

ADAPTIVE MEASURES FOR EXISTING SITE: SLOUGH BOROUGH COUNCIL RECYCLING CENTRE, SLOUGH, UK



Climate Change Risk Assessment for Site

- Design Comfort**
- Building overheating due to the glazing performance and the absence of overnight ventilation. The building lacks adequate insulation and is therefore susceptible to overheating in high temperature events
 - The opening ratio for glazing at approx 20 degrees centigrade is not adequate during operational hours 6am -6pm. Occupancy patterns, and associated mechanical cooling serve to exacerbate overheating issues related to operational systems.
- External Spaces**
- The open aspect of the site and lack of shading from trees for the building and its external spaces, provide little respite excepting the North East side of the building which is of a poor landscape quality.
 - The site is exposed to discomfort arising from high sun conditions for most of the operational period.
- Keeping Cool**
- The building performance is inadequate in the areas of insulation, glazing ventilation and air tightness. There remains a risk of discomfort during operational periods.
- Fixing and weather proofing**
- The building, including the flat roof, performs well during inclement weather, but poorly during the summer, especially in high temperature events and longer periods of warm weather, but at a lower temperature than DSY 2 events.
- Water conservation**
- There are no water conservation measures in place and these are a high priority in the proposed adaptation measures.
- Drainage**
- The site is identified by SBC as being situated in the Chalvey Flood Plain area. It is estimated that in a 1:100 – 1:1000 event, 1624 residential, 58 businesses and 100% of retail operations would be affected.
 - Building location and proximity to water course means that increased attenuation measures are vital. The proposed site for increased staff parking is already designated as a flood defence for the residential housing area to the North of Spackman Way.
 - This defensive function has to be retained by manipulation of finished levels and increased attenuation capacity through the introduction of SuDs elements.
- Landscape**
- A comprehensive landscape design is needed for the building and its environs.
 - Issues of building overheating, Urban Heat Island issues, water management (including control of excessive run off) energy conservation, drainage and air quality improvements will require a response from the landscape proposals.
- Air Quality and Ventilation**
- The M4 corridor is located within 200m of the recycling centres Eastern boundary. The stretch of motorway between junction's 5 and 6 has been found to contain significantly higher levels of Nitrogen Oxide than the Governments Air Quality Strategy (AQS).
 - In addition, on-site parking and the movement of heavy waste vehicles and plant around the centre, provides a more localised issue. Measures as part of the external and internal landscape strategy are required to address this critical problem.



Plan of proposed GI measures to new car park and existing building



Plan of proposed GI measures to new car park and existing building

Our GI Adaptation Strategy for the site contains the following recommendations for interventions

Internal Comfort and Building Façade

Overheating constitutes the biggest problem internally. The building has a low glazing ratio but the resistance to solar gain is overridden by the orientation of the building, the thermal mass of the brick façade, the low levels of available ventilation and the barrier to ventilation presented by the smell emanating from the nearby sewage pumping station.

To address these issues we suggest the following interventions:-

Increase the glazing ratio of the building with the introduction of a central atrium containing air tight construction measures, natural ventilation and glazing with a lower G-value to enable an increase in available light levels within the building.

Green Walls will increase the insulating capacity of the existing façade providing a reduction in winter heating requirements and a reduction in mechanical cooling in the summer months. The walls also aid attenuation, slowing the runoff from rainfall, which can be stored further in rain gardens.

The flat roof will be host to a joint green roof and solar panel intervention. Figures have shown that solar panels perform more efficiently when installed on a green roof increasing outputs by up to 10%. The introduction of a green roof will have a positive impact on attenuation for rainfall and provide a further layer of cooling for the building.

The planting to the green roof and the green walls in particular will contain aromatic plant material which will combat the pungent aroma of the pumping station, especially in the summer months, encouraging staff to open windows.

External Comfort and the Building Façade

The curtilage around the building is featureless and exposed. There is no shade or shelter from the dust which is produced from the waste and recycling operations. Air quality over the site is poor and exacerbated by emissions from the adjacent M4 and vehicular traffic in the recycling yard.

Rainfall management via increased attenuation capacity is essential to avoid adding to the risk of flooding from Salt Hill Stream to the North of the site. Our strategy is to increase the holding capacity on site before rainwater is released into the stream through an extensive rain garden system with a large volume holding capacity. Deciduous tree and underplanting in the rain gardens will provide shade to the building and also a layer of protection from the dust and emissions from the yard. Underplanting to the rain gardens will be PM reducing species.

This planting will form one end of a greenway which facilitates access between the building and the car park. The greenway is extended into the car park providing the staff with a walk into the office which has positive effects on health and wellbeing. Studies have shown that walking for 20 minutes per day in woodland has a beneficial effect on the body's circadian rhythms, which are associated with better sleep and stress reduction.

Drainage and Flooding

The existing flood defence on the car park site have formed the baseline for our design interventions. The North and South boundaries have been treated with GI elements to manage the runoff on site, (see below) considering attenuation, water movement through swales and grass channels. These elements are also employed in the management of porous paving drainage which flows through bio-retentive interceptors to purge toxins from petrochemical substances from the parking area.

Integrated in the landscape are *Plant-e* systems which produce electricity which powers a range of design features and monitoring equipment. The items are illuminated bollards, LED markers, weather stations, water quality monitors and interpretation boards which provide the users and public with climate adaptation information for greater public awareness.

Landscape Features

The designed landscape is a sustainable green infrastructure mechanism which addresses air quality, flooding, rainwater management, run off, Urban Heat Island (UHI) effects, biodiversity and habitat enhancement, aroma control and health and wellbeing.

The built structure elements aid the Adaptive Comfort Threshold (ACT) by the shading of windows, roofs and walls. They also contribute to the biophilic gain from being seen from office windows by the building occupants.

The curtilage measures address attenuation, air quality improvements, (UHI) effects, odour control, shading, and beneficial health and well being issues. This green link is multi-functional and comprised of complex interwoven layers that facilitate the maximum amount of issues for the minimum investment.

New Landscape Design

The collaboration between ourselves and *Plant-e* has allowed us for the first time to consider the design of elements and devices which power themselves. The work of *Plant-e* although revolutionary is still in the development stage and so retains constraints in levels of output at present. Sufficient voltage is available however to light a single LED, which we have incorporated into the car park kerb on the stream side to warn drivers of the risk. We can also provide illuminated bollards to the start and finished levels of the ramps along with speed restricting illuminated signage.



Car park boundary treatment 1



Rain garden detail



Car park boundary treatment 2