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THE CHANDLERY, THE THOROFARE, St. MARY'S, ISLES OF SCILLY.
PROPOSED CHANGE OF USE TO FIRST FLOOR.

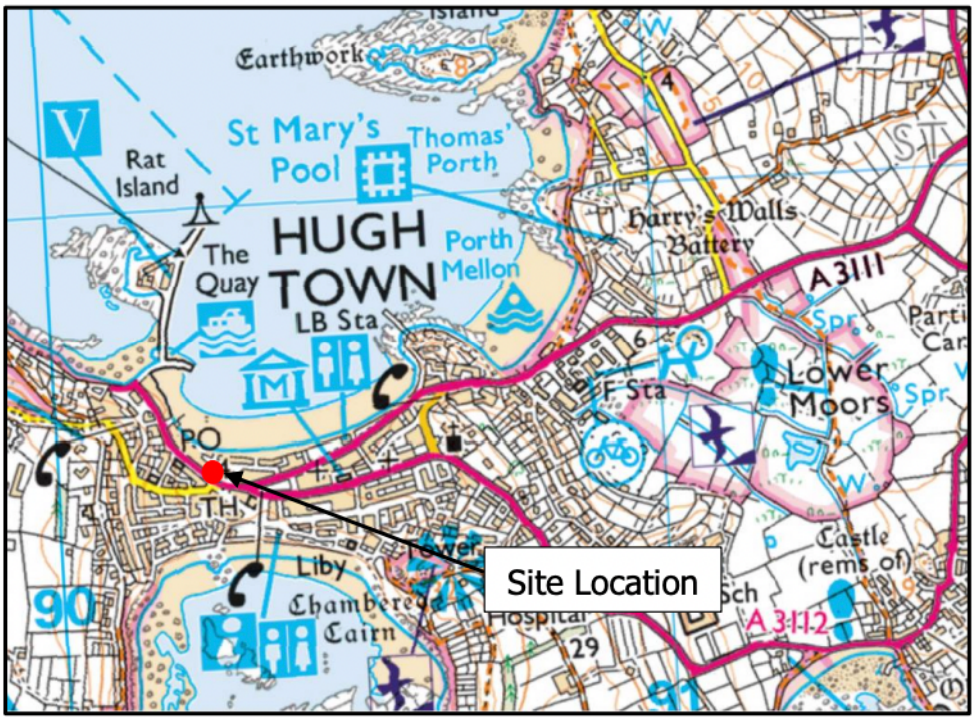
FLOOD RISK ASSESSMENT

Location

The building is located at the end of Thorofare, St Mary's, Isle of Scilly, as shown in the map below.

The property is detached with the northern elevation butting the Thorofare public highway, with a narrow pathway off this, running around the east and south elevations, giving pedestrian access to neighbouring properties, and then a concrete forecourt to the west elevation, with pedestrian access off this leading to Hugh Street. Access to the front and west side of the property is solely off the Thorofare.

Town Beach, with St Mary's Pool beyond, is located to the north of the building's location on the far side of other buildings opposite the Chandlery at a distance of about 15m to the beach.



The Chandlery is a two-storey building with a sloping forecourt to the west elevation.

The finished floor level (FFL) of the ground floor is 3.81m AOD. The FFL of the first floor is 6.72m AOD.

In the wider context, the site is located on a narrow strip of land which joins the two land areas with higher elevations to the east and west of St Mary's.

Ground topography rises towards the south west of the building to a high point of 42m AOD at the Garrison. To the east the land rises to a high point of 32m AOD at Tower. The levels of the narrow strip of land are between 3m AOD and 5m AOD with slightly higher levels located on the south side.

Existing and Proposed Usage

The building consists of commercial open space on the ground floor, with a single toilet to the rear gable end/east elevation. The first floor is also commercial open space, which is accessed via its own ground floor entrance and internal porch area leading to stairwell up. Externally there is a small concrete forecourt at the west elevation/gable end.
An existing site plan is included with the associated planning application reference P/23/001/COU, and the proposed changes to the ground & first floors of the property are shown in drawings C1-C13, included with the same planning application.

