

## **Leigh Flood Storage Area Operating Procedures**

The Environment Agency has provided the Leigh Flood Storage Area (FSA) operating procedures as part of the public inquiry into their application to increase the maximum stored water level within the Leigh FSA.

We have redacted information from the FSA operating procedures which relates to how to operate, monitor and impound the Leigh Barrier. We consider the entirety of section 15 and the appendices to contain sensitive information because disclosure would adversely affect international relations, defence, national security or public safety. Specifically in this case details about the operation of the Leigh Barrier would adversely affect public safety.

We have been guided in reaching this position by the Environmental Information Regulations 2004.

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**Leigh Flood Storage Area Officer Procedures**

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# **1 INTRODUCTION**

## **1.1 PREFACE**

The Environment Agency is a Category 1 Responder under the Civil Contingencies Act (2004). In order to comply with our Incident Management obligations under the act, we operate a series of duty officer roles on a 24 hours a day, 7 days a week rota.

The Kent and South London Area of the Environment Agency South East Region operate the Leigh Flood Storage Area (FSA); located on the River Medway upstream of Tonbridge. The principals of operation of the Leigh FSA are stated in the Medway Rivers Relief Act (1976).

## **1.2 SCOPE OF THE DOCUMENT**

This document contains the Leigh FSA operational procedures for the Leigh Flood Storage Area Operator (LFSAO) to follow when operating the asset.

## **1.3 DOCUMENTS TO SUPPORT THE FLOOD LFSAO PROCEDURES**

There are a number of other procedures and plans that may be used to support the LFSAO in Kent and South London. The list below is not exhaustive, but shows the key documents that you should be aware of, and which may help you when responding to a flood incident.

The following are operational procedures for other duty officers who have a role in managing flooding incidents:

- Flood Warning Duty Officer (FWDO) Procedures
- Assistant Flood Warning Duty Officer (AFWDO) Procedures
- Area Base Controller (ABC) Procedures
- Flood Incident Duty Officer (FIDO) Procedures
- Assistant Flood Incident Duty Officer (AFIDO) Procedures
- Monitoring and Forecasting Duty Officer (MFDO) Procedures

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## **2 NATIONAL FLOOD WARNING SERVICE**

As the Leigh Flood Storage Area Operator (LFSAO) you will be required to converse with the KSL FWDO South, where operational trigger levels for flood alerts/warnings may be triggered for communities downstream of Leigh FSA. This section provides an overview of the national flood warning service.

### **2.1 DEFINITION OF FLOOD WARNING CODES**

Please see 'Flood Warning Codes – what they are and what to do' a Guide to the Environment Agency's Flood Warning Codes.

### **2.2 COVERAGE OF FLOOD WARNING CODES**

There are many different sources and types of flood risk and flooding including river, coastal, estuarial, groundwater, sewer, surface water, overland flow, burst water mains, etc. The "codes" apply only to flooding from rivers, the sea or groundwater, or flooding related to rivers, the sea and groundwater, such as from sewers unable to discharge into swollen rivers.

The Flood Warning Service applies to specific locations known as "Flood Warning Areas". Flood Alerts provide more general information and are issued for the wider area at risk of flooding. Flood Warnings and Severe Flood Warnings are more closely targeted at the residents of specific Flood Warning Areas.

Any of the codes (Flood Alert, Flood Warning and Severe Flood Warning) can be issued at any stage and do not have to be issued in sequence.

### **2.3 FLOOD ALERT ONLY SERVICE**

Flood Alerts allow the Environment Agency to extend coverage of flood warnings to the wider floodplain. This approach may result in the Agency providing a different level of service to people at risk of flooding. Some people in the wider floodplain will only receive a Flood Alert Service, in contrast to some locations, which will receive a targeted Flood Warning Service. A Flood Alert Only service is viewed as an interim measure unless it is shown that it is not technically possible to offer anything more. The ultimate goal is a targeted Flood Warning Service for all areas, provided it is technically and financially feasible.

### **2.4 LOCAL VARIATIONS TO THE NATIONAL FLOOD WARNING SERVICE**

The Environment Agency's flood warning service aims to provide prior warning (2 hours in general) to people living in designated flood risk areas where a flood forecasting facility exists, and where lead times are sufficient to enable the Environment Agency to do so. In the upper reaches of urban catchments (particularly in London) and in upland areas (upper parts of the Medway), rivers can respond to heavy rainfall within a very short space of time. In such cases the warning target of two hours is not feasible without accurate, quantitative rainfall forecasts from the Met Office. Until and unless such forecasts become available an effective warning lead time of thirty minutes to one hour may be the best that can be achieved.

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### 3 KENT & SOUTH LONDON DUTY OFFICER ARRANGEMENTS

#### 3.1 GENERAL DUTIES

**All Kent and South London Duty Officers are required to:**

- Agree to and comply with the '*Terms of Reference*'
- Take part in the standby roster when required.
- Maintain a good understanding of all relevant operational procedures.
- Undertake a formal duty handover whenever the duty officer changes - including attendance at the Wednesday briefing/telecon. (see section 3.3)
- Ensure that they have the equipment and communication tools required to undertake their role.
- Attend regular training sessions and training exercises when required.
- Act as a mentor/coach to new duty officers and staff involved in incidents.
- Attend the Area Incident Room/Leigh FSA Control Room when required.
- Be prepared to respond to an incident at all times.
- Remain fully informed of any conditions or situations that may impact on their role
- Maintain an Incident Log throughout their duty period (see section 3.2).

**In addition LFSAOs also have a number of specific responsibilities:**

- Raise awareness of potential impacts/incidents with ABC & ADM (where appropriate).
- Act as the primary point of contact for the Area for the operation of the asset.
- Respond and plan to weather and river forecasts, telemetry alarms and NIRS in accordance with operational procedures.
- Maintain close liaison with other Area duty officers, Regional duty officers and external partners, advising of the developing situation.
- Provide any required data to the ABC to complete a HELP report within 1 hour of notification.
- Manage their assistants once in place.



### 3.2 **LOGGING**

One of our duties as a Category 1 responder is to record relevant data and information for the purposes of later analysis for learning lessons or for inquiry or investigation. Logging also helps us in another of our duties - providing a professional response to an incident.

It is therefore important that all duty officers or staff carrying out a decision-making role in KSL maintain a log at all times during an incident.

Information that is directly related to a potential or actual incident must be recorded – this will usually be started before an incident has ‘begun’.

Your log book should be used to record relevant information about the incident, as detailed below).

As a minimum the information that is logged must enable you, or others, to:

- Understand the context
- Manage the Incident
- Make decisions (and identify where decisions have been made)
- Implement Actions (or Identify where Actions are required / outstanding)

Logging Rules:

- The log entry **must** be pre-fixed with your name and your incident or duty role (this can be done once at the start of your shift/duty week or on the front of your book if you're using your own);
- The log entry **must** clearly identify a name for the incident concerned;
- Each entry **must** be chronologically numbered and pre-fixed with the time it was made using the 24hr clock;
- Each entry **is** dated using dd/mm/yy
- The log **must not** include short hand
- The log **must not** use abbreviation which are not in common use
- The log **must not** contain acronyms unless they have been written in full first.

When in the Leigh FSA control room use the LFSAO log book, which can be found on the desk or in the cupboard. When working from home LFSAOs should use their assigned official log books, provided by Flood Resilience.

### **3.3 DUTY HANDOVER**

Whenever the duty LFSAO changes, whether a duty-week handover, or a incident-shift handover, there are a number of things that need to be done to formally pass duty from one LFSAO to another.

1. The **incoming LFSAO** should pull the BT One Number to **themselves** (see section 3.4.1). Once this has been done, the outgoing LFSAO should ring the BT One Number to ensure it has been pushed successfully, and give a verbal handover to the incoming LFSAO. The **incoming LFSAO** must record all of the information that is being passed to them in their duty officer log book.
2. The **incoming LFSAO** must then log **themselves** as 'on duty' on SETEL. This can be done remotely via text message or by logging in to SETEL (see section 3.4.2). This will ensure that any alarms generated by SETEL for the LFSAO are directed to the correct duty officer.
3. For a duty-week handover, the **incoming LFSAO** must dial-in to the duty-week handover telecom at 10:30am on the Wednesday of their duty week to share the current situation in their patch with the rest of the duty team.

### **3.4 EQUIPMENT AND RESOURCES**

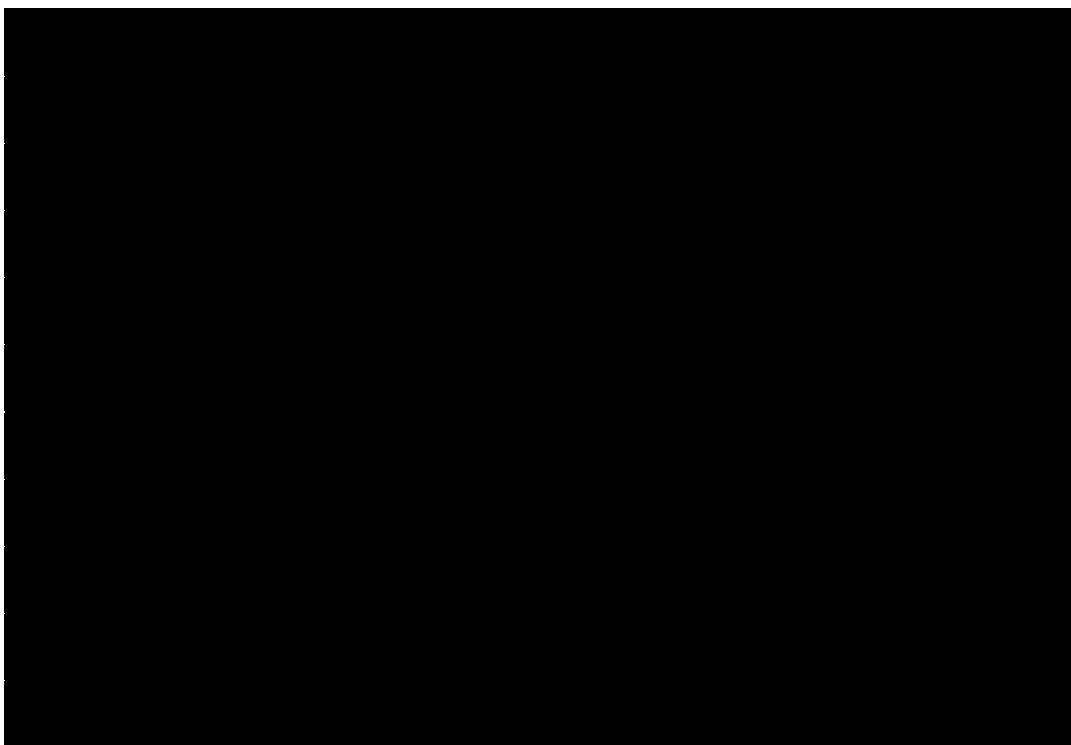
All LFSAOs must ensure that they have the following equipment / resources as a minimum whenever they are on duty:

- EA Laptop with access to:
  - SETEL (username/password required)
  - NFFS
  - IM Toolbox
  - HYRAD
  - Networked Drives
  - Log Book
- Copy of the LFSAO Operating Procedures
- Mobile Phone / Blackberry
- Access to the Internet from home (Broadband, Dial-up, 3g etc)

#### **3.4.1 BT ONE NUMBER**

All duty roles in KSL have a 0800 'single point of contact' number that can be transferred between the duty officers carrying out that role.

**LFSAO KSL BT One Number :** [REDACTED]

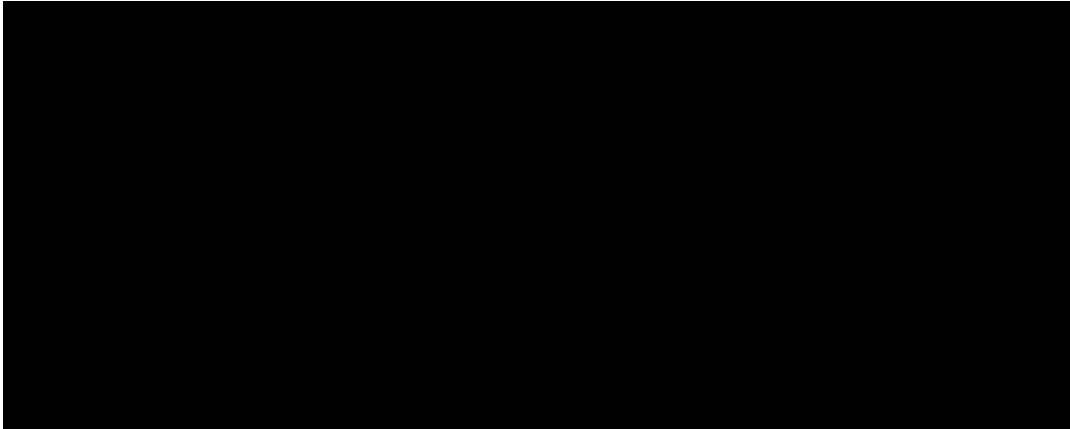


### **3.4.2 SETEL ROTA MANAGEMENT**

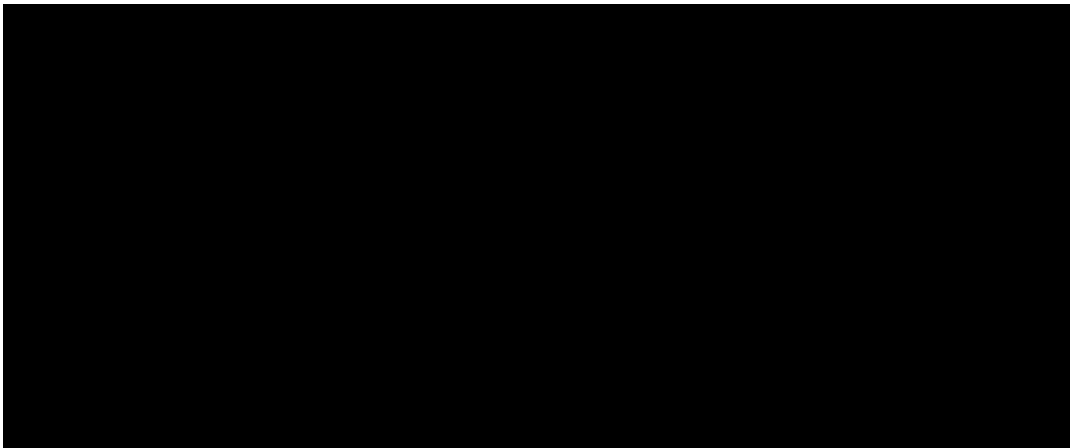
There are 2 methods for setting yourself 'on call' in SETEL – either by logging in to SETEL and setting yourself on call manually, or remotely by text message. It is important that this is done whenever duty is handed over, as it dictates who the alarms are passed to by the system.

Both methods must be carried out by the incoming LFSAO as the processes are user-specific.

#### **Manual method**



#### **Remote method**



The message must be in this exact format and sent from your work mobile phone number, otherwise it will not be recognised.

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## 4 FLOOD FORECASTING CENTRE WEATHER PRODUCTS

The Flood Forecasting Centre (FFC) is a collaboration between the Environment Agency and the Met Office. The centre provides specific weather products which are used to inform any decision to issue flood warnings.

Some of the products that are delivered are produced daily and should be used to help assess the level of activity that may be required from you as a duty officer. Others are produced on a risk-based approach so it is important that you understand the different products and when you will receive them.

All of the products described below can be accessed through the National Flood Forecasting System (NFFS) webservice or on the Met Office Hazard Manager Website.

### 4.1 FORECAST METEOROLOGICAL DATA (FMD)

Forecast Meteorological Data (FMD) is issued twice a day via email and provides a best estimate of forecast rainfall totals and temperatures on a region- by-region basis.

The FMD is split into two main sections:

- A breakdown of forecast rainfall for days 1 and 2 by EA Area and by time
- An overview of forecast rainfall for days 3 to 5, plus forecast temperatures both at Regional level.

The FFC will issue the FMD **every morning** by 07:30 to 08:00 local time and this product will be routinely updated **by 16:00 local for Days 1 and 2 only**. Other updates can be provided if required.

### 4.2 HYDROMETEOROLOGICAL (HYDROMET) GUIDANCE (HG)

The Hydromet Guidance (HG) is issued daily via email and is comprised of 4 main sections:

- A 5-day overview map showing the coastal and HRA assessment for 5 days ahead.
- National Overview on the general synoptic situation for England and Wales out to 10 days ahead.
- Regional Overview of precipitation and coastal amplification filled out on a risk basis.
- A commentary on the performance of model data feeds available in Hyrad and the National Flood Forecasting System (NFFS), surge ensembles and the performance of the new national Hydrological Grid-to-Grid model.

