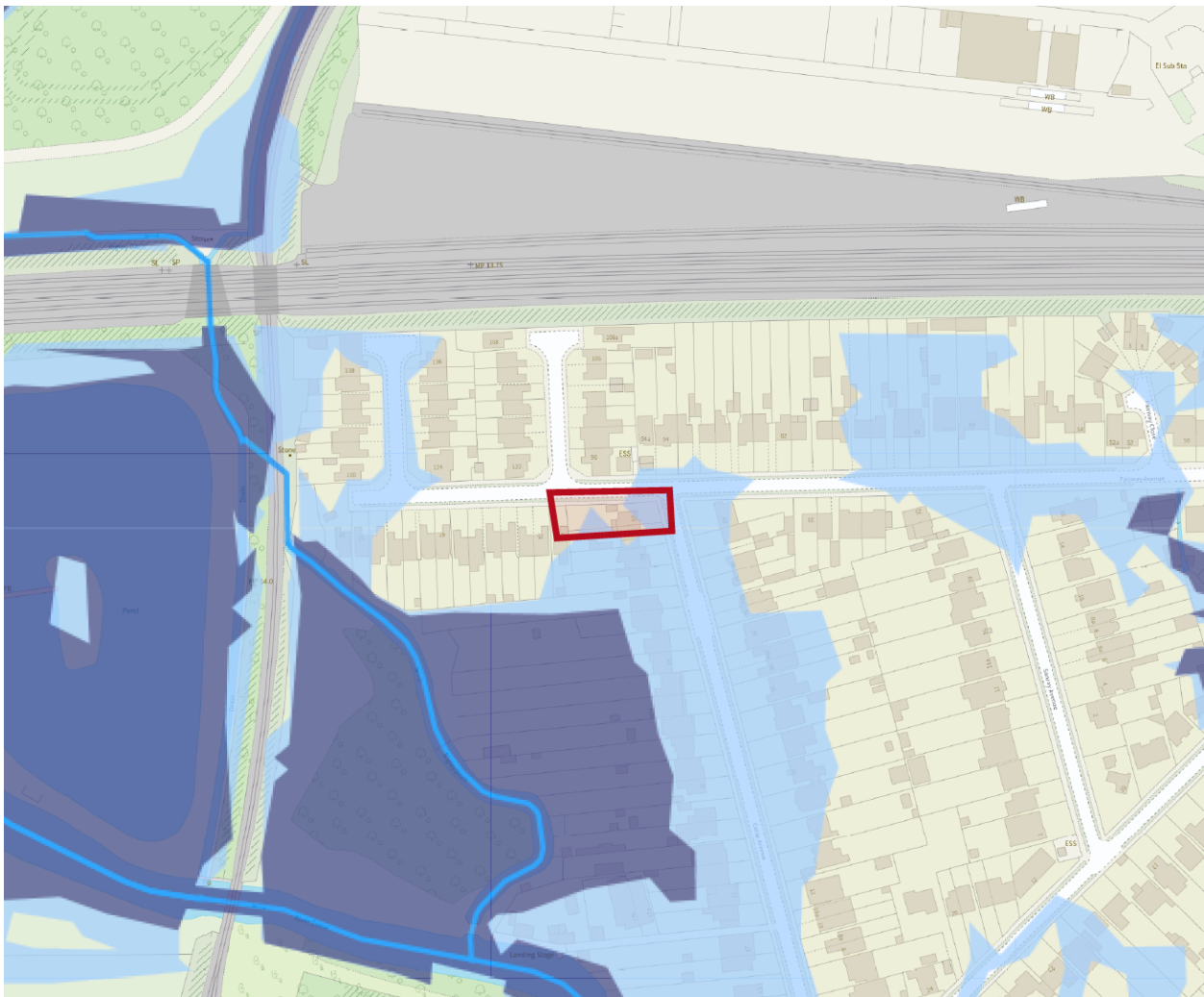


FLOOD RISK ASSESSMENT

24.03.23 FLOOD MITIGATION MEASURES

FLOOD ZONES: EA FLOOD ZONE 2

57 COLNE AVENUE, WEST DRAYTON, UB7 7AL



This report contains the details of Flood mitigation measures for 57 Colne Avenue, West Drayton, UB7 7AL.

Although the site is on flood zones 2 the flood levels are still below the existing building levels and therefore the proposed development will not be affected by the flood.

This report includes methods for water exclusion strategy up to a depth of 0.3m above existing ground level. The methods below will be used at construction stage to prevent water ingress into the property.

As required by the Boroughs drainage engineers; both resistance and resilient materials and techniques shall be used. The lowest 0.3m above ground floor will be built with resilient materials and techniques. This provides 0.3m of freeboard, which is the usual requirement set by the Environment Agency. The document "Improving the Flood Performance of New Buildings – Flood Resilient Construction" published by DEFRA / Environment Agency provides guidance on this subject. Specific examples of such construction would include natural stone – or other durable – flooring and waterproof walls as well as running all cabling and pipes (i.e. all services distribution) downwards first floor level. Meters, distribution board and combi-boiler shall be positioned above this 'GL +0.3m' level.

Surface Water Flooding

The estimated risk from surface water is Very Low. Low risk means that each year this area has a chance of flooding of between 0.1% and 1%. Surface water flooding, sometimes known as flash flooding:

- happens when heavy rain cannot drain away
- is difficult to predict as it depends on rainfall volume and location
- can happen up hills and away from rivers and other bodies of water
- is more widespread in areas with harder surfaces like concrete
- Local flood authorities (LLFA) are responsible for managing the flood risk from surface water.
- The depth of flooding for the above site is low risk depth. Based on the information provided by Environment Agency Flooding.