2.0 ASSESSMENT OF FLOOD RISKS

Groundwater

Groundwater flooding is linked to the presence of aquifers and the ability of the underlying geological strata to bear water. Flooding occurs when water levels in the ground rise above surface elevations. The Environment Agency/BGS maps have been reviewed to establish the aquifer designations of bedrock and superficial deposits underlying the building, with the aquifer designation classified as a Secondary A aquifer. This type of aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers. It is unlikely that groundwater would issue to the surface at this building as it is located in close proximity to the sea which will allow groundwater to drain down to the local sea levels. In addition, the nearby ground levels are similar to that of the building and provide limited opportunity for excessive water to build up and create high groundwater levels. As such, flooding from groundwater is not considered to represent a meaningful risk to the building and this form of flooding is discounted from further consideration.

Overland Flow

There is limited opportunity for significant overland flow to be generated upslope of the building. Assessment of the topography of the surrounding area indicates that flows from the west of the building generally travel to the north and will be conveyed out into the sea before reaching the building. Overland flows generated from the upslope areas to the east of the building generally travel to the north and west out towards the sea prior to reaching the building. The IoS Local Flood Risk Strategy 2017 notes that the heathland areas generally hold runoff after rainfall events. A portion of the upslope areas directly to the west of the building do have the potential to generate overland flows which may travel in the direction of the building. Due to the small catchment area and presence of built-up areas around the building/its location, it is anticipated that the existing drainage networks serving the locality will dispose of surface water runoff in the building's area. The IoS Local Flood Risk Strategy 2017 notes certain areas of Hugh Town, such as Porthcressa, have experienced surface water flooding during high tide lock conditions. However, improvements to the surface water drainage systems in the vicinity have reduced the occurrence of this. There is no mention of past surface water flooding events in the vicinity of the Chandlery building. This form of flooding is considered to be of low risk compared to tidal flooding, so this mechanism of flooding is discounted from further assessment, as consideration of tidal flooding will provide a much more onerous case.

Fluvial Flood Risk

There are no significant watercourses near or upslope of the building. In consideration of this, flooding from fluvial sources is not considered to represent a meaningful risk to the building and this form of flooding is discounted from further consideration.

Tidal Flooding

The elevation of the ground floor of the building is 3.81m AOD and the building is in close proximity to tidal waters in St. Mary's Pool.

Estimated still water tidal levels for St Mary's are provided below in Table 1, as provided by the Environment Agency (EA).

It is predicted that sea levels in the UK will be rising as a result of global climate change. Predictions provided by the EA recommend that an allowance of 1.45m should be assumed for net sea level rise in the south west of England over a 100-year horizon; 100 years is taken as a reasonable estimate for the lifetime of a mixed commercial/residential building such as this.

As such, sea level may be assumed to rise by 1.45m over the lifetime of the property. Predicted sea levels accounting for climate change over the lifetime of the property are provided within in the right-hand column of the table below.

Tidal Event	Current Day Still Water Level (m AOD)	Still Water Level with Climate Change Allowance (m AOD)
2 Year Return	3.48	4.93
5 Year Return	3.56	5.01
10 Year Return	3.61	5.06
50 Year Return	3.74	5.19
200 Year Return	3.84	5.29
1000 Year Return	3.96	5.41

Table 1 - Approximate Sea Levels – Current Day and with Climate Change Allowance

With reference to the above flood levels, when compared to the existing and proposed ground floor FFL of 3.81m AOD, the site is at risk of flooding from the present day 1 in 200year tidal flood event. The flood depth would be 0.03m, which means the building is located in Flood Zone 3. With reference to Appendix A of the Cornwall and IoS Shoreline Management Plan 2 (reproduced in part in Figure 3 below), it is noted that the policy for this stretch of shoreline is to hold the line for the present time with a possible managed retreat from 2105. The building is located within policy unit 42.3 – The Quay to Custom House.