The FFC will issue the Hydromet Guidance **every morning** by 07:00 local time and it will not be routinely updated unless the situation significantly changes.

### 4.3 FLOOD GUIDANCE STATEMENTS (FGS)

Flood Guidance Statements (FGS) are issued by the Flood Forecasting Centre (FFC) and provide an assessment of the likelihood and impact of flooding from all sources (rivers tidal/coastal, groundwater and surface water) across England and Wales for the next 5 days.

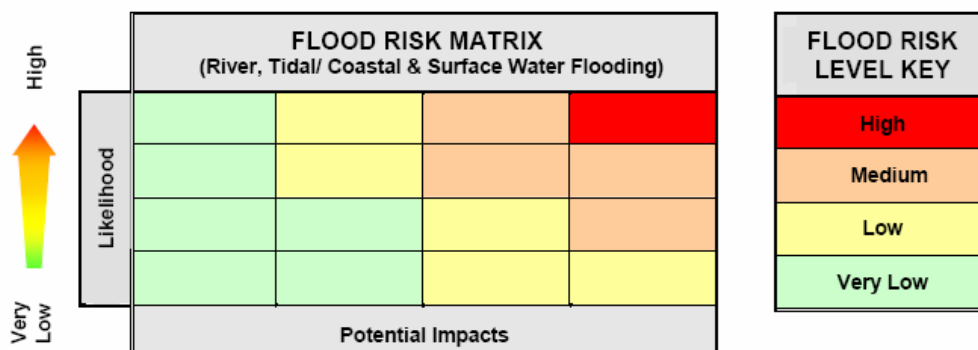
Statements are issued via email to Category 1 and 2 responders when their area of interest (i.e. county) is shown as low, medium or high risk and highlights the risk of all potential flood events, not just major ones.

The statement provides LRF-level information from days 1 and 2 and county-level information from days 3 to 5.

The level of risk assessment matrix and key are displayed below and should be used with the Potential Impacts Key, also displayed below.

#### FREQUENCY

Issued daily at 1030 local time. If the situation develops and there is a change to the risk in any county, the FFC will issue an updated FGS.



POTENTIAL IMPACTS KEY				
	VERY LOW	LOW	MEDIUM	HIGH
Typical impacts	<b>Minimal disruption</b> <ul style="list-style-type: none"> <li>Generally no impact, however there may still be</li> <li>Isolated and minor flooding of low-lying land and roads</li> <li>Isolated instances of spray/wave overtopping on coastal promenades</li> <li>Little or no disruption to travel although wet road surfaces could lead to difficult driving conditions</li> </ul>	<b>Minor disruption</b> <ul style="list-style-type: none"> <li>Localised flooding of land and roads – risk of aquaplaning</li> <li>Localised flooding could affect individual properties</li> <li>Individual properties in coastal locations affected by spray and/or wave overtopping</li> <li>Localised disruption to key sites identified in flood plans (e.g. railways, utilities)</li> <li>Local disruption to travel – longer journey times</li> </ul>	<b>Significant disruption</b> <ul style="list-style-type: none"> <li>Flooding affecting properties and parts of communities</li> <li>Damage to buildings/structures is possible</li> <li>Possible danger to life due to fast flowing/deep water/ wave overtopping/ wave inundation</li> <li>Disruption to key sites identified in flood plans (e.g. railways, utilities, hospitals)</li> <li>Disruption to travel is expected. A number of roads are likely to be closed</li> </ul>	<b>Severe disruption</b> <ul style="list-style-type: none"> <li>Widespread flooding affecting significant numbers of properties and whole communities</li> <li>Collapse of buildings/structures is possible</li> <li>Danger to life due to fast flowing/ deep water/ wave overtopping/ wave inundation</li> <li>Widespread disruption or loss of infrastructure identified in flood plans (e.g. railways, utilities, hospitals)</li> <li>Large scale evacuation of properties may be required</li> <li>Severe disruption to travel. Risk of motorists becoming stranded</li> </ul>

#### **4.4 HEAVY RAINFALL ALERTS (HRA)**

Heavy Rainfall Alerts are issued by the Flood Forecasting Centre (FFC) and provide a heavy rainfall forecast for the Kent and South London Area. This product will only be produced when there is **at least** a 20% probability that one or more of the following criteria will be met or exceeded.

- Thunderstorms/embedded convection with rainfall totals amounting to  $\geq 10$  mm in a 1-hour period or less.
- Rainfall totals amounting to  $\geq 15$ mm in a 6-hour period or less (Winter) or  $\geq 30$ mm in a 6-hour period or less (Summer)
- Lying snow of  $\geq 50$ mm **and** a rapid thaw situation in a 6-hour period or less.

The FWDO South will verbally notify the LFSAO when a HRA is issued or updated via the Leigh FSAO BT one number.

During Silent hours (00.00 – 06.00) the FWDO will pass these on at their discretion.

#### **4.5 FLOOD ADVISORY SERVICE (FAS) / SEVERE WEATHER ADVISORY GROUP (SWAG)**

The Flood Advisory Service is the process by which we share our flood forecast information and provide advice to our professional partners. This provides an early 'heads up' on impending flooding and promotes discussion on the likely impacts and the response of each organisation.

This is a joint service provided by the Environment Agency, Met Office Public Weather Service (PWS) Advisor and the Flood Forecasting Centre (FFC), and will take the form of a teleconference or email communication.

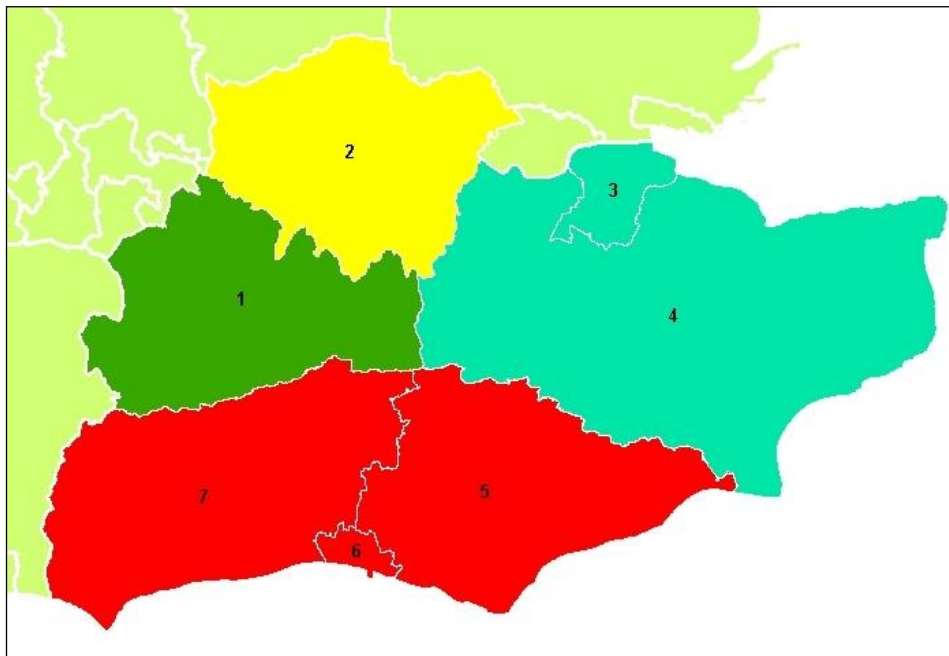
The decision as to whether to send an email or hold a teleconference will be based on the position on the risk matrix. This is an ABC decision informed by the FWDO.

A teleconference could be considered/convened up to 5 days in advance of the forecast rainfall (i.e. if any day on the FGS is coloured yellow/amber/red).



### **COVERAGE**

The teleconferences will operate on Local Resilience Forum (LRF) boundaries as shown below:



	County / Unitary	LRF	Lead Area (who organises the teleconferences)
1	Surrey	Surrey	West Thames Area
2	London	London	Kent and South London Area & Herts and North London Area
3	Medway Council (Unitary)	Kent	Kent and South London Area
4	Kent		
5	West Sussex	Sussex	Solent and South Downs Area
6	City of Brighton		
7	East Sussex		

It is the responsibility of the lead Area for each LRF to decide if a teleconference is needed. However, if flooding is only forecast for locations in Kent and South London which are within an LRF that we do not lead on (e.g. River Mole in Surrey is West Thames Area lead, then the onus will be on Kent & South London FWDO to request that a teleconference is organised.

Specific guidance for each LRF is described in sections: 4.5.1 – 4.5.4

### **FREQUENCY**

It should be agreed at the end of the teleconference if another one is needed and when this should be held. This will depend on the situation but they are likely to be held daily.

### **MET OFFICE PWS ADVISOR**

The Met Office PWS Advisor for the South East of England is [REDACTED]. The primary contact with the Met Office should be through the MFDO, but if we do need to make contact with the PWS advisor they can be reached on the details below:



He may deputise if resources are stretched.

**Green (very low risk)**

A teleconference will not be held when the FGS is green however one should be at least considered when the following triggers are met (which may happen when the FGS is green):

- There is an indication from forecast rainfall totals that Flood Warnings and/or several Flood Alerts may be issued.
- Maximum totals of 40-50mm of rain are forecast or 30mm is forecast with saturated ground conditions.

**Yellow (low risk)**

The West Thames FWDO South will speak to the MFDO about the potential for flooding over the following days and consider if a teleconference is needed. The above triggers should again be considered in this assessment.

If a teleconference is not held, then a partner email will be sent.

**Amber (medium risk)**

The West Thames FWDO South will consider a teleconference if the Flood Guidance Statement is amber for any of the next 5 days. A teleconference needs to be held if a widespread fluvial flooding incident is expected. Consider a teleconference if the flood guidance statement is for widespread surface water flooding. Speak to the FWDO about the situation and arrangements for the teleconference.

If a teleconference is not held, then a partner email should be sent.

**Red (high risk)**

A teleconference will be held.

**ADVERSE WEATHER TELECONFERENCE (AWT)**

The Adverse Weather Teleconference can be activated for all flooding scenarios including surface water flooding and when the anticipated impacts require that more detailed information and discussion about the situation would help organisations to be better prepared. For flooding events the EA will determine if the AWT is activated.

The ABC from Solent & South Downs Area will set up the teleconference and contact the KSL ABC to inform them a teleconference will be held. The ABC will notify the FWDO of the teleconference. The Leigh FSAO is not normally required to attend.

**KENT AND MEDWAY – KSL LEAD**

In Kent the FAS process is referred to as the Severe Weather Advisory Group or SWAG. Details of how to instigate the SWAG process can be found in the KSL FWDO lead pack. During office hours this will be carried out by the Flood Resilience Team. The North and South KSL FWDO will need to collaborate in advance of supplying information into the SWAG.

The actions that will be carried out at each level of risk on the FGS are shown below:

**Green (very low risk)**

A SWAG Teleconference will not usually be held when the FGS is green, however an email may be sent out to the group if any of the following conditions are met:

- The issuing of an **Alert or Warning of extreme or severe weather** by the **Met Office**.
- The **Environment Agency** is considering issuing or has issued multiple Flood Alerts or Flood Warnings in the Kent area.
- Tide levels and/or weather conditions are such as to cause concern.

**Yellow (low risk)**

A SWAG email may be sent or a telecon organised if the FGS is yellow and any of the following conditions are met:

- The issuing of an **Alert or Warning of extreme or severe weather** by the **Met Office**.
- The **Environment Agency** is considering issuing or has issued multiple Flood Alerts or Flood Warnings in the Kent area.
- Tide levels and/or weather conditions are such as to cause concern.

**Amber (medium risk)**

A SWAG teleconference will be held if Kent is coloured AMBER on the FGS and / or the following conditions are met:

- The issuing of an **Alert or Warning of extreme or severe weather** by the **Met Office**.
- The **Environment Agency** is considering issuing or has issued multiple Flood Alerts or Flood Warnings in the Kent area.
- Tide levels and/or weather conditions are such as to cause concern.

**Red (high risk)**

A SWAG teleconference will be held if Kent is coloured RED on the FGS and / or the following conditions are met:

- The issuing of an **Alert or Warning of extreme or severe weather** by the **Met Office**.
- The **Environment Agency** is considering issuing or has issued multiple Flood Alerts or Flood Warnings in the Kent area.
- Tide levels and/or weather conditions are such as to cause concern.

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## 5 SYSTEMS

### 5.1 HYRAD

The Hydrological Radar display system is a Microsoft Windows application that allows users to view historical and real-time displays of radar data. The data includes images from the UK Met Office radar products.

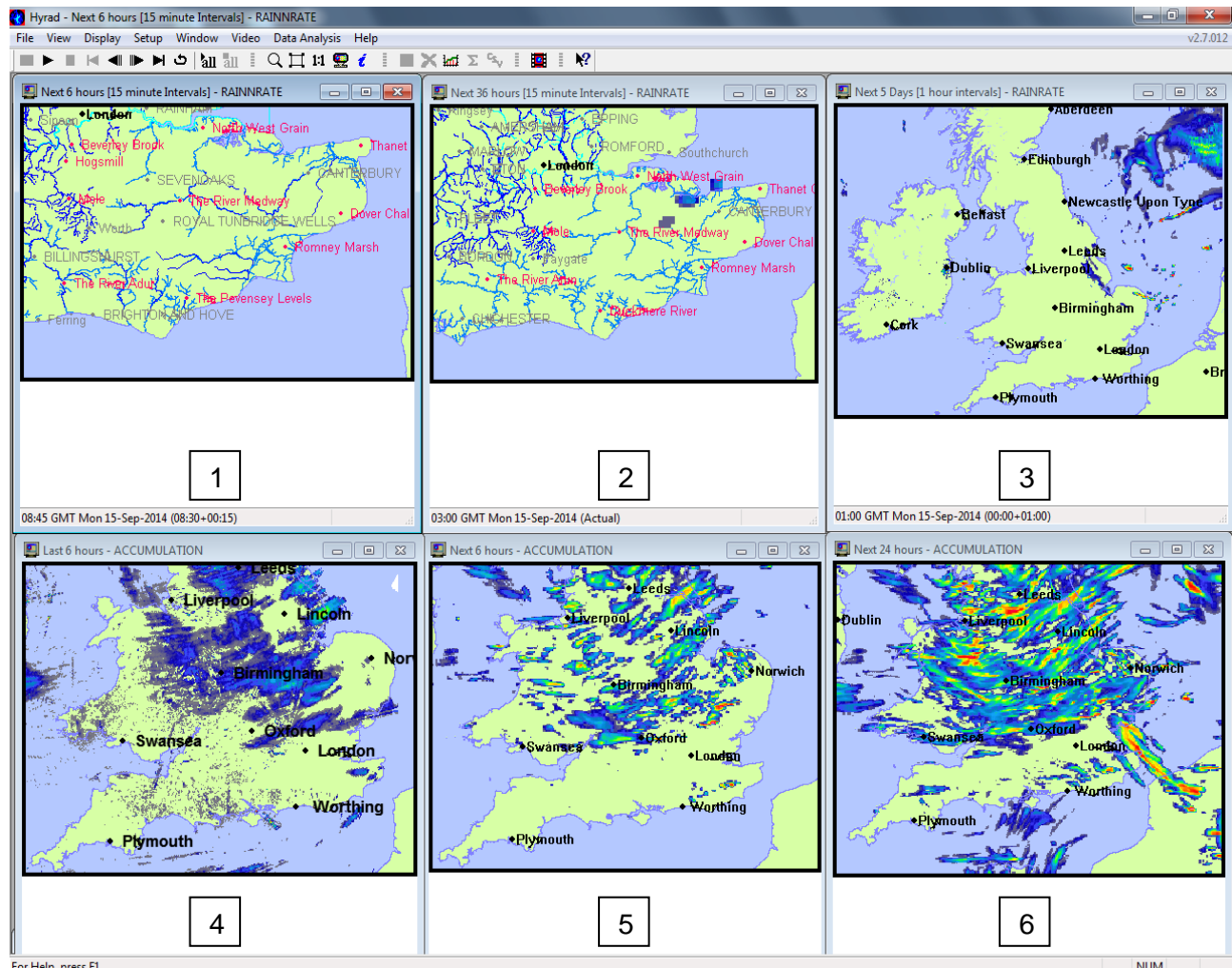


Figure 5.1 HyDRAD default displays

#### 1. Next 6 hours [15 minute Intervals] – RAINRATE

This product displays **forecast** rainfall by 15 minute intervals from time now to time +6 hours, updated every 15 minutes. It can be used to get an overview of the rain that is forecast across the Area. It takes observations and qc's the model in accordance, so is liable to change as observations deviate from forecast. This product is particularly useful for viewing potential impacts in catchments.