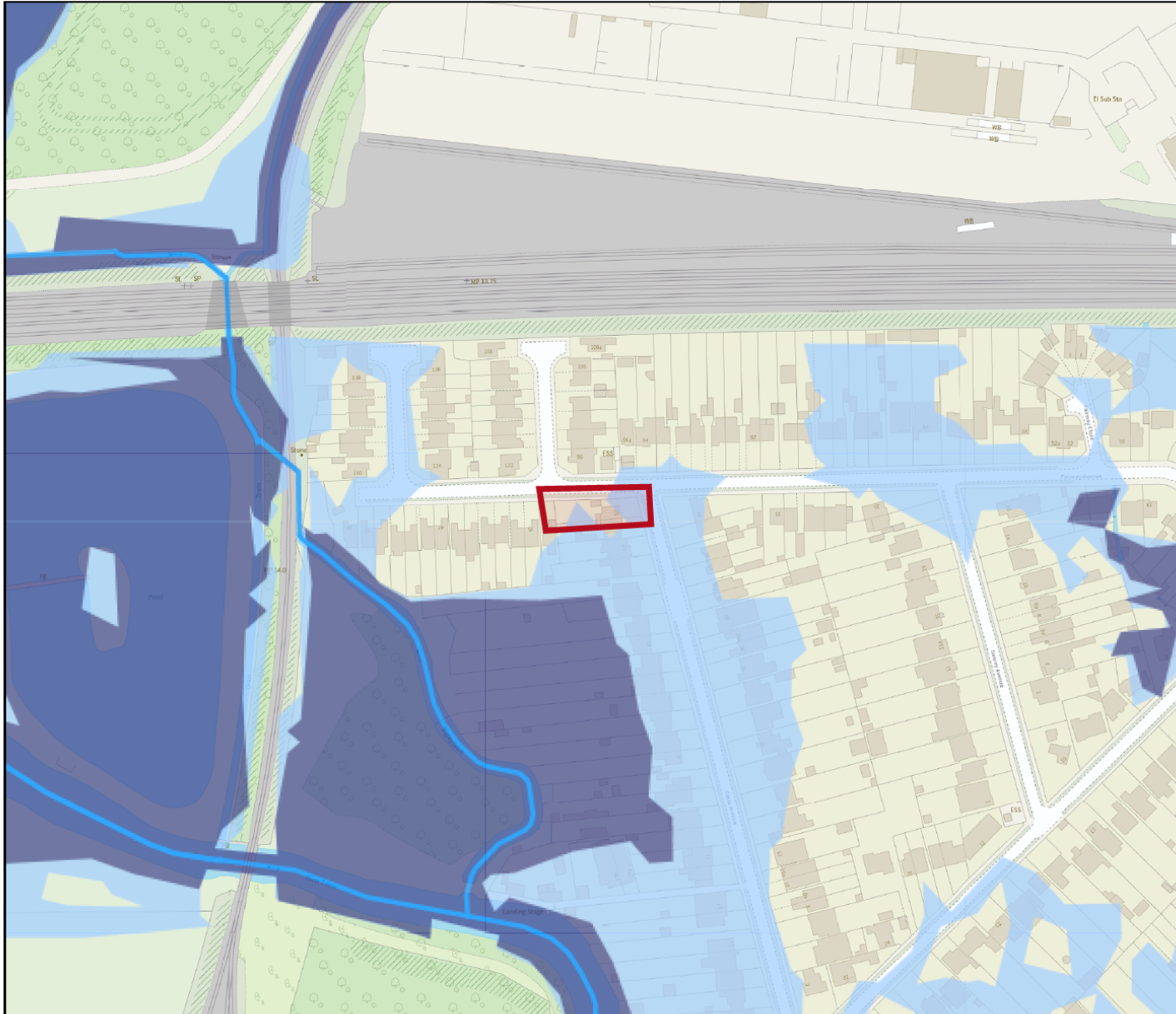
Rivers and Sea Flooding

The estimated risk from river and sea flooding is Medium.

Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%.

The 100-year flood level was obtained from Environment Agency. The 1 in 100+20% Climate change flood level for the site is 25.41 mAOD. As shows the results of models from Environment Agency.

There are no physical flood defences protecting this site.










Flood map for planning

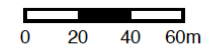
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505362/180006

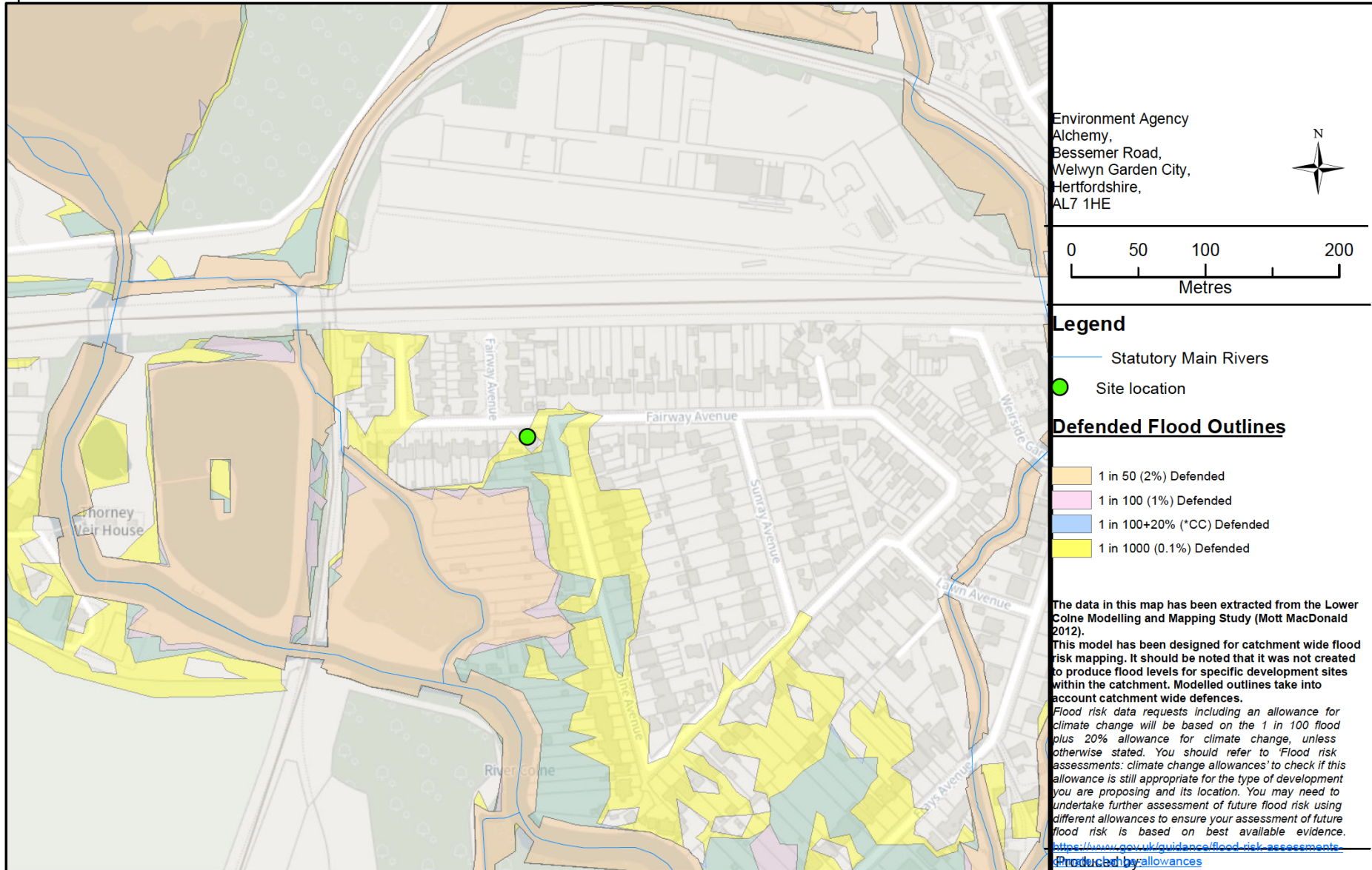
Scale
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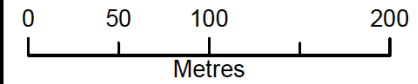
-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area





Detailed FRA centred on: 57 Colne Avenue, West Drayton UB7 7AL - 22/03/2023 - HNL303752NR







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Hertfordshire,
AL7 1HE



Legend

-  Statutory Main Rivers
-  Site location

Defended Flood Outlines

-  1 in 50 (2%) Defended
-  1 in 100 (1%) Defended
-  1 in 100+20% (*CC) Defended
-  1 in 1000 (0.1%) Defended

The data in this map has been extracted from the Lower Colne Modelling and Mapping Study (Mott MacDonald 2012).

