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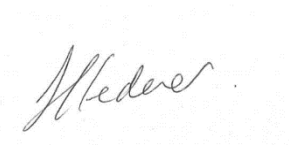
Ford Energy Recovery Facility and Waste Sorting and Transfer Facility

Viridor Energy Limited
Grundon Waste Management Limited
Ford Energy from Waste Limited

Technical Appendix D4 – Climate Change Resilience Assessment – Detailed Results

ENGINEERING CONSULTING

Document approval

	Name	Signature	Position	Date
Prepared by:	Hannah Lederer		Environmental Scientist	30/03/2021
Checked by:	Rosalind Flavell		Senior Consultant	30/03/2021

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Contents

1 Introduction

This appendix has been written in support of Chapter 7 – Climate Change of the ES to support the planning application for an Energy Recovery Facility (ERF) and Waste Sorting and Transfer Facility (WSTF) (the proposed development) to be located at the Ford Circular Technology Park.

This appendix provides the detailed results of the climate change resilience assessment.

The climate change resilience has been assessed for the following vulnerable receptors:

- plant buildings and operational equipment;
- vehicular access to site (for workers and waste);
- grid connection and local users; and
- on-site workers.

For each receptor, the impact of each predicted climatic effect is assessed. This has incorporated the design mitigation associated with each receptor, which is listed for each receptor and impact. The susceptibility and vulnerability to climate change have then been considered to determine the resulting sensitivity to the impacts of climate change. Magnitude and overall significance to effects have then been determined. This uses the methodology set out in Chapter 7 – Climate Change of the ES.

2 Plant buildings and operational equipment

2.1 Climatic effect – increase in temperatures

Increase in winter temperatures do not have any notable impact on the ERF buildings. However, the potential for an increase in mean summer temperatures of 2.5 °C as a central estimate in combination with drier summers, have the possibility to cause buildings to be heated up to higher temperature than current baselines.

This is not expected to have an impact on the buildings or process equipment, as measures to allow for the likely increases in summer temperatures have been incorporated into the design of the proposed development. The building materials will be chosen to be resilient to expected climatic extremes and there are movement joints within the building to allow for expansion and contraction of the materials. Standard specifications for process equipment and building materials include allowances for sufficiently wide temperature ranges which account for climate change. The main process building will use mechanical ventilation to ensure that it is well ventilated to deal with the heat generated within certain process areas.

Taking into account this imbedded mitigation:

- The susceptibility of the plant building and operations is deemed to be 'low' as the receptor has the ability to withstand the projected increases in summer temperatures due to incorporated design measures.
- The vulnerability of the plant is considered to be 'moderate' because although increases in temperatures could impact upon the buildings and operations, the materials can tolerate a wide range of conditions which are within the projections.

The buildings are high value receptors. The sensitivity of the plant building and operation to increased summer temperatures is deemed to be low, as although the receptor is of high value and is dependent upon climatic factors the receptor has the ability to withstand the projected changes.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). Although the probability of increased summer temperatures is high, the mitigation measures imbedded in the design of the proposed development are such that the consequence is low and the overall magnitude is deemed to be small. As a result, it is considered that the predicted increase in summer temperatures would be negligible and of no significance to the plant buildings and operation.

2.2 Climatic effect – increase in precipitation

Anticipated potential impacts to the plant buildings from an increase in winter precipitation of 13% as a central estimate are:

- increased surface run off and associated surface water flooding of the site;
- fluvial flooding; and
- groundwater flooding.

2.2.1 Surface water flooding

As set out in the Flood Risk Assessment (FRA) (Technical Appendix G) the Environment Agency's (EA's) surface water flood mapping indicates low risk of flooding from surface water in the external yard area surrounding the current hangars and waste transfer station (WTS) with the predicted

depth from the EA data as up to 0.3m. Furthermore, the area adjacent to the west of the site office and weighbridge is shown to be at medium risk of surface water flooding. Associated depth of flooding is predicted to be between 0.15 and 0.30 m.