#### 2. Next 36 hours [15 minute Intervals] – RAINRATE

This is a **forecast** product and displays the NWP model output of forecast rainfall. The Met Office Numerical Weather Prediction model (NWP) is run every 6 hours at 03:00, 09:00, 15:00 and 21:00, and the display shows the 36 hour rainfall forecast for the UK. This should compliment the FMD and HG products. Useful for a general and long range forecast

### **3. Next 5 Days [1 hour Intervals] – RAINRATE**

This is a forecast product and displays a 5 day forecast for the UK, at an hourly interval. The model is run every 12 hours. Useful for general and long range forecasts.

### **4. Last 6 Hours – ACCUMULATION**

This product displays actual observed accumulations for the last 6 hours, updated every 5 minutes.

### **5. Next 6 Hours – ACCUMULATION**

This product displays forecast accumulations for the next 6 hours, updated every 15 minutes.

This product is particularly useful in considering impacts that might be experienced in our quicker responding catchments, when used in conjunction with product 4 (see above)

### **6. Next 24 Hours – ACCUMULATION**

This product displays forecast accumulations for the next 24 hours from the latest NWP model run. The 24 hour period is from the start of the NWP model run + 24 hours.

Useful for a general overview of potential total rainfall in the area in the next 24 hours.

### **Tip**

Hyrad has a handy tool that will allow you run a statistics analysis on a catchment by catchment basis for each product.

1. Click on the product you want to run a statistical analysis for
2. Click “Data Analysis”, and use the “select catchment” option, then type in the catchment you require and click “ok”
3. Click “Data Analysis” again, and click “statistics”. This will bring up a pop-up page of statistical analysis run on the catchment you have selected. Depending on which product you have run the statistical analysis on, the contents will vary, but are fairly self explanatory.

## 5.2 **SOUTH EAST TELEMETRY SYSTEM (SETEL)**


SETEL is the Telemetry system in use in South East Region. It allows you to access 'live' data on river level and flow, rainfall, groundwater level and status of structures or equipment (e.g. gates or pumps) as well as performing a number of other actions.

The primary uses of SETEL in KSL are:

- 1.) Viewing 'live' data about sites – level, flows and status
- 2.) Handling Alarms

### 5.2.1 VIEWING LIVE DATA

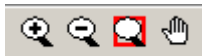
It is possible to see a live view (also known as a mimic) of data for a site – the measured parameter varies between sites, but primarily we will be interested in River Level and Flow.

Accessing the mimic for a specific site can be done either using the map or table-based navigation options (Area > Catchment > Site), or by using the 'Site Search' tool. 

When you open a site mimic, it opens into an 'overview' mode. This allows you to see the trace and access various other data about the site (images, outstation data etc), but it does not let you manipulate the trace.


In order to manipulate the mimic you need to click on the trace shown in the overview mode, which opens a detailed view of the mimic. Now you are able to zoom in to the data, change the time period on the X-Axis, interrogate the data and customise the display.

The main tools that you can use to do this are accessed either by right-clicking on the trace, or using the tool shortcuts at the top of the screen:



These tools (left to right) allow you to zoom in, zoom out, drag a box to zoom in to the area selected, and pan around the trace.

The 'Ruler' tool and 'Ruler Dialog' (accessed by right-clicking on the trace) allow you to view the value of the data points.

If the data displayed at a site isn't up to date, you can interrogate the outstation for the missing data by scanning or polling the site using the telephone icon on the overview tab: 



### 5.2.2 HANDLING ALARMS

SETEL can be used to view, acknowledge telemetry alarms on telemetry sites across the Area.

To receive alarms you will need to be set 'on-duty' within SETEL – refer to section 3.5.2 for instructions.

In SETEL, alarms that affect your role are shown in the Alarm Banner at the bottom of the screen – **right clicking** on an alarm will give you a number of options, including two most commonly used options; '**Acknowledge**' to accept the alarm and '**Display Alarm View**' to view the mimic for the site.

If an Alarm in the Alarm Banner is **red and flashing**, it **has not** been acknowledged and remains in Alarm state.

If an Alarm in the Alarm Banner is **red and not flashing**, it **has** been acknowledged and remains in Alarm state.

If an Alarm in the Alarm Banner is **green and flashing**, it **has not** been acknowledged, but is no longer in Alarm state.

### 5.2.3 HANDLING ALARMS VIA TELEPHONE

You may wish to acknowledge the alarm via the telephone if you are not logged on at that time, and/or the level of alert is not significant enough to prompt you to log on.

You will receive a telephone call that gives you details of the site and the alarm that has been triggered. You will then get options; Press **1** to repeat the message or **3 to accept** the alarm. Once you have pressed 3 you will then be asked for a six digit ID number and 4 digit pin code - the 6-digit number is your **employee number** and the 4-digit pin is '**1234**'. If you would rather accept the alarm through SETEL, you can press 0 after the alarm message and accept the alarm.

### 5.2.4 TROUBLESHOOTING

Full details of how to operate SETEL can be found in the SETEL User Guide, available on the SETEL Home page.

If you have any problems out-of-hours with SETEL, from logging in, to not receiving alarms, please contact the Telemetry Duty Officer.

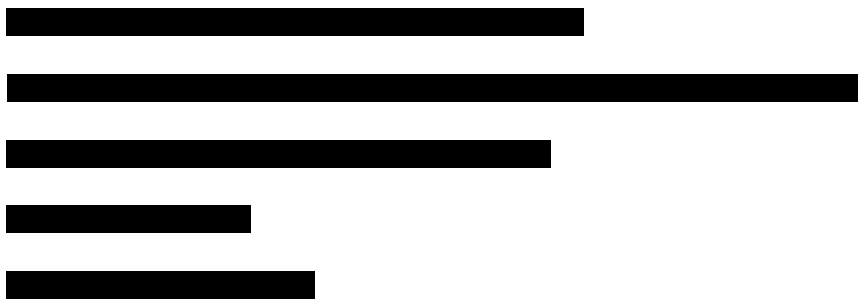
The area SuperUser for SETEL is [REDACTED].

### **5.3 NATIONAL FLOOD FORECASTING SYSTEM**

The Web Service is a set of web pages that provide access to:

- Met Office Weather Reports, Alerts and Warnings
- Forecasts produced by the NFFS itself
- Forecasting Duty Officers' comments on report content and forecast quality
- Regional Forecast outlook statement
- National Flood Guidance Statement
- Tide tables

#### **5.3.1 LOGGING ON TO NFFS**



#### **5.3.2 ACCESS FORECAST INFORMATION ON FLOWS AND LEVELS**

1. Select South East Region pages, then select NFFS Approved Forecast-SSD&KSL
2. Select the latest date – this will open up a new window/tab.
3. From the menu on the left of the screen select South East
  - Kent = all Catchments in Kent (Fluvial or Coastal Status)
  - South London = Mole and South London catchments (Fluvial Status)
4. Select the catchment
5. Select the location of the telemetry

This will generate a Fluvial Forecast Location Report.

The first graph will show the observed level and a forecast level. This graph is based on the trend of the last few values and should be used with caution. The vertical red line shows when the forecast was generated.

If there is a forecasting model for the site a second graph will be displayed. These are mostly rainfall runoff models and show forecasted flows.

## 5.4 **NIRS & CICS**

The National Incident Recording System (NIRS) is the system we use to record how we assess, respond to and minimise the effect of incidents.

A NIRS record will need to be created when any of the following criteria are met:

- We carry out reactive work because of the increased risk of flooding (e.g. clearing debris screens)
- We issue a Flood Alert or Warning
- We receive reports of actual flooding.

Only one NIRS record per Field Team catchment is required for each rainfall event, therefore once a NIRS has been raised any subsequent actions i.e. alerts/warnings can be added to the original NIRS record.

NIRS records are created on Field Teams operational boundaries. The FIDO is responsible for logging and assessing operational works and/or reports of actual flooding onto NIRS.

Weather warnings are not initially classed as an incident, they only become an incident when we take action to issue an alert/warning or send staff out (i.e. Ops gangs clearing trash screens, bridge runs).

### 5.4.1 **CREATING A NIRS RECORD**

To create a NIRS record fill in the electronic logging form located in the FWDO electronic lead pack and email to ICS [REDACTED] or alternatively call ICS on: [REDACTED].

#### **Important**

You should inform [REDACTED] (in office hours) that a NIRS has been raised and she will complete and close the NIRS during office hours. The initial NIRS record must be logged within 5 days using CICS, and the incident closed down within 21 days.

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## **6 LEIGH FLOOD STORAGE AREA BACKGROUND AND DESIGN**

### **6.1 SCHEME CONTEXT**

Following the 1968 floods, which devastated Tonbridge, the Leigh Flood Storage Area (FSA), then known as the Leigh Barrier was built in 1982 to reduce the risk of flooding from the River Medway to properties and businesses in Tonbridge and Hildenborough. The FSA is an online flood storage reservoir with a capacity of 5.56 million cubic metres and is regulated under the Reservoirs Act 1975. The main clay embankment is 1.3km long and outflows can be managed by the control structure, which consists of three radial gates. The impounding (or storage) area is 278 hectares and stretches from Leigh upstream to the village of Penshurst.

The storage area is operated to store the peak flows during a flood and together with the Tonbridge town floodwalls provides protection from flooding to Tonbridge. Downstream of Big Bridge (TQ 59059 46477) on the right bank, there are private flood walls and an Environment Agency flood wall down to Town Lock.

Dependent upon location, the standard of protection provided to Tonbridge and Hildenborough is between a 1 in 50 year event (2% Annual Exceedance Probability) to better than a 1 in 100 year event (1% Annual Exceedance Probability). 965 homes and 300 businesses benefit from these defences. This variance in the standard of protection provided is mostly due to variance in ground levels.

Communities downstream of Tonbridge will benefit from the operation of Leigh FSA due to a reduction in peak flows on the River Medway. This benefit decreases proportionately the further you go downstream as other factors, such as flows from other tributaries and the shape of the flood plain, become more influential in determining local flood risk.

The principals of operation of the Leigh FSA stated in the Medway Rivers Relief Act 1976 are:

- The structure is to be operated to reduce flood risk from the River Medway to Tonbridge and Hildenborough only.
- Water to be stored in the reservoir shall not exceed the maximum legal reservoir level (currently 28.05m AOD).
- A minimum impounding flow of 35m<sup>3</sup>/s.
- The outflow must not exceed the maximum rate of flow which will occur naturally in the river upstream of the control structure, i.e. the peak outflow must not be higher than it would be without the scheme in place.
- The level in the Powdermill Stream must not go below 23.95m AOD.

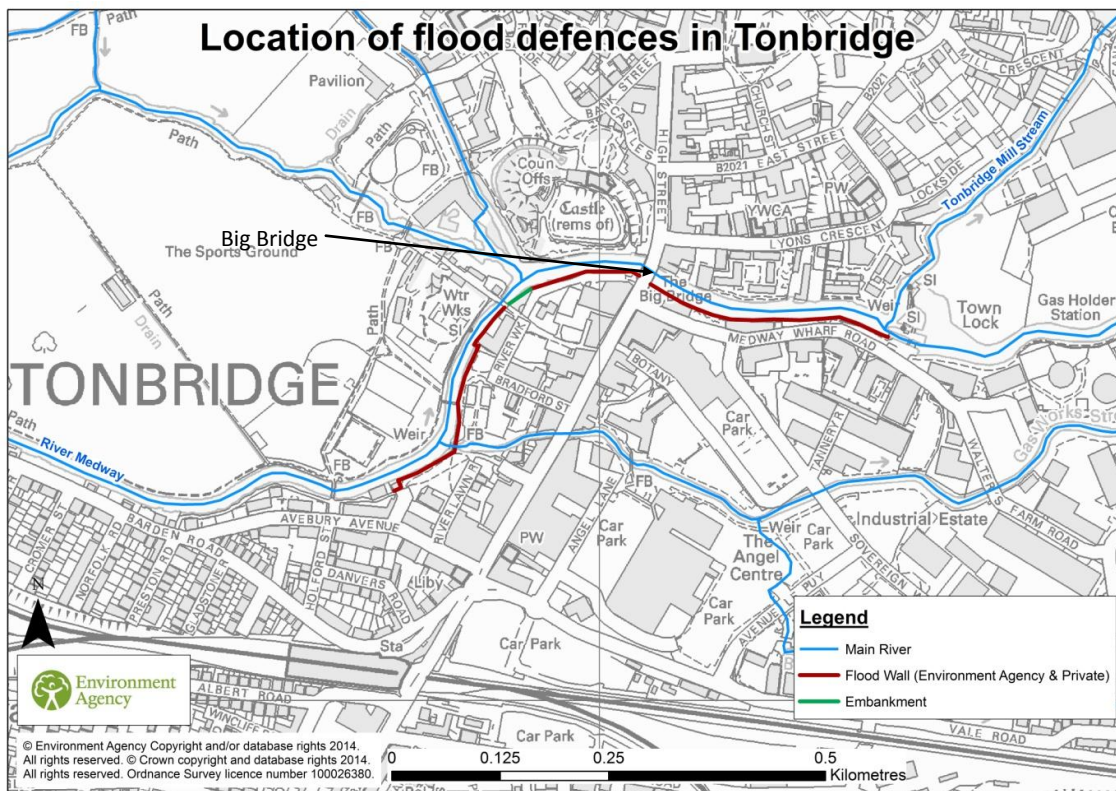


Figure 6.1 Flood defences map for Tonbridge

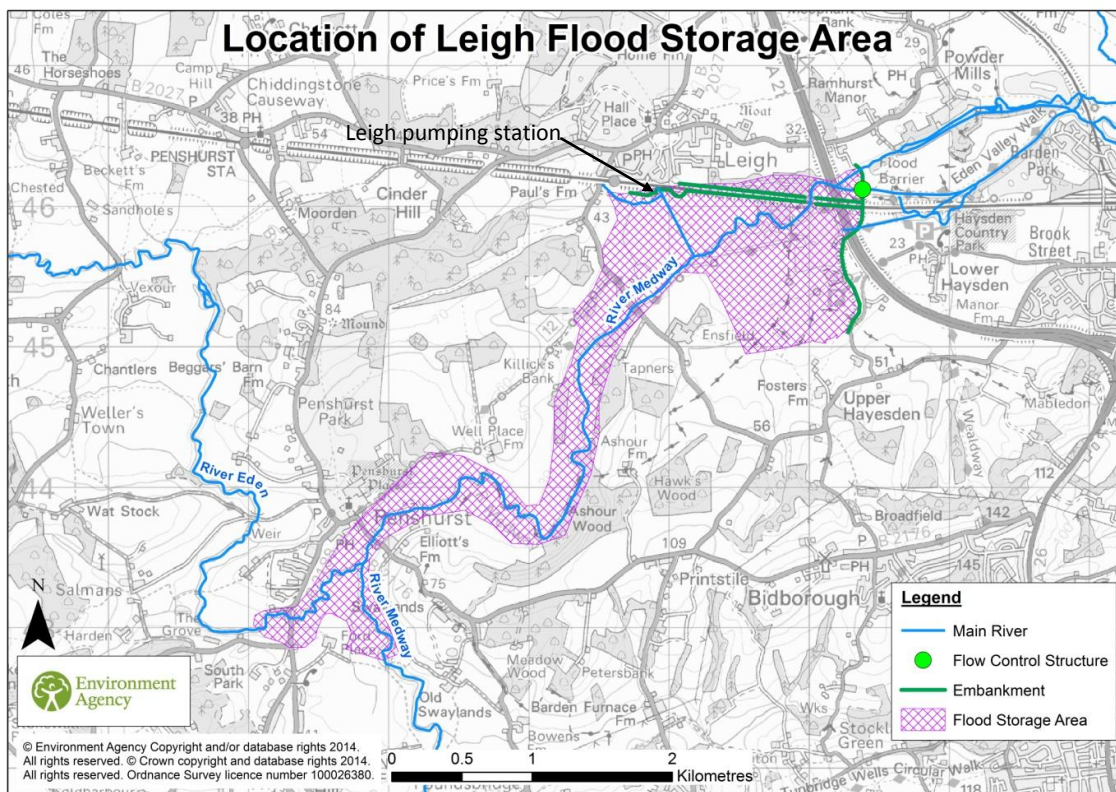
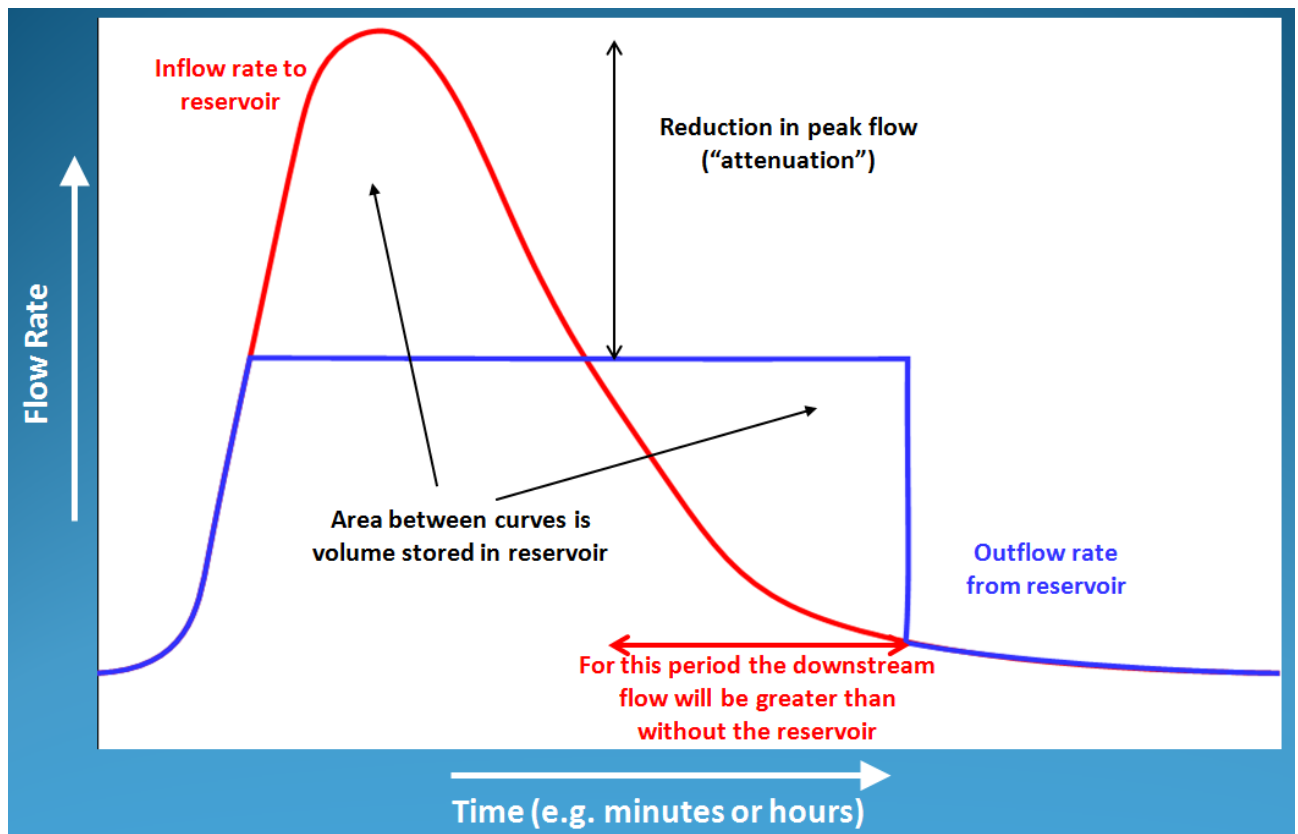


