



Environment  
Agency



River Medway (Flood Relief) Act 1976

Inquiry into the Environment Agency's  
revised Scheme for the Leigh Flood  
Storage Area, Kent

Statement of Case

Date: 22 December 2020

We are the Environment Agency. We protect and improve the environment.

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## List of abbreviations and glossary

28.05m AOD	28.05 metres above Ordnance Datum. This level, which is measured immediately upstream of the flood retention embankment at ref. 55640.14630, is the maximum level to which water may currently be retained in the Leigh Flood Storage Area.
28.60m AOD	28.60 metres above Ordnance Datum. This is the maximum level to which the Environment Agency wish to retain water in the Leigh Flood Storage Area. This level is also measured immediately upstream of the flood retention embankment at grid reference 55640.14630.
1976 Act	River Medway (Flood Relief) Act 1976
AEP	Annual Exceedance Probability, meaning the percentage chance in each and every year of a flood event occurring – it is common to refer to event magnitudes by AEP i.e. the percentage chance of that magnitude flood event occurring in each and every year
Application	The Environment Agency's application for the Revised Scheme (Appendix 1)
Cattle Arch Embankment	The embankment situated south of the railway line near Leigh, being Work No. 5 as defined in the 1976 Act. The location of this embankment is shown on the plan in Appendix 7.
Defra	Department for the Environment, Food and Rural Affairs
Deposited Plans	The Deposited Plans, which show the lines, situations and level of works as authorised by the 1976 Act (see the final recital of the 1976 Act). The plans have been retrieved from the Records Office at the House of Lords. A copy can be found in Appendix J of the Application.
Flood Defence Grant in Aid	Funding from central government for flood risk management.
FSA	Leigh Flood Storage Area
MIOS	Measures in the Interests of Safety, identified under the Reservoirs Act 1975
Main Embankment	The embankment situated across the River Medway floodplain near the A21 Tonbridge Bypass Medway Viaduct, being Work Nos. 9C, 9E, 9F, 9G and 9H as defined in the 1976 Act. The location of this embankment is shown on the plan in Appendix 7.

Planning Application	The Environment Agency's application for planning permission submitted to Sevenoaks District Council (reference: 20/02463/FUL) (Document 1)
Pumping Station Embankment	The embankment situated east of Ensfield Road and south of the railway line near Leigh, being Work Nos. 4 and 4A as defined in the 1976 Act. The location of this embankment is shown on the plan in Appendix 7.
Operating Procedures	Leigh Flood Storage Area Operating Procedures 2017
Revised Scheme	The proposed variation to the Scheme (see Appendix A of the Application)
Scheme	The Scheme approved under the 1976 Act which sets out key parameters of how the Leigh Flood Storage Area radial gates can be operated (see Appendix D of the Application).
Specified Interests	Named organisations and "such other persons representative of interests likely to be substantially affected by the scheme as the Minister may direct" (see section 17(3)(d) of the 1976 Act) to be consulted in the event the scheme is varied, replaced or revoked.

# 1. Introduction

- 1.1 Climate change is predicted to increase the risk of flooding in coming years. The Environment Agency is working on a project to increase the volume of flood water that can lawfully be stored in the Leigh Flood Storage Area (FSA) which together with other works will better protect 1,430 households downstream from flooding. To that end, the Environment Agency seeks authority to increase the maximum stored water level in the FSA from 28.05m AOD to 28.60m AOD.
- 1.2 The maximum level to which water can be lawfully stored in the FSA is documented in the Scheme. On 10 June 2020, the Environment Agency applied to Defra to vary the Scheme for the operation of the FSA (the Application; see Appendix 1) in accordance with the River Medway (Flood Relief) Act 1976 (the 1976 Act) (see Appendix C in the Application). Hereafter we refer to the scheme which the Environment Agency has asked the Minister to approve as the Revised Scheme.
- 1.3 The Environment Agency's predecessor, Southern Water Authority, finished constructing the FSA in 1982. The FSA lies on the River Medway between Penshurst and Leigh in Kent, upstream of Tonbridge and Hildenborough (see Appendix 7). It consists of radial gates sitting across the River Medway which, working with embankments, impounds water in times of flood. The stored water is released back into the River Medway downstream once the peak of the flood has passed. More detail about the radial gates' operation is given in Section 2. The FSA currently reduces the risk of flooding to approximately 1,200 households in Tonbridge and Hildenborough.
- 1.4 The River Medway has a history of flooding, and major floods have regularly occurred during the historic record. The FSA has operated successfully to protect Tonbridge and Hildenborough to a large extent but in December 2013, Tonbridge and Hildenborough experienced significant flooding from a series of storms despite the FSA being used to its maximum permitted capacity. With climate change predicted to bring more frequent and intense flooding, the Environment Agency now wants to increase the permitted capacity of the FSA to better protect households in Tonbridge and Hildenborough. The increased capacity will be achieved by storing water to a greater depth in the FSA.
- 1.5 Expansion of the FSA to increase the permitted level of water that can be stored and thus enable further reduction in flow rates downstream was a preferred option in the Middle Medway Strategy for Flood Risk Management (see Appendix 8). This Strategy was approved by Defra in 2005 and technically reviewed in 2011 by the Environment Agency.
- 1.6 The Environment Agency, working in partnership with Kent County Council, Tonbridge and Malling Borough Council and the South East Local Enterprise