The FRA concludes that the overall risk of flooding from surface water within the site boundary is considered to be low. Low risk of flooding from surface water means that each year, this area has a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%).

If flooding of the site were to be severe, there would be a risk of flood damage to buildings, resulting in maintenance and possible generation disruption. Whilst climate change is likely to result in increased potential for surface water flooding, the surface water drainage scheme has been designed to account for climate change impacts.

As set out in the FRA, the surface water drainage strategy incorporates a 40% allowance for climate change and four below ground attenuation creates that will store surface water prior to discharging it into an existing land drain at greenfield run off rates. These measures will ensure that the proposed development will not be at increased risk of surface water flooding as a result of climate change.

The proposed attenuation system will provide 2,400m^3 of attenuation storage volume, which has been designed to contain the 1-in-30 year critical storm event, including 40% allowance for climate change without causing any flooding to the site. Any exceedance flows beyond the 1-in-30 year critical storm event will be managed on site by allowing shallow ponding (i.e. approximately 150 mm average depth) in particular external hardstanding areas.

Taking into account this imbedded mitigation:

- The susceptibility of the plant building and operations to surface water flooding is deemed to be ‘low’ as the receptor has the ability to withstand the projected increased potential for surface water flooding.
- The vulnerability of the plant to surface water flooding is considered to be ‘moderate’ as although the increased potential for surface water flooding could impact upon the buildings and operations, the proposed mitigation measures ensures that they can tolerate the projected increases in surface water flooding events.

The buildings are high value receptors. The sensitivity of the plant buildings to surface water flooding is deemed to be low as although the receptor is of high value and climatic factors can affect it, the receptor has the ability to withstand the projected changes.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). Although the probability of increased surface water flooding is high, the mitigation measures embedded in the design of the proposed development are such that the consequence is low, and the overall magnitude is small. As a result, it is considered that the predicted increase in winter rainfall leading to the increased potential for surface water flooding would be of negligible significance to the plant buildings and operation.

2.2.2 Fluvial flooding

The predicted 19% increase in precipitation increases the potential risk of fluvial flooding. If flooding of the site were to be severe, there would be a risk of flood damage to buildings, resulting in maintenance and possible generation disruption.

The site is located 900 m to the west of the River Arun and as set out in the FRA the site is within Flood Zone 1 and has ‘low probability of flooding’. The closest Flood Zone 2 area is over 450 m away. Taking this into account:

- The susceptibility of the plant buildings and operations to fluvial flooding is deemed to be 'moderate', as the proposed development would be negatively impacted should fluvial flooding occur but has limited ability to withstand some increase in levels.
- The vulnerability of the plant buildings to fluvial flooding is considered to be 'moderate', as the receptor is dependent upon climatic factors but can tolerate a range in conditions (being in a Flood Zone 1).

The buildings are high value receptors. The sensitivity of the plant buildings and operations to fluvial flooding is deemed to be 'medium' as the receptor is of high value and climatic factors can affect it. However, the receptor has some ability to withstand the projected changes.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). The site is located within Flood Zone 1 and therefore there is a very low risk probability of a flood event occurring. Although this does not take climate change into account and so may not be as applicable to the future baseline, the change would have to be considerable for the flood zone to change enough that the site would not be within Flood Zone 1. Although flooding would result in a high consequence, due to a low probability, the overall magnitude is deemed to be 'small'. As a result, it is considered that the predicted increase in winter rainfall leading to the increased potential for fluvial flooding on site would have a slight effect on the plant buildings and would not be considered significant.

2.2.3 Groundwater flooding

Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata. A groundwater flood event results from a rise in groundwater level sufficient for the water table to intersect the ground surface and inundate low lying land. Groundwater floods may emerge from either point of diffuse locations. They tend to be long in duration developing over weeks or months and prevailing for days or weeks.

The predicted 19% increase in precipitation increases the potential risk of groundwater flooding. If flooding of the site were to be severe, there would be a risk of flood damage to buildings, resulting in maintenance and possible generation disruption.