SUMMARY OF SPECIFIC POLICIES

Policy Unit		SMP1 Policy	SMP2 Policy Plan			
		50 yrs	2025	2055	2105	Comment
42.1	The Mermaid Wall	Hold the line	HTL	HTL	HTL	This part of the quay is integral to the continued shelter of the remainder of the Town Beach frontage. The preferred policy would be to continue with a policy of holding the line, at least while economic justification remains.
42.2	The Quay	Hold the line	HTL	HTL	HTL	This part of the quay is also integral to the continued shelter of the remainder of the Town Beach frontage. There is little scope to realign the defence but its continued presence is accounted for in the management approach to other parts of the frontage. For that reason, (in addition to its historic value and overall importance to the economic well being of St Mary's) the preferred policy would be to continue with a policy of holding the line, at least while economic justification remains.
42.3	The Quay to Custom House	Hold the line	HTL	HTL	**MR**	Increasing pressure upon this part of the frontage may dictate that a longer term accommodation of rising sea levels is made – this may be done through realignment of the existing defence line. The erosion mapping indicates some pressure on the frontage but its sheltered nature means it is under less pressure than the Porthcressa frontline defences.
42.4	Custom house to Carn Thomas	Hold the line	HTL	HTL	**MR**	As with the previous policy unit frontage, a longer term realignment to accommodate rising sea levels and address the increasing risk factors is likely to be necessary.
42.5	Porth Mellon	Hold the line	HTL	**MR**	**MR**	Significant pressure on the Thomas Porth frontage from sea level rise and increasing storminess dictate that a careful management approach is required. The hinterland behind is low-lying and provides a route for flood waters into the Lower Moors area. Therefore the future management strategy needs to accommodate the increases in sea level rise and avoid coastal squeeze and foreshore narrowing where possible but at the

Figure 3 - Extract from Appendix A Cornwall and IoS Shoreline Management Plan 2

In view of this, it is evident that the building is at risk of flooding from tidal sources. This warrants further detailed consideration which is provided in Section 3.0 of this report.

Flood History

The Isle of Scilly Preliminary Flood Risk Assessment Report May 2011 records no evidence of past flooding to the building from surface water or ground water sources. The IoS Local Flood Risk Management Strategy March 2017 does not include any records of property flooding for the building's locality. The Defra Isles of Scilly Water Interests Survey Report on Flood Defenced produced by ARUP in 2011 does note there have been instances of flood water ponding in the Thorofare to the north of the building following high tides. Although only one instance of property flooding has been recorded at a property fronting Town Beach due to the installation of a basement window located at a low level. The report notes the north side of Hugh Town, behind which the building is located, is less susceptible to storm flooding than the Porthcressa side of the narrow land mass referred to earlier. This is due to the sheltered nature of the Town Beach. High tides coinciding with a storm surge pose the highest risk to the building.

Flooding as a Result of Development

Development works have the potential to increase flood risk to properties down slope of the Chandlery building, through the introduction of impermeable areas on previously permeable areas. However, the Chandlery is an existing building/site which is already covered in impermeable surfaces, so there is no risk of increasing runoff from the building/site, as the proposed first floor internal conversion and replacement doors/fenestration to the building as a whole will not increase the impermeable areas around/on the site of the building. Therefore, the proposed alterations present no risk of increasing flooding elsewhere.

3.0 TIDAL FLOOD RISK

Tidal flood risk to the building is considered in more detail below. The still water tidal flood levels for the building/site are shown in Table 1, Section 2.0 above. The 1 in 200 and 1 in 1000year data has been summarised below for reference which also includes a depth of flooding when compared to the buildings' ground floor FFL of 3.81m AOD.

Event	Water Surface Elevation (m AOD)	Depth of Flooding at Ground Floor FFL (m)
1 in 200 Yr.	3.84	0.03
1 in 200 Yr. with CC	5.29	1.48
1 in 1000 Yr.	3.96	0.12

Table 2 – Still Water Tidal Flood Levels and Depth at the Site Ground Floor Level

Data from the EA also provides Depth of Flooding Maps and Head of Water Maps for undefended flood events for the 1 in 200year and 1 in 1000year horizons, with a climate change scenario being provided for the 1 in 200year event. This data is taken from the IoS Coastal Model 2019. It is noted that the maps include an allowance for wave overtopping. A summary of the flood depths and water surface elevations obtained from the EA mapping is provided in Table 2 below. This includes an assessment of the flood depth on the ground floor FFL of the building. The first floor FFL is 6.72m AOD.

