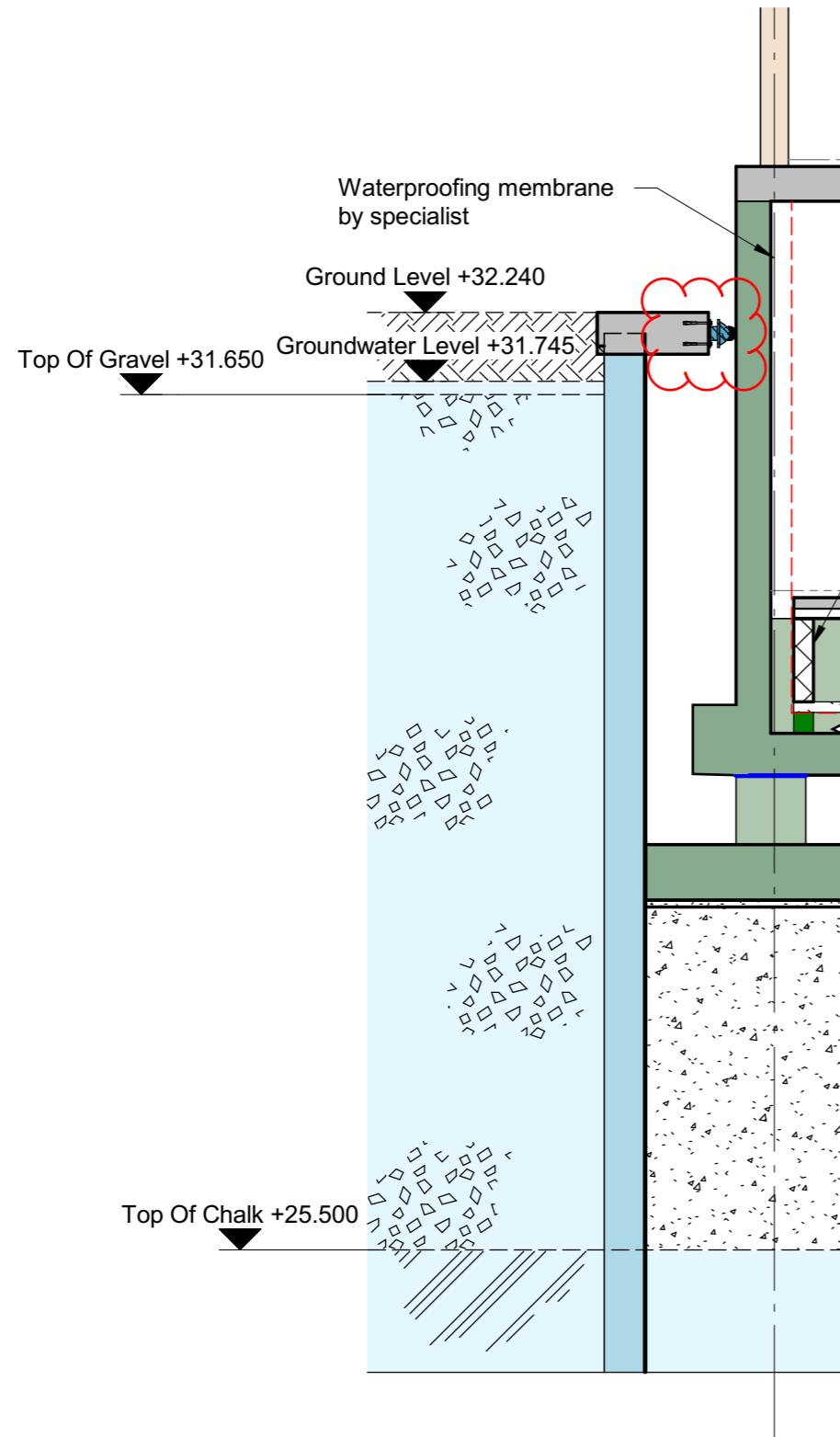


ANCHORAGE SYSTEM



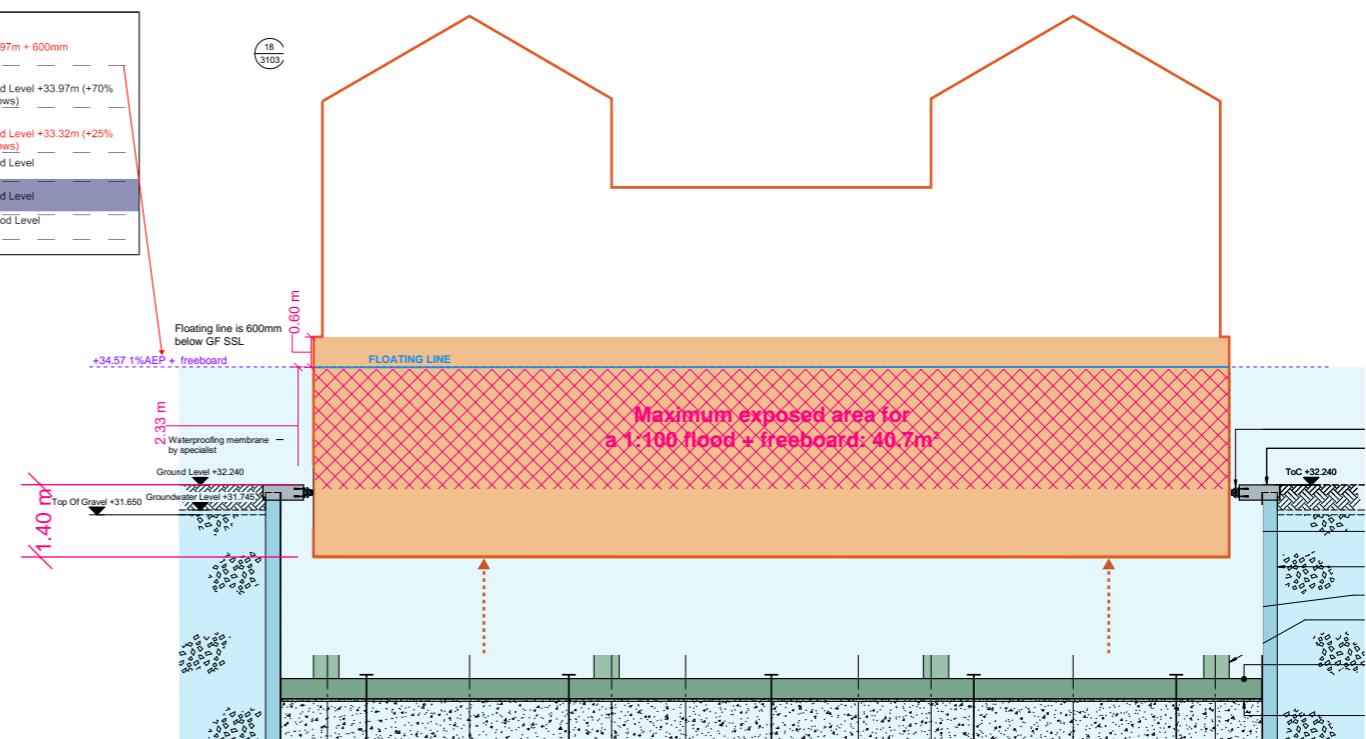
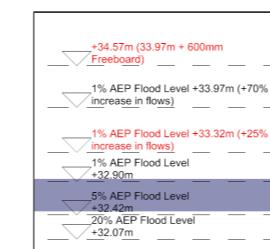
SECTION THROUGH DRY DOCK
AND PART OF THE BASEMENT

For the flooded case, the anchorage requirements of the house have been identified to be broken down into the following categories:

- Horizontal anchorage when floating
- Ability to withstand floodwater velocities and floating debris when floating
- Vertical anchorage to prevent it from floating out and away from its dock



CUSHION ROLLER FENDER
SYSTEM



At the house's maximum floating position, the bottom of the basement slab would be >1.4m below the top of the dry dock at a 1% AEP flood + freeboard.