This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences.

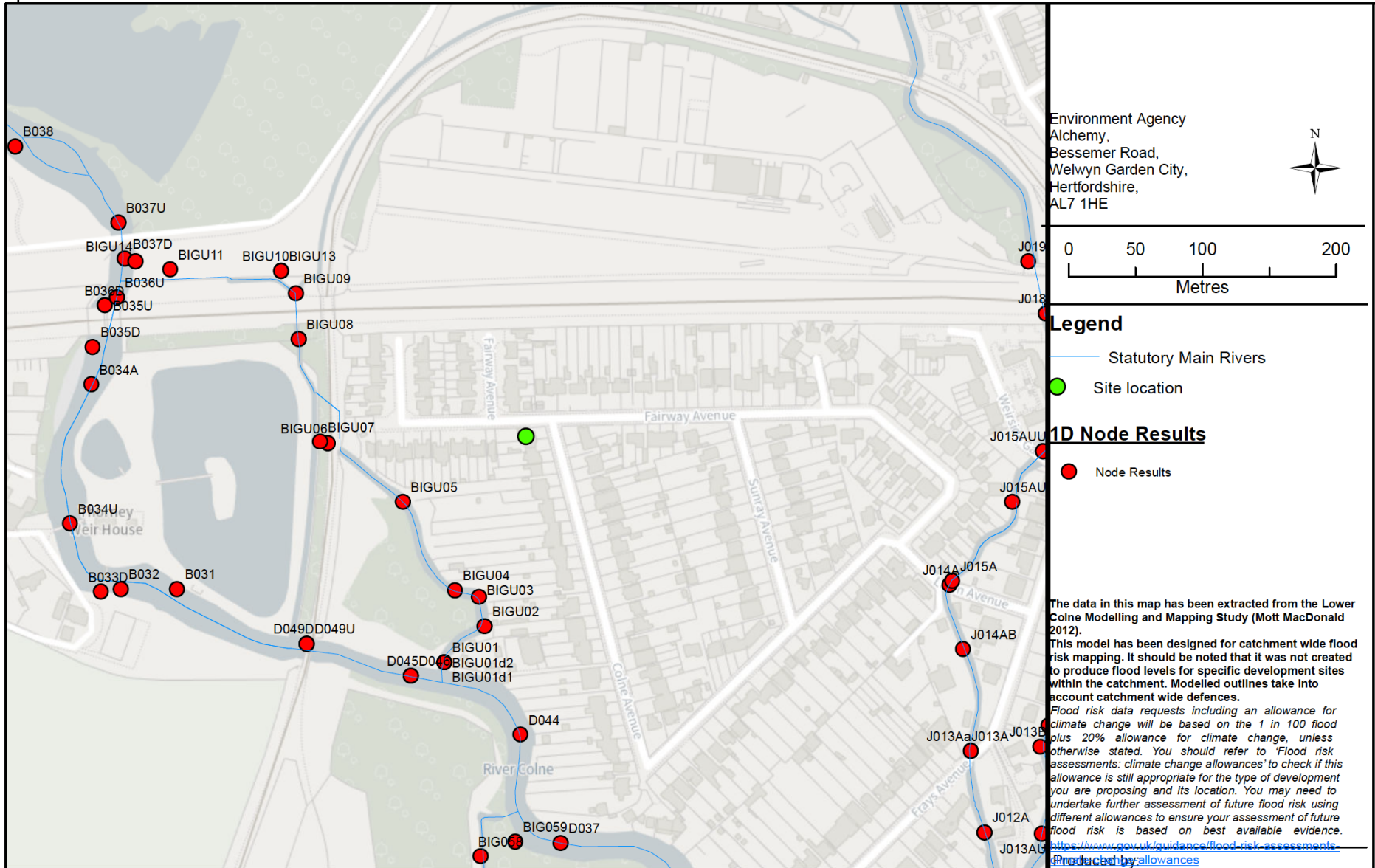
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<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Partnerships & Strategic Overview,
Hertfordshire & North London

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Detailed FRA centred on: 57 Colne Avenue, West Drayton UB7 7AL - 22/03/2023 - HNL303752NR



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MODELLED FLOOD LEVEL

Node Label	Easting	Northing	Return Period							
			2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	100 yr + 20%	1000 yr
B031	505106	179890	25.14	25.25	25.32	25.4	25.46	25.52	25.61	25.77
B032	505064	179890	25.15	25.26	25.33	25.41	25.47	25.53	25.62	25.77
B033D	505049	179888	25.28	25.36	25.41	25.47	25.52	25.56	25.64	25.77
B034A	505042	180043	25.54	25.61	25.67	25.72	25.78	25.82	25.9	26.01
B034U	505026	179939	25.44	25.5	25.54	25.6	25.65	25.69	25.77	25.89
B035D	505043	180071	25.58	25.66	25.72	25.78	25.84	25.89	25.97	26.08
B035U	505052	180102	25.59	25.68	25.73	25.8	25.85	25.91	25.98	26.1
B036D	505052	180102	25.59	25.68	25.74	25.81	25.86	25.91	25.99	26.11
B036U	505061	180108	25.6	25.7	25.76	25.82	25.88	25.94	26.02	26.14
B037D	505067	180137	25.62	25.73	25.79	25.86	25.93	25.98	26.06	26.19
B037U	505062	180164	25.63	25.74	25.81	25.88	25.95	26.01	26.1	26.23
B038	504985	180221	25.69	25.82	25.9	25.98	26.06	26.12	26.22	26.37
BIG058	505333	179690	24.71	24.82	24.9	24.98	25.05	25.1	25.18	25.29
BIG059	505359	179701	24.73	24.84	24.92	25.00	25.07	25.13	25.2	25.31
BIGU01	505306	179835	24.78	24.91	25.01	25.11	25.2	25.27	25.37	25.5
BIGU01d1	505306	179835	24.78	24.91	25.00	25.10	25.18	25.25	25.35	25.48
BIGU01d2	505306	179835	24.78	24.91	25.00	25.10	25.18	25.25	25.35	25.48
BIGU02	505336	179862	24.78	24.92	25.02	25.13	25.22	25.3	25.41	25.53
BIGU03	505332	179884	24.78	24.92	25.02	25.13	25.23	25.3	25.41	25.53
BIGU04	505314	179889	24.78	24.92	25.02	25.13	25.23	25.3	25.41	25.53