As set out in the FRA, the Arun District Council SFRA indicates that the area in general is highly susceptible to groundwater flooding. However, there are limited areas of the development that have the potential to interact with groundwater. The main below ground excavation will be for the construction of the waste bunker. Based on the existing groundwater level data at the site, the potential for the bunker excavation to interact with groundwater is anticipated to be minimal. As such elements of the design that could interact with groundwater are limited to the installation of supporting structural piles and bunker. This can be mitigated (if needed). Local surface ponding of water will be allowed to occur in extreme events in managed hardstanding areas. These areas will be at marginally lower elevations and would also allow for the ponding of groundwater, should a groundwater flood event occur. There is also managed overland flow path within the site boundary which directs water through site and down an existing flow path towards the local watercourse.

Taking this into account:

- The susceptibility of the plant buildings and operations to groundwater flooding is deemed to be 'moderate', as the proposed development would be negatively impacted should groundwater flooding occur but has limited ability to withstand some increase in levels.
- The vulnerability of the plant to groundwater flooding is considered to be 'moderate' as although the increased potential for groundwater flooding could impact upon the buildings and

operations, the proposed mitigation measures ensure that they can tolerate the projected increases in groundwater flooding events.

The buildings are high value receptors. The sensitivity of the plant buildings and operations to groundwater flooding is deemed to be 'medium' as the receptor is of high value and climatic factors can affect it. However, the receptor has some ability to withstand the projected changes to climate.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). The Arun District Council SFRA indicates that the site is highly susceptible to groundwater flooding. However, there are limited areas of the development that have the potential to interact with groundwater. Although there is a high probability of groundwater flooding, due to the low consequence as a result of the imbedded mitigation, the overall magnitude is deemed to be 'small'. As a result, it is considered that the predicted increase in winter rainfall leading to the increased potential for fluvial flooding on site would have a slight effect on the plant buildings and would not be considered significant.

2.3 Climatic effect – decreased summer precipitation

Decrease in summer rainfall of 22% gives the increased possibility of drought. As the ERF is a net user of water, it may be impacted by depletion of water resources in the UK, especially in the south, caused by climate change.

In order to minimise the reliance on mains water the following measures are imbedded in the design of the proposed development:

Rainwater harvesting tanks will be installed in the ERF and WSTF buildings to collect rainwater from building roof areas. This water will be used on site to support site activities / processes where appropriate (e.g. toilets, washing HGVs, etc.)

Where practicable, waste waters generated from the process will be re-used/recycled within the facilities. Process effluents and wash down waters collected from internal process areas will be collected in a process effluent system and stored within a dirty water pit ready for re-use.

Taking into account this imbedded mitigation:

- The susceptibility of the plant building and operations is deemed to be 'low' as the receptor has the ability to withstand the projected decrease in summer rainfall with the use of on-site water resources to minimise reliance on mains water.
- The vulnerability of the plant is also considered to be 'moderate' as even if on-site water resources are depleted the proposed development would be able to use mains water. It is however acknowledged that the mains water would be vulnerable to reduced summer rainfall. Despite this, the water provider for the area, Southern Water, has a statutory obligation to manage the water resources for their users and have a drought plan which sets out the steps they would take during low rainfall to ensure a reliable water supply is delivered.

The buildings are high value receptors. The sensitivity of the plant building and operation to decreased summer rainfall is deemed to be low as although the receptor is of high value and climatic factors can affect it, the receptor has the ability to withstand the projected changes.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). Although there is a likelihood of decreased summer rainfall, the mitigation measures imbedded in the design of the proposed development are such that the consequence is low and overall magnitude is small. As a result, it is considered that the predicted decrease in summer rainfall leading to the increased potential for drought would be of negligible significance to the plant building and operation.

2.4 Climatic effect – extreme events

The predicted increase in rain caused by storms and extreme events is covered in the flooding sections. Surges in wind may have an impact on the wind loading of buildings, the potential impact being structural damage to the buildings, for example wind gusts could cause damage or shifting to cladding or bolts causing a risk of cladding or external parts of the building coming loose.

