

JULY 2016

nationalgrid

# Climate Change Adaptation Reporting

---

## Second Round Response



NATIONAL GRID GAS  
UK GAS TRANSMISSION  
UK GAS DISTRIBUTION

**Climate Change Adaptation**  
**Second Round Adaptation Response**  
**National Grid Gas**

**Contents**

<b>Section</b>	<b>Title</b>	<b>Page</b>
1.	Introduction	3
2.	UK Gas Network	4
3.	Individual Companies	5
4.	Adaptation – First Round Reports	6
5.	Understanding Climate Risk	8
6.	Understanding Uncertainties	9
7.	Addressing Barriers and Understanding Interdependencies	11
8.	Monitoring and Evaluating	12
9.	Opportunities and Benefits	13
10.	Progress	13
11.	Challenges	13
12.	Interdependencies and barriers	13
13.	Appendix 1 – Risk Assessment - Update From First Round Reporting	15

## 1. Introduction

National Grid Gas (NGG) plc owns and operates the UK Gas Transmission system and the low pressure Gas Distribution in the heart of England distributing to approximately eleven million homes, office and schools via 7,700km of gas pipelines. This response has been developed collaboratively by the Energy Network Association (ENA) gas environmental sub group. This group is comprised of:

- National Grid
- Northern Gas Networks
- SGN
- Wales & West Utilities

The ENA is the industry body for the UK gas and electricity network companies. ENA facilitates the sharing of best practice and helps provide a coordinated approach to the climate change adaptation response by these companies, where that response is considered common to all network operators in Great Britain.

The representatives of the ENA Gas Environment Group have worked collaboratively to develop a comprehensive united industry response to the questions posed by the Climate Change Adaptation Reporting Power, Guidance for Repeat Reporters. The report reflects the common issues faced by the businesses in addressing the risks of climate change. Network specific information, where applicable, is included in italics within the body of the report.

The companies control and maintain the critical national infrastructure that delivers vital services into homes and businesses throughout the UK. Gas is transported through Gas Transmission networks to regional Gas Distribution networks that then deliver energy to customers on behalf of suppliers. Business operations include connecting new consumers, maintaining and replacing pipe work and associated assets, and dealing with gas emergencies along pipelines and within domestic, commercial and industrial properties.

National Grid is the owner and operator of the national gas transmission system and four of the eight regional Gas Distribution networks in Great Britain. The other Gas Distribution Network Operators (GDNs) are Southern Gas Networks (SGN), Scotland Gas Networks (SGN), Wales & West Utilities (WWU) and Northern Gas Networks (NGN).

The primary duties of the companies are covered under the requirements of the Gas Act 1986 and Electricity Act 1989 to develop and maintain efficient, reliable, safe and secure networks and to facilitate competition. Further duties are included within secondary legislation Regulations.

All GDNs operate regulated monopoly businesses operating under licences issued by Ofgem. Allowed revenues for the industry are currently set by Ofgem every eight years under the RIIO (Revenue = Incentives + Innovation + Outputs) Price Control Review framework and these reviews govern the costs and income associated with operating regulated activities.

## 2. The UK Gas Network

### Gas Distribution

- 1  SGN  
Your gas. Our network.
- 2  Northern Gas Networks
- 3  nationalgrid
- 4  Gas Networks Ireland
- 5  WALES & WEST UTILITIES
- 6  SGN  
Your gas. Our network.



### Gas Transmission

- 1  nationalgrid



### **3. Individual Companies**

National Grid Gas (NGG) plc owns and operates the UK Gas Transmission system and the low pressure Gas Distribution in the heart of England distributing to approximately eleven million homes, office and schools via 7,700km of gas pipelines. NGG connects producers, processors, storage, transmission and distribution network operators as well as suppliers to industrial, commercial and domestic users.

SGN is a privately owned Gas Distribution company, operating over 74,000km of gas mains and services in the south and South East regions of England and the whole of Scotland under the banner of SGN. It is the UK's second largest Gas Distribution network company and is responsible for delivering gas to its 5.8 million customers safely, reliably and efficiently.

Wales & West Utilities (WWU) was launched as an independent Gas Distribution business in June 2005 following the sale of the gas network for Wales and the South West of England. With more than 35,000km of mains, WWU transports gas to the homes and businesses of 2.5 million consumers across a geography covering 1/6th of the UK and serving a population of 7.4 million people.

Northern Gas Networks (NGN) is responsible for delivering gas to 2.7 million homes and businesses across northern England. The Company was formed when The North of England Gas Distribution network was acquired from National Grid plc in June 2005. NGN's network consists of 37,000km of gas pipes and associated delivery and storage apparatus. NGN's area covers northern Cumbria, the North East and North, East and West Yorkshire with a population of more than 6 million people.

Gas is delivered from the beach terminal through the high pressure National Transmission System (NTS), owned and operated by National Grid, to the GDNs. Gas is delivered into the Local Transmission System (LTS) of each network via offtakes from the NTS. Gas under high pressure in the LTS is moved around the distribution networks and subsequently reduced to Intermediate Pressure (IP), Medium Pressure (MP) or Low Pressure (LP) via Pressure Reducing Installations. Gas is then delivered to commercial and domestic customers via a network of polyethylene (PE) and metallic LP mains and services.

Each GDN's distribution network is comprised of pipelines operating at different pressure tiers. High Pressure (HP) pipelines operate between 70 and 7 Bar, Intermediate Pressure (IP) between 7 and 2 Bar, Medium Pressure (MP) between 2 Bar and 75 mbar and Low Pressure (LP) below 75 mbar. In addition, each company owns and operates storage infrastructure such as High Pressure vessels and Liquefied Petroleum gasholders.

#### **4. Adaptation – First Round Reports**

The Climate Change Act 2008 provides the framework for ensuring the UK's ability to adapt to climate change. Defra established an Adapting to Climate Change Programme and in November 2009 laid a strategy before Parliament for using the Adaptation Reporting Power under the Act. Responses were subsequently submitted by the companies to the First Round of Adaptation Reporting in 2010, which was designed to:

- Assess the current and predicted impact of climate change in relation to the companies' functions; and
- Outline the proposals and policies for adapting to climate change in the exercise of those functions and the timescales for introducing those proposals and policies.

The Reports therefore represented individual company assessments of existing assets and business processes and identified areas where the environment is capable of impacting the ability to meet its business objective.

