31.0 Crossharbour Town Centre

Site Number:	30
Site Location:	East Ferry Road
Grid Reference:	538030, 179150



31.1 SITE DESCRIPTION

The site occupies an area of 4.89ha; the existing land uses comprises of a health facility with supermarket and associated car parking, the Crossharbour DLR station and medium rise offices. The site is bounded by East Ferry Road to the west, Mudchute Park to the south, and residential housing to the east and north.

The topography is varied across the site with ground levels in the south at approximately 4.6mAOD and in the north at approximately 2.5mAOD. In the west of the site towards the DLR track and East Ferry Road ground levels range from 6.2 to 8.1mAOD.

Proposed land uses include:-

- Large-scale housing development;
- Idea Store;
- Leisure Facility; and
- District Heating Facility.

Proposed Land Use	Vulnerability Classification
Large-scale housing development	More Vulnerable
Idea Store	More Vulnerable
Leisure Facility	Less Vulnerable
District Heating Facility	Less Vulnerable

In accordance with Table D2 of PPS 25, the classifications of the proposed uses are as follows:

31.2 SUMMARY OF FLOOD RISK

31.2.1 FLOOD ZONE MAPS

The entirety of the site is located within Flood Zone 3. All proposed uses are compatible within this flood zone however 'more vulnerable' uses will be subject to the Sequential and Exception Tests.



Figure 31-2 PPS25 Flood Zones at the Crossharbour Town Centre Site

31.3 SOURCES OF FLOODING

31.3.1 TIDAL

Actual Risk

The site is defended from tidal inundation during the 0.5% AEP tidal event by the existing Thames Tidal Flood Defences (including the Thames Barrier) for the lifetime of the development. The site is considered to be at low actual risk of tidal flooding.

Residual Risk

There is a residual risk of tidal flooding from an extreme surge event. The site is defended against inundation from the River Thames during a 0.1% AEP tidal event and is considered as having a low probability of the defences overtopping.

There remains a risk to the site of flooding should a breach of the Thames Tidal Flood Defences occur. Breach analyses were carried out as a part of the LB of Tower Hamlets Level 1 SFRA. The flood extent for Breach 3a (South Quay) extends to the northern boundary of the site with some flood waters encroaching on the extremities of the site. The majority of the site is located on ground approximately 1-2m higher than the flooded area. Development may still require a site specific breach analysis to determine the worst case scenario.



Figure 31-3 South Quay Breach Extent at the Crossharbour Town Centre Site

31.3.2 FLUVIAL

Actual Risk

The site is located outside of the 1% AEP event with inclusion of climate change flood extent of the River Lee. The site is concluded as having a low risk of actual fluvial flooding.

Residual Risk

The site is located outside of the 0.1% AEP event flood extent of the River Lee.

The risk of a breach in the fluvial defences is unlikely to result in inundation of the site due to its distance from the watercourse. The site is concluded as having a low risk of residual fluvial flooding.

31.3.3 SURFACE WATER/SEWER

Some accumulation of surface water is predicted around the existing large building. Depths of water are predicted to reach 0.3m in a 1% AEP event.



Figure 31-4 Maximum Depth of Surface Water in a 1% AEP Rainfall Event at the Crossharbour Town Centre Site

31.3.4 GROUNDWATER

The site is not shown to have an increased potential of elevated groundwater.

31.3.5 ARTIFICIAL SOURCES

The West India and Millwall Docks lie directly to the west of the site. The Docks are maintained and managed by British Waterways and must be consulted in relation to any development next to or within the docks in the London Docklands. The area surrounding the docks has been built up and is generally higher than the level of the docks at above 5mAOD. This is at or above the level of the dock walls and therefore there is a low risk of flooding from the docks to the surrounding area.