Partnership, has secured the required funding to complete the works associated with the Revised Scheme. The benefits of the proposed changes satisfy the Flood Defence Grant in Aid Partnership Funding criteria and the South East Local Enterprise Partnership economic benefit funding rules.

- 1.7 This Statement of Case sets out the general background and benefits of the Revised Scheme before dealing with the issues that the Environment Agency considers have been raised by the objections made to the Application.

## 2. The existing Leigh Flood Storage Area

- 2.1 The Environment Agency will explain how the provisions of the 1976 Act apply and how it operates the FSA. The 1976 Act authorised the Southern Water Authority to construct the FSA and authorises the Environment Agency and its predecessors to operate the radial gates in accordance with a Scheme approved by the Minister. The Environment Agency may renew and alter the works forming the FSA and can apply for the Scheme to be amended. As the FSA is a drainage work, the Environment Agency also has powers under the Water Resources Act 1991 and the Land Drainage Act 1991 in relation to the FSA. The 1976 Act includes the right of those who sustain damage through the Environment Agency's exercise of its powers under the 1976 Act to claim compensation. Southern Water Authority also entered into agreements with landowners under section 25 of the 1976 Act when the FSA was originally built and these continue to apply (see Appendix 5 for a list of the short particulars of those agreements and Appendix 6 for a plan showing the land covered by those agreements).
- 2.2 The procedure by which decisions are made by the Environment Agency to operate the FSA during a flood event are currently set out in the Operating Procedures (see Document 17). The approach of using a set of operating procedures would remain under the Revised Scheme.
- 2.3 The FSA is an online flood storage reservoir, meaning that the River Medway constantly flows through the storage area and the radial gates, unlike a flood barrier which constrains the flow. The radial gates consist of 3 radial gates within a concrete structure built into a 1.3km long, 5m high earth embankment (the Main Embankment). These radial gates are used to control the amount of water flowing downstream by either letting the river flow normally or controlling the flow to hold water in the storage area. Most of the time the outside gates are closed and the centre gate remains open, allowing the river to flow normally whilst maintaining an upstream water level. During a flood the centre gate closes and the side gates open. After the peak flood flow has passed the side gates remain open to allow the FSA to empty in a controlled manner. Once the FSA is empty the side gates close and the centre gate opens allowing the river to return to normal levels.
- 2.4 The FSA is normally kept empty. In times of flood the radial gates influence upstream levels either by automatic gate movements or by the intervention of an operator. When the water level reaches 28.05m AOD, the FSA covers approximately 278 acres and can store approximately 5,580,000m<sup>3</sup> of water.
- 2.5 Flood risk reduction in Tonbridge is achieved by reducing the peak flood flows through Tonbridge. The volume of the FSA is utilised to store only the peak flows of a flood event allowing much of the flood to pass through the radial gates.

## 3. The background to the Revised Scheme

- 3.1 The Environment Agency will explain the how the proposals to increase the capacity of the FSA have come forward.
- 3.2 The background to the Revised Scheme and the related works are set out in the Application, and in the documents submitted in support of the Environment Agency's related planning application (the Planning Application; see Document 1) and the Environmental Statement (see Document 3).
- 3.3 In response to the December 2013 floods, the Medway Flood Partnership was formed to bring together local partners, national agencies, non-governmental organisations and community representatives to develop an action plan to reduce the risk of river flooding in the upper River Medway catchment. In 2017, the Medway Flood Partnership published the Medway Flood Action Plan (see Document 14) which sets out how the Partnership will work together to tackle flood risk in the upper River Medway catchment between 2017 and 2023. Increasing the capacity of the FSA is one of the headline projects of the Medway Flood Action Plan.