Figure 6.2 Location of the Leigh FSA

## Leigh Flood Storage Area Operational Procedures

Figure 6.3 below illustrates the operation principles of flood storage reservoirs such as Leigh FSA and how it is operated to capture the peak flows in the storage area, leading to a reduction in the peak flows going downstream.



**Figure 6.3 The principles of operation of an online flood storage reservoir**

(Source: A. Pepper)

### **6.2 CONTROL STRUCTURE AND RADIAL GATES**

- Stilling basin – St Anthony Fall's type
- Downstream channel is revetted to prevent scour to the river banks
- Radial gates: Centre gate: 9.1m wide, 7.0m radius and depth of 4.5m

South and North gates: 6.6m wide, 7.0m radius and depth of 5.5m



### **6.3 EMBANKMENTS**

- Main embankment 1.3km long, 5.7m high at maximum height, 4.5m wide and side slopes of 1:3
- Clay core supported by gravel shoulders, material derived from borrow pits in the area between Straight Mile and the River Medway.
- Gravel shoulders with relatively low permeability
- Railway embankment 2.8km long, 3.5m high, constructed to ensure stability of the existing bank during drawdown.

### **6.4 LEIGH PUMPING STATION**

Leigh Pumping Station takes surface water from Leigh Village and pumps it over the embankments and into the storage area (grid reference: TQ 54906 46113). Flow from the village is directed into a bypass channel then through a 11m archimedean screw (capacity  $1.43\text{m}^3/\text{s}$ ), which pumps the water over the 3.1m high embankment. There is a gravity discharge culvert that passes through the embankment. There is also a Southern Water pumping station adjacent to ours, with emergency pumps installed to handle storm overflow discharges.



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## 7 THE ROLE OF THE LEIGH FLOOD STORAGE AREA OPERATOR (LFSAO) ON DUTY

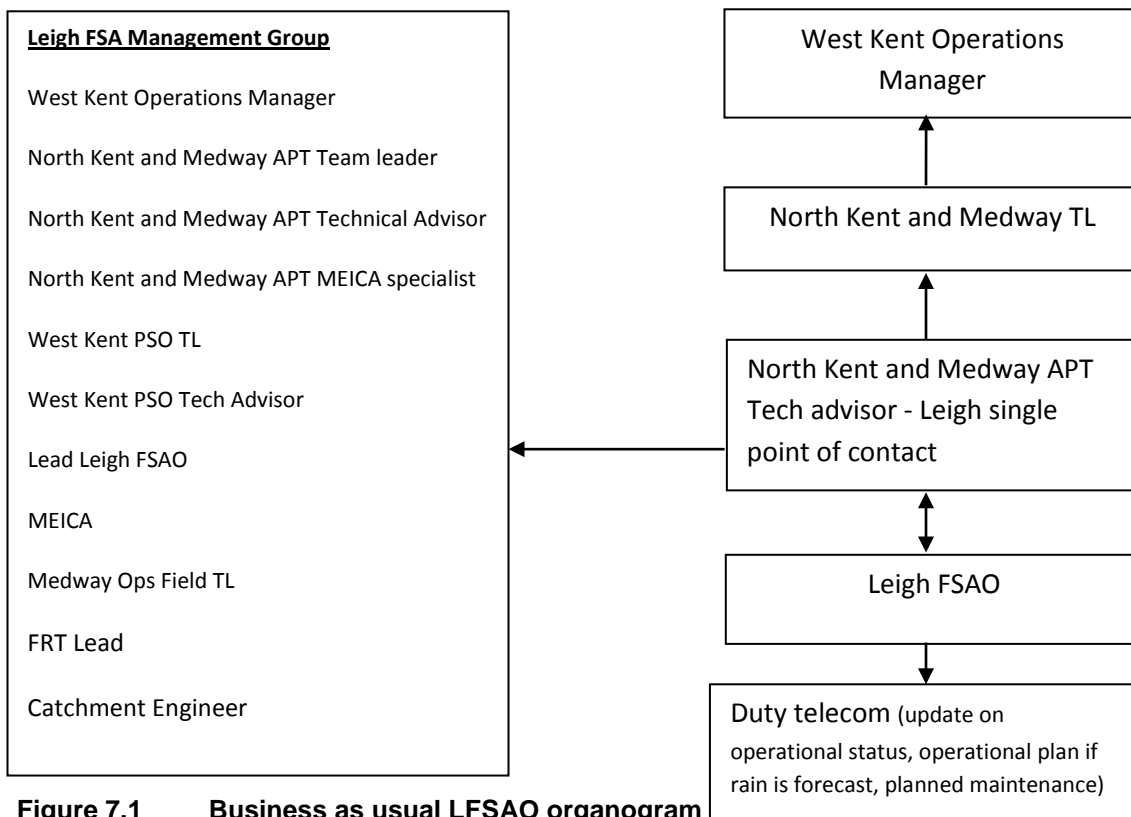
### 7.1 RESPONSIBILITIES OF THE LFSAO ON STANDBY

The responsibilities of the duty LFSAO are:

- To evaluate conditions which could result in the need to monitor and/or operate Leigh FSA. Using the data available, the LFSAO on duty is responsible for assessing if and when the structure is likely to require continuous/regular monitoring or operating. When defined triggers are expected to be met the LFSAO should make contact with the ABC and ask for a rota to be drawn together.
- To identify and escalate issues with the operability of the structure which may impede operation, following the relevant contingency procedure.

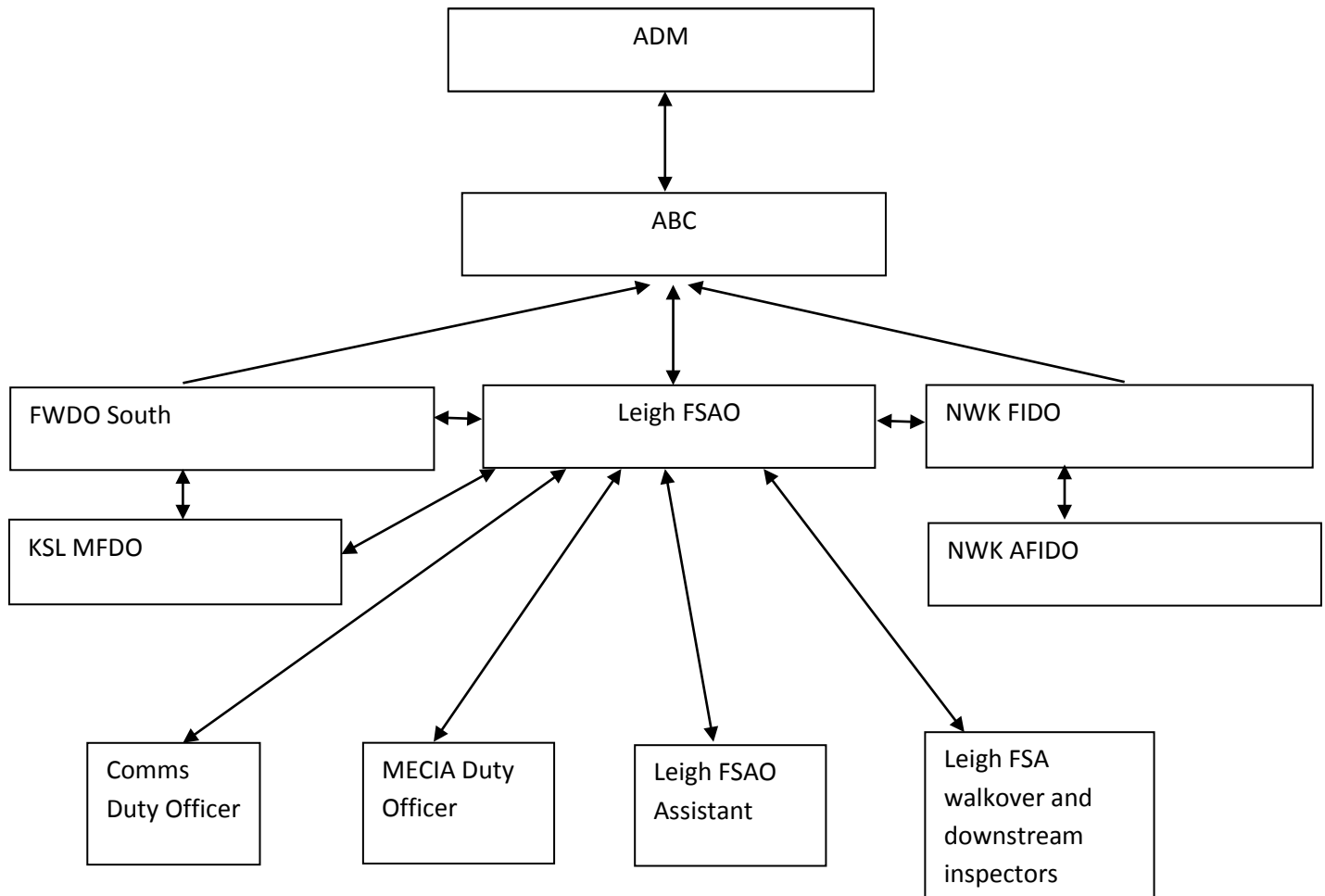
The LFSAO is also required to support the Medway and North Kent Asset Performance Team (APT) with planned maintenance activities and operate the structure when required. This may include lowering of the pen and undertaking manual gate movements.

All LFSAOs will attend operator meetings and participate in post incident reviews to identify areas for continuous improvement.



**Figure 7.1 Business as usual LFSAO organogram**

## Leigh Flood Storage Area Operational Procedures



**Figure 7.2 Internal Incident LFSAO organogram**

## **7.2 LFSAO WEEKLY DUTY CHECKS**

It is the responsibility of the outgoing duty officer to update the incoming duty officer of antecedent catchment conditions and current operational status of the structure. Refer to the Leigh handover prompt sheet (see Appendix B).

### **7.2.1 ESTABLISHING CURRENT CATCHMENT CONDITIONS**

At the beginning of your week on duty make yourself aware of the current forecast, rainfall totals over the previous week and the soil moisture deficit (SMD) for the catchment.

Do this before the weekly duty telecom. Think ahead about what the forecast could mean in terms of monitoring/operation and advise on any developing management plan and any specific considerations of impacts that this may have within the catchment

**1** - Log in to SETEL and establish current catchment conditions at the following gauges (flow and levels of Upper Medway and River Eden).

Medway gauges:

- Summerford Bridge
- Colliers Land Bridge

Eden Gauges:

- Edenbridge
- Vexour

**2** - Review the SMD value for the catchment. The latest SMD data measured in mm can be found on NFFS, click on MORECS and read the data for square 173.

Throughout your duty week pay careful attention to forecasts and continuously review your planning assumptions and feedback changes to the wider incident response duty officer team.

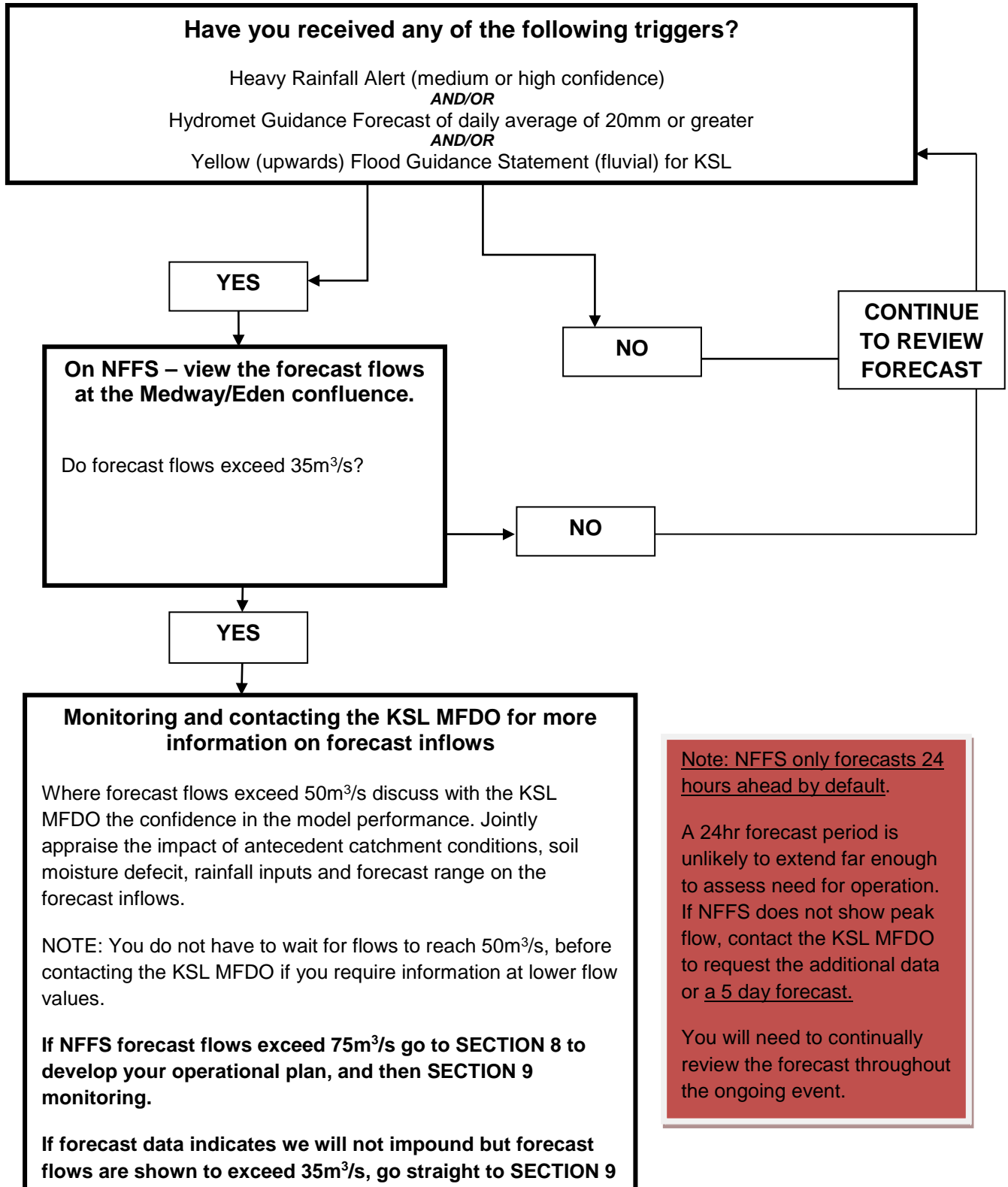
### **7.2.2 REVIEW TEMPORARY WORKS NOTICES**

At the start of the duty week ensure you are aware of any temporary works notices

so that these can be considered during operational planning or in discussing forecast flows with other duty roles. Also consult with the Incident Management Report which can be found on the Incident Management Toolbox.