The water levels within the docks are controlled by a series of lock gates and do not normally fluctuate with the tide level in the River Thames. There is a residual risk that during tidal flood events, the lock gates at the entrances to the docks may fail or be breached. The locks are not single structures and are a series of regularly maintained double gates so the probability of failure is low. The potential hazard of such an event was assessed as part of the LB of Tower Hamlets Level 1 SFRA. The results of the modelled scenario do not show flooding of the Crossharbour Town Centre site due to the higher elevations of the surrounding land compared to the docks.

31.4 GENERAL FLOOD RISK MANAGEMENT

The Crossharbour Town Centre site is shown to be located within Flood Zone 3. All proposed uses are compatible within this flood zone however 'more vulnerable' uses will be subject to the Sequential and Exception Tests.

The Sequential Approach should be adopted in the development layout. Ground levels are highest along the southern boundary of the site. Higher vulnerability land uses should be located here with lower vulnerability and water compatible uses located elsewhere in the site.

The site is shown to be defended from actual risk of tidal or fluvial flooding. A breach in the Thames tidal defences is shown to pose a potential risk of flooding to low-lying areas within the site. A site specific breach assessment may be required to inform finished floor levels. The finished floor levels of all sleeping accommodation in these areas should be above the 0.5% AEP breach level. Where possible, 'less vulnerable' uses to be located on the ground floor with 'more vulnerable' uses located on the first or upper floors. It is recommended that flood resilience measures are incorporated into buildings to withstand the hydrostatic forces associated with deep water. Where possible, electrical fittings and appliances should be raised above the flood level.

Development should consider safe access and egress for site users and emergency services. Potential evacuation routes could include heading south along East Ferry Road and seeking refuge in the high ground at Mudchute Park. Potential evacuation routes should be verified following confirmation of flooding mechanisms. A site specific flood emergency plan should be prepared, in consultation with Council emergency planners, emergency services, and with reference to Multi Agency Flood Plan to evacuate site users out of the floodplain in an 'emergency' flood event.

All site users are to receive an 'information pack' from developers identifying, as a minimum, the risk of flooding, how this is being managed on site, actions site users should take in the event of a flood, appropriate emergency contact details.

The site is shown to be at risk of surface water flooding. It is recommended that further analysis of the risk of surface water flooding is undertaken to verify the results of the hydraulic modelling. 'At source' control measures such as green roofs, rainwater harvesting and water butts should be included in the design. Permeable paving should be incorporated within car parking and hard landscape areas.

Will development increase flood risk elsewhere?

• Unlikely. Development layout must consider surface water flow routes and manage runoff on site sustainably with a target to achieve Greenfield runoff rates.

How can development reduce flood risk overall?

- Include 'at source' SUDS control measures to reduce existing site runoff in accordance with London Plan and local policy.
- Incorporation of flood resistance/resilience measures.

How can the development be made safe?

- Adoption of the Sequential Approach in development layout.
- Floor levels of all sleeping accommodation to be raised 300mm above flood level or located on the first or upper floors.
- Consideration of safe access / egress from the site and safe refuge.
- Implementation of a flood emergency plan.

• Incorporation of flood resistance / resilience measures up to the flood level.

Is there a reasonable prospect of compliance with part c of the Exception Test? Yes, for reasons above.

32.0 Marshwall East

Site Number:	31
Site Location:	Marshwall, Limeharbour
Grid Reference:	538018, 179730



Figure 32-1 Marshwall East Site

32.1 SITE DESCRIPTION

The site occupies an area of 12.94Ha and currently comprises of commercial and residential land uses, and open space. The site is bound by the West India and Millwall Docks to the north and west. Ground levels are highest in these areas at between 5 to 7mAOD. Ground levels in the east of the site are approximately 4 to 5mAOD with some areas as low as 2.8mAOD.

The proposed use of the site includes a large-scale housing development and a district heating facility. The site forms a part of a larger mixed use development consisting of commercial uses and open spaces.