## 4. The effect of the Revised Scheme

- 4.1 When the FSA was constructed, Southern Water Authority placed the radial gates and embankment at a point on the River Medway which made the best use of the local topography and the river's floodplain. Much of the area within the FSA would flood naturally but the radial gates and the embankment enable flood water to be stored to a greater depth to hold the peak of a flood and reduce flood risk downstream.
- 4.2 The Environment Agency considered a number of options as part of the assessments leading up to the Application, including operating the FSA as it is currently. Various scenarios for altering the maximum permitted water level during operation of the FSA were considered. The Environment Agency has chosen to request increasing the maximum operating water level from 28.05m AOD to 28.60m AOD because it provides the greatest benefit-cost ratio. This change does not require the crest of the Main Embankment to be raised, and it will increase the number of households benefitting from a reduction in flood risk. It will increase the permitted storage volume from approximately 5,580,000m<sup>3</sup> to approximately 7,200,000m<sup>3</sup> thus enabling greater reduction in peak flow rates during flood events.
- 4.3 This increase in flood storage volumes to improve protection for downstream receptors will, when used, result in an increase in the flood extent and depth within the FSA. The change in flood extents due to the proposed increase in its permitted storage capacity from 28.05m AOD to 28.60m AOD is relatively small. The greatest change in depth and extent is in the immediate vicinity of the Main Embankment and the local effect of the change in operation diminishes along the flooded valley upstream.
- 4.4 Increasing the permitted capacity of the FSA will allow a new flood defence to be built at Hildenborough. Without the increase in the permitted capacity of the FSA, a new defence in Hildenborough would not be permitted because it would reduce flood storage in the natural floodplain and increase flood risk in Tonbridge. The proposed increase in the permitted capacity of the FSA will offset this loss of storage at Hildenborough. The project as a whole will reduce the risk of flooding to an additional 230 households over and above those already benefiting from the FSA.
- 4.5 Modelling has shown that the additional level of water permitted to be impounded as part of the Revised Scheme would reduce in impact as one progresses upstream from the radial gates such that at Penshurst there is no further increase in either depth or extent. However, the Environment Agency does acknowledge that there is a residual risk of increased duration of flooding from the Revised Scheme at Penshurst, as set out in its Flood Risk Assessment submitted as part of the Planning Application (see Appendix 4 paragraph 5.1.3)

- 4.6 The environmental impacts of the Revised Scheme are minimal. There are no designated conservation sites within the FSA. However, protected species such as badgers, bats, dormice and great crested newts are found in the FSA. The construction work will be carried out so that these species are not disturbed and if there is a risk they may be disturbed the Environment Agency will apply to Natural England for a licence. The Environment Agency has already consulted with Natural England concerning the Revised Scheme. This has been covered in more detail in the Environmental Statement submitted with the Planning Application (see Document 3).
- 4.7 Whilst there may be temporary disruption during the construction works necessary to implement the Revised Scheme, there will be no lasting impact on public access and recreation.
- 4.8 Part of the FSA falls within the High Weald Area of Outstanding Natural Beauty. The High Weald Area of Outstanding Natural Beauty Unit has confirmed that in their opinion the Revised Scheme will not impact on the area of outstanding natural beauty.
- 4.9 No designated heritage assets will be affected by the Revised Scheme.
- 4.10 The Revised Scheme potentially engages rights protected under Article 1 to the First Protocol and Article 8 to the European Convention on Human Rights. The Environment Agency considers that the Revised Scheme is in the public interest, in accordance with law and its consequences are proportionate to the purpose for which the Revised Scheme is sought. It also considers that the Revised Scheme represents a fair balance between the competing interests of the individual and the community as a whole and that it could not be achieved without the Revised Scheme.