Event	Water Surface Elevation (m AOD)	Water Depth from Map (m)	Water Depth Based Upon Site Level of 3.81m AOD(m)
1 in 200 Yr.	3.0-4.0	0.0 to 3.0	0.19
1 in 200 Yr. with CC	5.2 to 5.6	0.0 to 3.0	1.79
1 in 1000 Yr.	3.5 to 4.5	0.0 to 3.0	0.69

Table 3. Summary of Flood Depths and Levels Derived from EA Information

Reference to the EA flood mapping (see Figure 3 below) indicates that the ground floor of the building is at risk of flooding during the present day predicted 1 in 200year tidal flood event. Therefore, the building can be described as being located in Flood Zone 3 (High risk of flooding). The flood depth at the ground floor level is predicted to be 0.19m in the present day 1 in 200year tidal flood event with the allowance for wave overtopping.

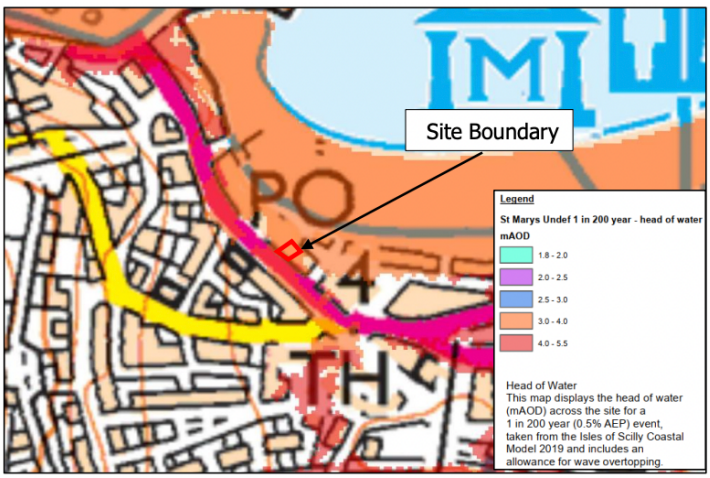


Figure 3 **Extract from EA Flood Map for Planning 1in 200 Year – Level (m AOD)**

During the climate change event (Figure 4), water is shown to inundate a larger area around the building and the building itself is shown to be located in an area with the highest flood levels of 5.2 to 5.6m AOD.

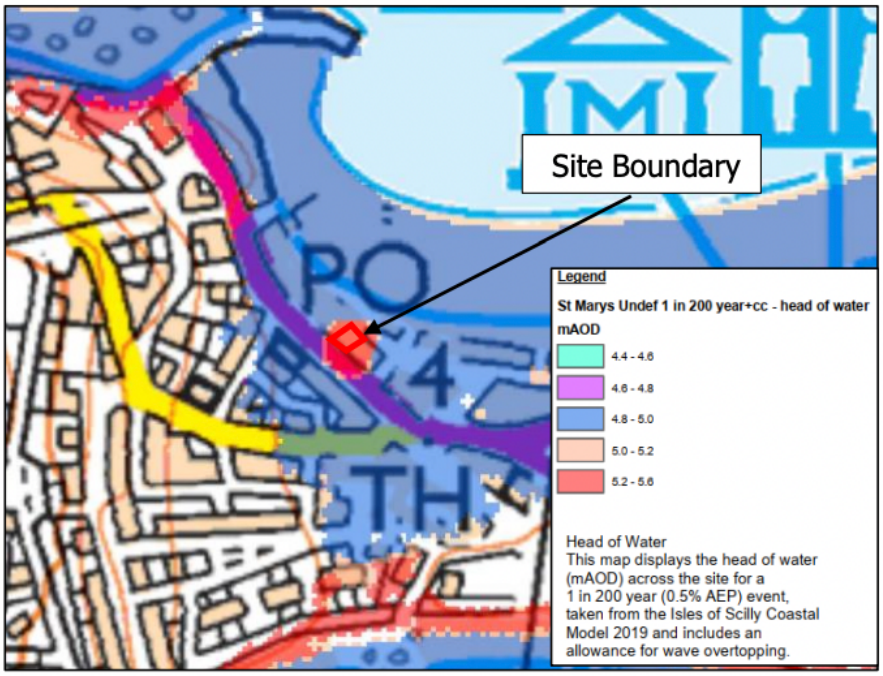


Figure 4 **Extract from EA Flood Map for Planning 1 in 200 Year with Climate Change - Depth**

The maximum depth of flooding on the building's location in the climate change situation is predicted to be 1.79m based on a minimum ground elevation at the site of 3.81m AOD.