This formed part of the process of ensuring the businesses adapt to the expected climate changes including hotter and drier summers, warmer and wetter winters, coastal, river bed and bank erosion and increasingly extreme weather events such as flooding. The main categories of weather events and environmental risks were identified as follows:

- Flooding and heavy rain fall (including saturated ground conditions);
- Snow and ice;
- Increases in temperature, heat waves and drought conditions;
- Coastal erosion from sea level rise;
- River erosion; and
- Storm events and high winds.

Using information drawn from UKCP09 and working alongside the Meteorological Office Hadley Research Centre, the Environment Agency and the Scottish Environmental Protection Agency, the key risks and opportunities facing the businesses were identified. High emissions projections to 2050 and 2080 were used to determine worst case scenarios and for correlation against the lifetimes of existing assets. Account was taken of the expected increase in number, frequency and intensity of weather events.

The risk methodology and categorisation identified a number of potentially vulnerable areas and the mitigation measures that were either in place or needed to be developed further. Decisions on the appropriate controls are dependent on the accuracy of the supporting information and data and whether a quantitative or qualitative assessment has been made.

The Reports highlighted that network assets and processes may be vulnerable to certain aspects of climate change. However, the national and regional infrastructure has a significant degree of resilience to these impacts and none of the identified risks were considered to be high. The management of these risks is now embedded within companies' overall risk management processes to ensure that any appropriate actions are recorded and completed. Responsibility and ownership of these action plans ensures their timely delivery and climate change adaptation is also subject to the same level of ongoing review and evaluation as other business risks.

Revenue is determined by Ofgem price control mechanisms (currently RIIO-GD1 – Revenue = Incentives + Innovation + Outputs) and dictate the expenditure by the businesses, including the level of adaptation investment. Any increase in adaptation related costs will be required over longer medium to long term timescales however.

The inherent resilience of the networks is largely due to the majority of Gas Distribution assets being located underground, with greater resilience built into the Gas Transmission network compared to the distribution network. Those assets most at risk to the weather and climate parameters, highlighted above, are those found above ground; typically large Pressure Reducing Installations (PRIs), critical sites such as data centres, and pipelines in

close proximity to watercourses. Impacts are usually localised to the asset and the process it supports and are unlikely to lead to a loss of supply or result in a risk to the system as a whole.

In addition prolonged periods of extreme weather could have a significant impact on the ability of the workforce to access and carry out their roles, particularly field-based engineers. They could also impact on the ability to conduct 'business as usual' activities as a result of the reliance on appropriate adaptation of other major infrastructures, such as telecommunications and transport. Impacts on the operation of supply chain businesses and the continued availability of equipment also needs to be considered. The environmental impact of companies' assets could be affected by the mobilisation and migration of land contaminants from flooding and ground saturation.

These interdependencies can be mitigated through the implementation of maintenance and inspection regimes, the development of flood defence measures, the availability of necessary equipment, up to date contingency measures and ensuring Business Continuity Management Plans are in place.

## **5. Understanding Climate Risk**

### **5.1. How has your understanding of climate risks, impacts and their effects on your sector/organisation and stakeholders advanced since your first round report?**

There has been no significant change in the understanding of climate change risks since the first round of Adaptation Reports were submitted in 2010/11. This understanding was based on the UKCP09 data published under the Climate Impacts Programme (UKCIP) that forecast the risks under various scenarios to the end of this century.

Similarly Environment Agency flood maps that were available and referenced at the time have not been developed any further and so the perceived risk remains the same. However, all the gas networks operators have experienced severe weather events in last few years which have provided ongoing learning and further insight into, and confidence in, the resilience of the gas networks infrastructure.

Actual flooding events occurring within the years subsequent to the original report have also demonstrated the network's ability to withstand incidents of this nature without impacting on security of supply.

### **5.2. What climate change evidence or research have you used to better understand the implications for organisational functions?**

The Companies are still reliant on UKCP09 as the primary source of information and data and which remains the only such reference available. Updates from the Climate Ready service or other updated research data would therefore be welcomed. The UKCP09 data does continue to provide a valid assessment of climate change impacts.

Wales & West Utilities has shared information with all networks, through the ENA group, regarding the development of a pilot project with Landmark Information Group to map the physical impacts of climate change. This involves more detailed mapping, than that which is currently available, on changes in floodplains, growth in flood depth as well as erosion to banks and beds of water course, against their assets. These have been presented to a number of government departments including Defra and DECC.

### **5.3. Has your understanding of thresholds of climate impacts advanced to better pinpoint organisational vulnerability? If so, how?**

UKCP09 provides climate information for the UK up to the end of the century. The projections show three different scenarios representing high, medium and low greenhouse gas levels. Information is provided on observed climate data, future climate projections and future marine and coastal projections. These scenarios are still being used and remain the best existing available information.

*National Grid Gas Distribution have undertaken a review of the resilience of our network assets against the effects of flooding. This review has been driven in part by the resilience review led by Oliver Letwin, via DECC, to support this review information has been provided on how many of our assets that supply significant numbers of customers are located in areas that would be impacted by 1:1000 flood conditions. The expected impact of flooding on the operation of these assets has been assessed and provided to DECC to feed into the Government Review process.*

### **5.4. How have you developed your quantified assessment and analysis of risk likelihood and impacts?**

The original round of Adaptation reporting provided networks with increased confidence in the level of resilience in our asset infrastructure and this allowed the companies to focus on the remaining areas of risk. The existing risk assessments have been reviewed and confirmed as being still fit for purpose and the current risk ratings remain the same based on the available data.

An updated assessment of National Grid Gas Transmission and Distribution risks are presented in Appendix 1.



## **6. Understanding Uncertainties**

### **6.1. What uncertainties remain in monitoring and evaluating climate risks to your sector's/organisation's functions?**

There is a need for cross sector planning scenarios to ensure that sectors with interdependencies have used similar assumptions when reporting; this was not fulfilled in the first round of reporting. This is important to address the wide variety of views regarding the extent and impact of climate change on national infrastructure.

The overall level of uncertainty for gas networks is low as the sector has a high level of inherent resilience due to the level of safety awareness and regulatory overview.

Monitoring, evaluating and adapting to risks of all types, including climate change, are an integral part of business as usual.

### **6.2. What new uncertainties have come to light?**

No new uncertainties in Gas Distribution have emerged since the original Adaptation report. The businesses continue to monitor three key areas of flooding, ground subsidence and coastal and river erosion.