In accordance with Table D2 of PPS 25, the classifications of the proposed uses are as follows:

Proposed Land Use	Vulnerability Classification
Large-scale housing development	More Vulnerable
District Heating Facility	Less Vulnerable

32.2 SUMMARY OF FLOOD RISK

32.2.1 FLOOD ZONE MAPS

The entirety of the site is located within Flood Zone 3. All proposed uses are compatible within this flood zone however 'more vulnerable' uses will be subject to the Sequential and Exception Tests.



Figure 32-2 PPS25 Flood Zones at the Marshwall East Site

32.3 SOURCES OF FLOODING

32.3.1 TIDAL

Actual Risk

The site is defended from tidal inundation during the 0.5% AEP tidal event by the existing Thames Tidal Flood Defences (including the Thames Barrier) for the lifetime of the development. The site is considered to be at low risk of tidal flooding.

Residual Risk

There is a residual risk of tidal flooding from an extreme surge event. The site is defended against inundation from the River Thames during a 0.1% AEP tidal event and is considered as having a low probability of the defences overtopping.

There remains a risk to the site of flooding should a breach of the Thames Tidal Flood Defences occur. Breach analyses were carried out as a part of the LB of Tower Hamlets Level 1 SFRA. The flood extent for Breach 3 (South Quay) extends to the eastern boundary of the site. The majority of the site is located on ground approximately 2-3m higher than the flooded area. Development may require a site specific breach

analysis to determine the worst case scenario.



Figure 32-3 South Quay Breach Extent at the Marshwall East Site

32.3.2 FLUVIAL

Actual Risk

The site is located outside of the 1% AEP event with inclusion of climate change flood extent of the River Lee. The site is concluded as having a low risk of actual fluvial flooding.

Residual Risk

The site is located outside of the 0.1% AEP event flood extent of the River Lee.

The risk of a breach in the fluvial defences is unlikely to result in inundation of the site due to its distance from the watercourse. The site is concluded as having a low risk of residual fluvial flooding.

32.3.3 SURFACE WATER/SEWER

Small areas of surface water flooding are predicted across the site, most noticeably accumulating around the existing building in the south of the site. As the areas are isolated and shallow, the predicted flooding is likely to be a result of inaccuracies in the LiDAR or assumptions made in the modelling rather than an indication of actual risk of surface water flooding.



Figure 32-4 Maximum Depth of Surface Water in a 1% AEP Rainfall Event at the Marshwall East Site32.3.4GROUNDWATER

The northern part of the site is shown to have an increased potential of elevated groundwater. It is recommended that the susceptibility of the site to groundwater flooding is verified via borehole logs. If the site or parts of the site are shown to be at risk, development proposals will need to consider site ground conditions and groundwater levels over the lifetime of the development. In particular the design of any underground structures or services and foundations.



Figure 32-5 Increased Potential of Elevated Groundwater at the Marshwall East Site

32.3.5 ARTIFICIAL SOURCES

The West India and Millwall Docks lie directly to the west of the site. The Docks are maintained and managed by British Waterways and must be consulted in relation to any development next to or within the docks in the London Docklands. The area surrounding the docks has been built up and is generally higher than the level of the docks at above 5mAOD. This is at or above the level of the dock walls and therefore there is a low risk of flooding from the docks to the surrounding area.

The water levels within the docks are controlled by a series of lock gates and do not normally fluctuate with the tide level in the River Thames. There is a residual risk that during tidal flood events, the lock gates at the entrances to the docks may fail or be breached. The locks are not single structures and are a series of regularly maintained double gates so the probability of failure is low. The potential hazard of such an event was assessed as part of the LB of Tower Hamlets Level 1 SFRA. The results of the modelled scenario do not show flooding of the Millennium Quarter site due to the higher elevations of the surrounding land compared to the docks.

32.4 GENERAL FLOOD RISK MANAGEMENT

The Marshwall East Masterplan site is shown to be located within Flood Zone 3. All proposed uses are compatible within this flood zone however 'more vulnerable' uses will be subject to the Sequential and Exception Tests.