MODELLED FLOOD LEVEL

Node Label	Easting	Northing	Return Period							
			2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	100 yr + 20%	1000 yr
BIGU05	505275	179955	24.78	24.93	25.04	25.15	25.25	25.32	25.42	25.55
BIGU06	505219	179999	24.79	24.94	25.05	25.17	25.28	25.35	25.45	25.58
BIGU07	505213	180000	24.79	24.94	25.07	25.19	25.31	25.4	25.52	25.68
BIGU08	505197	180077	24.79	24.95	25.08	25.22	25.35	25.45	25.61	25.78
BIGU09	505195	180111	24.79	24.96	25.09	25.23	25.36	25.46	25.62	25.8
BIGU10	505184	180128	24.79	24.98	25.11	25.26	25.40	25.51	25.70	25.92
BIGU11	505101	180129	24.81	25.02	25.18	25.33	25.46	25.57	25.73	25.92
BIGU13	505184	180128	24.81	25.03	25.18	25.34	25.47	25.58	25.75	25.94
BIGU14	505075	180135	24.82	25.04	25.19	25.35	25.48	25.59	25.75	25.95
D037	505393	179700	24.73	24.84	24.92	25.00	25.07	25.13	25.20	25.31
D044	505363	179781	24.73	24.84	24.92	25.00	25.07	25.13	25.20	25.31
D045	505281	179825	24.78	24.91	25.00	25.10	25.18	25.25	25.35	25.48
D046	505281	179825	24.78	24.91	25.00	25.10	25.18	25.25	25.35	25.48
D049D	505203	179849	24.89	25.01	25.09	25.18	25.26	25.32	25.42	25.56
D049U	505203	179849	24.89	25.01	25.09	25.18	25.26	25.32	25.43	25.57
J012A	505710	179708	24.82	24.87	24.89	24.90	24.92	24.93	24.97	25.06
J013A	505700	179769	24.85	24.90	24.92	24.93	24.95	24.96	25.00	25.09
J013Aa	505700	179769	24.85	24.90	24.92	24.93	24.95	24.96	25.00	25.08
J013AU	505753	179707	24.86	24.91	24.93	24.94	24.95	24.97	25.01	25.09
J013B	505752	179772	24.87	24.92	24.94	24.95	24.96	24.98	25.02	25.10
J014A	505684	179893	24.94	24.99	25.00	25.02	25.03	25.04	25.07	25.14
J014AB	505694	179845	24.90	24.94	24.96	24.98	24.99	25.00	25.04	25.11
J015A	505686	179896	24.94	24.99	25.00	25.02	25.03	25.04	25.07	25.14
J015AU	505731	179955	25.09	25.13	25.14	25.15	25.16	25.17	25.19	25.24
J015Auu	505754	179993	25.25	25.29	25.30	25.31	25.32	25.32	25.34	25.36
J019	505743	180135	26.45	26.49	26.51	26.52	26.53	26.53	26.55	26.56