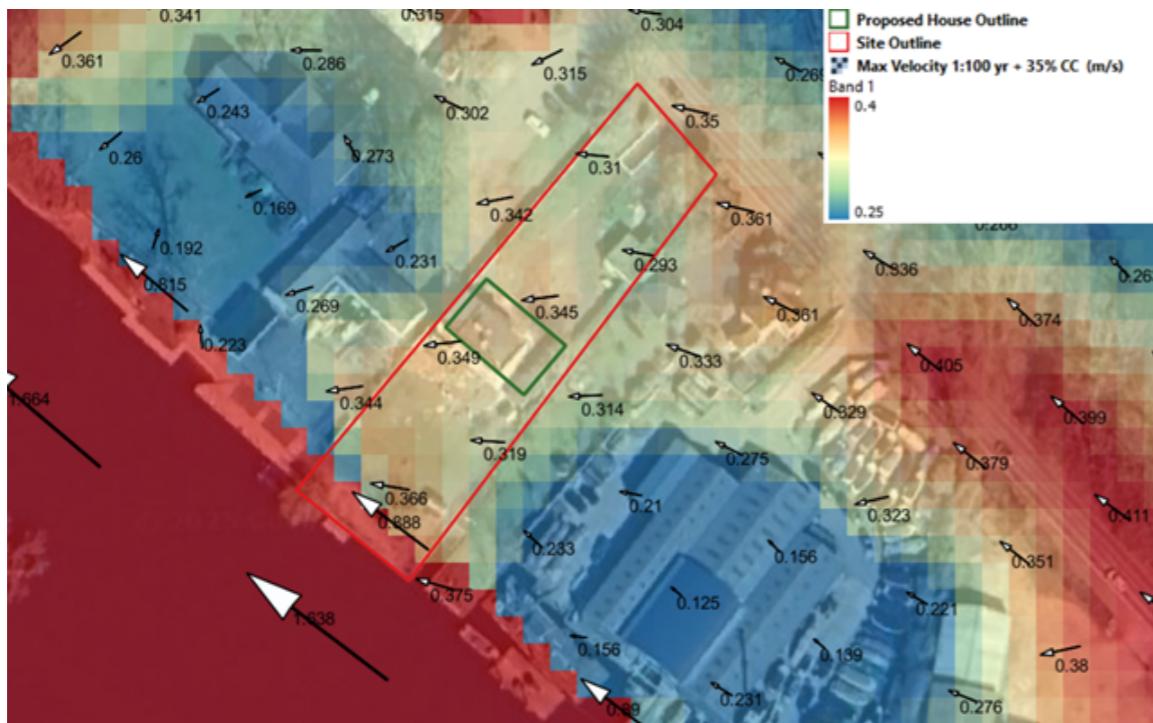
Horizontal anchorage when floating

The house has a waterproof RC basement box which sits within a dry dock. Using a cushion roller fender system, the house is restrained horizontally.

Ability to withstand floodwater velocities and floating debris when floating

Buoyancy calculations are carried out to ensure that the house floats when the water is at least 600mm below the ground floor structural slab level. This determines what we call the floating line, which is the point reached by the water at which the house will float. This gives a maximum exposed surface area of the house's basement box of 40.7m² in elevation approximately.