The Sequential Approach should be adopted in the development layout. Ground levels are highest along the northern and western boundaries of the site. Higher vulnerability land uses should be located here with lower vulnerability and water compatible uses located elsewhere in the site.

The site is shown to be defended from actual risk of tidal or fluvial flooding. A breach in the Thames tidal defences is shown to pose a potential risk of flooding to low-lying areas within the site. A site specific breach assessment may be required to inform finished floor levels. The finished floor levels of all sleeping accommodation in these areas should be above the 0.5% AEP breach level. Where possible, 'less vulnerable' uses to be located on the ground floor with 'more vulnerable' uses located on the first or upper floors. It is recommended that flood resilience measures are incorporated into buildings to withstand the hydrostatic forces associated with deep water. Where possible, electrical fittings and appliances should be raised above the flood level.

Development should consider safe access and egress for site users and emergency services. Potential evacuation routes could include heading west along Marshwall. Potential evacuation routes should be verified following confirmation of flooding mechanisms. A site specific flood emergency plan should be prepared, in consultation with Council emergency planners, emergency services, and with reference to Multi Agency Flood Plan to evacuate site users out of the floodplain in an 'emergency' flood event.

All site users are to receive an 'information pack' from developers identifying, as a minimum, the risk of flooding, how this is being managed on site, actions site users should take in the event of a flood, appropriate emergency contact details.

'At source' control measures such as green roofs, rainwater harvesting and water butts should be included in the design. Permeable paving should be incorporated within car parking and hard landscape areas.

Development proposals will need to consider site ground conditions and groundwater levels over the lifetime of the development. In particular the design of any underground structures or services and foundations.

Will development increase flood risk elsewhere?

• Unlikely. Development layout must consider surface water flow routes and manage runoff on site sustainably with a target to achieve Greenfield runoff rates.

How can development reduce flood risk overall?

- Include 'at source' SUDS control measures to reduce existing site runoff in accordance with London Plan and local policy.
- Incorporation of flood resistance/resilience measures

How can the development be made safe?

- Adoption of the Sequential Approach in development layout.
- Floor levels of all sleeping accommodation to be raised 300mm above flood level, i.e. located on the first or upper floors
- Consideration of safe access / egress from the site and safe refuge.
- Implementation of a flood emergency plan.
- Incorporation of flood resistance / resilience measures up to the flood level.
- Design of development to consider mitigating the risk of groundwater flooding with use of impermeable materials.

Is there a reasonable prospect of compliance with part c of the Exception Test?

Yes, for reasons above.

33.0 Summary

Table 33-1 below summaries the findings of chapters 2.0 to 32.0. All proposed land uses for the sites put forward in the Sites and Placemaking Development Plan Document (May 2011) have been found to be permitted within the identified Environment Agency Flood Zones for each site. Some proposed land uses however, will require the Sequential and Exception Tests.

C:+C		Elood	Vulnerability	Identified		Recommended Flood
Numbor	Site Name	Tono	Classification of	Sources of	Exception Test?	Risk Management
Inulinat		ZUILE	Proposed Uses	Flood Risk		Measures
~	Bishopsgate Goods Yard	τ	More vulnerable Less vulnerable Water-compatible	Surface water	No	 Flood resilience/resistance measures
2	Hollybush Gardens	Ţ	More vulnerable	Groundwater	0 Z	 Use of impermeable materials for underground structures
3	Marian Place gas works and The Oval	1	More vulnerable Less vulnerable Water-compatible	Surface water Groundwater	No	 Flood resilience/resistance measures Use of impermeable materials for underground structures
4	Goodman's Fields	T	More vulnerable Less vulnerable	Surface water Groundwater	No	 Flood resilience/resistance measures Use of impermeable materials for underground structures
5	Royal London Hospital	T	More vulnerable Less vulnerable	Groundwater	No	 Use of impermeable materials for underground structures