The flood map without climate change shows portions of the access into the building being flooded. The flood map for climate change shows a larger proportion of nearby Hugh Street flooded. Access/departure is discussed further in Section 5.0 of this report. Using the Rule of Twelfths for tidal movement and assuming a tidal range of 7.64m, it is estimated that the ground floor of the building (3.81m AOD) will be subject to flooding for a period of about 6 minutes, centred around the peak of the tide for the present day 1 in 200year tidal flood event.

In comparison, for the future predicted 1 in 200year event with an allowance for climate change, the ground floor could be inundated for a period of 2 hours 40 minutes. Given the timing of spring tides in this area, the high-risk times will be centred around the early morning and late afternoon periods during a spring tide cycle. Spring tides occur on a consistent bi-weekly basis with the peak of the tide typically occurring between 5:00am-7:00am and 17:00pm-19:00pm. High spring tides are predictable, but weather conditions can create storm surges and ground swell that add to the water levels, so unfavourable conditions could still occur outside of the spring tide cycle, though the worst conditions will always occur during the coincidence of a high spring tide, strong winds from the north to north-west and storm surge caused by low barometric pressure.

4.0 FLOOD SUMMARY

The risk of flooding to the building from various sources have been considered, with the only meaningful risk of flooding considered to be from tidal flooding propagating from the direction of St. Mary's Pool. The present day predicted tidal flood level for the 1 in 200year return period event is 3.84m AOD. As the FFL of the building is 3.81m AOD the depth of flooding during this event is predicted to be 0.03m which means the building is in Flood Zone 3. With the predicted effects of climate change and rising sea levels, the risk of tidal flooding will increase, and the building is predicted to experience flooding during an extreme still water tidal event (1 in 200 year) to a maximum depth of about 1.48m. With reference to the EA IoS Coastal Model 2019, which includes an allowance for wave overtopping, these flood levels are predicted to increase.

In summary, the current 1 in 200year event could result in flood depths at ground floor FFL of up to 0.19m. With an allowance for climate change these depths could be up to 1.79m. For the 1 in 1000year event depths could be up to 0.69m. The building itself will not increase runoff rates. Also, it will not result in any redirection of flood flow routing or infilling of any fluvial flood plain, and as such will not act to raise flood risk elsewhere.

5.0 ACCESS AND DEPARTURE

Access and departure for the ground floor of the building is off the public highway of The Thorofare. The preferred access route furthest away from the beach would be via the pedestrian alley way leading up to Hugh Street, and as such, this will be discussed in more detail below as the preferred access. Light Detection and Radar (LiDAR) data has been used to assess ground levels in the vicinity of the building/site. Figure 5 shows an extract from this data laid onto an aerial photograph. The preferred access/departure route is indicated by the magenta arrows and the building/site is outlined in red.

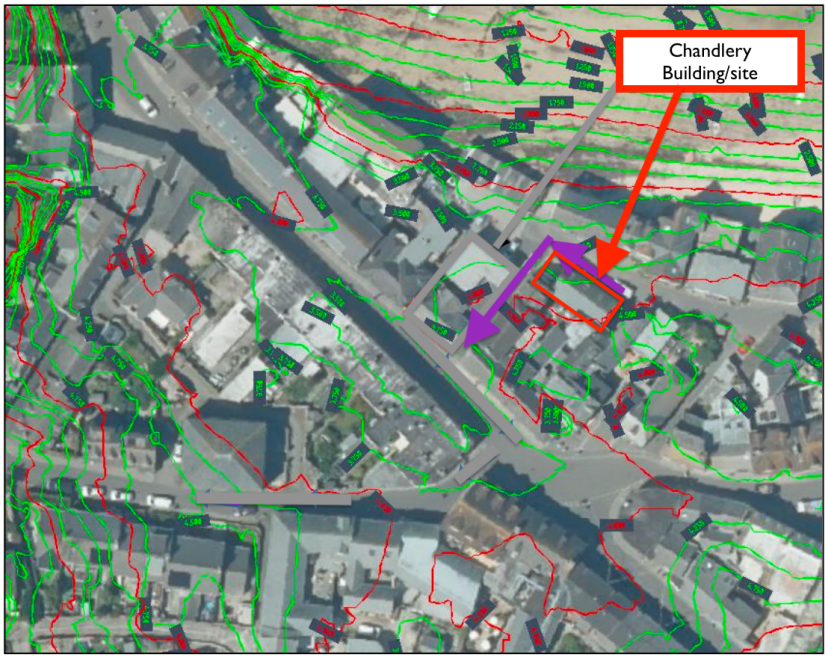


Figure 5 – Contour data from LiDAR including the Preferred Access/Egress route for the Site