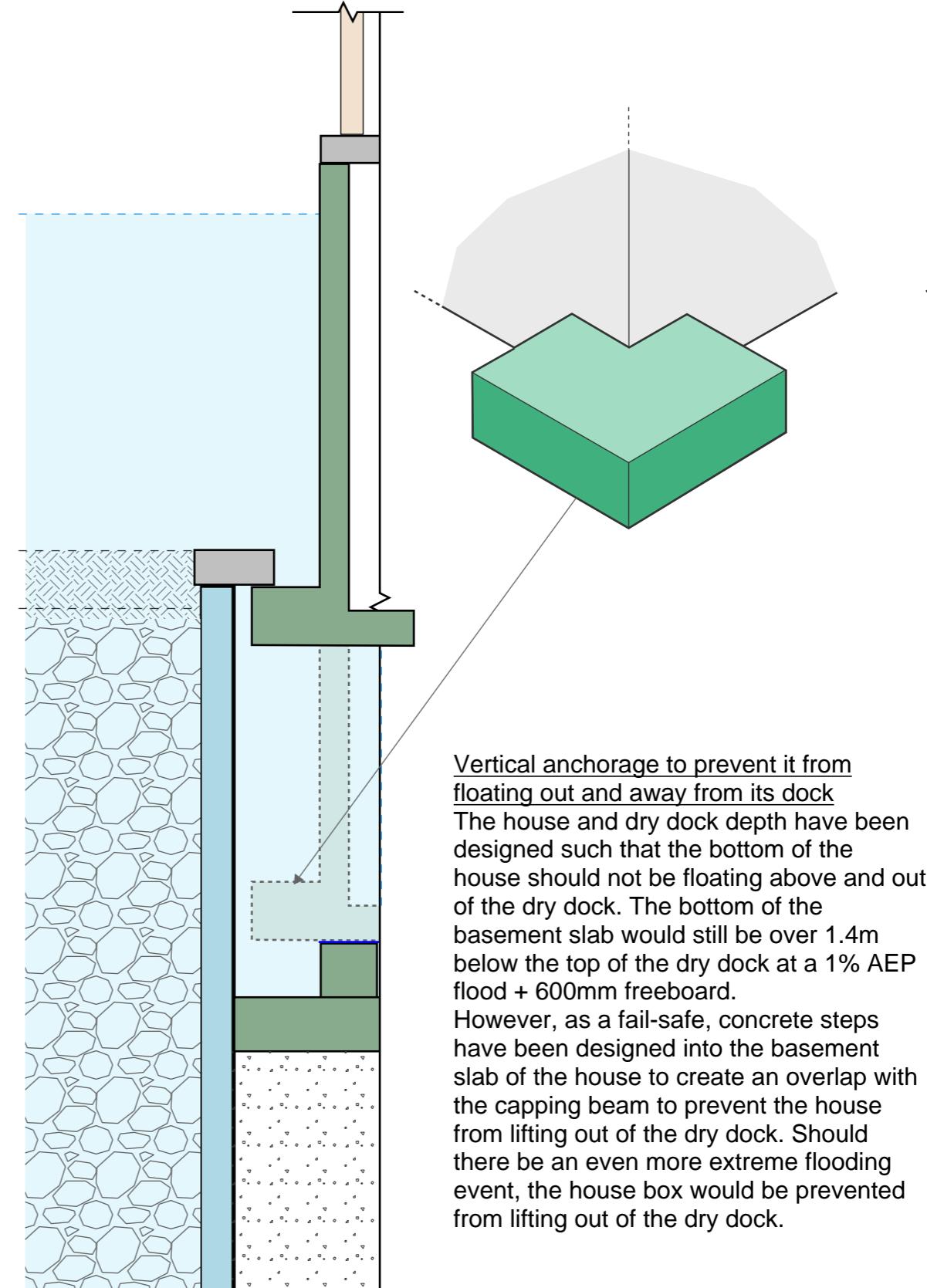
ANCHORAGE SYSTEM



From the diagram above, we can see that in a 1:100-year + 35% climate change (and even 1:1000-year) flood event, we are looking at a floodwater velocity of up to 0.35 m/s around the proposed house's location. This equates to a pressure of 0.06 kN/m², which is 10 times less than the wind peak velocity pressure the house sees, which is equal to 0.68 kN/m².

For a car with passenger that has a typical gross vehicle weight (GVW) of 3500kg, over a 2m width at the floodwater speed shown above, would have an impact force of around 21.5kN.

The basement which has 250mm thick RC walls, being struck by the vehicle with a 21.5kN force, will be able to withstand it. This also satisfies the impact load of a floating tree trunk, which would be lighter than the vehicle we have designed for.



Vertical anchorage to prevent it from floating out and away from its dock
The house and dry dock depth have been designed such that the bottom of the house should not be floating above and out of the dry dock. The bottom of the basement slab would still be over 1.4m below the top of the dry dock at a 1% AEP flood + 600mm freeboard. However, as a fail-safe, concrete steps have been designed into the basement slab of the house to create an overlap with the capping beam to prevent the house from lifting out of the dry dock. Should there be an even more extreme flooding event, the house box would be prevented from lifting out of the dry dock.

DEBRIS SCHEME

Grating

The gap between the dry dock and the house at the top should be shielded with some grating or grillage to minimise debris accumulating.