## 5. Works necessary for the Revised Scheme

- 5.1 Whilst the Revised Scheme relates to the operation of the radial gates, there are a number of works that are required in order to expand the permitted capacity of the FSA. These will be built under the Environment Agency's statutory powers, and some of them require planning permission. The intention is that there would be no storage of flood waters to the level permitted in the Revised Scheme until completion of these works.
- 5.2 The Environment Agency applied for planning permission on 26 August 2020 for the works required in order to expand the permitted capacity of the FSA and also for other works at the Main Embankment required under the Reservoirs Act 1975 (see Document 1). Sevenoaks District Council are acting as the nominated local planning authority for the three local planning authorities which the FSA affects. At present, it is anticipated that Sevenoaks District Council will make a decision on the planning application in January 2021. The Environment Agency will keep the parties to the inquiry informed of any change in its status.
- 5.3 The Environment Agency will phase the construction works so that the FSA remains operational and continues to be able to reduce flood risk to Tonbridge and Hildenborough throughout construction.
- 5.4 The crest of the Main Embankment is already high enough to accommodate the proposed increase in the maximum impounded water level from 28.05m AOD to 28.60m AOD. However, works are needed in other locations to contain the proposed water level increase.
- 5.5 The radial gates must be modified and refurbished to accommodate the proposed increase in the maximum impounded water level and for their ongoing reliable operation.
- 5.6 The crests of the embankments to the east of Ensfield Road and south of the railway line, known as Pumping Station Embankment and Cattle Arch Embankment situated just south of the village of Leigh (see Appendix 7), will be raised so that they are not at risk of overtopping by wind-driven waves when the FSA is storing water to the new permitted level. A flap valve will be installed across the watercourse that currently flows through Pumping Station Embankment to prevent impounded water from within the FSA flowing out of the FSA. Infrastructure for temporary pumps will be installed so that the area can still drain when the FSA is in use.
- 5.7 Network Rail have been consulted and have approved the proposed works at the interface between Pumping Station Embankment and Cattle Arch Embankment and the railway line.

5.8 As noted in the Application, the Environment Agency will be carrying out works to the Main Embankment required under the Reservoirs Act 1975 in any event at the same time as the associated works to reduce the impact on local people and save costs. Following an inspection in 2016 by the Inspecting Engineer, works are needed to protect the crest and downstream slope of the embankment from erosion. These are referred to by their acronym, MIOS, being measures in the interest of safety. These works will involve stripping the topsoil on the crest and downstream face of the main embankment and laying reinforcing materials which will extend approximately 6m beyond the toe drain at its base.

## 6. Consultation on the Revised Scheme

- 6.1 In accordance with section 17 of the 1976 Act, the Environment Agency has consulted with Kent County Council, Maidstone Borough Council, Sevenoaks District Council, Tonbridge and Malling Borough Council, Tunbridge Wells Borough Council, the National Farmers' Union, the Country Landowners' & Business Association, Network Rail. The Environment Agency is also required to consult with other persons likely to be substantially affected by the scheme as the Minister may direct and has consulted with all those persons owning or occupying a property within the FSA, or who have an easement with the Environment Agency which relates to the FSA, or will be brought into the FSA as a result of the Revised Scheme.
- 6.2 Defra has requested that the Environment Agency also consult the following parties, in addition to the Specified Interests: Southern Water Services Limited; Natural England; the Upper Medway Internal Drainage Board; Leigh Parish Council; Penshurst Parish Council; Bidborough Parish Council; High Weald Area of Outstanding Natural Beauty Unit; and Kent Wildlife Trust.
- 6.3 Letters of support or no objection have been received from:
- Kent County Council,
  - Maidstone Borough Council,
  - Tonbridge and Malling Borough Council,
  - Tunbridge Wells Borough Council,
  - the Upper Medway Internal Drainage Board,
  - Natural England,
  - Southern Water Services Limited,
  - Network Rail, and
  - High Weald Area of Outstanding Natural Beauty Unit.
- 6.4 During the consultation period, Sevenoaks District Council made a representation confirming that they raise no objection to the Revised Scheme providing a wave wall is implemented in full at Pauls Farm in Leigh prior to the increase of flood storage water level. These works are the works described in 5.6 above and the Environment Agency plan to construct such a wall (see Appendix L in the Application).
- 6.5 The following parties have objected to the Application and the Environment Agency has responded to these objections individually (see Appendices 2 and 3).

<b>Name</b>	<b>Address</b>
<b>Penshurst Parish Council</b>	c/o The Parish Clerk, Windmill Farm, Chevening Road, Chipstead, Sevenoaks, TN13 2SA
<b>Country Landowners &amp; Business Association</b>	Fosse House, East Anton Court, Ickneild Way, Andover, SP10 5RG
<b>Mr A &amp; Mrs J L Massey</b>	Sagitawah House, High Street, Penshurst, Tonbridge, TN11 8BT
<b>Mr K E &amp; Mrs J R Storey</b>	Bridge House, Rogues Hill, Penshurst, Tonbridge, TN11 8BQ
<b>The Viscount De L'Isle, MBE, The Trustees of Penshurst Settled Lands Trust &amp; The Executors of The Right Honourable William Philip Viscount De L'Isle VC KG</b>	The Estate Office, Penshurst Place & Gardens, Penshurst, Tonbridge, TN11 8DG
<b>Mr &amp; Mrs M Hill</b>	Elliotts House, Rogues Hill, Penshurst, Tonbridge, TN11 8BQ
<b>Mr T Burraston &amp; Ms G M Pallen</b>	Colquhouns Cottage, High Street, Penshurst, Tonbridge, TN11 8BT
<b>Mr R &amp; Mrs A Calvocoressi</b>	Colquhouns, High Street, Penshurst, Tonbridge, TN11 8BT
<b>Mr J &amp; Mrs K Thompson</b>	The Yews, Rogues Hill, Penshurst, Tonbridge, TN11 8BQ
<b>Mrs L Menard</b>	Longford, High Street, Penshurst, Tonbridge, TN11 8BT