However, as part of the structural design for the building wind loading studies will be carried out which include a safety factor. This safety factor is sufficient to allow for these strong winds and associated wind loading. In addition, preventative measures such as preventative maintenance and regular inspections of the cladding and building materials will also be carried out.

Taking into account this imbedded mitigation:

- The susceptibility of the plant building and operations is deemed to be 'low' as the receptor has the ability to withstand any the projected increase in wind speeds due to incorporated design.
- The vulnerability of the plant is considered to be 'moderate' as the receptor is dependent upon climatic factors but can tolerate a range in conditions.

The buildings are high value receptors. The sensitivity of the plant building and operation to extreme events is deemed to be medium because the receptor is of high value and climatic factors can affect it, although there is some ability to withstand the projected changes.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). The probability of increased winds speeds is medium (UKCP18 projections do not quantify but predict they will increase), the mitigation measures imbedded in the design of the proposed development are such that the likelihood of adverse impacts is low and the overall magnitude is considered to be 'small'. As a result, it is considered that the predicted increase in wind speeds during extreme events leading to increased potential for structural damage to buildings would be of have a slight effect on the plant buildings and operation and would not be considered significant.

2.5 Summary

The assessment of climate change impacts on plant buildings and operation is summarised in Table 1.

Table 1: Summary of assessment for plant buildings and operation

Predicted change in climate	Impact	Susceptibility	Vulnerability	Resulting sensitivity	Magnitude of effect considering mitigation	Overall significance
Increase in temperatures	Over -heating	Low	Moderate	Low	Small	Negligible
Increase in rainfall	Surface water flooding	Low	Moderate	Low	Small	Negligible
	Fluvial flooding	Moderate	Moderate	Medium	Small	Slight
	Groundwater flooding	Moderate	Moderate	Medium	Small	Slight

Predicted change in climate	Impact	Susceptibility	Vulnerability	Resulting sensitivity	Magnitude of effect considering mitigation	Overall significance
Decrease in summer rainfall	Drought	Low	Moderate	Low	Small	Negligible
Extreme events	Building damage from high winds	Low	Moderate	Medium	Small	Slight

In summary, the overall effect of climate change on the buildings and operation is assessed to be negligible to slight. This is not a significant effect.

3 Vehicular access to site (for workers and waste)

3.1 Climatic effect – increase in temperatures

Increase in winter and summer temperatures is not anticipated to have any notable impact on vehicular access to site.

3.2 Climatic effect – increased winter precipitation

Anticipated potential impacts to vehicular access to site from a 13% in winter precipitation are:

- Increased surface run off and associated surface water flooding of access routes;
- Fluvial flooding of access routes; and
- Groundwater flooding of access routes.

If waste feedstock cannot access the ERF, there is a risk of supply disruption and potential shut down. If waste cannot access the WSTF, there may be disruption to the collections and removal of waste from local areas and disruption to the delivery of recyclates. If staff cannot access the site, there may be an impact to shift patterns and the potential for partial or complete shut down if there are not enough staff to maintain safe plant operation.

The highways network is designed for resilience to extreme events, and the Climate Change Strategy of WSCC includes assurance to create a transport network resilient to flooding.

In the case that vehicles are restricted from accessing the site, the design of the proposed development includes contingency planning for five days: the waste bunker has the capacity for five days' worth of waste storage; there are over five days of APCr residues maintained on site; and there is sufficient storage capacity for over five days of IBA and APCr storage. Therefore, the proposed development would be able to continue normal operations for five days, by which time it is expected that any road restrictions would have been removed or alternative routes created. In addition, the operating procedures would include monitoring of weather conditions and should weather conditions occur that could result in localised flooding of roads then measures would be put in place to ensure the facility could continue to operate.