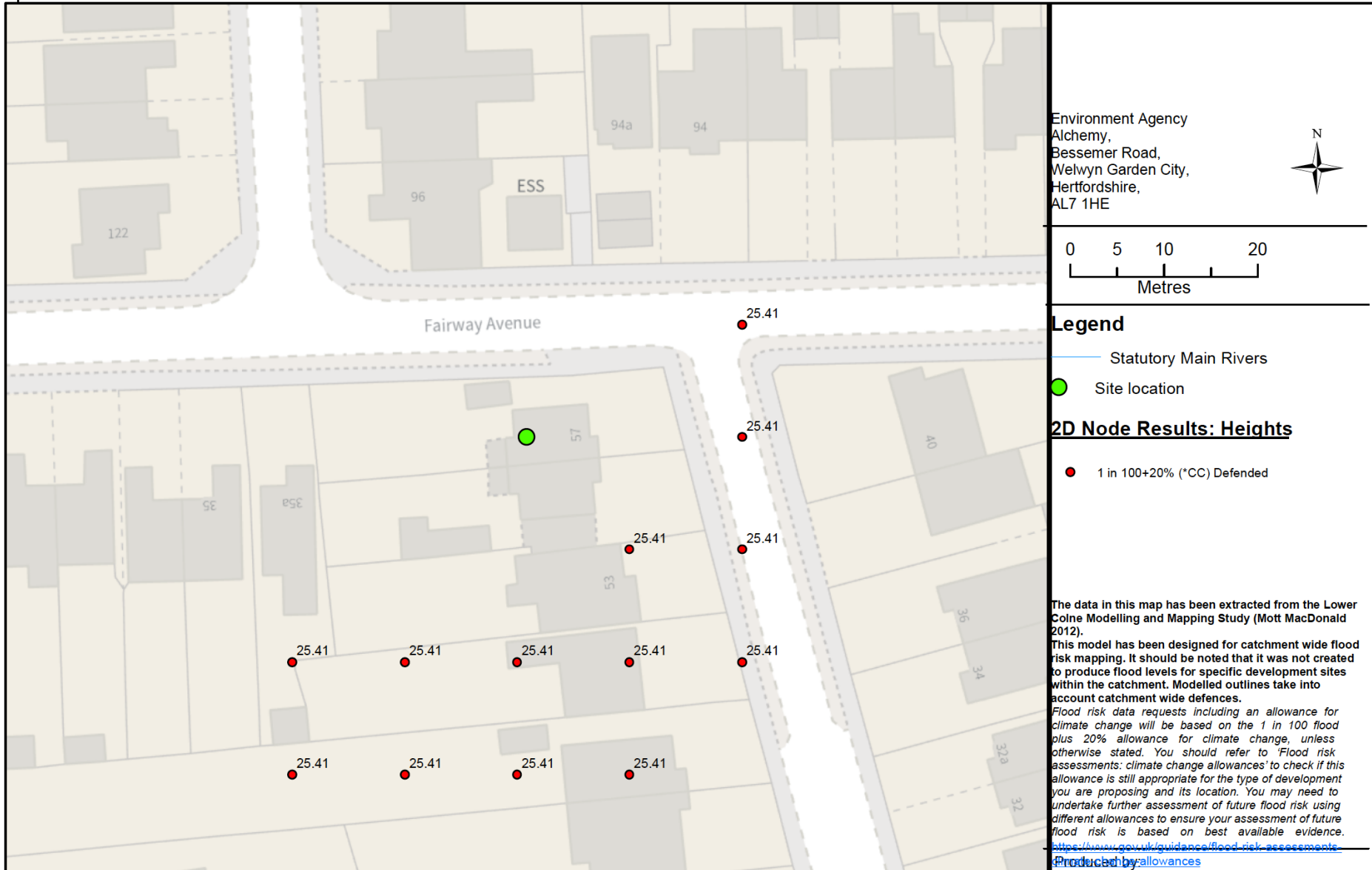
MODELLED FLOWS

Node Label	Easting	Northing	Return Period							
			2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	100 yr + 20%	1000 yr
B031	505106	179890	8.04	10.03	11.4	12.74	13.95	14.83	15.32	15.57
B032	505064	179890	8.04	10.03	11.4	12.74	13.97	15.07	16.78	19.13
B033D	505049	179888	8.04	10.03	11.4	12.73	13.97	15.06	16.78	19.06
B034A	505042	180043	8.04	10.03	11.4	12.74	13.96	15.07	16.78	19.07
B034U	505026	179939	8.04	10.03	11.4	12.73	13.97	15.06	16.78	19.06
B035D	505043	180071	8.04	10.03	11.4	12.73	13.97	15.07	16.78	19.07
B035U	505052	180102	8.04	10.03	11.4	12.73	13.97	15.07	16.78	19.07
B036D	505052	180102	8.04	10.03	11.4	12.74	13.97	15.06	16.78	19.06
B036U	505061	180108	8.58	11.6	13.84	16.2	18.47	20.56	23.94	28.93
B037D	505067	180137	8.58	11.6	13.84	16.19	18.46	20.56	23.95	28.95
B037U	505062	180164	8.58	11.6	13.84	16.19	18.46	20.56	23.95	28.95
B038	504985	180221	8.58	11.50	13.61	15.22	15.68	15.67	15.67	15.69
BIG058	505333	179690	0.47	0.65	0.82	1.00	1.18	1.33	1.57	1.95
BIG059	505359	179701	0.47	0.65	0.82	1.00	1.18	1.33	1.57	1.94
BIGU01	505306	179835	0.54	1.57	2.44	3.50	4.45	4.97	5.46	5.57
BIGU01d1	505306	179835	0.54	1.57	2.44	3.50	4.45	4.97	5.46	5.57
BIGU01d2	505306	179835	0.54	1.57	2.44	3.50	4.45	4.97	5.46	5.57
BIGU02	505336	179862	0.54	1.57	2.44	3.46	4.19	4.45	4.52	4.50
BIGU03	505332	179884	0.54	1.57	2.44	3.46	4.15	4.35	4.41	4.70
BIGU04	505314	179889	0.54	1.57	2.44	3.46	4.22	4.50	4.60	4.99

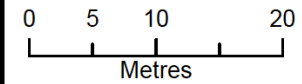
MODELLED FLOWS

Node Label	Easting	Northing	Return Period							
			2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	100 yr + 20%	1000 yr
BIGU05	505275	179955	0.54	1.57	2.44	3.46	4.49	5.24	6.06	6.46
BIGU06	505219	179999	0.54	1.57	2.44	3.46	4.50	5.51	7.22	9.08
BIGU07	505213	180000	0.54	1.57	2.44	3.46	4.50	5.51	7.23	9.08
BIGU08	505197	180077	0.54	1.57	2.44	3.46	4.50	5.51	7.29	9.67
BIGU09	505195	180111	0.54	1.57	2.44	3.46	4.50	5.51	7.29	9.67
BIGU10	505184	180128	0.54	1.57	2.44	3.46	4.42	5.05	5.31	5.37
BIGU11	505101	180129	0.54	1.57	2.44	3.46	4.50	5.50	7.17	9.70
BIGU13	505184	180128	0.54	1.57	2.44	3.46	4.50	5.50	7.17	9.88
BIGU14	505075	180135	0.54	1.57	2.44	3.46	4.50	5.50	7.17	9.88
D037	505393	179700	8.11	10.95	13.02	15.19	17.26	19.21	22.44	26.52
D044	505363	179781	8.58	11.60	13.84	16.18	18.44	20.54	24.01	28.45
D045	505281	179825	8.58	11.60	13.84	16.18	18.44	20.54	24.00	27.71
D046	505281	179825	8.04	10.03	11.40	12.69	13.99	15.56	18.55	22.18
D049D	505203	179849	8.04	10.03	11.40	12.73	13.96	15.03	16.77	20.59
D049U	505203	179849	8.04	10.03	11.40	12.73	13.96	15.03	16.77	20.59
J012A	505710	179708	1.86	2.01	2.08	2.12	2.16	2.19	2.24	2.28
J013A	505700	179769	1.86	2.01	2.08	2.12	2.16	2.19	2.24	2.28
J013Aa	505700	179769	1.86	2.01	2.08	2.12	2.16	2.19	2.24	2.28
J013AU	505753	179707	1.31	1.42	1.47	1.50	1.52	1.54	1.58	1.62
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J014AB	505694	179845	1.86	2.02	2.09	2.12	2.16	2.19	2.24	2.28
J015A	505686	179896	1.85	2.02	2.09	2.12	2.16	2.19	2.24	2.28
J015AU	505731	179955	1.86	2.02	2.09	2.12	2.16	2.19	2.24	2.29
J015AUU	505754	179993	1.86	2.02	2.09	2.12	2.16	2.19	2.24	2.29
J019	505743	180135	6.20	6.70	6.94	7.00	7.09	7.17	7.33	7.46

Detailed FRA centred on: 57 Colne Avenue, West Drayton UB7 7AL - 22/03/2023 - HNL303752NR



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 AL7 1HE



Legend

- Statutory Main Rivers
- Site location

2D Node Results: Heights

- 1 in 100+20% (*CC) Defended

The data in this map has been extracted from the Lower Colne Modelling and Mapping Study (Mott MacDonald 2012).