### 7.2.3 TRIGGERS FOR OPERATIONAL PLANNING AND MONITORING

Use the flow chart below to determine when to develop an operational plan and/or start monitoring.



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## 8 LEIGH FLOOD STORAGE AREA FORECASTING AND OPERATIONAL PLANNING

**USE THIS SECTION WHEN FORECAST DATA SUGGESTS THAT IMPOUNDING WILL OCCUR AND YOU NEED TO DEVELOP AN OPERATIONAL PLAN. IF YOU ARE NOT GOING TO IMPOUND GO STRAIGHT TO SECTION 9.**

### 8.1 INTRODUCTION

The LFSAO is responsible for developing the optimum operating plan to maximise the flood storage area (FSA) capacity and reduction in downstream flood risk. The Leigh FSA is designed to allow control over a variable outflow to enable operators to maximise storage volume in the reduction of downstream flood impact.

These procedures are based on two modes of operation for the FSA; these are described as 'Fixed Flow' and 'Variable Flow' and are defined below:

- **Fixed Flow** – An *effective* operating plan is developed based on a 'fixed' outflow from the FSA of 75m<sup>3</sup>/s. For the majority of flood events this will provide a safe and effective operation of the FSA and flood risk reduction downstream. This mode of operation is not appropriate for all flood events.
- **Variable Flow** – An *optimum* operating plan is developed based on the operator defining an initial outflow and modifying outflow for the duration of the flood event. This aims to maximize use of FSA volume and provide the greatest flood risk reduction based on forecast and real time data.

The Reservoir Balance Spreadsheet (RBS) provides a decision making support tool allowing the operator to investigate a range of 'variable flow' options in order to tailor operation to the specific event characteristics. Supporting information and guidance is given in these procedures to help the operator with the decision making process.

There are three fundamental reasons to move to 'variable' flow operation:

- To conserve reservoir capacity (outflow is set at greater than 'fixed' flow)
- To reduce flood risk downstream (outflow is set at less than 'fixed' flow)
- The Supervising Engineer has advised that the reservoir must be drawn down for safety reasons.

During the early stages of an event if it is unclear whether the operator should switch from a fixed outflow regime to a variable outflow regime, the operator is advised to keep to the fixed outflow regime, whilst continuing to monitor and evaluate the real time data.

Likewise if the real time data and evidence available suggests that the LFSAO should operate using a variable flow operating regime from the start of an event, this can also be considered.

Forecast inflows from the National Flood Forecasting Service (NFFS) model at the **Medway/Eden confluence** are input into the Reservoir Balance Sheet to develop a strategic operational plan for managing flows through Leigh FSA. This is prepared prior to an event when forecast flows are shown to exceed 75m<sup>3</sup>/s.

**You will need to update and review this plan as the event progresses using updated model runs, gauge data and information on catchment conditions.**

## **8.2 DEVELOPING AN OPERATIONAL MANAGEMENT PLAN (WHEN FORECAST FLOWS EXCEED 75M<sup>3</sup>/S)**

### **1 – Request a copy of the forecast inflows at the Medway/Eden confluence**

Request a csv file of inflows for the event from the KSL MFDO. Make sure to ask for flows at the Medway/Eden confluence. Consider an appropriate timeframe that you require the data for (24 hours – 5 days). Speak to the KSL MFDO about their confidence in the model performance.

You may want to plan using most likely and worse case rainfall scenario, which will require separate model runs. The KSL MFDO will advise you the most likely rainfall scenario and discuss current confidence with the performance of the Medway model.

A 5 day model run may be required to allow you to plan for entire events. However it should be noted that model confidence between days 3-5 will be low, as confidence in the rainfall forecast feeding into the model increases the closer that we are to an event.

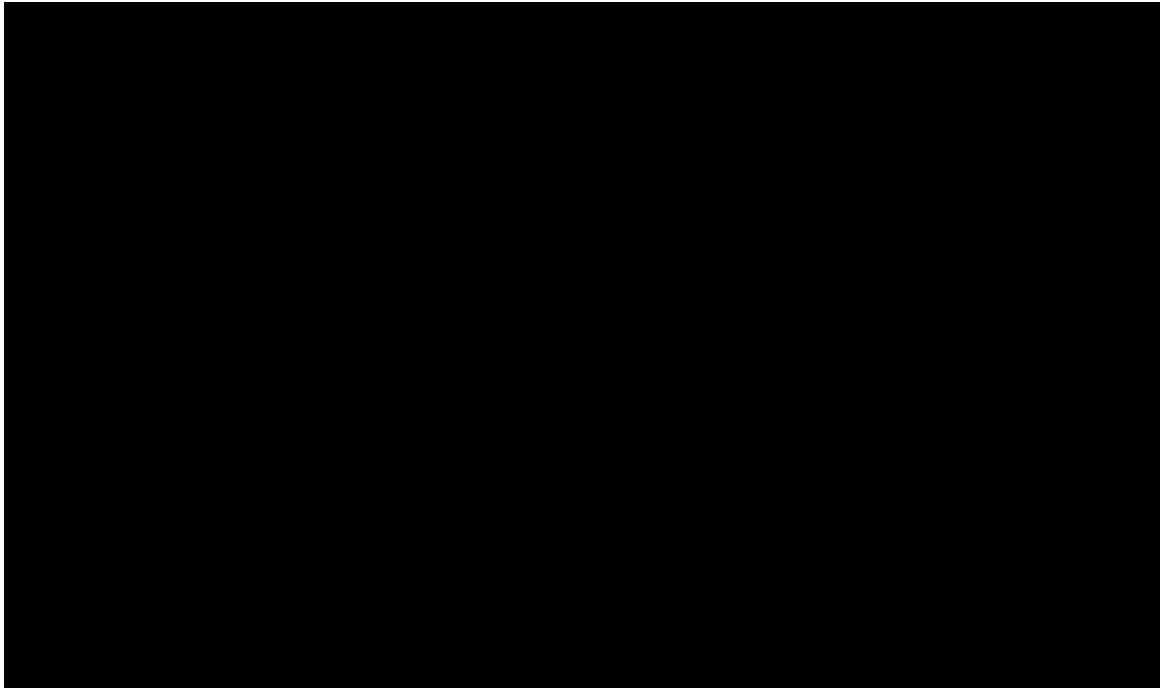
### **2 - Open the Reservoir Balance Sheet tool from your desktop and paste in the inflow data to the 'forecast fixed outflow mode' tab**

Go to the '**forecast fixed outflow mode**' tab. Paste the forecast flows into the inflow column.

Edit the date and time as appropriate with your first data entry and input the reservoir level at the corresponding date and time. NOTE to find the reservoir level quickly go to the SETEL Leigh FSA overview page, left click on 'Upstream WL' and select 'Display Historic List'.



**Figure 8.1**      **SETEL historic list function**



### **3 – Review reservoir levels under the ‘fixed flow’ operating regime**

Click on the ‘forecast fixed chart’ tab. Review the reservoir levels and capacity filled in the reservoir. Select ‘reservoir level’ from the chart options. If the reservoir level is forecast to be below 28.05mAOD (represented as a red line showing 100% capacity reached), then you will be able to manage the event by keeping the outflow fixed to 75m<sup>3</sup>/s.

### **4 – Switching to ‘variable flow’ operating mode**

If the reservoir level is forecast to go above 28.05m AOD then you will need to switch to ‘variable flow’ operating mode, as keeping to an outflow of 75m<sup>3</sup>/s would cause the storage area to become full and exceed the legal maximum impounding level (28.05m AOD). This mode allows the LFSAO to identify a variable flow operating plan, maximizing the use of the storage area and providing the greatest flood risk benefit.

### **5 – Prepare the ‘variable flow’ operating plan**

To prepare the variable flow operating plan click on the ‘**forecast variable**’ tab. Use the variation outflow column to identify the optimum outflow that ensures that the reservoir level does not exceed 28.05m AOD. Go to the ‘**forecast variable chart**’ tab review charts for reservoir level, rate of rise and inflow/outflow.

**Remember:** we use the forecasting point of the Medway/Eden confluence on the NFFS

model, located upstream of Leigh FSA. This will mean that travel time to Leigh FSA will need to be accounted for.

Further information on how to use the RBS can be found in Appendix J.

## **6 - Prepare an event data folder for the event**

Make a copy of the 'YYMMDD new event template' folder and save it in the relevant year folder renaming the folder with the appropriate date. Save a copy of the RBS in the 'RBS> Forecast' sub folder.

## **7- Prepare your operational plan**

Use the template found in the 'operational plan' sub folder to prepare your operational plan. Rename this template with the appropriate date and save.

**Once complete email the operational plan to the ABC, FWDO South, NKFIDO, ADM, other LFSAOs and the LFSAO inbox.**

## **8.3 NFFS UPDATES AND FLOOD WARNING CONSIDERATIONS**

**In addition when operating in 'variable flow' mode:**

**1** - Email a copy of the completed RBS with the **forecast variable flow outflows** to the **KSL MFDO** to input into the Medway forecasting model. This will ensure that the model will provide a more accurate NFFS forecast for flows downstream of Tonbridge. If you update your operational plan throughout the event, you must send the new forecast outflows to the KSL MFDO.

**2**- Discuss the **likely outflows** with the FWDO South in relation to the following downstream flood warning triggers for the River Medway. For your information these are:

East Peckham – 80m<sup>3</sup>/s outflow from Leigh

Tonbridge and Hildenborough – 100-120m<sup>3</sup>/s outflow from Leigh

Laddingford and Paddock Wood – 140-150m<sup>3</sup>/s outflow from Leigh

Tonbridge severe flood warning – 140-150m<sup>3</sup>/s outflow from Leigh

This is just an initial discussion at this stage and the FWDO South will require updates throughout the ongoing event once impounding starts and the operational plan is

## Leigh Flood Storage Area Operational Procedures

updated based on real time data, downstream conditions and updated NFFS forecast model runs.

### **8.4 CONSIDERATIONS DURING MULTIPLE EVENTS**

During multiple events the Leigh FSAO should consider downstream conditions when developing the operational plan. The flood plain capacity of the sports fields in Tonbridge and impact of debris and silt that may have been washed downstream means that flood impacts may be observed at lower outflows. Therefore the LFSAO may need to consider if it is appropriate to impound at flows of less than  $75\text{m}^3/\text{s}$  during some events.

Note: the sports fields in Tonbridge act as floodplain storage and can store 1-2million  $\text{m}^3$  of flood water.

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## 9 LEIGH FLOOD STORAGE AREA MONITORING

**USE THIS SECTION WHEN FORECAST FLOWS FROM THE MEDWAY MODEL ARE SHOWN TO EXCEED 35m<sup>3</sup>/s.**

Real time data from rain and river gauges in the Upper Medway catchment are used to monitor the developing flood and forecast inflows to Leigh FSA in plus 7 hours. You will also need to record the upstream reservoir level and calculate the outflows at Leigh.

- **Flows** at Colliers Land Bridge and Vexour indicate the size of the potential flood and the likely inflows into the Leigh FSA.
- **Outflow** from Leigh will tell you when to operate in either manual or automatic, when you need to impound and allow the potential downstream impacts of flows to be evaluated.

### 9.1 MONITORING RAINFALL DATA IN THE UPPER CATCHMENT

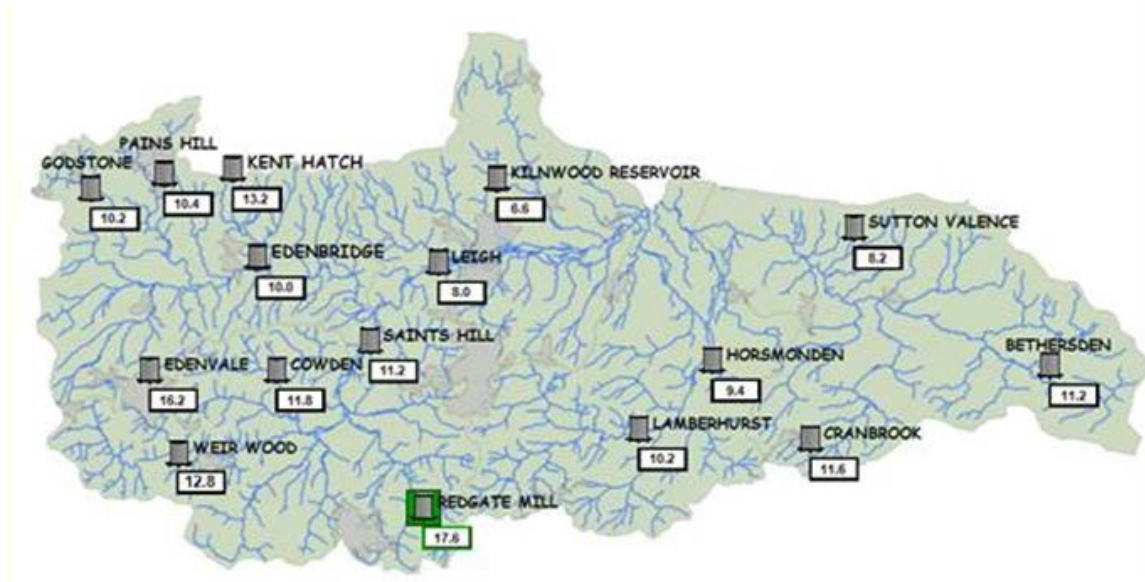
Throughout an event monitoring of rainfall totals in the upper catchment should be undertaken frequently and totals recorded in the log book, over the most relevant time frame.

**The key upstream rain gauges are:**

- **Upper Medway:** Weir wood, Redgate Mill, Cowden and Saints Hill.
- **Upper Eden:** Godstone, Edenvale, Pains Hill, Kent Hatch and Edenbridge.

Real time catchment rainfall data can be found on Leigh SETEL by clicking on **rainfall** from the home page.

## Leigh Flood Storage Area Operational Procedures



**Figure 9.1 Key rain gauges in the Upper Medway catchment**

Rain gauges in Sussex such as Balcombe can also be used to provide an indication of actual rainfall versus forecast, when the prevailing weather pattern is coming from the south west. The KSL MFDO will also be reviewing forecast compared to actual rainfall totals.

Table 9.1 below provides a means of assessing the size of the developing flood using recorded rainfall totals. During saturated catchment conditions **only** (when the Soil Moisture Deficit is 0mm) use the table below to assess the size of potential peak flows, using upstream rain gauge data. When using this table it is important to think about storm duration and multiple events. During unsaturated conditions the peak flows shown in the table below will be over estimated.

**Table 9.1 Initial assessment of the size of the developing flood (m<sup>3</sup>/s)**

Storm duration (hrs)	Rainfall (mm)										
	16	20	30	40	50	60	70	80	90	100	
6 - 24	40-48	70-85	100-120	130-160	165-210	200-255	240-300				
24-48	30-40	50-70	75-100	95-130	120-165	150-200	175-220				
48-72	25-30	40-50	60-75	75-95	95-120	115-150	140-160	160-200	180-230	200-265	>265

Note: Small flood: inflow < 80 m<sup>3</sup>/s  
Medium flood: inflow 80 - 160 m<sup>3</sup>/s  
Large flood: inflow > 160 m<sup>3</sup>/s  
The calculation is based on FEH techniques

## **9.2 MONITORING UPSTREAM FLOWS AND COMPLETING THE MONITORING LOG**

Following rainfall in the upper catchment the first upstream gauges that provide an indication of upstream river levels starting to rise are Summerford Bridge on the Upper Medway and Edenbridge on the Upper Eden. When you receive the following river level alarms start to increase your awareness of what is happening in the catchment (for example how much rain has fallen, review river levels upstream):

- Summerford Bridge Act Con ops (40.5m AOD) or Act Ops (40.7 m AOD)

AND/OR

- Edenbridge Act Con ops (39 m AOD) or Act Ops (40.1m AOD)

Just upstream of Penshurst beyond the River Medway and River Eden confluence there are two level/flow gauges; Colliers Land Bridge on the River Medway and Vexour on the River Eden.