Taking into account this imbedded mitigation:

- The susceptibility of the vehicular access to site to flooding is deemed to be 'moderate' because the receptor would be temporarily impacted by flooding.
- The vulnerability of the vehicular access to site to flooding is considered to be 'low' as the receptor is dependent upon some climatic factors, but these have been accounted for by the proposed development's contingency plan.

The value of vehicular access to site is medium. The sensitivity of vehicular access to site to flooding is deemed to be low because the receptor has the ability to withstand projected changes.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). Although the probability of increased flooding is high, the mitigation measures imbedded in the design of the proposed development are such that the consequence is low and the overall magnitude is small. As a result, it is considered that that the predicted increase in winter rainfall leading to the increased potential for surface water and fluvial flooding would be of negligible significance to the vehicular access to site.

3.3 Climatic effect – decreased summer precipitation

Decrease in summer rainfall of 22% gives the increased possibility of drought. This is not expected to impact the vehicular access to site.

3.4 Climatic effect – extreme events

The predicted increase in rain caused by storms and extreme events is covered in the flooding sections. Surges in wind may have an impact on the vehicular access to site where they cause branches to be blown off or trees to be blown over, resulting in a road blockage.

If waste feedstock cannot access the ERF, there is a risk of supply disruption and potential shut down. If waste cannot access the WSTF, there may be disruption to the collections and removal of waste from local areas and disruption to the delivery of recyclates. If staff cannot access the site, there may be an impact to shift patterns and the potential for partial or complete shut down if there are not enough staff to maintain safe plant operation.

The highways network is designed for resilience to extreme events, and the Climate Change Strategy of WSCC includes assurance to create a transport network resilient to flooding.

In the case that vehicles are restricted from accessing the site, the design of the proposed development includes contingency planning for five days: the waste bunker has the capacity for five days' worth of waste storage; there are over five days of APCr residues maintained on site; and there is sufficient storage capacity for over five days of IBA and APCr storage. Therefore, the proposed development would be able to continue normal operations for five days, by which time it is expected that any road restrictions would have been removed or alternative routes created.

Taking into account this imbedded mitigation:

- The susceptibility of vehicular access to site to tree fall as a result of extreme winds is deemed to be 'low' as the receptor has the ability to withstand a blockage to the site.
- The vulnerability of vehicular access to site to tree fall as a result of extreme winds is considered to be 'moderate' as it is expected that WSCC would remove any blockages promptly, but if not any impact from said blockages have been accounted for by the proposed development's contingency plan.

The value of vehicular access to site is medium. The sensitivity of vehicular access to site to tree fall as a result of extreme winds is deemed to be low because the receptor has the ability to withstand projected changes.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). Although the probability of increased tree fall is high, the mitigation measures imbedded in the design of the proposed development and actions of the Highways Authority and WSCC are such that the consequence is low and the overall magnitude is small. As a result, it is considered that the predicted increase in wind speeds leading to the increased potential for tree fall causing access road blockages would be of negligible significance to the vehicular access to site.

3.5 Summary

The assessment of climate change impacts on vehicular access to the site is summarised in Table 2.

Table 2: Summary of assessment for vehicular access to site

Predicted change in climate	Impact	Susceptibility	Vulnerability	Resulting sensitivity	Magnitude of effect considering mitigation	Overall significance
Increase in winter rainfall	Flooding of access roads	Moderate	Low	Low	Small	Negligible
Extreme events	Trees and branches blocking access roads	Low	Moderate	Low	Small	Negligible

In summary, the overall significance of climate change on vehicular access to site is assessed to be negligible.

4 Grid connection and local users

4.1 Climatic effect – increase in temperatures

Increases in summer or winter temperatures are not expected to impact the grid connection or local users.

4.2 Climatic effect - Increased winter precipitation

Anticipated potential impacts to grid connection and local electricity users from a 13 mm (19%) increase in winter precipitation are flooding events from surface water flooding, groundwater flooding, or fluvial flooding which could cause water damage to the grid connection and electricity supply. This would result in no output of power from the proposed development to the local electricity distribution network.