Further information on flooding risks is available from both internal and external sources. However, this is limited. Further analysis is still required to understand the impact associated with subsidence/land slips and the extent to which climate change will cause ground movement. Asset replacement programmes continue to reduce this risk by removing brittle metallic mains from the network however. River and coastal erosion continue to be monitored at identified locations and investment strategies are introduced where required.

*Flooding in the winter of 2015/16 highlighted the risk associated with gas distribution mains and bridge crossings. The integrity of third party assets (such as bridges) requires assurance by the third party and we need to ensure we work collaboratively. The mitigation of this risk is being taken to the Gas Technical Group, under Energy Emergencies Executive Committee (E3C). E3C is the principal fora for identifying both the risks and mitigating processes and actions necessary to manage the impact of emergencies affecting the supply of gas and/or electricity to consumers in GB. They are key bodies for industry, regulators and UK Government and Devolved Administrations to work together in building the resilience of energy supplies. The group includes representation from National Grid Gas Distribution and Transmission alongside DECC and Ofgem. The proposal is to generate information exchange between river and highways authorities and gas network operators. If heightened risk to crossings can be notified in advance the distribution network operators could put mitigation/contingencies in place to safeguard people, property and supplies.*

*Further information on predicted flood depths would enable an improved assessment of the risks to above ground installations.*

*Changing tidal patterns have driven significant investment in one of National Grid Transmission key gas pipelines. We recognised that one of our key Gas Transmission pipelines that crosses the river Humber, over time had become exposed due to these changing tidal patterns eroding the river bed that covered the pipeline. The 5 km pipeline is a critical part of the gas infrastructure, connecting the Easington Gas Supply Terminal to the national network. We developed an innovative engineering solution to protect it and ensure continued operations of the pipeline in the short term. This solution involved filling exposed areas with gravel-filled bags and placing concrete 'mattresses' over the top with plastic fronds to mimic seaweed and encourage the settlement of sand and silt. We subsequently carried out detailed environmental and technical studies consulting with local communities on a number of options to determine the best solution for replacing the pipeline. It is considered the best long-term solution is to construct a replacement pipeline in a tunnel to be dug beneath the River Humber. This will minimise the impacts on the river and surrounding environment. Investment in the project is upwards of £100 Million. More detailed information on the project can be found on the project website <http://www2.nationalgrid.com/UK/In-your-area/Projects/River-Humber-Pipeline/>.*

### **6.3. What further implications do uncertainties have on action your sector/organisation has taken or plans to take?**

Any emerging uncertainties will be captured within the risk management approach adopted by the companies and addressed within business work plans.

This process needs to ensure that any asset investment made is necessary, timely and appropriate. All of the companies are regulated monopoly businesses and as such capital and operating expenditure is subject to economic regulation by Ofgem. This is achieved via a periodic price control process known as RIIO (Revenue = Incentives + Innovation + Outputs). The current price control runs from 2013 to 2021 and, unless there are exceptional or unforeseen circumstances, then the levels of approved revenue needed to accommodate the planned asset infrastructure investment and maintenance for this period, including any work required to adapt to climate change, have now been determined.

At present the current UKCP09 data does not support further asset investment beyond that already planned. The existing revenues will allow for some reactive investment but the available forecast projection data does not adequately support significant adaptation investment at this time. However, the Landmark pilot project indicates the potential to generate meaningful asset impact data. This could be used to support further infrastructure investment across multiple industries such as utilities, transport, telecommunications, insurance bodies and construction.

Climate change risk will continue to be monitored as part of the companies' approach to risk management and information will be shared with the sector via ENA.

### **6.4. What progress have you made to address information gaps?**

Along with other sectors the gas network industry remains reliant on national climate change data, projection scenarios and research published by the Government. Consequently these need to be periodically revised and updated. Access to a tool, such as the Landmark climate change physical impact mapping, would be of great benefit in justifying and delivering robust adaptation measures across the whole of the UK.

In the meantime the ongoing monitoring of network operations, particularly in periods of severe weather, together with sharing of experience across the sector via the ENA, has improved the confidence levels in the resilience of the networks to future climate change impacts. This in turn provides an indication of any appropriate mitigating actions that may be required.

*National Grid Gas Distribution has identified all installations at a flood risk of 1:1000 flood feeding 5000 or more customers (as part of the Letwin review). There are about 260 installations in National Grid's gas distribution network and about 800 nationally. These installations are considered very low risk but flood depth predictions would enable us to pinpoint any priority areas.*

### **6.5. What are the strategic business and methodological assumptions that underpin your analysis of impacts and risks?**

Company business strategies are driven by both asset life cycles and the regulatory framework within which the sector operates.

Assets are installed with an expectation of over 40 years of reliable service based on equipment integrity, level of operational use and suitable maintenance regimes. Based on these parameters, and the standards to which such equipment is initially designed, constructed and installed, assets are deemed to be climate resilient during this service lifetime.

The levels of asset investment that are determined in the intervening price control periods assist in the assessment and response to the impact of climate change adaptation. The assumptions that are made as part of this process remain based on the available long term climate data forecasts.

## **7. Addressing Barriers and Understanding Uncertainties**

### **7.1. Where you've identified interdependencies, how have these assisted or hindered actions to address climate risk?**

The First Round Reports highlighted key interdependencies with other sectors that were not previously required to report via the mandatory process or did not provide a comprehensive level of reporting. Details of fundamental interdependencies with transport, telecommunications and the local authority sectors in particular have resulted in some areas which retain higher risk profiles than necessary and which would have benefited from being designated as Reporting Authorities from the outset.

Within the gas sector, high levels of cooperation exist between all the network operators to manage emergency situations including major incident simulations. This, together with joint working via the ENA, helps to create an environment of cooperation to address climate risk.

### **7.2. What were the main barriers to implementing adaptation actions and why?**

The currency and robustness of the existing data set is a potential barrier to an effective adaptation response. UKCP09 continues to provide a valid assessment of climate change, although it is unclear if the projected forecasts within UKCP09, which dictate the required investment now, are sufficiently accurate and robust to inform the required business decisions. Please refer to the previous comments on the Landmark pilot project.

There is also a need for stronger links between the forecasts and the actual projected impact at the local, regional and national environment level i.e. the level of rainfall, frequency of severe events, change in wind levels, the degree, extent and depth of flooding, increased rates of erosion and the exacerbation of land movement etc that will impact on all sectors.