6.6 As at the date of this document, none of the objectors listed above have withdrawn their objections. The Environment Agency is still working to allay their concerns, and the Environment Agency will keep Defra and the Inspector informed if any do withdraw their objection prior to the inquiry since that may impact on the number of sitting days.

## 7. Matters for the Inquiry

- 7.1 The Environment Agency will respond to any matters that the Secretary of State and / or Inspector may indicate need to be addressed. For the moment, this section reflects the main issues raised by objectors. The Environment Agency will bring evidence before the inquiry to address these issues as well as the overall nature and benefits of the Revised Scheme.
- 7.2 The Environment Agency will explain the strong public interest in allowing the Scheme to be revised in order to achieve a greater level of flood risk protection.
- 7.3 Many towns and villages have established along the floodplain of the River Medway, and flooding is a significant threat to many homes and businesses throughout the Medway valley. Tonbridge in particular is at risk of flooding.
- 7.4 In more recent times, significant flooding occurred in the 1920's, 1947, 1960, 1963, 1968, 1974, 1979, 2000/01, and 2013/14. Many of these floods had a significant impact – damage to homes, disruption to business, upheaval to people's lives and the continued uncertainty of the threat of another flood.
- 7.5 Reducing flood risk in the River Medway catchment is a significant challenge. The Medway Flood Partnership was formed in 2017 to bring together a number of organisations to coordinate flood management activities to reduce flood risk and increase flood resilience in communities across the middle and upper catchment. A key action in the Medway Flood Action Plan, written by the Medway Flood Partnership, is to expand the permitted storage capacity of the FSA to reduce the risk of flooding to more homes in Tonbridge and Hildenborough.
- 7.6 The FSA was built in 1982 following the devastating floods of 1968 and reduces the risk of flooding to approximately 1,200 households and businesses. Climate change is predicted to increase the risk of flooding in the coming years. The Environment Agency is working with Kent County Council, Tonbridge and Malling Borough Council and the South East Local Enterprise Partnership on this project to increase the permitted storage capacity of the FSA and to build flood defences in Hildenborough to improve flood protection to more homes and businesses.
- 7.7 These proposed flood defences in Hildenborough, which this project will enable, will give a better standard of protection to people and property in that village. In isolation this would cause a slight increase in flood risk in Tonbridge, but this will be more than offset by the increased capacity within the FSA gained by increasing the maximum storage level to 28.60m.
- 7.8 The main issues identified by the objectors relate to:
- The use of flood modelling
  - The rate of flow when the FSA can be used

- Flooding at Penshurst and roads in the locality
- Duration of impoundment
- Procedural objections to the Application

## The use of flood modelling

- 7.9 The Environment Agency and the wider hydrological industry use modelling software, mapping techniques, topographical and rainfall data to understand a wide range of catchment processes including how river catchments respond to different rainfall events and to identify the impacts of these events.
- 7.10 The Environment Agency will explain what flood modelling work has been prepared on this river catchment area. The Environment Agency commissioned JBA Consulting to make use of the Medway Flood Model 2015 (see Document 18) to simulate and help analyse the options for increasing the permitted capacity to the FSA. Further modelling work has been carried out to inform the Flood Risk Assessment (see Appendix 4) submitted as part of the Planning Application.
- 7.11 The Flood Risk Assessment presented outputs for the 1.33% AEP event, 1% AEP event and 1% AEP +20% flow rate event (which represents an increase in peak river flow rates accounting for the future predicted effects of climate change). The location within the FSA that the change in flood depths due to the Revised Scheme stopped was consistent between these events. For more extreme flood events, such as a 1% AEP climate change event described above, the increase in depth reduces closer to the embankment (compared with smaller magnitude flood events) because the flood flows from the catchment upstream begin to have a greater influence relative to the operation of the radial gates at the FSA (see Section 5.1 (pages 24 – 26) and Appendices A and B of Appendix 4).
- 7.12 The objectors have questioned the accuracy of the flood risk modelling, in particular because the Environment Agency do not monitor river levels or flows at Rogues Hill in Penshurst. The community of Penshurst is especially concerned that the Environment Agency modelling has not reliably predicted the impact of the Revised Scheme.
- 7.13 The Environment Agency acknowledges that flood risk modelling includes uncertainties, and the modelling at the FSA is not an exception to this. However, within the flood risk modelling, the only change between the baseline and Revised Scheme scenarios is the change in the permitted maximum storage level from 28.05m AOD to 28.60m AOD. The basic simplicity of this change means the Environment Agency is confident to use the model results to investigate the potential effects and correspondingly the decision-making with respect to the changes for the Revised Scheme.