When you receive one or more of the following river level alarms:

- Colliers Land Bridge Act Con Ops AND/OR Vexour Act Con Ops, (31m AOD)

The LFSAO will make an assessment on forecast and actual inflows and outflows to help determine if and when continuous Leigh FSA monitoring should commence, as well as how long monitoring might be required for. If river levels are peaking at around the Act Con Ops level and you are not likely to see flows above 35m<sup>3</sup>/s, then full monitoring is not required.

If flows are likely to exceed 35m<sup>3</sup>/s, monitoring should be undertaken and entries should be made every 30 minutes once the outflow exceeds 30 m<sup>3</sup>/s. If monitoring will exceed 8 hours, contact the ABC to organise a rota.

### **1 – Prepare an event data folder**

If you have not already done so under Section 3 prepare an event data folder for the event. Go to: [REDACTED]

Make a copy of the 'YYMMDD new event template' folder and save it in the relevant year folder renaming the folder with the appropriate date.

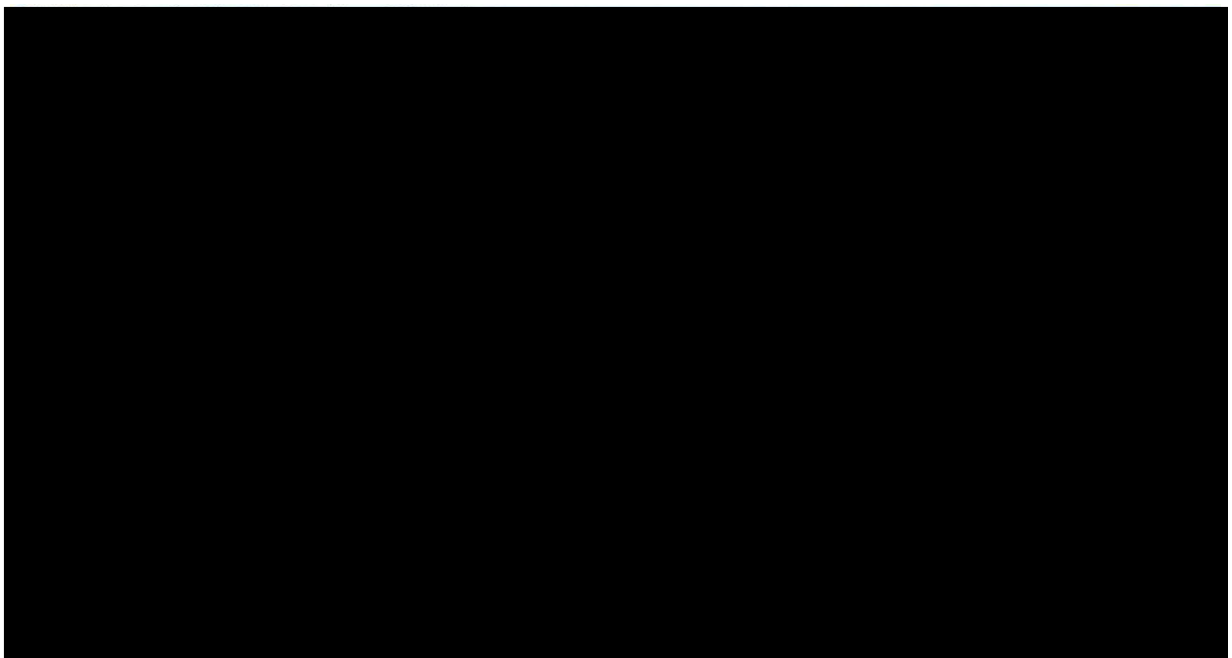
### **2 – Open the monitoring log template**

Open the monitoring log template in the 'monitoring' sub folder and save it with appropriate title YYMMDD.



**Table 9.2      Monitoring log template**

**3 – Use Leigh SETEL to obtain the relevant monitoring data**



**Figure 9.2      Accessing the Leigh SETEL Overview Page**



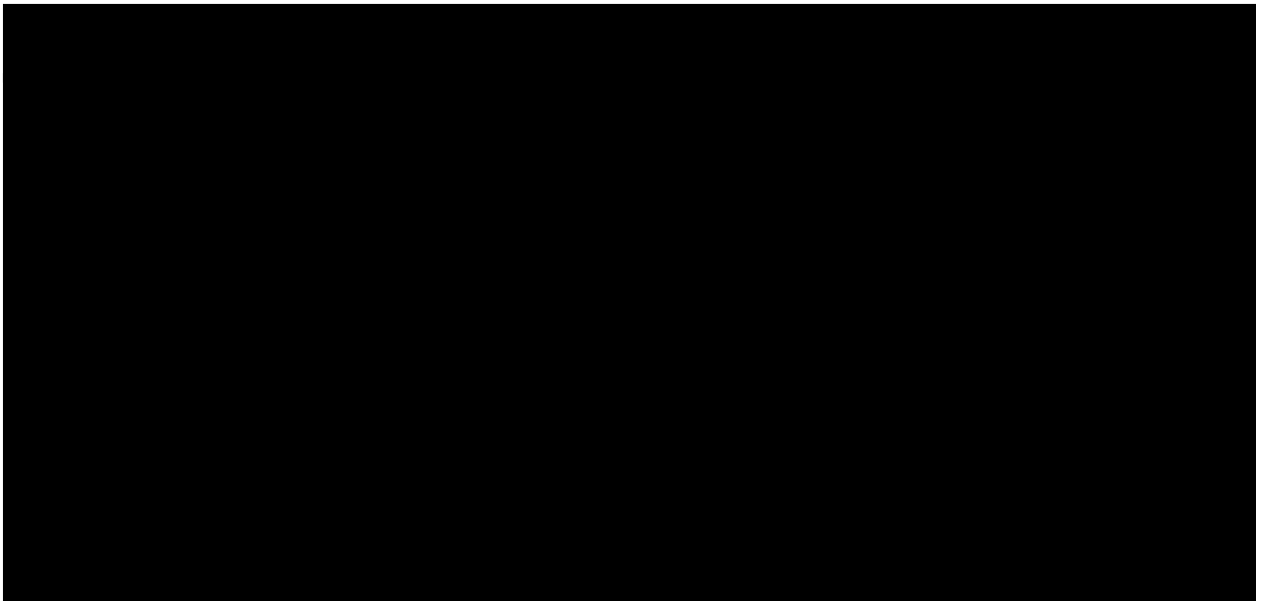


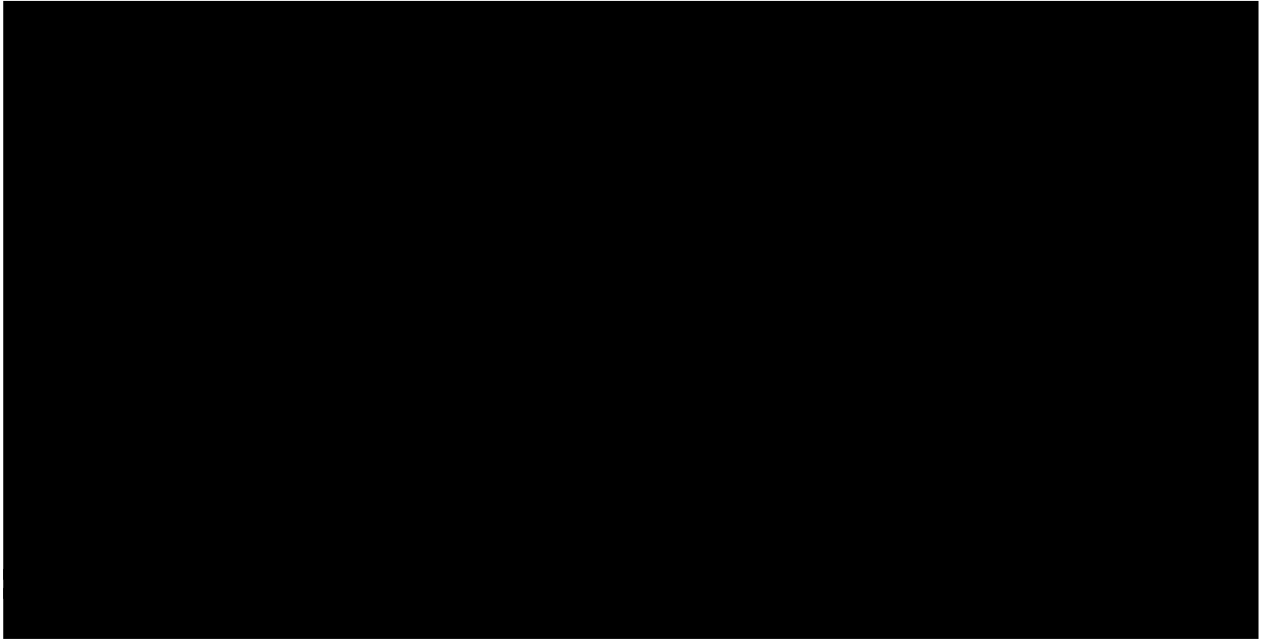
**Figure 9.3      Obtaining monitoring data from the Leigh FSA Overview page**

If you have issues with SETEL at any point phone the Supra H&T duty officer on:



Flows can also be read directly from the multiple site mimics on Leigh SETEL. These can be found by selecting **Flood Storage Area Live** on the screen shown in Figure 2 below. On the Home Display Screen (below) you can view a multiple site mimic by selecting a box displaying the site name (shown by the red arrow).





**Figure 9.4**      **Obtaining flows for Colliers Land Bridge and Vexour from the multiple site mimic**

Flows for Collier Land Bridge and Vexour can be read from under the hydrograph (shown by red arrows on Figure 9.4 above). Make a note of the flows at Colliers Land Bridge and Vexour and use the table in Table 9.3 below to predict the estimated inflow to the FSA in approximately +7 hours.

# Leigh Flood Storage Area Operational Procedures

Predicted Flow (m³/s)		Flow at Collier's Land (m³/s)																																				
		4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70			
Flow at vexour (m³/s)	4	10	12	13	14	15	16	17	18	20	21	22	23	24	25	26	28	29	30	31	32	33	34	36	37	38	39	40	41	42	43	45	46	47	48			
	6	12	13	15	16	17	18	19	20	21	23	24	25	26	27	28	29	31	32	33	34	35	36	37	38	40	41	42	43	44	45	46	48	49	50			
	8	14	15	16	18	19	20	21	22	23	24	26	27	28	29	30	31	32	33	35	36	37	38	39	40	41	43	44	45	46	47	48	49	51	52			
	10	16	17	18	19	21	22	23	24	25	26	27	28	30	31	32	33	34	35	36	38	39	40	41	42	43	44	46	47	48	49	50	51	52	53			
	12	18	19	20	21	22	23	25	26	27	28	29	30	31	33	34	35	36	37	38	39	41	42	43	44	45	46	47	48	50	51	52	53	54	55			
	14	20	21	22	23	24	25	26	28	29	30	31	32	33	34	36	37	38	39	40	41	42	43	45	46	47	48	49	50	51	53	54	56	58	59			
	16	21	23	24	25	26	27	28	29	31	32	33	34	35	36	37	38	40	41	42	43	44	45	46	48	49	50	51	52	53	54	56	57	58	59			
	18	23	24	26	27	28	29	30	31	32	33	35	36	37	38	39	40	41	43	44	45	46	47	48	49	51	52	53	54	55	56	57	58	60	61			
	20	25	26	27	28	30	31	32	33	34	35	36	38	39	40	41	42	43	44	46	47	48	49	50	51	52	53	55	56	57	58	59	60	61	63			
	22	27	28	29	30	31	33	34	35	36	37	38	39	41	42	43	44	45	46	47	48	50	51	52	53	54	55	56	58	59	60	61	62	63	64			
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	26	31	32	33	34	35	36	37	38	40	41	42	43	44	45	46	48	49	50	51	52	53	54	56	57	58	59	60	61	62	63	65	66	67	68			
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	34	38	39	40	41	42	43	45	46	47	48	49	50	51	53	54	55	56	57	58	59	61	62	63	64	65	66	67	68	70	71	72	73	74	75			
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	38	41	43	44	45	46	47	48	49	51	52	53	54	55	56	57	58	60	61	62	63	64	65	66	68	69	70	71	72	73	74	76	77	78	79			
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	44	47	48	49	50	51	53	54	55	56	57	58	59	61	62	63	64	65	66	67	68	70	71	72	73	74	75	76	78	79	80	81	82	83	84			
	46	49	50	51	52	53	54	56	57	58	59	60	61	62	63	65	66	67	68	69	70	71	73	74	75	76	77	78	79	81	82	83	84	85	86			
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	50	52	53	55	56	57	58	59	60	61	63	64	65	66	67	68	69	71	72	73	74	75	76	77	79	80	81	82	83	84	85	86	88	89	90			
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	54	56	57	58	59	61	62	63	64	65	66	67	68	70	71	72	73	74	75	76	78	79	80	81	82	83	84	86	87	88	89	90	91	92	94			
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	58	60	61	62	63	64	65	66	68	69	70	71	72	73	74	76	77	78	79	80	81	82	84	85	86	87	88	89	90	91	93	94	95	96	97			
	60	61	63	64	65	66	67	68	69	71	72	73	74	75	76	77	79	80	81	82	83	84	85	86	88	89	90	91	92	93	94	96	97	98	99			
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	64	65	66	67	68	70	71	72	73	74	75	76	78	79	80	81	82	83	84	86	87	88	89	90	91	92	94	95	96	97	98	99	100	101	103			
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	68	69	70	71	72	73	74	76	77	78	79	80	81	82	84	85	86	87	88	89	90	91	93	94	95	96	97	98	99	101	102	103	104	105	106			
	70	71	72	73	74	75	76	77	79	80	81	82	83	84	85	86	88	89	90	91	92	93	94	96	97	98	99	100	101	102	104	105	106	107	108			

**Table 9.3 Plus 7 hour look up chart (Revision C, January 2013)**

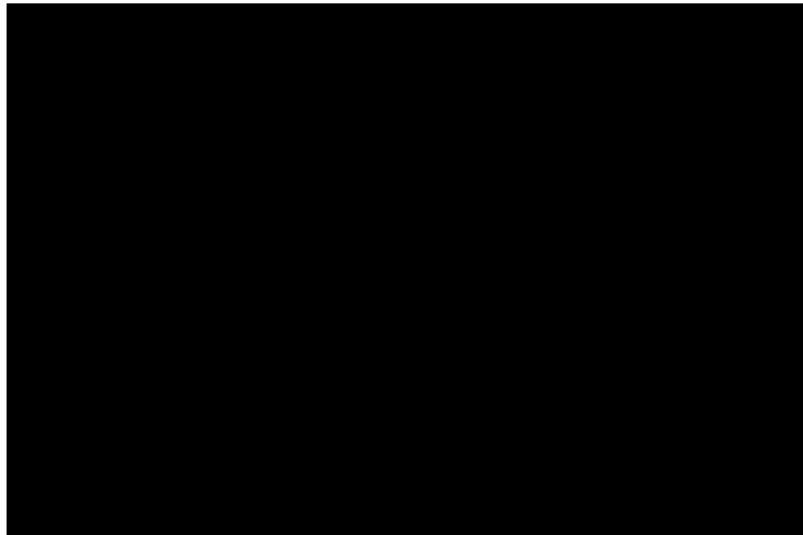
A larger version of this table can also be found in Appendix C of these procedures and in the Leigh Structure Control Room as an A3 laminated sheet.

During a large flood this table may be exceeded. However flows for Colliers and Vexour should still be recorded from SETEL in the monitoring log table. The +7 hour flow column should be left blank.

## 4 – Calculating the Leigh FSA outflow (m³/s)

Should the current Leigh FSA outflow become unavailable on SETEL follow the steps below to calculate the outflow using the Gate Opening Calculator (GOC).

1. Open the Gate Opening Calculator (GOC) tool from your desktop (Figure 9.5) and input the Reservoir Level, D/S level and gate openings to establish the actual outflow at the structure.



**Figure 9.5 The GOC Tool**

2. Record the results in the table in Table 9.2.
3. If your GOC is unavailable at any time, refer the gate opening and outflow chart in appendix O.

A LFSAO operational tools guide can be found in Appendix J.

The gauging station at Lucifier bridge records the flows on the River Medway, Powdermill Stream and from the Haysden Culvert up to 50m<sup>3</sup>/s. This can be used as an indication of the flow through the structure up to 50m<sup>3</sup>/s. **However actual outflow should always be recorded from Leigh SETEL.**

### **5 –Recording NFFS forecast flows**

Use the most recent NFFS forecast to record the NFFS forecast flow at the current time. Remember to check if a new forecast report has been issued by reloading the NFFS page.

### **9.3 MONITORING CONDITIONS AT ENSFIELD ROAD**

When assessing or monitoring the inflows upstream of the Leigh Flood Storage Area it is important to consider the impact to Ensfield Road and where possible pre-determine the requirement to deploy the Medway Operations Field Team to inspect and/or close the road due to flooding.