It remains difficult to accurately predict the level of funding needed by the regulated businesses for long term adaptation measures due to the current periodic price control investment cycle. A detailed process of assessment led to Ofgem determining the allowed level of revenue and investment for the companies only covering the period from 2013 – 2021, including any expenditure required for adaptation.

### **7.3. Have new barriers been identified? Are these being addressed? If so, how?**

Any interdependencies with other sectors that are identified, and which impact on the operation of the gas networks, will be included within the company risk and business action plans going forward.

Further research and analysis into climate change impacts would certainly allow risks to be better understood.

## **8. Monitoring and Evaluating**

### **8.1. How effectively has consideration of climate change risks been embedded within your sector or organisation?**

There is an increasing level of awareness within the companies and its employees on climate change risks and the requirements for both mitigation and adaptation response. This is aided by the sharing of information and best practice via ENA, the industry body for the sector. ENA represents both the gas and electricity network companies providing opportunities for further liaison and learning opportunities as all energy sector companies are designated as Reporting Authorities and share some common issues.

The gas network businesses already demonstrate comprehensive existing management of their assets and resilience to existing and future climate impacts. Increasingly this is seen as a business as usual aspect of risk management. This work is further supported by the sector's involvement in wider national Government resilience and emergency response fora.

### **8.2. How effective have organisational monitoring and evaluation processes been to ensure adaptation responses are implemented and on track? If these have not been effective, what barriers prevented this?**

As per some of the previous answers, actions detailed in the Adaptation Reports continue to be monitored. These Action Plans have been incorporated within the company business plans as appropriate based on the level of risk.

Progression against the understanding of specific issues, such as flooding risks, coupled with experience of recent events has moved the companies forward in their understanding. Local impacts of river and coastal erosion on assets are also monitored and investment is made where required. Greater understanding and analysis of ground movement is potentially one area requiring further investigation, but monitoring parameters within existing risk and incident management systems provide assurance on any future required action.

### **8.3. How effective were monitoring and evaluation processes in determining how the organisation/sector handled recent extreme weather conditions?**

The planning of emergency responses in all conditions is part of business as usual practice, and whilst every severe weather episode provides learning and continuous improvement opportunities, the sector managed the recent extreme weather conditions without significant unforeseen problems. No unforeseen changes to the sector approach to adaptation have been identified from these events.

### **8.4. Has the sector/organisation identified any financial benefits from implementing adaptation actions? Perhaps through cost benefit analysis, fewer working days lost, more efficient operations etc?**

Minimal financial benefits have been identified by the companies to date, but there is an appreciation of the benefit of early adaptation response where necessary to help mitigate future costs. The costs incurred in resourcing adaptation related work are subsumed within planned operational expenditure.

### **8.5. Has there been sufficient flexibility in the approach to adaptation within the sector/organisation, which allowed you to pursue alternative courses of action? If not what remedial measures could you take to ensure flexibility?**

The industry already works within a framework where long term investment, and its underlying assumptions, is subject to periodic regulatory review. The long term safe operation of the gas networks is separately subject to the approval of safety cases with the Health and Safety Executive on a regular basis. These existing arrangements comfortably sit alongside the Adaptation Reporting framework and provide a sufficiently flexible approach.

## **9. Opportunities and Benefits**

### **9.1. What action have you taken to exploit opportunities?**

Limited opportunities have been identified by the companies to date.

### **9.2. How effective were your efforts?**

Not applicable.

## **10. Progress**

### **10.1. Do you consider actions set out in your progress update have allowed your organisation to build adaptive capacity? If so, how?**

Long term asset assurance is an essential component of the long term business strategies of the gas network companies. The Adaptation reporting and monitoring process has not only provided confidence in the existing framework and plans, but has also contributed to building adaptive capacity as part of a wider framework of business as usual processes. Existing controls were in place for most of the identified risks, but there has been an increased awareness in other areas such as ground movement and river bank erosion.

### **10.2. Do you consider that your organisation is more aware of and resilient to the likely impacts from a changing climate? If so, in what ways?**

See above response.

### **Exemplars**

### **10.3. Do you feel the actions listed in the update are exemplar? If so, how?**

No exemplar actions identified.

### **10.4. Would you be willing to develop a case study to highlight best practice in conjunction with Defra and the Climate Ready Support Service?**

This would be considered if the sector approach or identified actions were deemed suitable.

## **11. Challenges**

### **11.1. Where and why have challenges been experienced when making progress on actions?**

The actions required to date have been relatively light touch and so the companies have not experienced significant obstacles to their implementation. It is potentially more difficult to assess and respond to the likelihood of increased climate change events and the associated research needed to determine this.

### **11.2. Were these challenges expected or have they come to light as part of the process?**

No significant challenges have been identified as part of the process.

### **11.3. Have climate change communications issues been encountered that Defra/the Climate Ready Support Service or sector bodies/the Regulator could help to address?**

The development of physical climate impact mapping rather than just UKCP09 forecasts alone would be welcomed by the sector.

## **12. Interdependencies and barriers**

### **12.1. What challenges have been experienced working through the issues related to interdependencies and barriers?**

Establishing clear climate scenarios that all sectors can use to help identify and manage interdependencies has been identified as an issue; this will ensure that all sectors, including those that were exempt from the first round of reporting, are equally advanced in their response to adaptation.

Going forward it is important to address the challenge of aligning both national and international progress on climate change adaptation (and mitigation).

**12.2. How effectively and in what ways have barriers been tackled?**

No comment.

**12.3. What wider actions, outside your organisation, within trade bodies, regulators or through government, do you think are necessary to address barriers?**

Reaching beyond climate forecasts alone to deliver physical impacts mapping.