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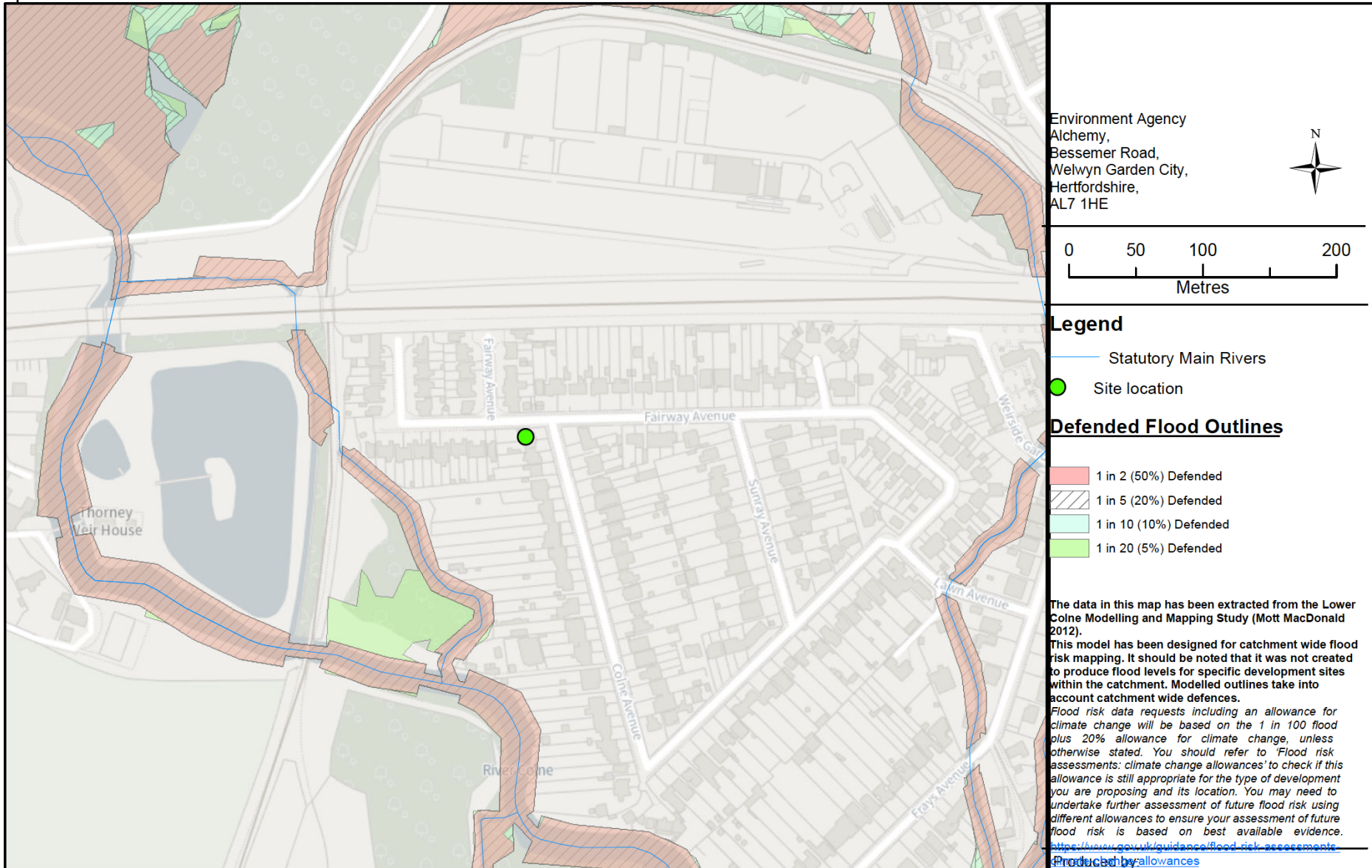
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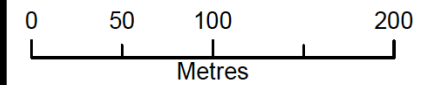
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Detailed FRA centred on: 57 Colne Avenue, West Drayton UB7 7AL - 22/03/2023 - HNL303752NR



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 Welwyn Garden City,
 Hertfordshire,
 AL7 1HE



Legend

- Statutory Main Rivers
- Site location

Defended Flood Outlines

- 1 in 2 (50%) Defended
- 1 in 5 (20%) Defended
- 1 in 10 (10%) Defended
- 1 in 20 (5%) Defended

The data in this map has been extracted from the Lower Colne Modelling and Mapping Study (Mott MacDonald 2012).

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Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, 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.

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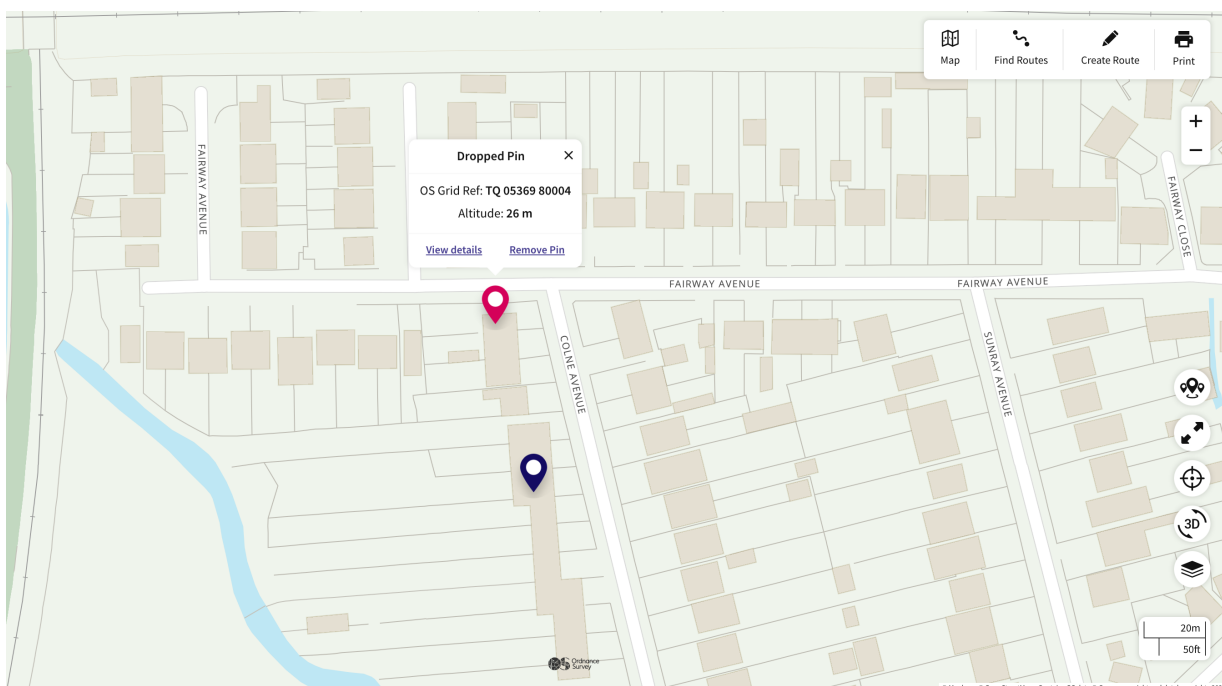
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Existing building floor levels and surrounding site

The ground level of the development from OS maps is 26m AOD as shown in the map Ordnance Survey (OS) map in the map below. This is above the estimated flood level of 25.41 m AOD.

The finished floor level will be in-line to the existing floor level of the development which is app 250 mm higher than the ground level.

Since the ground level is already higher than the estimated flood level and the finished floor level will be set no less than the existing floor level, this suffice the EA criteria for finished floor level to be set no lesser than 300mm above the predicted 100-year flood level plus climate changed allowance for river flooding.