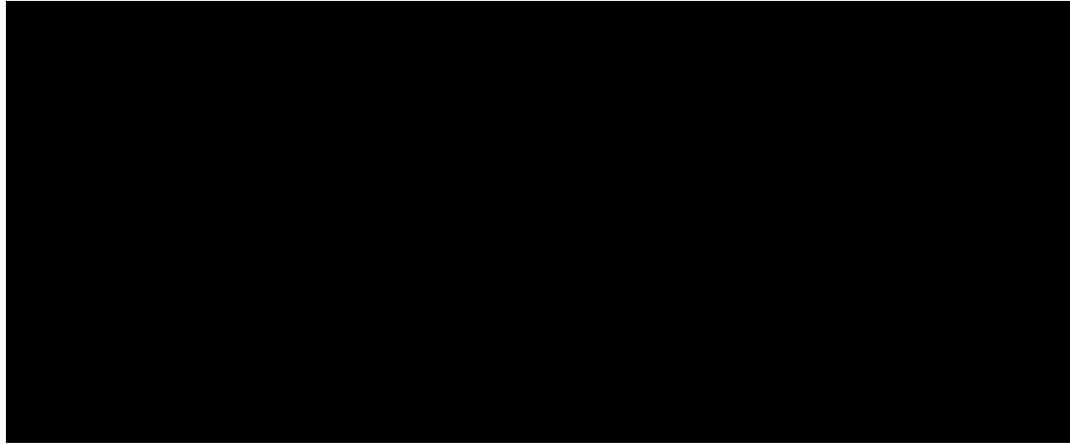
Ensfield Road is at risk of starting to flood under two circumstances:

- During Leigh Flood storage area impounding when the upstream level is between 24.6m AOD and 24.8m AOD.

## Leigh Flood Storage Area Operational Procedures

- During fluvial flooding (i.e. overwhelming flow) when the combined flows figures at Colliers Land and Vexour are between [REDACTED]  
[REDACTED]  
[REDACTED] In this circumstance there is a 6-7 hour lead time before these critical flows reach Ensfield Road.

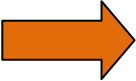
The following table helps to identify the conditions under which Ensfield Road is at risk of flooding. It should be used by LFSAOs to pre-identify the need for the Medway Operations Field Teams to visually inspect and/or close Ensfield Road.



**Table 9.4      Monitoring Ensfield Road conditions**



The procedure for closing Ensfield Road can be found in Appendix F.

#### 9.4 TRIGGERS FOR OPERATIONAL ACTIVITY AT THE LEIGH CONTROL ROOM

Actual outflow Trigger	Action	Associated Comments
20m <sup>3</sup> /s	Notify the Medway Navigation Duty Officer [REDACTED] that 20m <sup>3</sup> /s is being discharged at the Leigh Flood Storage Area.	The Medway Navigation Duty Officers put warning signs on the locks to notify users of fast flows.
35-40 m <sup>3</sup> /s	<p>At 35 m<sup>3</sup>/s the following SETEL alarm will trigger for information:</p> <p>ACT CON OPS Leigh FSA outflow has reached 35m<sup>3</sup>/s</p> <p>Contact the FWDO South to discuss the need to issue a <b>Flood Alert</b> for The Middle River Medway (Penshurst to East Peckham).</p> <p>If a Flood Alert is issued make contact with [REDACTED] as they are at risk of flooding. They have demountable barriers (cill level = 22.26 mAOD crest level = 23.45 mAOD) which must be erected before outflow from Leigh reaches 50m<sup>3</sup>/s.</p>	<p>FWDO South [REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>Out of hours call [REDACTED] and after the message press 0. This will divert your call to their out of hours facility. Tell the operator that a Flood Alert has been issued; they will pass the message onto the appropriate individual.</p>
	<p>Assess current and forecast conditions to establish whether monitoring can be carried out remotely or from the Leigh Control Room. If flows are going to exceed 50m<sup>3</sup>/s then monitoring should take place from the Leigh Control Room. Speak to the ABC to inform them when monitoring commences from the Leigh Control Room.</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	


	<div data-bbox="305 178 1075 210" data-label="Text"><p>[REDACTED]</p></div> <div data-bbox="305 237 1370 457" data-label="Text"><p>[REDACTED]</p></div>
<div data-bbox="138 1136 224 1167" data-label="Text"><p>50m<sup>3</sup>/s</p></div>	<div data-bbox="305 552 976 653" data-label="Text"><p>If outflow reaches 50m<sup>3</sup>/s and is forecast to increase, attend the Control Room and ensure an operator rota is set up.</p></div> <div data-bbox="305 680 976 856" data-label="Text"><p>If outflows are likely to exceed 80m<sup>3</sup>/s, ensure two operators are on duty per shift for the rising limb. This is to ensure two operators are available to undertake the necessary calculations and review the operational plan during the early stages of the event.</p></div> <div data-bbox="305 945 976 1155" data-label="Text"><p>[REDACTED]</p></div> <div data-bbox="305 1304 777 1335" data-label="Section-Header"><p><b>IMPOUNDING BEGINS AT 24.7m AOD</b></p></div> <div data-bbox="305 1365 976 1505" data-label="Text"><p>Ensure gate movements are made to avoid impounding early. When the upstream reservoir level is &lt;24.7m AOD the River Medway is flowing within its banks and the storage area is empty.</p></div> <div data-bbox="305 1533 976 1810" data-label="Text"><p>[REDACTED]</p></div>

# Leigh Flood Storage Area Operational Procedures

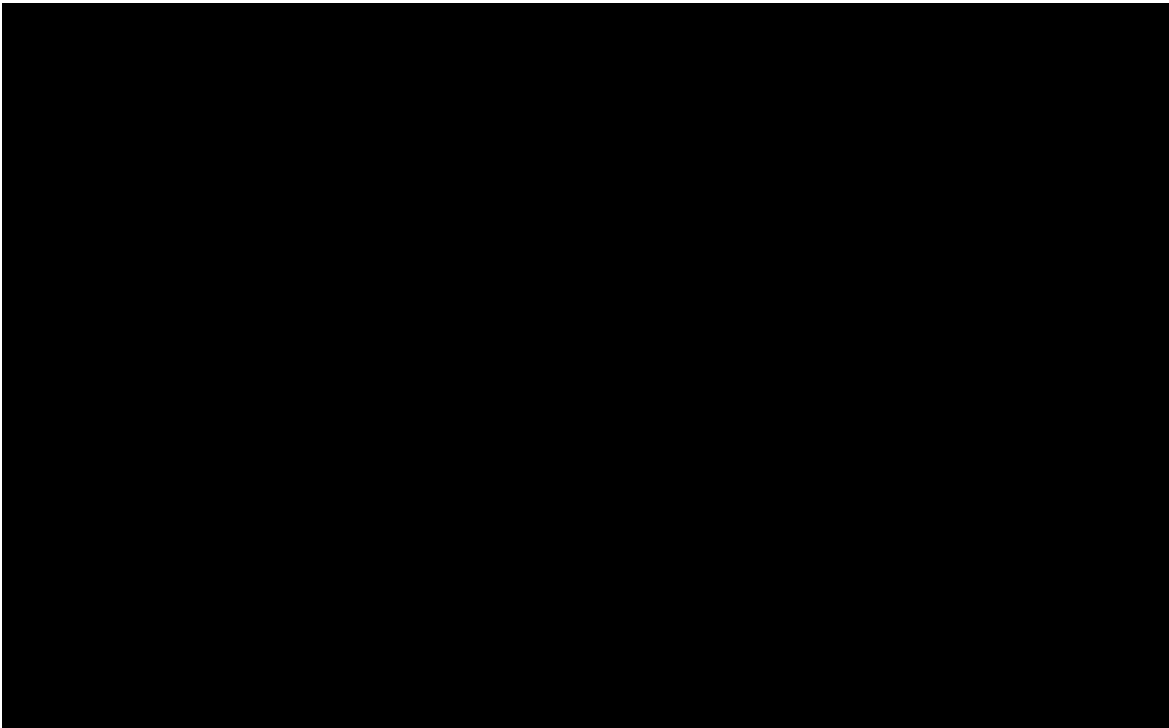
	<p>Consider issuing a <b>Preliminary Impounding Warning</b> based on catchment conditions and discussion with the NWK FIDO, FWDO South and KSL MFDO. The instructions for issuing can be found in Appendix F. This can include information based on forecast rainfall at this stage and can be issued before 50m<sup>3</sup>/s outflow if you have high confidence that you will be impounding .</p> <p><b>Contact H&amp;T</b> to deploy the arc boat to undertake spot gaugings at Lucifer Bridge gauging station and downstream of Leigh for outflows above 50m<sup>3</sup>/s.</p>	<p>NWK FIDO [REDACTED]</p> <p>FWDO South [REDACTED]</p> <p>KSL MFDO [REDACTED]</p>
	<b>50 m<sup>3</sup>/s FLOOD ALERT IN FORCE</b>	
	<p>When the u/s level reaches <b>24.5m AOD</b> speak to the NWK FIDO to get the Medway Operations Field Team to check the condition of [REDACTED] as this can start to flood before impounding. (See part 4.3 and Appendix F for more detail). Try to arrange this during daylight hours. The code for the padlock on the Ensfield Road gates to provide to the Fire Brigade [REDACTED]</p> <p>If the observations from the Operations Field Team are that Ensfield Road needs to be closed activate the <b>Radio Closure Announcement</b> using the procedure in Appendix F.</p>	<p>NWK FIDO [REDACTED]</p>
<b>55m<sup>3</sup>/s +</b>	<p>Contact the KSL MFDO and request that the Medway Flood Forecasting Model is run again as per the instructions in section 3.</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	<p>KSL MFDO [REDACTED]</p>



## Leigh Flood Storage Area Operational Procedures

<b>65m<sup>3</sup>/s +</b>	<p>Liaise with the NWK FIDO to arrange for the Medway Operations Field Team to visit Tonbridge, East Peckham and Yalding.</p> <p><b>Liaise with the FWDO South on the potential for issuing Flood Warnings.</b> The lowest trigger level is for East Peckham where the flood warning for the River Medway is issued at an outflow of 80m<sup>3</sup>/s from Leigh (see section 5 for more detail).</p>	<p>NK FIDO [REDACTED]</p> <p>FWDO South [REDACTED]</p>
<b>70m<sup>3</sup>/s</b>	<p>At 70 m<sup>3</sup>/s the following SETEL alarm will trigger for information:</p> <p>ACT CON OPS Leigh FSA outflow has reached 70m<sup>3</sup>/s.</p> <p>Issue the <b>Impounding Warning</b> and consider impounding, dependent upon catchment conditions and forecast information. Discuss with NK FIDO, FWDO South, KSL MFDO and ABC. The instructions for issuing can be found in Appendix G. During large events the flow may increase rapidly from 70-75m<sup>3</sup>/s. If you are confident you will impound you can issue this warning before 70m<sup>3</sup>/s. If possible try to issue this warning during daylight hours to make it useful for the upstream landowners.</p>	<p>NK FIDO [REDACTED]</p> <p>FWDO South [REDACTED]</p> <p>KSL MFDO [REDACTED]</p> <p>ABC [REDACTED]</p>
	<p><b>Following the decision to impound:</b></p> <ul style="list-style-type: none"> <li>• Inform ABC and request that the HELP report or Sitrep is updated</li> <li>• Inform the NWK FIDO, Area Duty Manager (ADM), FWDO South.</li> <li>• During office hours notify [REDACTED] (Engineer) and Peter Howe (Medway &amp; North Kent APT). Notify the Supervising Engineer [REDACTED]</li> </ul>	

[REDACTED]



**Figure 9.6** How to switch a gate to manual control. For each gate select 'enable control' followed by 'gate to man' and then click 'yes' to the command prompt.

#### **9.5 POST EVENT - WHEN TO CEASE MONITORING (NON IMPOUNDING EVENT)**

**NOTE:** When considering ceasing to monitor at Leigh FSA the rainfall forecast must be taken into account. Check also that the peaks have both passed through at Colliers Land and Vexour.

Once monitoring has ceased the upstream water level will need to be monitored to ensure that it does not go above the indicator for impounding [REDACTED]

**Non Impounding Event** - Following a non-impounding event, once flows at Colliers and Vexour have peaked you can reduce the monitoring frequency until the peak flows have passed through Leigh.

The structure should be taken out of Manual and returned to Automatic when the upstream level is between [REDACTED] and [REDACTED].

## 9.6 POST EVENT – AFTER CEASING MONITORING

After the weather event has passed and formal/continuous monitoring has ceased it is the responsibility of the closing LFSAO to carry out the following tasks:

1. Ensure all data recorded is saved in the following location: at [REDACTED]  
[REDACTED] in the relevant folder.
2. Push the LFSAO BT One Number back to their mobile number.
3. **REMEMBER:** It is important throughout this procedure to discuss likely scenarios as well as forecast and model confidence with the KSL MFDO. The FWDO South should also be involved in these discussions.

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## 10 LEIGH FLOOD STORAGE AREA IMPOUNDING PROCEDURE

**REMEMBER:** It is important throughout this procedure to discuss likely scenarios as well as forecast and model confidence with the KSL MFDO. The FWDO South should also be involved in these discussions. The ABC and ADM must be kept informed throughout.

The following steps must be followed to commence impounding.