**Appendix 1 – Risk Assessment - Update From First Round Reporting Risk Matrix**

		Specific Physical Characteristics of Climate Adaptation Scenarios																				
		UKCP09 Characteristics			Met Office Characteristics				NG Characteristics													
		1	2	3	4	5	6	7	8	9												
Key Assets and Processes		Solar Heat - Temperature rise of up to 8°C			Increased heavy rainfall (by a factor of 2-4)				Sea level rises of up to 50cm		Increased lightning		Wind and Gale		Snow, Sleet, Blizzard, Ice and freezing fog		Increased flooding		Increased coastal/river erosion		Increased subsidence/land slip	
		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes						
Included in National Grid's Risk Management Process	Assets																					
	Local Transmission Systems (above 7barg system)	Assets are underground and so increases in above ground temperature rises likely to have a minimal impact			Assets are underground and so are protected from the rain. - note the separate flooding/erosion risks			There is a risk of assets "floating" if they end up below sea level - further work required to understand what assets would be below sea level and what the risk of this would be			Assets are underground and so are protected from lightning		The majority of assets are underground, however some are on 3rd party assets and further work is required to give assurance of their integrity		Assets are underground and so are protected from snow/ice etc.		There is a risk of assets "floating" in flooded ground - further work required to understand the risk		Assets are already protected by robust monitoring process and investments are made when required. Risk of increased erosion will be managed by existing processes however increased investment will be required to protect assets.		Robust processes in place (TD1) to identify issues. It is not anticipated that this will be an issue however the risk will be monitored to see if further action is required.	
	The distribution pipeline system (below 7 barg)	Assets are underground and so increases in above ground temperature rises likely to have a minimal impact			Assets are underground and so are protected from the rain. - note the separate flooding/erosion risks			There is a risk of assets "floating" if they end up below sea level - further work required to understand what the risk is			Assets are underground and so are protected from lightning		The majority of assets are underground, however some are on 3rd party assets and further work is required to give assurance of their integrity		Assets are underground and so generally are protected from snow/ice etc. - however cast/spun iron pipes susceptible to cracking if below zero temperatures persist and penetrate to mains depth		There is a risk of assets "floating" in flooded ground - further work required to understand the risk		Risk of increased erosion will be managed by existing processes however increased investment will be required to protect assets.		If there is increased subsidence there is significant additional risk to existing metallic MP and LP mains. This risk is substantially reduced by replacing with PE pipes. Where distribution mains are sited beneath metallised surfaces this is not thought to be a significant risk.	
	Pressure Reduction Installations (PRIs)	Max Design temperatures are +60°C and these assets operate in far hotter temperatures than the UK therefore a 10°C rise is unlikely to have a major impact.			Assets are designed to withstand existing storm conditions. Projections suggest increased frequencies of heavy rain rather than increases in severity			The assets will become in-operable if they end up below sea level - further work required to understand which, if any, assets are affected			Assets currently protected against lightning and increased strikes unlikely to have an impact. However, increased lightning strikes will mean increased power failures - consideration may need to be given to installing more fixed standby generators at installations		PRIs are designed to withstand anticipated wind and gales, however there is a risk that increased wind and gales could blow trees and other debris onto PRIs and these could damage the sites resulting in local incidents or loss of supply		PRIs are designed to operate in severe winter conditions. There is a risk that snow on a satellite dish may cause short term operational issues but not the long term integrity of the network		Flooding at a PRI will have an adverse effect on electric power systems, telemetry and National Grid's direct control of the site and visibility of its operations. However it is anticipated that the site will continue to flow gas even if flooded. Additional investment will be required to protect specific sites that are prone to flooding in the longer term to maintain full control of sites and avoid repair costs.		Assets are already protected by robust monitoring process and investment would be made if required. Further work is required to understand if there are any specific PRIs that are at risk from river or coastal erosion. Any risk of increased erosion will be managed by existing processes however increased investment will be required to protect assets.		Assets are already protected by robust monitoring process and investment would be made if required. There is a risk that these assets become inoperable or there is a gas release due to substantial ground movement. This risk should be monitored to see if further work is required	
Control Systems and Telemetry	General instrumentation specification for design of systems. Majority of process instrumentation has a maximum operating temperature values of 60 -80 °C. Telemetry outstation max operating temperature is 55°C. Communications infrastructure to support telemetry components have maximum operating temperature of 40°C.			Not expected to have an impact on asset. Most process instrumentation has a minimum Ingress Protection (IP) rating of IP54. (protection against water spray vertical ±180°). New sites impact assessed during a risk assessment process (HAZOP).			The assets will become in-operable if they end up below sea level - further work required to understand which, if any, assets are affected			Covered in design of systems. Risk assessment identifies if lightning protection required. Increased lightning is not expected to be an issue		Housings that contain the control systems and telemetry are designed to withstand anticipated wind and gales, however there is a risk that increased wind and gales could blow trees and other debris onto sites and these could damage the sites resulting in local incidents or loss of supply		There is a risk that snow on a satellite dish may cause short term operational issues but not the long term integrity of the network. The risk assessment process (HAZOP) for new sites should help mitigate this.		