However, the proposed development has been designed so that the grid connection and associated cables are underground. This protects them from any above ground damage from storm or wind events and the cables are designed to be resilient to water and so would not be impacted by any flooding events.

Taking into account this imbedded mitigation:

- The susceptibility of grid connection and local users is deemed to be 'moderate' as the receptor would be impacted should flooding damage to cables occur but has some ability to withstand flooding.
- The vulnerability of grid connection is considered to be 'low' as mitigation measures (such as the use of underground caballing) have been included to ensure that climatic factors have little influence on the receptor.

The value of gird connection and local users is high. The sensitivity of grid connection and local users to increased winter precipitation is deemed to be low as the receptor has the ability to withstand projected changes.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). Although the probability of increased winter precipitation is high, the mitigation measures imbedded in the design of the proposed development are such that the consequence is low and the overall magnitude is small. As a result, it is considered that the predicted increase in rainfall leading to the increased potential for flooding would be of negligible significance to the grid connection and local users.

4.3 Climatic effect – decreased summer precipitation

Decrease in summer rainfall gives the possibility of drought. This is not expected to impact the grid connection or local users.

4.4 Climatic effect - extreme events

The predicted increase in rain caused by storms and extreme events is covered in the flooding sections. Surges in wind are not expected to impact the grid connection or local users, given that the connection is via an underground cable.

4.5 Summary

The assessment of climate change impacts on grid connection and local users is summarised in Table 3

Table 3: Summary of assessment for grid connection and local users

Predicted change in climate	Impact	Susceptibility	Vulnerability	Resulting sensitivity	Magnitude of effect considering mitigation	Overall significance
Increase in winter rainfall	Infrastructure damage due to flooding	Moderate	Low	Low	Small	Negligible

In addition, unlike conventional power stations such as gas fired power stations, the ERF has the ability to re-start itself in the event of a shut down, without reliance on supply of electricity from the grid. This is referred to as the facility having 'black start' capability. This enables the facility to generate and supply electricity into the local grid, even in the event of a major grid failure. Such facilities are important for the resilience of the local and national grid.

In summary, the overall significance of climate change on the grid connection and local users is assessed to be negligible.

5 On-site workers

5.1 Climatic effect – increase in temperatures

Increase in winter temperatures are not expected to have any detrimental impact on the on-site workers as these would remain below the summer highs. However, the potential for an increase in mean summer temperatures of 2.5 ºC as a central estimate in combination with drier summers, have the possibility to cause discomfort or very mild health effects for on-site workers.

The majority of workers would only access the office areas which would include mechanical ventilation and heating systems to ensure the temperatures are comfortable. The main process building will use mechanical ventilation to ensure that it is well ventilated to deal with the heat generated within certain process areas. In addition, Risk Assessment Method Statement (RAMS) will be developed which staff must follow when working around the site which will include details of agreed safe working practices and PPE equipment to be worn.

Taking into account this imbedded mitigation:

- The susceptibility of on-site workers is deemed to be 'moderate' as the receptor has some ability to withstand projected changes in prevailing conditions.
- The vulnerability of on-site workers is considered to be 'low' as mitigation measures (such as the use of mechanical ventilation) have been included to ensure that climatic factors have little influence on the receptor.

The value of on-site workers is high. The sensitivity of on-site workers to increased temperatures is deemed to be low because the receptor has the ability to withstand projected changes as a result of the imbedded mitigation.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). Although the probability of increased temperatures is high, the mitigation measures imbedded in the design of the proposed development are such that the consequence is low and the overall magnitude is small. As a result, it is considered that the predicted increase in temperatures causing discomfort or very mild health effects for on-site workers would be of negligible significance.

5.2 Climatic effect - Increased winter precipitation

Increase in summer rainfall gives the possibility of flooding on-site (either fluvial, groundwater or surface water). This could result in dangerous working conditions or closure of the site. However, as set out previously there are mitigation measures built into the design including RAMS to account for these events should they occur.