- 7.14 The main reasons for potential uncertainties in flood risk mapping models are:
- The model schematisation process involves a simplification of the representation of complex physical features that influence the relationship between flow and water level;
  - Data inputs to models (e.g. flood flows, ground level data) have their own uncertainties with respect to the quality and resolution of the information; and
  - Outputs from models are primarily linked to uncertainties in the selection of appropriate parameters which are used in the numeric and computational analyses that are the basis for the predicted results.
- 7.15 In the context of the FSA modelling, with the exception of water levels at the radial gates which differ due to the Revised Scheme, influential modelling inputs are consistent between the baseline and Revised Scheme modelling scenarios (e.g. flood flows, ground level data, and schematisation of the model). Therefore, a comparative analysis to understand the potential effects of the Revised Scheme can reasonably be made using the results obtained from the models representing the two scenarios, as it is reasonable to assume that the influence of uncertainties is not so influential for this exercise.
- 7.16 The Environment Agency has flow and level gauges at Chafford Bridge, Colliers Land Bridge on the River Medway and at Penshurst and Vexour Bridge on the River Eden. Data from these gauging stations was used to calibrate the Medway Flood Model 2015 and is used to inform the operation of the FSA. In addition, the Environment Agency has substantial knowledge and expertise of historic events to use in predicting the effect of the Revised Scheme.
- 7.17 The Environment Agency notes that some of the objectors consider that the river level should be measured at Rogues Hill in order to understand how operation of the FSA affects flood levels in Penshurst. Changes in peak water levels due to the Revised Scheme are not predicted to extend to Rogues Hill and so adjustments to the model at this location would not be expected to alter the conclusions regarding effects on peak water levels of the Revised Scheme. However, to provide supplementary information for future flood events that the residents consider would be beneficial, the Environment Agency is investigating the possibility of installing an additional river level gauge in the vicinity of Rogues Hill.
- 7.18 Whilst the Environment Agency acknowledge that Penhurst can be affected by the operation of the existing FSA, its position is that the principal source of flooding is from upstream flows. The operation of the FSA was the subject of an independent audit following the December 2013 floods by H R Wallingford (see Document 19). Environment Agency staff also observed the flooding at Rogues Hill in February 2020 to understand the extent and timing of flooding at this location. The timing and extent of the flooding in February 2020 supports the model predictions of design events - with flooding having been observed to occur at Rogues Hill before the operation of the FSA.

7.19 The Environment Agency will explain how the flood modelling has been used to inform its decisions. The timing and duration of impoundment at the FSA varies on an event-by-event basis, reflecting the nature of the flood flows reaching the area from upstream, future forecast conditions and the FSA's operator's decisions on impoundment. For the purpose of the flood risk modelling, a large number of flood events were used to inform the assessment. Its conclusions are based on this. The duration of additional impoundment is not predicted to occur until a flood event's magnitude exceeds a 10% AEP, and there is a wide variety in the time in which flood water is likely to be impounded above 28.05mAOD. The duration of the impoundment increases or decreases according to the magnitude and characteristics of the flood event. The average duration of additional impoundment above a level of 28.05mAOD at the upstream side of the radial gates is likely to be 19 hours, and the maximum duration has been assessed to be between 50-60 hours.

## The rate of flow when the FSA can be used

7.20 The Scheme allows the FSA to be used when the flow rate in the River Medway exceeds 35m<sup>3</sup>/second. Since 2011, the default position of the Environment Agency has been to use the FSA when the flow is forecast to exceed 75m<sup>3</sup>/second, when measured at the embankment. However, this is the Environment Agency's impounding threshold within the Procedures and the Environment Agency has to use its discretion in deciding at what flow to operate the radial gates. The Environment Agency needs to operate the FSA in a wide range of conditions and, despite the objections raised to this, needs to retain the flexibility to operate the FSA at the flow necessary to cope with the flood event. The optimum impounding threshold for a flood event may be higher or lower than 75m<sup>3</sup>/second to achieve maximum benefits from the FSA for any given event.