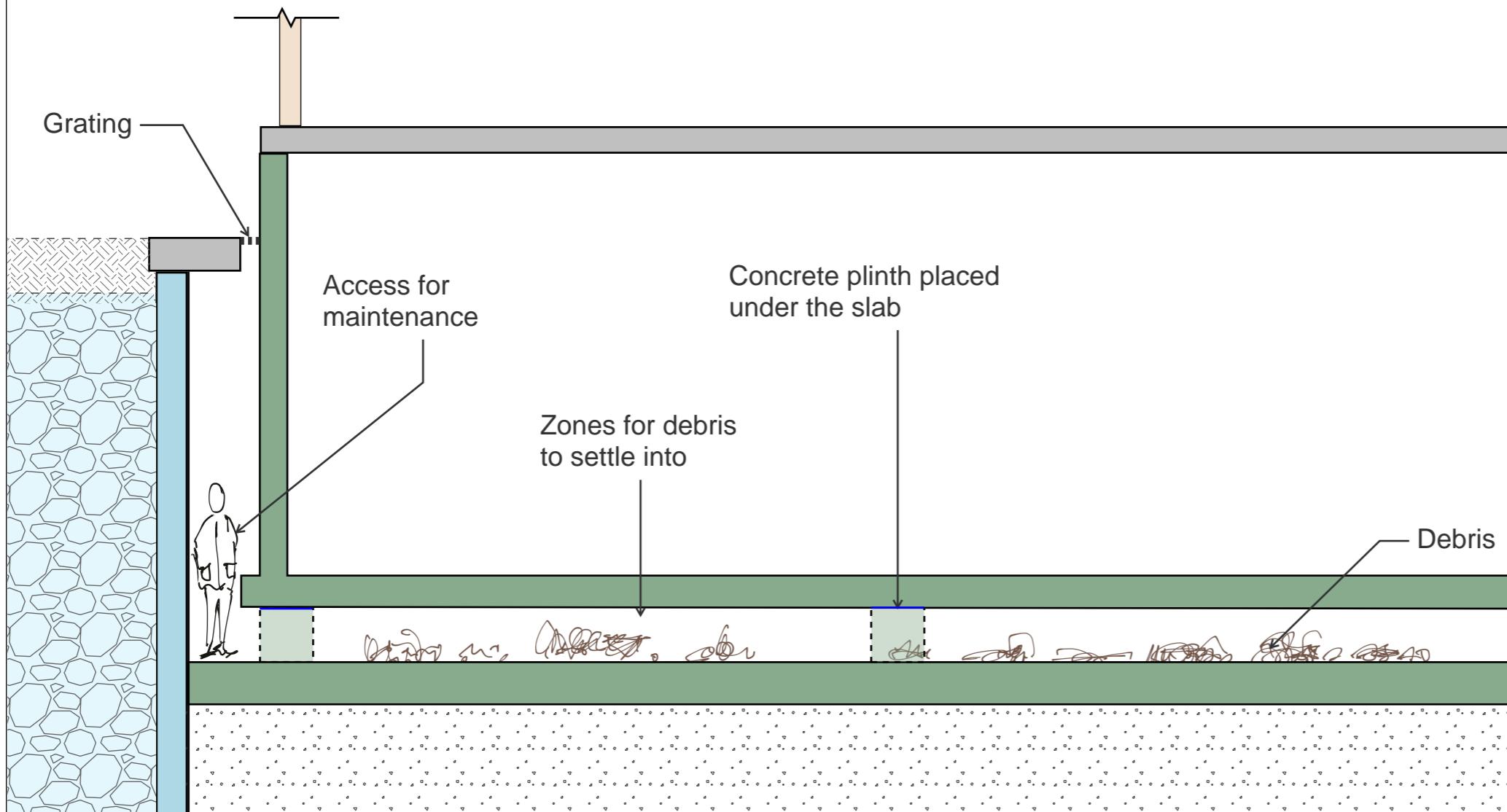
Concrete Plinths

The house is designed to sit on discrete 500x500x500mm reinforced concrete stools, which are anchored into the dry dock's slab, to create a void for debris and silt to settle into. This prevents the house from landing on an uneven surface and offers a space to waterjet out debris and silt from underneath the house.

By reducing the surface area onto which the house bears on, this provides areas for debris to lodge into. This also provides corridors for maintenance to be carried out by using a broom or high-pressure waterjet to clear out the debris.

Sump pumps will be used to evacuate silt and excess water, including water from rainwater.

Alternatively, larger debris items can be swept aside into the areas offering access for removal.



MAINTENANCE SCHEME

House Floating Strategy

The floating strategy relies on the principle of buoyancy, which is a passive simple system where maintenance is kept to a minimum and is outlined below.

The house's basement box will be designed with the suitable waterproofing strategy with two layers of protection.

It will be cast using waterproof concrete, which is a maintenance free primary form of defence.

Inside the basement box is a drained cavity system, which is a widely used system for basements, which would be maintained with the rest of the house's mechanical systems.