Taking this into account:

- The susceptibility of the on-site workers to flooding is deemed to be 'moderate', as the workers would be negatively impacted should flooding occur but they have the ability to withstand some increase in levels.
- The vulnerability of the on-site workers flooding is considered to be 'low' as although the increased potential for groundwater flooding could impact upon the buildings and operations, the proposed mitigation measures ensures that they can tolerate the projected increases in flooding events.

The on-site workers are high value receptors. The sensitivity of the on-site workers to flooding is deemed to be 'low' as the receptor is of high value and climatic factors can affect it. However, the receptor has some ability to withstand the projected changes.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). The embedded mitigation measures are such that the consequence of a flooding event on on-site workers would be low, although the probability is medium. Therefore, the overall magnitude is deemed to be 'small'. As a result, it is considered that the predicted increase in winter rainfall leading to the increased potential for flooding and the effects on on-site works would be of negligible significance.

5.3 Climatic effect – decreased summer precipitation

Decrease in summer rainfall gives the possibility of drought however not to any extent that would be expected to impact the on-site workers.

5.4 Climatic effect - extreme events

The predicted increase in rain caused by storms and extreme events is covered in the flooding sections. Gusts of wind may have an impact on the safety of on-site workers around the buildings. For example, if wind gusts were to cause damage or shifting to cladding or bolts there is risk of cladding or external parts of the building coming loose and being a falling hazard to on-site workers. There is also some risk to workers stability if they are, for example, climbing one of the stacks. The risk of wind exposure is greater up the stacks due to its height and higher exposure to winds.

The risk of wind damage to on-site workers caused by damage to buildings is reduced by measures such as preventative maintenance and regular inspections of the cladding and building materials. All works would be covered under site specific RAMS. This will include measures such as ensuring that prior to any workers climbing one of the stacks, wind speeds are checked to ensure they are not at dangerous levels. The stacks will each include a hooped ladder and all workers would need to be connected with a harness.

Taking into account this imbedded mitigation:

- The susceptibility of the on-site workers is deemed to be 'low' as the receptor has the ability to withstand any the projected increase in wind speeds due to incorporated design and preventative measures.
- The vulnerability of the workers is considered to be 'moderate' as the receptor is dependent upon climatic factors and may be injured but measures would be in place to minimise the risk.

The on-site workers are high value receptors. The sensitivity of the on-site workers to extreme events is deemed to be medium because the receptor is of high value and climatic factors can affect it, although there is some ability to withstand the projected changes.

The magnitude of effect is determined based on the probability and consequence (including consideration of the mitigation measures). The probability of increased winds speeds is medium (UKCP18 projections do not quantify but predict they will increase), the mitigation measures and preventative measures embedded in the design of the proposed development are such that the likelihood of adverse impacts is low and the overall magnitude is considered to be 'small'. As a result, it is considered that the predicted increase in wind speeds during extreme events leading to increased potential for structural damage to buildings causing damage to on-site workers would have a slight effect and would not be considered significant.

5.5 Summary

The assessment of climate change impacts on on-site workers is summarised in Table 4.

Table 4: Summary of assessment for on-site workers

Predicted change in climate	Impact	Susceptibility	Vulnerability	Resulting sensitivity	Magnitude of effect considering mitigation	Overall significance
Increase in temperatures	Discomfort or very mild health effects	Moderate	Low	Low	Small	Negligible
Increased winter precipitation	On-site Flooding (fluvial, groundwater or surface water)	Moderate	Low	Low	Small	Negligible
Extreme events	Surges in wind and effects on worker safety	Low	Moderate	Medium	Small	Slight

In summary, the overall significance of climate change on on-site workers is assessed to be negligible to slight. This is not a significant effect.

ENGINEERING CONSULTING

FICHTNER

Consulting Engineers Limited

Kingsgate (Floor 3), Wellington Road North,
Stockport, Cheshire, SK4 1LW,
United Kingdom

t: +44 (0)161 476 0032
f: +44 (0)161 474 0618

www.fichtner.co.uk