Table 33-1 Suggested Sites within the London Borough of Tower Hamlets

33.0 Summary

Site	Sita Nama	Flood	Vulnerability Classification of	Identified Sources of	Evcantion Tact?	Recommended Flood Bick Management
Number	She Nallie	Zone	Proposed Uses	Flood Risk		Management Measures
						Sequential Approach
9		1&3	Less vulnerable	Tidal breach	No	
	Centre & Vaughan Way					 Safe access/egress and
						retuge
						 Sequential Approach
						Raised floor levels
			More wilhershle	Surface water	Yes – for more	 Safe access/egress and
7	News International	1&3		Groundwater	vulnerable uses	refuge
				Tidal	located within FZ3	 Use of impermeable
						materials for underground
						structures
						 Use of impermeable
ω	St. George's Pools	1	Less vulnerable	Groundwater	No	materials for underground
						structures
						 Sequential Approach
						Raised floor levels
						 Safe access/egress and
						refuge
			More vulnerahle	Fluvial	May be required	 Flood resilience/resistance
σ	Fish Island Area Action	1 7 8, 3	l ess vulherable	Surface water	for more	measures
)	Plan	т, г қ л	Water-romnatible	Groundwater	vulnerable uses	 Use of impermeable
				Artificial source	located within FZ3	materials for underground
						structures
						 Incorporation of 'at source'
						SUDS to reduce runoff into
						identified CDA.
10	Mile End Hospital	1	More vulnerable Less vulnerable	None	No	1

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33.0 Summary

Site		Flood	Vulnerability	Identified		Recommended Flood
Number	Site Name	Zone	Classification of Proposed Uses	Sources of Flood Risk	Exception Test?	Risk Management Measures
11	Southern Grove Lodge	1	More vulnerable Less vulnerable	None	No	
12	Toby Lane Depot and 11- 13 Solebay Street	1	More vulnerable	Groundwater	No	 Use of impermeable materials for underground structures
13	Bow Locks	1, 2 & 3	More vulnerable Less vulnerable	Fluvial breach Surface water Artificial source	Yes – for more vulnerable uses located within FZ3	 Sequential Approach Raised floor levels Safe access/egress and refuge
41	Bromley-by-Bow Redevelopment	1,2&3	More vulnerable Less vulnerable Water-compatible	Fluvial Artificial source	Yes – for more vulnerable uses located within FZ3	 Sequential Approach Raised floor levels Safe access/egress and refuge Flood resilience/resistance measures Incorporation of 'at source' SUDS to reduce runoff into identified CDA.
15	Bow Common gas works	1	More vulnerable Less vulnerable	Groundwater	No	 Use of impermeable materials for underground structures
9	Chrisp Street town centre	2	More vulnerable Less vulnerable	Groundwater	Q	 Use of impermeable materials for underground structures Incorporation of 'at source' SUDS to reduce runoff into identified CDA.

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		-	Vulnerability	Identified		Recommended Flood
Sumber	Site Name	rioou Zone	Classification of Proposed Uses	Sources of Flood Risk	Exception Test?	Risk Management Measures
17	Cording Street	2 & 3	More vulnerable	Groundwater	Yes – for more vulnerable uses located within FZ3	 Sequential Approach Use of impermeable materials for underground structures Incorporation of 'at source' SUDS to reduce runoff into identified CDA.
18	Poplar Baths	2	Less vulnerable	Groundwater	No	 Use of impermeable materials for underground structures
19	Ailsa Street	m	More vulnerable Less vulnerable	Tidal breach Fluvial breach Artificial source	Yes – for more vulnerable uses located within FZ3	 Sequential Approach Raised floor levels Safe access/egress and refuge Flood resilience/resistance measures Use of impermeable materials for underground structures
20	Leven Road gas works	m	More vulnerable Less vulnerable Water-compatible	Tidal breach Fluvial breach Groundwater Artificial source	Yes – for more vulnerable uses located within FZ3	 Sequential Approach Raised floor levels Safe access/egress and refuge Flood resilience/resistance measures Use of impermeable materials for underground structures