7.21 How the Environment Agency operated the FSA during January 2014 shows why the Environment Agency needs to retain such flexibility. Following the significant flooding experienced over Christmas 2013 the catchment conditions were such that the Environment Agency had to reduce outflows to around 60m<sup>3</sup>/second to prevent flooding of property in Tonbridge.

7.22 There are only three reasons to deviate from the default position:

- To conserve reservoir capacity (outflow is set at greater than 75m<sup>3</sup>/second to allow greater flow downstream)
- To reduce flood risk downstream (outflow is set at less than 75m<sup>3</sup>/second to reduce flow downstream)
- The Supervising Engineer has advised that the reservoir must be drawn down for safety reasons.

## Flooding at Penshurst and roads in the locality

- 7.23 Some objectors have expressed concern that the Revised Scheme will increase the risk of flooding at Penshurst, especially Chafford Bridge, Colliers Land Bridge, Rogues Hill and Long Bridge (see Appendix 6 for the location of these features). It is the Environment Agency's position that the Revised Scheme will not do this.
- 7.24 Chafford Bridge and Colliers Land Bridge are the first to flood during a flood event. This is because flooding upstream of Penshurst is driven by high flows from the Rivers Medway and Eden flowing toward their confluence at Penshurst. As Chafford Bridge and Colliers Land Bridge are upstream of Penshurst, they will experience the peak of the flood first.
- 7.25 A comparison of the data collected from the Environment Agency's gauging stations at Colliers Land Bridge on the River Eden upstream of the FSA and at the radial gates at the bottom of the FSA shows that the current Scheme does not exacerbate flooding at the above locations since levels at Colliers Land Bridge fall by the time impounding begins at the FSA. Flood modelling of a 1% AEP plus climate change event shows that there is no increase in depth of flooding at these locations as a result of the Revised Scheme.
- 7.26 The same applies to Long Bridge in that the flooding at this location is caused by the rate and volume of water flowing downstream in the River Eden.
- 7.27 Although Rogues Hill flooded prior to the construction of the FSA, the Environment Agency has carried out modelling to understand the relationship between the FSA and the flooding at Rogues Hill. Whilst the existing FSA may increase the depth of flooding at Rogues Hill by up to 0.1m, the Environment Agency maintains that the Revised Scheme will not increase flooding at Rogues Hill any further, as demonstrated by the Flood Risk Assessment.
- 7.28 The Environment Agency acknowledges that several roads around Penshurst currently experience flooding and recognises the risk and inconvenience that this causes. Flooding in Penshurst and the roads in Penshurst starts as a result of high flows originating upstream from the Rivers Eden and Medway. Of the roads within Penshurst, the current operation of the FSA only affects Rogues Hill. Flooding of the roads at Chafford Bridge, Colliers Land Bridge and Long Bridge results from upstream flow rates and drains away as these high flows pass.
- 7.29 The Flood Risk Assessment confirms that the Revised Scheme will not change the flood water levels at Rogues Hill (see section 5.1 of the Flood Risk Assessment, Appendix 4). The Environment Agency has engaged the National Flood Forum to help the local community to set up a flood action group. This will allow the concerns of the community to be raised with all of the organisations involved in

managing flood risk so that ways to mitigate the impact and improve the resilience of the community to flooding can be explored together.

## Duration of impoundment

7.30 Some objectors have argued that the Revised Scheme will increase the time taken for water to drain away from Penshurst. Section 5.1.3 of the Flood Risk Assessment states that the maximum additional time that water levels may exceed the current maximum permitted level of 28.05mAOD at the radial gates is 50 – 60 hours whilst the average is 19 hours. It is important to note that these periods apply to the section of the FSA immediately upstream of the radial gates control structure. The additional duration of impoundment at Penshurst will be less as the influence of the impoundment becomes less influential compared with the flood flows originating from the catchment upstream.

## Procedural objections to the Application

7.31 Two objections have been made to the manner in which the Environment Agency has made the Application. The Environment Agency does not know if these will be pursued, now that there is an inquiry being held, but these matters are addressed here for the sake of completeness. First, it has been said that the requirements of section 17(3)(e) of the 1976 Act have not been met, as the Environment Agency should submit the Revised Scheme to the Specified Interests before its submission to the Minister. The Environment Agency posted the Revised Scheme to the Specified Interests using the Royal Mail's first class Signed For service on 8 June 2020 and then submitted electronically the Application to the Minister on 10 June 2020. However, it appears that some Specified Interests received their copy of the Application on 11 June 2020 which means that their copy of the Scheme reached them after the Minister. They would, however, have received it before the Minister received his hard copy. If there has been a breach of section 17(3)(e), it has been a minor one and the Environment Agency have apologised for this (see Appendix 3). However, Defra has accepted the representations of those who received their copy of the Revised Scheme after the Minister. As such, any delay in them receiving the notification of the Environment Agency's intention to vary the Scheme has not denied them the opportunity to be heard by the Minister. They have not suffered any detriment or prejudice from this delay.