Dry Dock Structure

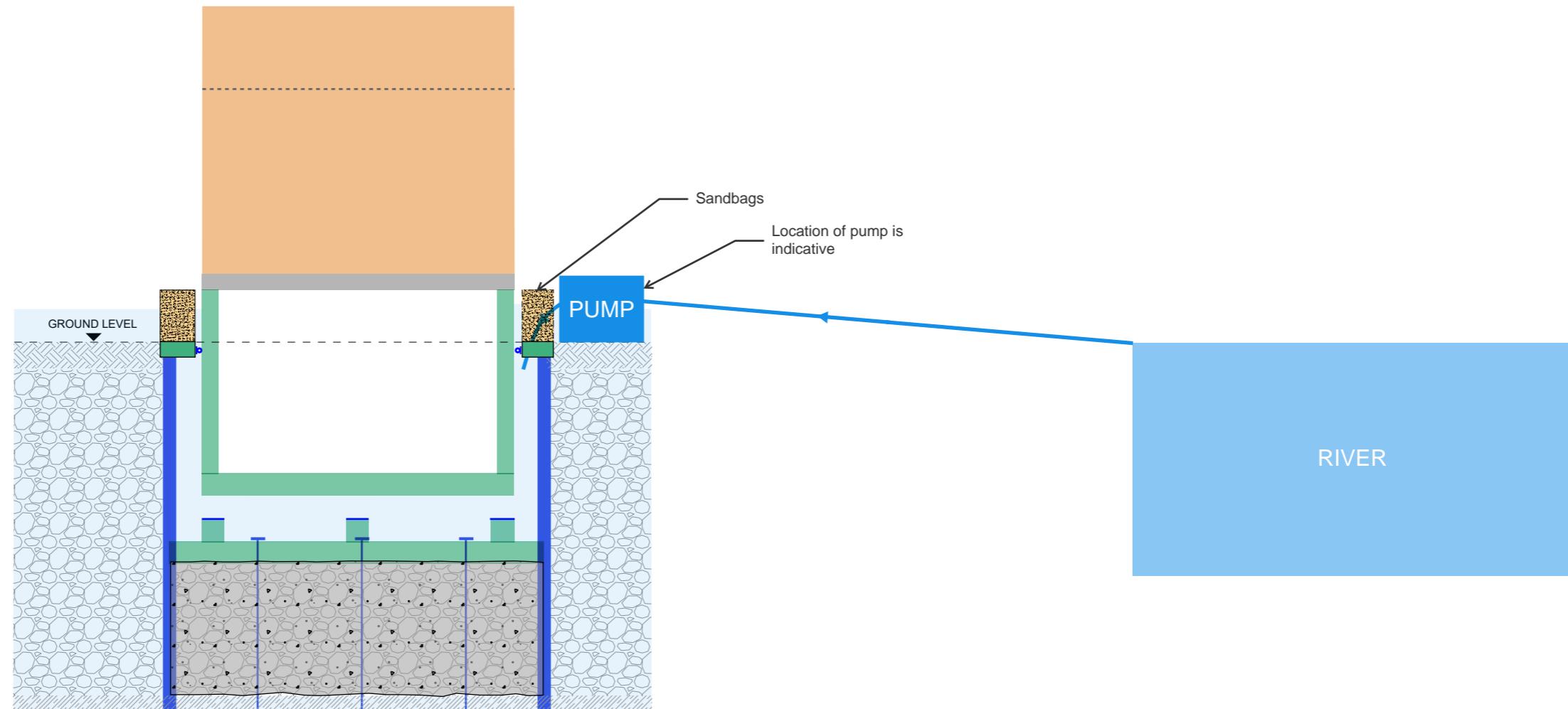
The dry dock structure constitutes of sheet pile walls, waterproof reinforced concrete slab, and ground anchors. This structure does not require regular maintenance.

Cushion Roller Fenders

Cushion roller fenders are to be visually inspected every year and replaced if required. The design and position of these offer easy replacement through unbolting the parts and replacing with new cushion rollers if necessary. The maintenance procedure for these should follow the O&M manual.

Debris Maintenance

After flooding, in case of large debris accumulation, there is a possibility of introducing hydraulic jacks under house basement box slab in order to lift the house further to facilitate access for significant debris removal.



Test Float

A test float of the house is recommended to be carried out if the house has not been subjected to a flood-induced float after 3 years.

INDICATIVE SKETCH SHOWING TEST FLOAT