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Cito		Elond	Vulnerability	Identified		Recommended Flood
Numbor	Site Name	Tong	Classification of	Sources of	Exception Test?	Risk Management
		ZUIIE	Proposed Uses	Flood Risk		Measures
					May be required	
21	Sorrellane	ć	More vulnerable	anon	for more	 Section tial Annroach
-		n	Less vulnerable		vulnerable uses	
					located within FZ3	
						 Sequential Approach
				Tidal broach	Voc for more	 Raised floor levels
22	l aamonth Daning	c	More vulnerable	Fluxial breach	res – i ui illure	 Safe access/egress and
1		ſ	Less vulnerable	Surface water	located within E73	refuge
						 Flood resilience/resistance
						measures
					May be required	
23	Reliters I TD	Ċ	More vulnerable	and	for more	 Sequential Annuach
2		n	Less vulnerable		vulnerable uses	
					located within FZ3	
						 Sequential Approach
					Voc for more	 Raised floor levels
VC	BIALKWAII NEACII Regeneration	c	More vulnerable	Tidal breach	res – i ui illure	 Safe access/egress and
1		ſ	Less vulnerable	Fluvial breach	located within F73	refuge
						 Flood resilience/resistance
						measures

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	F
	Identified
	Vulnerability
	Flood
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C:+ 0		Elond	Vulnerability	Identified		Recommended Flood
Number	Site Name	Zone	Classification of Proposed Uses	Sources of Flood Risk	Exception Test?	Risk Management Measures
25	Aspen Way	m	More vulnerable Less vulnerable	Tidal breach Fluvial breach Surface water Groundwater Artificial Source	May be required for more vulnerable uses located within FZ3	 Sequential Approach Raised floor levels Safe access/egress and refuge Flood resilience/resistance measures Use of impermeable materials for underground structures
26	Wood Wharf	2 & 3	More vulnerable Less vulnerable	Groundwater	May be required for more vulnerable uses located within FZ3	 Use of impermeable materials for underground structures
27	Billingsgate Market	ß	More vulnerable Less vulnerable	Tidal breach Fluvial breach Surface water Groundwater	Yes – for more vulnerable uses located within FZ3	 Sequential Approach Raised floor levels Use of impermeable materials for underground structures
28	Millennium Quarter	m	More vulnerable Less vulnerable	Tidal breach Surface water	Yes – for more vulnerable uses located within FZ3	 Sequential Approach Raised floor levels Safe access/egress and refuge Flood resilience/resistance measures

33.0 Summary

Ē	poo	Vulnerability	Identified		Recommended Flood
	Tona	Classification of	Sources of	Exception Test?	Risk Management
20		Proposed Uses	Flood Risk		Measures
					 Sequential Approach
				Voc – for more	 Raised floor levels
-	ſ	More vulnerable	Tidal breach	viilnerahle iises	 Safe access/egress and
)	Less vulnerable	Surface water	Incated within F73	refuge
					 Flood resilience/resistance
					measures
					 Sequential Approach
				Voc – for more	 Raised floor levels
	'n	More vulnerable	Tidal breach	viilnerahla iicec	 Safe access/egress and
		Less vulnerable	Surface water	located within F73	refuge
					 Flood resilience/resistance
					measures
					 Sequential Approach
					 Raised floor levels
					 Safe access/egress and
		More witherable	Tidal broach	Yes – for more	refuge
	ß	l acc vulharable	Groundwater	vulnerable uses	Flood resilience/resistance
			ol ou laware	located within FZ3	measures
					 Use of impermeable
					materials for underground
					structures

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Appendix A. Data Register

Appendix B. Figures

- B.1 Flood Zone Maps
- B.2 Surface Water Depth: 1% AEP rainfall event
- B.3 Surface Water Hazard: 1% AEP rainfall event
- B.4 Increased Potential for Elevated Groundwater
- B.5 Reservoir Inundation Mapping
- B.6 Recorded Incidents of Sewer Flooding
- B.7 Key Development Sites

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