Control system equipment at sites that are at risk from flooding are designed accordingly. If flooding was to occur at sites not experiencing flooding at present, then this may cause failure of control systems and telemetry. Additional investment will be required to protect specific sites that are prone to flooding in the longer term to maintain full control and avoid repair costs. Impacts on new sites are assessed using a risk assessment process		Assets are already protected by robust monitoring process and investment would be made if required. Further work is required to understand if there are any specific PRIs that host the control systems and telemetry are at risk from river or coastal erosion. Any risk of increased erosion will be managed by existing processes however increased investment will be required to protect assets		Not expected to impact on control system and telemetry asset. Other assets may be impacted. New sites impact assessed during the risk assessment process		
	Emergency	Increased temperatures should not adversely impact our ability to deliver an emergency service			Increased rainfall should not adversely impact our ability to deliver an emergency service [note flooding risk]			Further work required to understand if there would be any assets that would be below sea level supplying other assets or customers that are above sea level			Increased lightning unlikely to have any additional impacts beyond stormy weather		Increased wind and gales could lead to more trees and debris blocking roads, creating difficulties in travelling to gas escapes, either making it impossible or increasing time to attend. This would impact our standards of service		Increased snow etc. could create difficulties in travelling to gas escapes, either making it impossible or increasing time to attend. This would impact our standards of service		Severe or prolonged flooding could create difficulties in travelling to gas escapes, either making it impossible or increasing time to attend. This would impact our standards of service		Increased coastal/river erosion should not adversely impact our ability to deliver an emergency service		Increased subsidence should not adversely impact our ability to deliver an emergency service. If there was a significant increase in volumes of escapes then this may require additional resources	
Maintenance	Changes in weather may impact on working practices. Work should still be able to be completed but there may be increased costs			Heavy rain may hamper time taken to complete work			Further work required to understand if there would be any assets that would be below sea level supplying other assets or customers that are above sea level			Increased lightning unlikely to have any additional impacts beyond stormy weather		Increased wind and gales may increase safety risk to personnel working on sites		Difficulty in travelling to sites to respond to faults and undertake maintenance. Routine maintenance deferred eg Aerial survey		Severe or prolonged flooding may make it impossible to maintain assets as required for safe operations - further work required to understand flooding risk to better assess its impact		Might require more frequent inspections in future		Might require more frequent inspections in future		
Investment, Construction and Repair	Changes in weather may impact on working practices. Work should still be able to be completed but there may be increased costs			Heavy rain may hamper time taken to complete work			Further work required to understand if there would be any assets that would be below sea level supplying other assets or customers that are above sea level			Increased lightning unlikely to have any additional impacts beyond stormy weather		Increased wind and gales may increase safety risk to personnel working on assets		Increased snow etc may hamper time taken to complete work		Severe or prolonged flooding may make it impossible to construct new and repair existing assets in a timely manner - potentially impacting on customer service and security of supply - further work required to understand flooding risk to better assess it		Increased coastal/river erosion should not adversely impact our construction activities		Increased subsidence may increase the volume and complexity of investment and repair operations but procedures and techniques will be adapted to meet these challenges		
Control Centre Operations	Increased temperatures should not adversely impact our control centre operations			Increased rainfall should not adversely impact our control centre operations			Control Centre sites are not located near the sea and so will not be impacted by sea level rises of up to 50cm			Buildings are already protected against a greater frequency of lightning strikes. Lightning may cause an increase in intermittent loss of telemetry, however Business Continuity Management (BCM) plans and plant design provides resilience.		Increased wind and gales should not adversely impact our control centre operations		Increased snow etc should not adversely impact our control centre operations		Increased flooding should not adversely impact our control centre operations as not located on flood plains		Increased coastal/river erosion should not adversely impact our control centre operations as not located close to rivers or the coast		Control Centre sites are well located with solid foundations and so should not be impacted by subsidence.		
Office staff (including call centres)	Increased temperatures should not adversely impact our office based operations			Increased rainfall should not adversely impact our office based operations.			Key Office sites are not located near the sea and so will not be impacted by sea level rises of up to 50cm			Buildings are already protected against lightning strikes and so increased strikes not anticipated to adversely impact our office based operations		Increased wind and gales should not adversely impact our office based operations.		Severe or prolonged snow etc. may make building ingress and egress impossible or make the building inoperable. This may reduce standards of service and require additional resources to facilitate a timely return to normal operations.		Severe or prolonged flooding may make building ingress and egress impossible or make the building inoperable. This may reduce standards of service and require additional resources to facilitate a timely return to normal operations.		Increased coastal/river erosion should not adversely impact our major offices as not located close to rivers or the coast		Major office sites are well located with solid foundations and so should not be impacted by subsidence.		