Flood resilient measures

Foundations

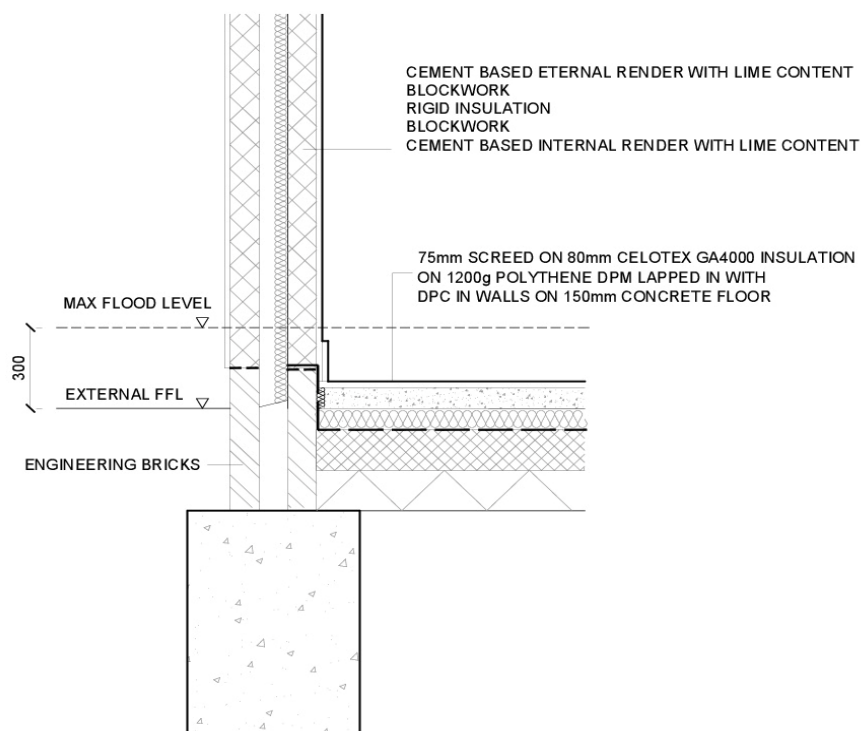
Concrete blocks used in foundations should be sealed with an impermeable material or encased in concrete to prevent water movement from ground to the wall construction.

Floor

Ground supported floors are the preferred option and concrete slabs of at least 150mm thickness will be specified for non-reinforced constructions. Hollow slabs are not suitable if the element are not effectively sealed.

Hardcore and binding: bed at least 100mm thick of well compacted inert material (to reduce the risk of settlement and consequential cracking) blinded with fine inert material to provide a smooth base.

Damp Proof Membrane (d.p.m): will be provided to minimize the passage of water through ground floors. Impermeable polythene membranes should be at least 1200 gauge to minimise ripping. Join membrane sections with overlaps of 300mm, and also tape (mastic tape with an overlap of 50mm minimum).



Insulation materials

Water will lower the insulation properties of some insulation materials. Floor insulation should be of the closed-cell type to minimise the impact of flood water. The location of insulation materials, whether above or below the floor slab, is usually based on either achieving rapid heating of the building or aiming for more even temperature distribution with reduced risk of condensation. Insulation placed above the floor slab (and underneath the floor finish) rather than below would minimise the effect of flood water on the insulation properties and be more easily replaced, if needed.

Floor finishes

Suitable floor finishes include ceramic or concrete-based floor tiles, stones and sand/cement screeds. All tiles should be bedded on a cement-based adhesive/bedding compound and water resistant grout should be used. Concrete screeds above polystyrene or polyurethane insulation should be avoided as they hinder drying of the insulation material. Suitable materials for skirting boards include ceramic tiles and PVC. Ceramic tiles are likely to be more economically viable and environmentally acceptable.

Wall construction-Partial Fill Cavity:

External cement based render, with lime content (1 cement : 4 sand : ½ lime on concrete blockwork), external face consisting of blocks, rigid insulation, internal face consisting of blocks, internal cement based render preferably with lime content, the following mix is effective for flood resilience 1 cement : 6 sand : 1 lime on Aircrete

Doors

Sealed PVC external framed doors should be used and, where the use of wooden doors is a preferred option, all efforts should be made to ensure a good fit and seal to their frames.

Services

Where possible all services should be sealed with expanding foam or similar closed cell material.

Pipework: closed cell insulation should be used for pipes which are below the predicted flood level.

Drainage services: non-return valves are recommended in the drainage system to prevent back-flow in situations where there is an identified risk of the fouls sewer surcharging.

Maintenance of these valves is important to ensure their continued effectiveness.

Water, electricity and gas meters: should be located above predicted flood level.

Electrical services: electrical sockets should be installed above flood level for ground floors to minimise damage to electrical services and allow speedy re-occupation. Electric ring mains should be installed at first floor level with drops to ground floor sockets and switches above 300mm from GL.

Heating services: Boiler units and ancillary devices should be installed above predicted flood level and preferably on the first floor of two-storey properties. Electric underfloor heating should be avoided on ground floors and controls such as thermostast should be placed above flood level. Conventional heating systems, e.g hot water pipes are unlikely to be significantly affected by flood water unless it contains a large amount of salts. The less common, hot air duct heating would remain effective provided it is installed above the design flood level.

Communications wiring: wiring for telephone, TV, internet and other services should be protected by suitable insulation in the distribution ducts to prevent damage above 300mm from GL.

Emergency Flood Plan

As the property is situated in a flood zone it would be prudent for a flood warning and evacuation plan to be set up and implemented post development. This plan would include residents signing up to the Environment Agency flood warning service.




The EA operate a flood forecasting and warning service in areas at risk of flooding from rivers or the sea, which relies on direct measurements of rainfall, river levels, tide levels, in-house predictive models, rainfall radar data and information from the Met Office. This service operates 24 hours a day, 365 days a year.

If flooding is forecast, warnings are issued using a set of easily recognisable codes.

The flood warning service has three types of warning that will help you to prepare for flooding and take action.

Know your flood warning service

Our new warning service has three types of warnings - Flood Alert, Flood Warning and Severe Flood Warning - that will help you prepare for flooding and take necessary actions.

Online flood risk forecast	 FLOOD ALERT	 FLOOD WARNING	 SEVERE FLOOD WARNING	Warning no longer in force
What it means Be aware. Keep an eye on the weather situation.	What it means Flooding is possible. Be prepared.	What it means Flooding is expected. Immediate action required.	What it means Severe flooding. Danger to life.	What it means No further flooding is currently expected in your area.
When it's used Forecasts of flooding on our website are updated at least once a day.	When it's used Two hours to two days in advance of flooding.	When it's used Half an hour to one day in advance of flooding.	When it's used When flooding poses a significant threat to life.	When it's used When river or sea conditions begin to return to normal.
What to do <ul style="list-style-type: none"> • Check weather conditions. • Check for updated flood forecasts on our website. 	What to do <ul style="list-style-type: none"> • Be prepared to act on your flood plan. • Prepare a flood kit of essential items. • Monitor local water levels and the flood forecast on our website. 	What to do <ul style="list-style-type: none"> • Move family, pets and valuables to a safe place. • Turn off gas, electricity and water supplies if safe to do so. • Put flood protection equipment in place. 	What to do <ul style="list-style-type: none"> • Stay in a safe place with a means of escape. • Be ready should you need to evacuate from your home. • Co-operate with the emergency services. • Call 999 if you are in immediate danger. 	What to do <ul style="list-style-type: none"> • Be careful. Flood water may still be around for several days. • If you've been flooded, ring your insurance company as soon as possible.