Road levels to the front of the building are around 3.75m AOD as shown in the above figure. Moving in a south easterly direction away from the building, the ground levels rise to 4.5m AOD. Moving in a south westerly direction goes to higher ground where levels raise above 4m AOD and above.

Table 13.1 Danger to people for different combinations of depth and velocity

Velocity (m/s)	Depth of flooding (m)											
	0.05	0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.00												
0.10												
0.25												
0.50												
1.00												
1.50												
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3.00												
3.50												
4.00												
4.50												
5.00												

Key:
- Danger for some
- Danger for most
- Danger for all

Figure 6 – Extract from FD2320/TR2

In the event of an anticipated extreme flood where the water level is predicted to exceed about 3.5m AOD, then it is recommended that the building is evacuated in advance of the

high tide and the ground floor commercial premises are not used, if applicable. Residents of the first floor of the building should also ideally evacuate, but where this is not possible, they could take refuge at that first-floor level, as it will remain at least 2.5m above the peak flood level and will act as a safe haven. The maximum period of forced occupation due to flooding is estimated to be 1 hour 5 minutes for the present-day flood event, which is viable. An evacuation route can be incorporated into a Flood Evacuation Plan for the building, which should be prepared in accordance with further advice provided within Section 7.0 of this report.

6.0 POLICY

The site has been shown to be in Flood Zone 3. In accordance with Planning Practice Guidance (PPG) Table 3, the building use would be classified as 'More Vulnerable' due to the proposed new residential unit.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Figure 6 – PPG Table 3

It is understood that Paragraph 168 in NPPF states that "Applications for some minor development and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments…" The building would be classified as 'more vulnerable' due to the proposed change of use to provide a new residential unit. However, as this is a minor alteration, application of the sequential and exception tests are not required, and the appropriateness of the first floor residential unit of the building should be judged on the site-specific flood risk assessment.

7.0 MITIGATION MEASURES

The building is currently located in Flood Zone 3 and used as a commercial building. The proposed change of use will alter the first-floor internal space of the building to create a new separate residential flat. A range of mitigation measures are proposed in order to ensure the safety of the building over its anticipated lifetime. Adopting these measures has the potential to reduce the level of flood risk to the site.

To this end the following mitigation measures are proposed:
1. The proposed changes are for alterations within an existing building, with direct access from street level. Therefore, it would not be practical to raise the Finished Floor Levels. Accordingly, in line with Environment Agency standing advice, the proposed finished floor level (FFLs) for any new building should be no lower than the FFLs of the equivalent existing building.
2. All new alteration works undertaken below 5.89m AOD (1 in 200-year event + climate change + 600mm freeboard) should be carried out using flood resilient materials where practicable. Further advice on flood resilient construction is available from Improving Flood Resilience of New Buildings which is available at:
http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf
From above, the following is highlighted:
"6.6 Doors and windows Doors:
General advice for resilient/resistant design Doors:
Raising the threshold as high as possible, while complying with level access requirements, should be considered as the primary measure. In addition, sealed PVC external framed doors should be used…..
Windows/patio doors:
Windows and patio doors are vulnerable to flood water and similar measures to those used for doors should be taken. Special care should be taken to ensure adequate sealing of any PVC window/door sills to the fabric of the building. Of particular concern would be excessive water pressure on the glazing….. Double glazing conforming to the relevant standards would in principle adequately resist the pressures generated by flood waters."
Accordingly, it should be noted that the associated planning application is compliant here, as it has proposed to replace current wooden pedestrian access doorways with sealed UPVC/Composite doors, plus the new first floor patio style doors (double glazed), as well providing new double glazed replacement windows throughout the ground floor. Additionally, the thresholds to both of these doorways already have raised thresholds, relative to the public highway of the Thorofare.
3. All future electrical circuitry and apparatus is to be installed at or higher than 5.89m AOD where practicable or made resistant to flooding as far as practicable if/where it cannot be installed at high level.
4. Provision to be made for the installation of flood resistant barriers on all the ground floor pedestrian door openings to the building.
5. A detailed Flood Evacuation Plan is to be prepared, which will become particularly relevant with the onset of sea level rise arising from climate change. This plan is to describe how the premises will be used and how residents will be managed when tidal flooding is expected. As a minimum it should address the following items: a. Describe how tide levels and sea conditions will be monitored and when action will be triggered; predicted water levels of 3.4m and 3.7m AOD are suggested as early trigger thresholds. The plan should include proposals for monitoring local radio, monitoring the EA's website and keeping in contact with the IoS Council. In this regard the IoS Local Flood Risk Management Strategy notes that flood warning information will be disseminated by the Council by the following means: Council website, Community Message Board, Tourist Information Office, Town Hall, Radio Scilly, and Posters in various locations. Where deemed appropriate, door knocking in specific vulnerable areas. Direct to IOS Fire and Rescue Service. General flooding advice is provided on the Council website and Z-Cards have been produced and distributed to all