7.32 Second, there has been an objection raised about the form of the Revised Scheme that has been submitted. For the avoidance of doubt, the Environment Agency has confirmed that the proposed revisions would include the provision that the Revised Scheme would not come into operation until after planning permission is granted and the new works built. A similar provision was made in the Scheme. This is in paragraph 2 of the Revised Scheme, which was set out in the covering letter to the application submitted on 8 June 2020. This Application included a

further copy of the Revised Scheme in Appendix B. The copy set out in Appendix B of the Application differed from that in the covering letter since it did not include paragraph 2 as it appears in the covering letter. The Environment Agency has apologised for this error (see Appendix 3) and for any confusion caused.

## 8. Conclusions

- 8.1 Tonbridge and Hildenborough have historically been at risk of flooding from the River Medway. In 1968 Tonbridge was one of the towns worst affected by devastating floods experienced across the south east of England. It was that event that led to construction of the FSA which reduces the risk of flooding to approximately 1,200 households and 300 businesses in the town. Despite the benefit provided by the FSA, the heavy rainfall in December 2013 resulted in flooding to more than 260 homes and 50 businesses in Tonbridge and Hildenborough on Christmas Eve and Day. Many of these homes were flooded to such an extent that the residents had to be evacuated. The Revised Scheme will further improve the flood protection to vulnerable homes and businesses in Tonbridge and Hildenborough and so reduce the frequency and severity of flooding in future.

# Appendices

1. **The Application**
2. **Objections to the Revised Scheme**
3. **Environment Agency responses to the Objections**
4. **Flood Risk Assessment**
5. **Schedule of owners and occupiers and short particulars of agreements made under section 25 of the River Medway (Flood Relief) Act 1976**
6. **Map showing extent of land covered by agreements made under section 25 of the River Medway (Flood Relief) Act 1976**
7. **Maps identifying features and locations within the FSA and its vicinity**
8. **The Middle Medway Strategy Study for Flood Risk Management (2005)**

# Documents

So far as possible, the documents which may be referred to during the inquiry have been mentioned in the foregoing statement and listed in the Appendix.

In addition to the documents mentioned in the Appendix, the Environment Agency may refer to or put in evidence at the inquiry the documents listed below. Subject to any restrictions due to the Covid-19 pandemic, these documents may be inspected by prior appointment only at the Environment Agency, Medway House, Powder Mill Lane, Leigh, Tonbridge, TN11 9AS.

Anyone wishing to do so are asked to email [LEHES@environment-agency.gov.uk](mailto:LEHES@environment-agency.gov.uk) to arrange a suitable time or write to: The LEHES Project, Environment Agency, Orchard House, London Road, West Malling, ME19 5SH

1. Planning Application
2. Planning Design Access Statement
3. Environmental Statement
4. Environmental Statement Non-Technical Summary
5. Environmental Action Plan
6. Planning Application Drawings Red Line Boundary Plan (ENVIMSE100377-JBA-LZ-00-DR-PL-1000)
7. Planning Application Drawings Scheme Overview Plan (ENVIMSE100377-JBA-LZ-00-DR-PL-1002)
8. Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities (Environment Agency, 2016)
9. Tonbridge and Malling Borough Council, Level 1 Strategic Flood Risk Assessment Final Report, 2016
10. Maidstone Borough Council, Level 1 Strategic Flood Risk Assessment Addendum Report, 2016
11. Sevenoaks District Council, Level 1 Strategic Flood Risk Assessment Final Report, 2017
12. Tunbridge Wells Borough Council, Level 1 Strategic Flood Risk Assessment Final Report, 2019
13. Kent County Council, Local Flood Risk Management Strategy, 2012-2023, 2017

14. Medway Flood Partnership Medway Flood Action Plan 2017
15. Environment Agency River Medway Flood Storage Areas Project Strategic Outline Case, 2016
16. Environment Agency Thames River Basin Flood Risk Management Plan 2015-2021 Part B, 2016
17. Environment Agency Leigh Flood Storage Area Operating Procedures
18. Medway Flood Model 2015
19. HR Wallingford Leigh Flood Storage Area Review July 2015