Recommended Flood Plan

Before a flood:

- Find out if you are at risk of flooding;
- Find out if you can receive flood warning;
- Prepare and keep a list of all your contacts to hand or save them on your mobile phone/tablet;
- Think about what items you can move now and what you would want to move to safety during a flood such as pets, cars, furniture and electrical equipment;
- Know how to turn off gas, electricity and water supplies;
- Prepare a flood kit of essential items and keep it handy. It can include copies of important documents, a torch, a battery-powered or wind-up radio, blankets and warm clothing, waterproofs, rubber gloves and a first aid kit including all essential medication.

On receipt of a flood warning:

- Tune into your local radio station on a battery or wind-up radio;
- Fill jugs and saucepans with water
- Grab your already prepared flood kit
- Collect blankets, torch, first aid kit, medication and food;
- Move important documents, personal items, valuables and lightweight belongings upstairs or to high shelves;
- Raise large items of furniture, or put them in large bags if you have them;
- Move people, outdoor belongings, cars and pets to higher ground
- Switch off water, gas and electricity at mains when water is about to enter your home. Do not touch sources of electricity when in standing water;
- Fit flood protection products, if you have them, for example flood boards, airbrick covers and sandbags;
- If you do not have non-return valves fitted, plug water inlet pipes with towels or cloths; Know your means of escape;
- Listen to the advice of the emergency service and evacuate if told to do so;
- Avoid walking or driving through flood water. 300mm of fast flowing water can knock over an adult and two feet of water can move a car

Site Evacuation Procedures & Routes

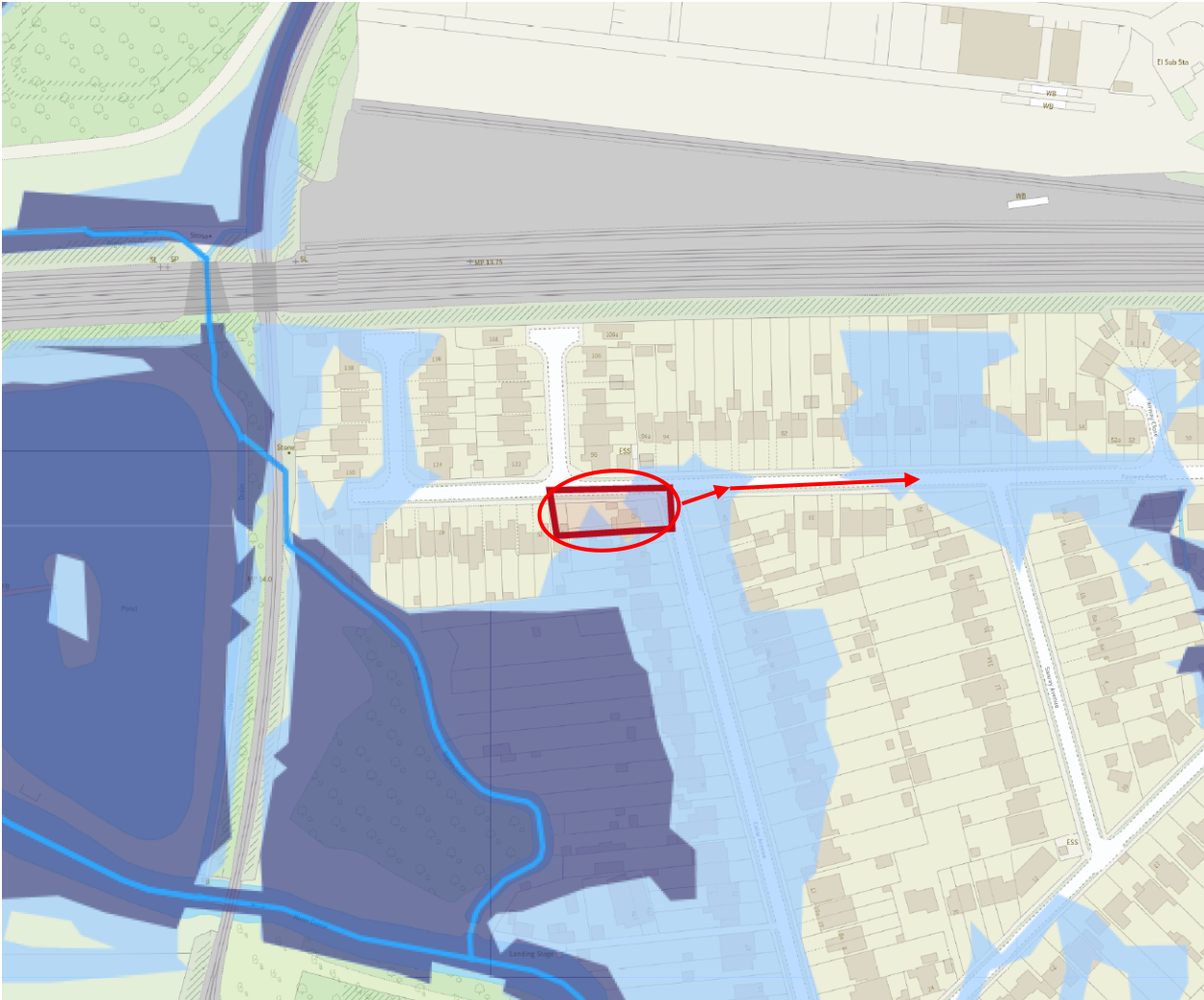
Identify in advance of flooding what actions could be taken to protect your property. Allow time for this to occur before any routes become affected by the flooding. Evacuation procedures should be developed which identify when and how evacuation takes place, and to where everyone evacuates to, if necessary signed routes may be required, (including the maintenance of signs and keeping evacuation routes clear). Consideration should be given to the road network around the site, especially if these are more likely to flood first and therefore affect evacuation time, and to the safety of the proposed evacuation location / rendezvous point.

The evacuation procedures should include options for the evacuation of ALL people on site, (including those with restricted mobility). It should be assumed that visitors will not have local knowledge and will need to be guided to a safe route / location.

Evacuation Route

The evacuation route will be:

1. Exit the property via front door onto Colne Avenue.
2. Walk east on Fairway Avenue.



After a flood

- If you have flooded, contact your insurance company as soon as possible
- Take photographs and videos of your damaged property as a record for your insurance company;
- If you don't have insurance, contact your local authority for information on grants and charities that may help you;
- Flood water can contain sewage, chemicals and animal waste. Always wear waterproof outwear, including gloves, wellington boots and a face mask;
- Have your electrics, central heating and water checked by qualified engineers before switching them back on.

Conclusion

The area may be at a medium risk of flooding however the site itself is considered to be generally at a low risk from all sources of flooding.

However, the scheme has been designed to accommodate safe operations that incorporate suitable flood resilient measures for extreme flood events.

There will not be an increase in impermeable areas on the site. Based on the likely flooding risk, it is considered that the proposed development can be constructed and operated safely in flood risk terms, without increasing flood risk elsewhere and is therefore appropriate development in accordance with the NPPF.