households giving information about how to be prepared in the event of an emergency, including flood incidents

FLOOD ALERT

Amber Alert – Significant tidal overtopping is possible. (3.4m AOD)

- Monitor flood warnings and advice issued by the Environment Agency, IoS Council, the Emergency Services and local radio
- Monitor sea conditions in the Pool
- Prepare to implement Flood Evacuation Plan

FLOOD WARNING

Warning - Significant tidal overtopping is expected. (3.7m AOD)

- Continue to monitor flood warnings and weather/tide conditions
- Put Flood Evacuation Plan into action
- Inform affected persons that flood contingency plan is in force

SEVERE FLOOD WARNING

Severe - Dangerous level of tidal overtopping is expected (4.0m AOD)

- Continue to monitor flood warnings and weather/tide conditions
- Continue to enforce Flood Evacuation Plan and monitor effectiveness
- Advice persons when tide/weather conditions have subsided to safe levels and that normal operation is resumed
- Advise persons of Flood Contingency Plan being implemented again during next tidal cycle

b. Describe proposals as to how flat residents and commercial space users will be informed about flooding risks, mitigation measures and emergency access routes and how they will be informed when the Plan is in place. c. Describe how and when any vehicles associated with the premises will be moved to higher ground d. Describe how and when flood barriers will be deployed e. Describe how the risks will be deemed to have subsided to normal levels and how this will be communicated to flat residents and commercial space users 6. Register with the Environment Agency's countrywide flood warning system in as far as it covers the Isle of Scilly. Flood warnings are issued by phone, text or email. Registration to receive warnings can either be by phone on 0345 988 1188 or online at www.gov.uk/signup-for-flood-warnings 7. With these specified mitigation and contingency measures being adopted, then it is considered that the building may be used/occupied in a safe and appropriate manner over its lifetime.

8.0 CONCLUSIONS

The risk of flooding to the building from various sources have been considered. The only meaningful risk of flooding is considered to be from tidal flooding propagating from the direction of St. Mary's Pool. The present day predicted tidal flood level for the 1 in 200year return period event is 3.84m AOD. As the FFL of the site is 3.81m AOD the depth of flooding during this event is predicted to be 0.03m which means the site is in Flood Zone 3. With the predicted effects of climate change and rising sea levels, the risk of tidal flooding will increase, and the building is predicted to experience flooding during an extreme tidal event

(1 in 200 yr.) to a maximum depth of about 1.48m. With reference to the EA IoS Coastal Model 2019 which includes an allowance for wave overtopping, these flood levels are predicted to increase. In summary, the current 1 in 200year event could result in flood depths at ground floor FFL of up to 0.19m. With an allowance for climate change these depths could be up to 1.79m. For the 1 in 1000year event depths could be up to 0.69m. A range of mitigation measures are proposed as outlined in Section 7.0 above. The preparation of a detailed Flood Evacuation Plan is a key aspect of the mitigation measures, though the plan will become especially pertinent with the onset of predicted sea level rise resulting from climate change. With the specified mitigation and contingency measures being adopted, then it is considered that the building may be occupied/used in a safe and appropriate manner over its lifetime.