### Specific Physical Characteristics of Climate Adaptation Scenarios

Key Assets and Processes	UKCP through its network of 09 Characteristics			Met Office Characteristics				Increased coastal/river erosion		Increased subsidence	
	Solar Heat - Temperature rise of up to 8°C	Increased heavy rainfall (by a factor of 2-4)	Sea level rises of up to 50cm	Increased lightning	Wind and Gale	Snow, Sleet, Blizzard, Ice and freezing fog	Increased flooding	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
National Transmission Pipework (~70 barg)	Pipework is buried which therefore significantly reduces any increases in temperature.	Pipework is buried and is therefore protected from increased heavy rain.	Pipework is buried and is therefore not impacted by an increase in sea level.	Pipework is buried and is therefore not impacted by increased lightning	Pipework is buried and is therefore not impacted by increased wind and gale	Pipework is buried and is therefore not impacted by increased snow, sleet and blizzard etc.	There is the potential for pipework to float if the ground above it is fluidised by flood waters.	N/A - River Crossings considered as a separate issue	Subsidence is monitored and assessed. The network is regularly inspected by helicopter.		
River Crossings	Asset buried and under water, impact of increased temperature will be minimal	Increased heavy rainfall may increase erosion to river bed/bank. Covered separately	Sea level rises will have minimal impact on river crossings	Increased lightning will not affect river crossings	Increased wind and gale will not affect river crossings	Snow, sleet, blizzards etc. may impact river bank/bed erosion. Covered separately	This will impact upon river bed/bank erosion. Covered Separately	Climate change may accelerate river bed/bank erosion. This is a process that is already being managed. There is one crossing that has been identified as an issue - this is being remedied	Subsidence is monitored and assessed. The network is regularly inspected by helicopter.		
Compressor Stations	Compressors are being used in the summer - not what they were designed to do	Increased heavy rainfall does not pose an issue with the operation of compressor sites.	Potential that low lying compressor stations may be affected by increase in sea level.	Compressor stations are fitted with standby generators and protected against lightning strikes.	There is the potential that with increased wind, there may be excess loadings expected on existing assets.	Potential for freezing fog to cause blockages in gas turbine air intake filter. Causing high differential pressure trip.	There is only one site currently at risk from flooding, this is not a risk security of supply.	N/A - Asset not on coast	Subsidence is monitored and assessed. The network is regularly inspected by helicopter.	Compressor stations situated on flat land - no risk of subsidence	
LNG Storage Facilities	Increased temperature may reduce liquefaction efficiency but will not have a detrimental affect on security of supply or safety.	Increased heavy rainfall does not pose an issue with the operation of LNG storage facilities	LNG Storage Facilities are not on the coast and so will not be affected by sea level increases.	LNG storage facilities are fitted with lightning protection and standby generation	There is the potential that with increased wind, there may be excess loadings expected on existing assets.	Increased extreme cold weather conditions will not affect the operation of the LNG storage facilities	LNG sites have been assessed for flooding risk. There is currently no risk to the sites.	N/A - Asset not on coast	Subsidence is monitored and assessed. The network is regularly inspected by helicopter.		
Above Ground Installations	The operation of AGIs will not be affected by increases in temperature.	The operation of AGIs will not be affected by increased heavy rainfall.	Potential that low lying AGIs may be affected by increase in sea level.	AGIs are fitted with Uninterruptible Power Supplies in case external electricity supply failure. Increased lightning will have no other affect on the operation.	AGIs are not adversely affected by an increase in wind and gale conditions.	The operation of AGIs will not be affected by increased snow, sleet, etc.	While increased flooding increases the risk of site flooding, this will not adversely effect security of supply.	Climate change may accelerate river bed/bank erosion, this could potentially affect AGIs associated with river crossings. This is a process that is already being managed.	Subsidence is monitored and assessed. The network is regularly inspected by helicopter.		
Gas Terminals	The operation of terminals will not be affected by increases in temperature.	Operation of gas terminals will remain unaffected during periods of heavy rainfall.	Gas terminals are located by the coast by nature of their duty.	Gas terminals are fitted with standby generation in case external electricity supply failure. Increased lightning will have no other affect on the operation.	There is the potential that the wind loadings that any assets were designed against will no longer be applicable.	The operation of Gas Terminals will not be affected by increased snow, sleet, etc.	Currently all terminals are either not at risk of flooding or adequately protected by EA/SEPA defences.	All terminals on the coast. English terminals are defended by EA coastal management plan. Scottish terminal managed by site	Subsidence is monitored and assessed. The network is regularly inspected by helicopter.		
Processes											
Emergency	Increased temperatures should not adversely impact our ability to deliver an emergency service	Increased rainfall should not adversely impact our ability to deliver an emergency service [note flooding risk]	Increased sea level should not adversely impact our ability to deliver an emergency service [note flooding risk]	Increased lightning will not affect our ability to respond to emergencies.	Increased wind and gale will not affect our ability to respond to emergencies.	Increased extreme cold weather events will not affect our ability to respond to emergencies.	Flooding may make it difficult to access sites where there are emergency situations to be dealt with. The sites themselves will not be affected.	N/A - This will not affect emergency response	N/A - This will not affect emergency response		
Maintenance	Changes in weather may impact on working practices. Work should still be able to be completed but there may be increased costs	Heavy rain may hamper time taken to complete work. Deferral processes in place.	Sea level rises should not adversely affect the ability to complete maintenance on the sites.	While maintenance may be put off during storms, there is a deferral process in place.	Increased wind may affect the ability to do line checking from a helicopter. However a deferral system is in place and the lines can be checked on foot at ground level.	While maintenance may be put off during storms, there is a deferral process in place.	There will be no maintenance during a flood condition - following a flood extra maintenance will be required. This will not pose a risk to safety or security of supply.	N/A - This will not affect maintenance activities	N/A - This will not affect maintenance activities		
Investment, Construction and Repair	Changes in weather may impact on working practices. Work should still be able to be completed but there may be increased costs	Heavy rain may hamper time taken to complete work. Deferral processes in place. Potential cost increase.	Any investment will first take account of location and not build anything by the sea unless it is protected against sea level rises.	Increased lightning will not affect our ability to deliver investment. It may hamper time to complete construction work.	Any future construction work will be designed to withstand a specified wind loading. Wind loading specifications may need to be reviewed if there is any evidence of increased wind speeds.	Snow and blizzard will not affect our ability to deliver investment. It may hamper time to complete construction work - this is not a risk to safety or security of supply.	Any future investment and construction will firstly take account of location and assess against potential flood hazards - this is not a risk to safety or security of supply	This may result in gas lines being isolated for repair, thus impacting on future investment work. This can be worked around.	This may result in gas lines being isolated for repair, thus impacting on future investment work. This can be worked around.		
Control Centre Operations	Increased temperatures should not adversely impact our control centre operations	Increased rainfall should not adversely impact our control centre operations	Control Centre sites are not located near the sea and so will not be impacted by sea level rises of up to 50cm	There is a risk that telemetry links could be lost between sites. On the majority of sites telemetry is via satellite with an ISDN backup. GNCC have a procedure on responding to a site with a loss of communication.	There is a risk that telemetry links could be lost between sites. On the majority of sites telemetry is via satellite with an ISDN backup. GNCC have a procedure on responding to a site with a loss of communication.	There is a risk that telemetry links could be lost between sites. On the majority of sites telemetry is via satellite with an ISDN backup. GNCC have a procedure on responding to a site with a loss of communication.	There is a risk that telemetry links could be lost between sites. On the majority of sites telemetry is via satellite with an ISDN backup. GNCC have a procedure on responding to a site with a loss of communication.	N/A - This will not affect emergency control centre operations	N/A - This will not affect emergency control centre operations		
Office staff (including call centres)	Increased temperatures should not adversely impact our office based operations	Increased rainfall should not adversely impact our office based operations	Key Office sites are not located near the sea and so will not be impacted by sea level rises of up to 50cm [check with NGP]	Increased lightning will have no affect on office staff.	Business continuity plans are in place. Relevant staff have the capability of working from home if they cannot get to the office.	Business continuity plans are in place. Relevant staff have the capability of working from home if they can not get to the office.	Business continuity plans are in place. Relevant staff have the capability of working from home if they cannot get to the office.	N/A - This will not affect office staff	N/A - This will not affect office staff		



## Summary of yellows from Risk Assessment Matrix for Gas Transmission

Business Function	Climate variable (e.g. increase in temperature)	Primary impact of climate change variable (e.g. health)	Threshold(s) above which this will affect your organisation	Likelihood of threshold(s) being exceeded in the future and confidence in the assessment	Potential impacts on organisation and stakeholders	Proposed action to mitigate impact	Timescale over which risks are expected to materialise and action is planned
Gas Transmission	Increased River Erosion	Potential exposure of pipelines within water courses including rivers and estuaries, which could lead to a security of supply issue.	The locations where the risk exists are regularly monitored and controlled. For climate change to have a major effect on the organisation, coastal and river erosion would have to significantly increase above already experienced levels.	There is limited research in river erosion; however the threshold at which we would be affected is seen as relatively high, therefore we are reasonably confident in our assessment.	This has the potential to lead to security of supply issues.	New water course crossings are installed considering the best available technique for the duty and environmental conditions. This may involve tunnelling and/or direct drilling into the rock beneath the water course as opposed to installing the pipeline in a trench, which has more susceptibility to erosion.  All water course crossings are monitored and assessed at an appropriate frequency.  Action plans are in place on all water course crossings affected by erosion	As previously stated it is thought unlikely that the increased effect of water course erosion will cause National Grid Gas any significant issue above that already being experienced. However, there is an action plan in place to resolve all outstanding water course crossing erosion issues. It is thought that this number will increase in the future, however the processes already embedded in the organisation are seen as able to address this risk.
Gas Transmission	Increased Coastal Erosion	Loss of supply due to loss of Gas Terminal.	Loss of Gas Terminal into the sea due to coastal erosion.	This is incredibly unlikely. The EA monitor the coastal advance and accretion and put a management plan in place to ensure it does not affect the critical national infrastructure.	With no controls, the UK would lose gas supplies from the North Sea and or Europe. This would be a major security of supply issue.	Work with the EA to ensure coastal management plans are up to date and effective.  Need to ensure that there is a suitable plan in place for the Scottish gas terminal.	With continuation of shoreline management plans, it is believed that this will never become an issue. National Grid and other interested parties, however, continue to monitor and manage the issue within ongoing processes.
Gas Transmission	Increased temperature.	Potential security of supply issues as compressor stations not designed to run at elevated temperatures. Climate change, in itself, is not the only factor. The issue being that units are now being run in a more flexible manner, in order to respond to system demands. This combined with the impact of climate change will cause an issue.	Summer operation of some compressor stations is already an issue, further temperature rises will cause more. There is not a specific limit, as it depends both on the external temperature and the load on the unit.	This is already happening as a result of running some compressor stations in the summer – which were designed to run in the winter only.	With no controls in place, this would cause security of supply issues as some compressors would not be operational at elevated temperatures.	Modification work has been undertaken at a number of compressor sites to mitigate the impact of running compressors during the warmer months of the year.  Work continues to monitor affected compressor station cab temperatures and further works are being implemented where required to lessen the effect.	This is already occurring, with the increase in ambient temperature, it is expected to become more of a problem. As units and network analysis is undertaken, affected units will either be modified, replaced or the system enhanced in that area. This could be over a significant timescale, perhaps along the current asset replacement plans.
Gas Transmission	Increased flooding	The primary impact is unavailability of localised compression, which has the potential to constrain the gas network if the compressor in question is required and a substitute is also unavailable.  If compressor stations are affected by flooding they can be bypassed without significantly affecting gas supply.	The threshold of greater than 1 in 75 (flooding) must be reached simultaneously with appropriate flow/demand conditions and unavailability of alternative compression.	There is an extremely remote chance of the level of flooding required coinciding with the level of demand required to cause a security of supply issue.	With no controls put in place, the potential scenario could have significant financial implications to National Grid Gas Transmission.	A review of the latest agency flood mapping is in progress to determine the affected sites and to what extent flooding may affect availability operability.  For the sites affected, contingency plans/arrangements will be developed.	Work is ongoing and is anticipated to be complete within 2016.

**Appendix 2 – National Grid Gas Climate Change Action Plan**

Corresponding High Level Risk (Eg B3)	Included in the National Grid risk assessment process	Risk Description	Risk Owner	Risk Ratings			Existing Controls	Improvement Actions	Action Owner(s)	Timescale for delivery
				Current						
				F	R	L				
A8	Yes	<p>There is a risk that increased coastal or river erosion will expose/damage LTS pipeline systems either directly or by water borne debris</p> <p>Because of increase in sea level, heavy rains or flash flooding of river systems as a result of climate adaptation</p> <p>Leading to need for pipeline repair and potential release of gas or loss of supply</p>	Yes	2	4	1	The existing controls are defined in policy T/PR/Maint/5. These include regular aerial or vantage point surveys and diver surveys of river crossings. Surveillance is increased following severe weather	None identified	NA	NA
B8	Yes	<p>There is a risk that increased coastal or river erosion will expose/damage &lt;7bar pipe systems either directly or by water borne debris</p> <p>Because of increase in sea level, heavy rains or flash flooding of river systems as a result of climate adaptation</p> <p>Leading to need for pipeline repair and potential release of gas or loss of supply</p>	Yes	1	4	2	This is currently a low probability event and is managed using existing processes to respond to incidents on pipelines	<p>Monitor any near misses or incidents as a result of river or coastal erosion.</p> <p>Review current practices and identify opportunities to develop policy to mitigate any increased risk due to climate adaptation</p> <p>Work to risk assess floatation of pipes is planned to be revisited during 2016</p>	Yes	Yes
B9	Yes	<p>There is a risk that increased groundslip/subsidence will lead to stressing or failure of &lt;7bar cast iron pipe systems</p> <p>Because of increased periods of heavy rain followed by increased dry spells as a result of climate adaptation</p> <p>Leading to need for pipeline repair and potential release of gas or loss of supply</p>	Yes	3	4	3	This is currently a low probability event and is managed using existing processes to respond to incidents on pipelines	<p>Continue policy mains replacement programme and look for opportunities to advance as this reduces the risk</p> <p>Monitor any near misses or incidents as a result of ground movement.</p> <p>Review current practices and identify opportunities to develop policy to mitigate any increased risk due to climate adaptation.</p> <p>Identify if further research is required to better understand the link between climate adaptation and ground movement and the resulting impact on pipelines.</p>	Yes	Yes
C3	Yes	<p>There is a risk that increased flooding will lead to PRIs being underwater</p> <p>Because of increased rainfall due to climate adaptation</p> <p>Leading to the need for PRIs repairs and potential loss of supply</p>	Yes	2	4	3	<p>This is currently a low probability event and is managed using existing processes to respond to incidents on PRIs</p> <p>Flooding Project has identified high risk sites</p>	<p>Identify remedial actions required at identified high risk sites</p> <p>Improve corporate understanding of the predicted flood depth to enable targeted investment in our asset infrastructure.</p> <p>Monitor any near misses or incidents as a result of flooding</p> <p>Work to risk assess floatation of pipes is planned to be revisited during 2016</p>	Yes	Yes

Corresponding High Level Risk (Eg B3)	Included in the National Grid risk assessment process	Risk Description	Risk Owner	Risk Ratings			Existing Controls	Improvement Actions	Action Owner(s)	Timescale for delivery
				Current						
				F	R	L				
D7	Yes	<p>There is a risk that increased flooding will lead to control systems and telemetry being underwater and failing</p> <p>Because of increased rainfall due to climate adaptation</p> <p>Leading to the need to repair/replace control systems and telemetry and the potential loss of supply</p>	Yes	1	4	3	<p>This is currently a low probability event and is managed using existing processes to respond to incidents on PRIs</p> <p>Flooding Project has identified high risk sites</p>	<p>Identify remedial actions required at identified high risk sites</p> <p>Improve corporate understanding of the predicted flood depth to enable targeted investment in our asset infrastructure.</p> <p>Monitor any near misses or incidents as a result of flooding</p> <p>Work to risk assess floatation of pipes is planned to be revisited during 2016</p>	Yes	Yes