### 10.1 CLOSING THE POWDERMILL PENSTOCK

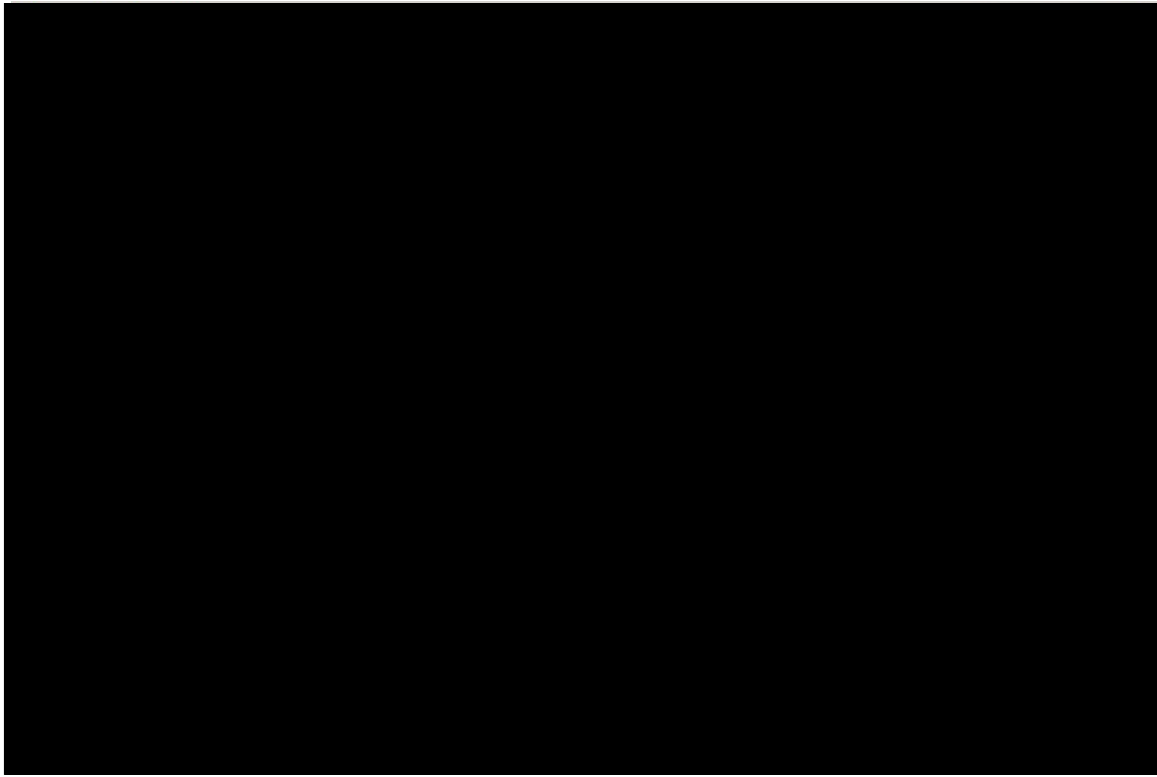


Figure 10.1



Figure 10.2

4. The Powder Mill screen will open (Figure 10.3)



**Figure 10.3**



**Figure 10.4**

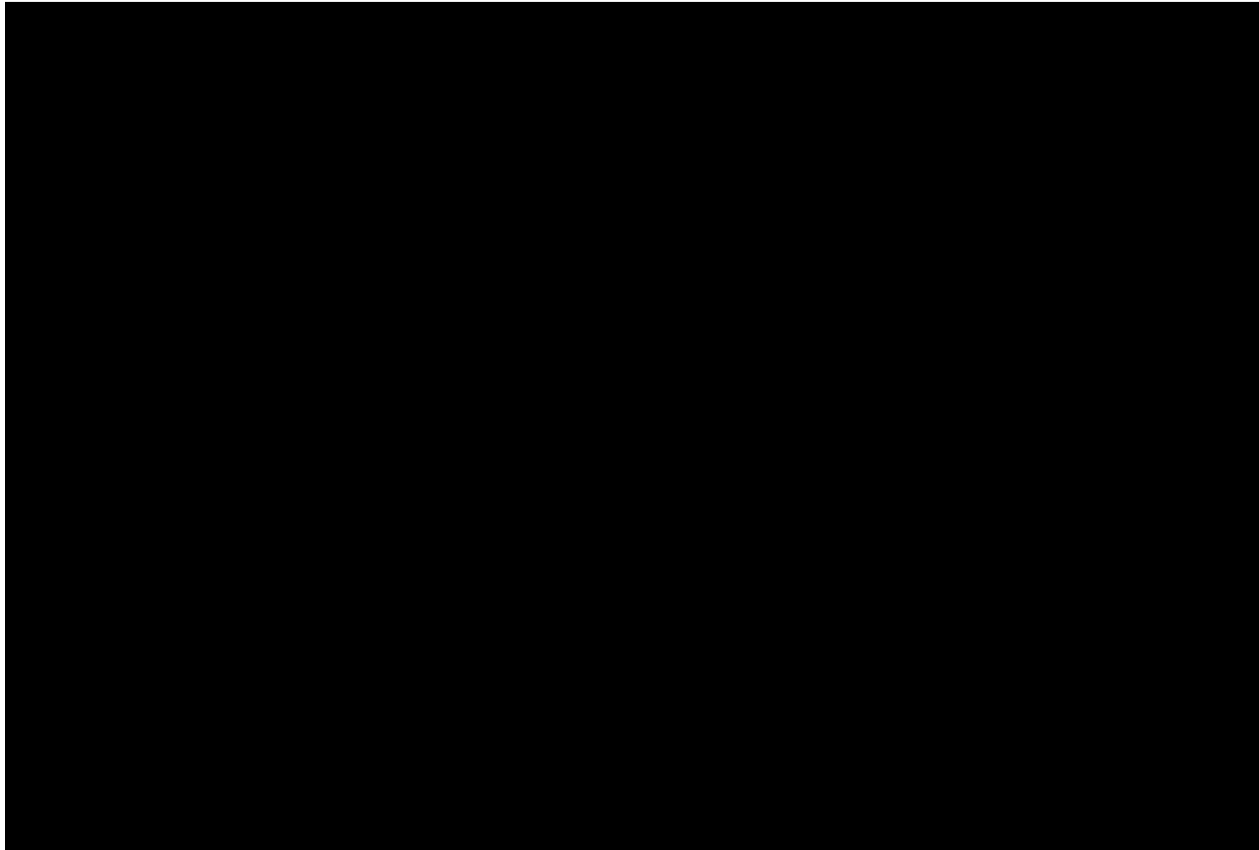
[REDACTED]

[REDACTED]

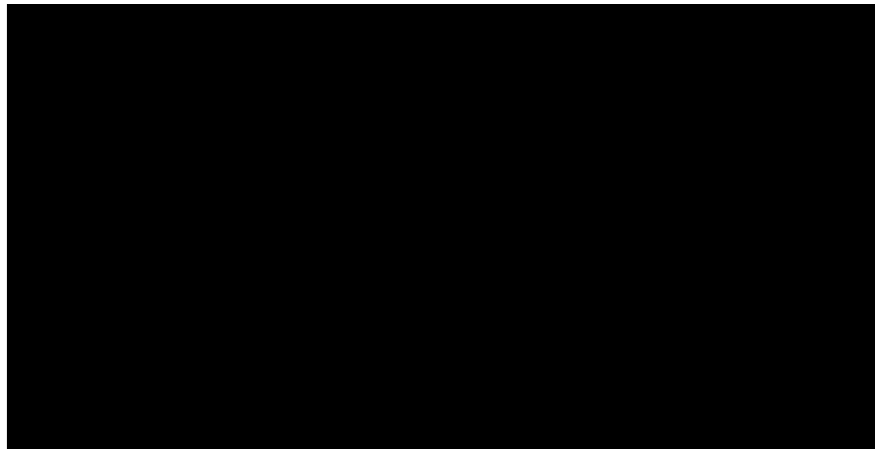
[REDACTED]

[REDACTED]

[REDACTED]



**Figure 10.5**



**Figure 10.6**



## 10.2 CLOSING THE CENTRE GATE

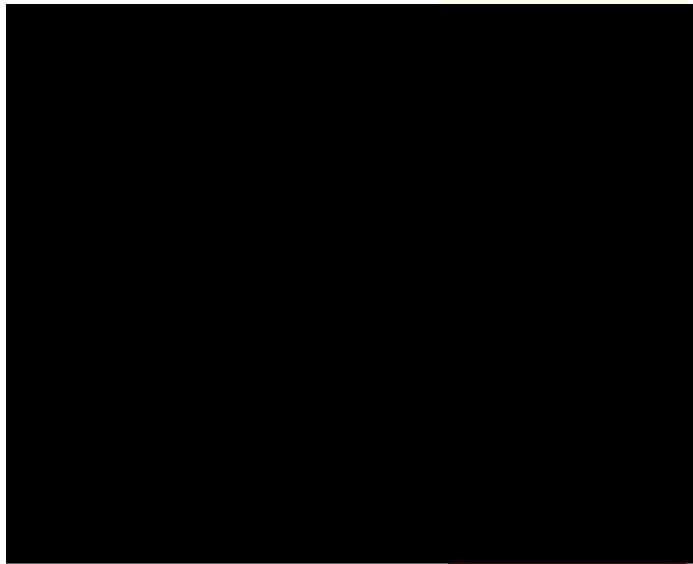


Figure 10.7



Figure 10.8

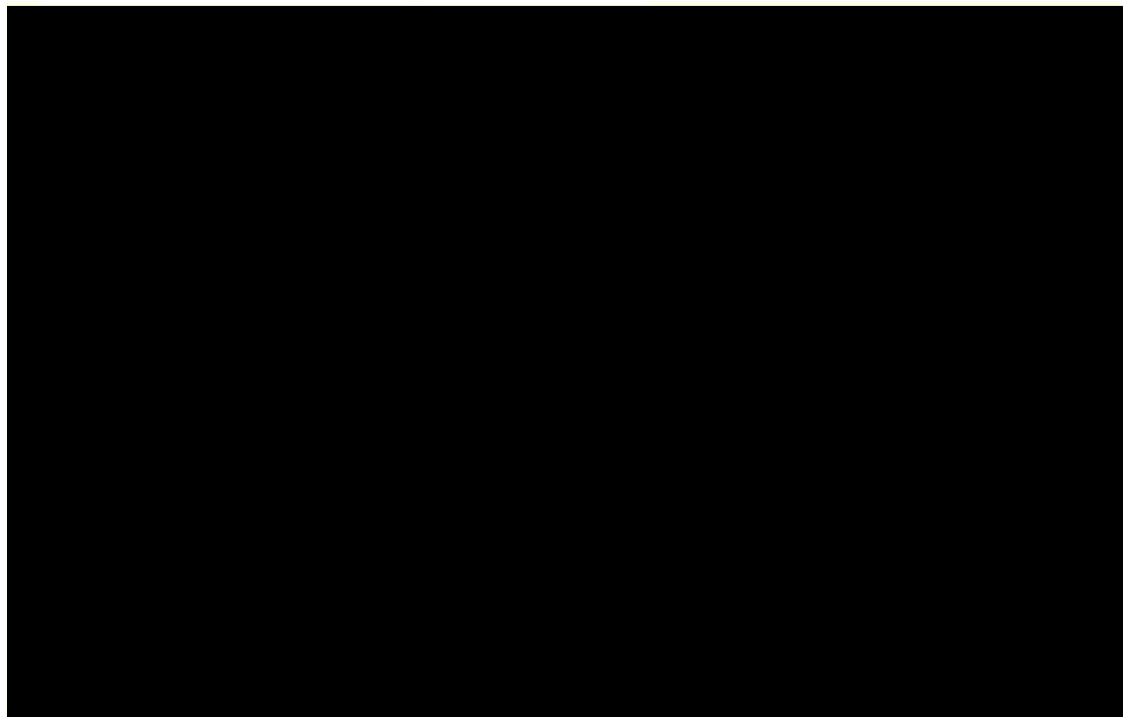




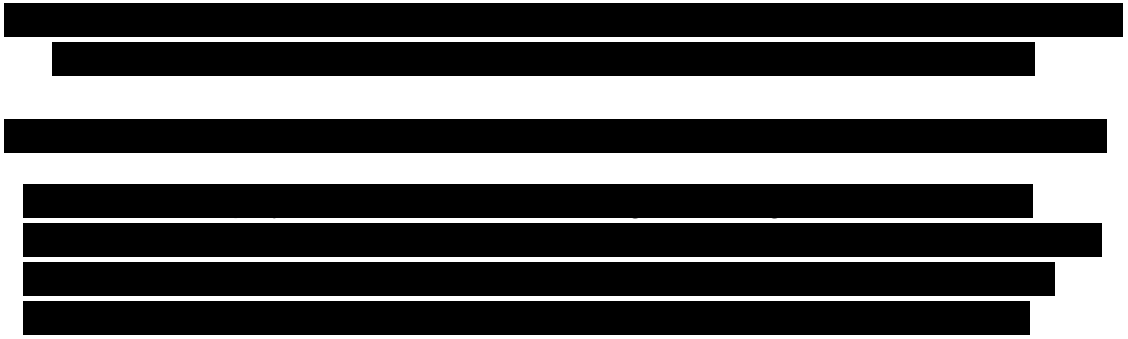
**Figure 10.9**



2.



**Figure 10.10**



### 10.3 MANAGING THE OUTFLOW



Use the RBS to work out the target flow. This should be 75m<sup>3</sup>/s (+/-5 m<sup>3</sup>/s) if you are operating under the fixed flow operating regime.

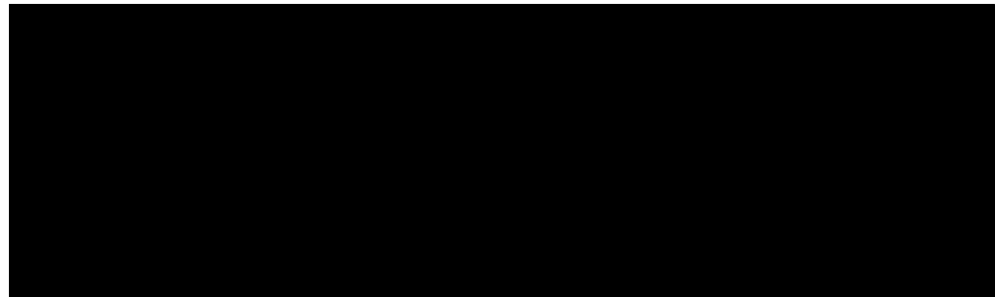
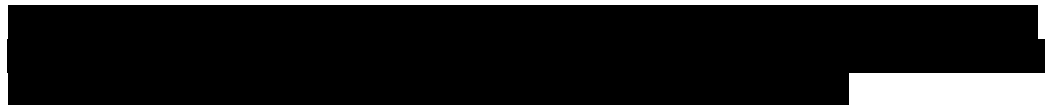
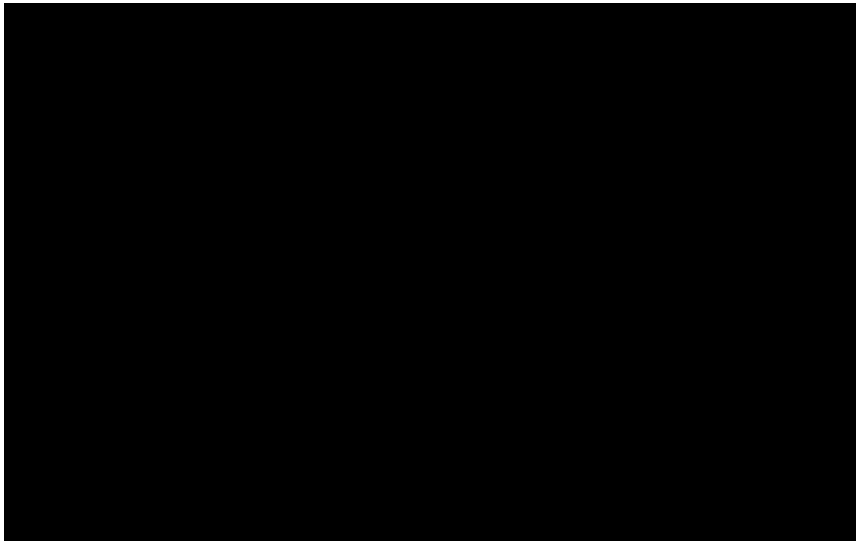


Figure 10.11





**Figure 10.12**

2. Move the North and South gates to the required positions. This can be done using the steps set out in 10.2 of these procedures by enabling the required gate.
3. Go to the Leigh Flood Storage Area Overview page on SETEL to find the latest Leigh FSA outflow in  $\text{m}^3/\text{s}$  (see Section 9 Figures 9.2 and 9.3 for print screens). Input this value into the 'Manual Outflow' column in the RBS (Figure 10.11).

This will enable you to confirm if the actual outflow is within  $\pm 5 \text{ m}^3/\text{s}$  of the outflow set in the RBS ( $75 \text{ m}^3/\text{s}$  if following the 'fixed flow' operating regime). If the actual outflow is significantly outside of these limits, an additional gate movement may be required to bring the actual outflow back in line with the default.

4. **Every 15 minutes** record the Upstream Reservoir Level in the RBS and the actual Outflow in Manual Outflow column. If a reading is not completed on time use the 'historic list' function on the Leigh FSA Overview page to ensure the correct value is entered. Monitor the calculated inflow and rate of reservoir rise. If the RBS becomes unavailable at any time reservoir rate of rise can be calculated using the equation found in Appendix O.

Reservoir rate of rise can be used as an indicator to identify the scale of the flood and identify inflows into the reservoir as shown in table 10.1 overpage.

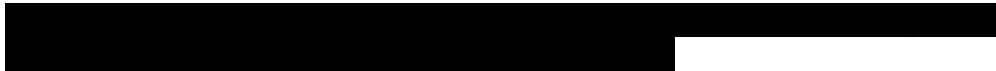


**Table 10.1 Net reservoir inflow as a function of the reservoir level and rate of rise**



Table 1 - Leigh FSA Monitoring														
Operator(s):														
Date	Time	Flow at Colliers (m³/s)	Flow at Vexour (m³/s)	Predicted Inflow using table	+ 7 Hours	Gate Opening (m)			Leigh Upstream Level (m AOD)	Leigh FSA GOC Outflow (m³/s)	Leigh Downstream Level (m AOD)	Lucifer Bridge Flow (m³/s)	Optional	
						N	C	S					Forecast Outflow (m3/s)	Time of NFFS Forecast
01/01/2015	00:00	0.00	0.00	0	07:00	0.000	0.000	0.000	24.100	0	24.000	24.0	0	01/01/2015 @ 00:00
	00:30				07:30									

**Figure 10.13**



#### 10.4 OBSERVATIONS DOWNSTREAM OF LEIGH FSA

[Redacted text block]

[Redacted text block]

Table 10.2 Downstream flood impact thresholds

Actual Outflow	Locations that need to be observed for flood impacts
50m <sup>3</sup> /s	<b>Tonbridge sports fields</b> start to flood. These fields act as floodplain storage and can store 1-2million m <sup>3</sup> of flood water. Once full they do not easily drain and so in subsequent events the downstream conditions may change at lower outflows.
65m <sup>3</sup> /s	<b>Tonbridge sports field, Blossom Bank (Cannon Lane) site not properties</b> , Tonbridge tributaries including <b>Hildenbrook and Hawden Stream</b> .
80m <sup>3</sup> /s	<i>River Medway flood warning threshold for East Peckham.</i> All sites listed above plus <b>East Peckham and Yalding</b>
100-120m <sup>3</sup> /s	<i>Flood warning threshold for Tonbridge and Hildenborough</i> All sites listed above plus <b>Tonbridge town centre and Hildenborough</b>
140-150 cumecs	<i>River Medway flood warning threshold for Paddock Wood and Laddingford and severe flood warning threshold for Tonbridge</i> All sites listed above and <b>Paddock Wood</b> (south of railway) and <b>Laddingford</b> .

**10.5 OPERATIONAL REVIEW TRIGGER LEVELS**

Whilst impounding the LFSAO should undertake a review of the operational plan at each of the reservoir level triggers identified below.

**Table 10.3 Operational Review Trigger Levels**

Upstream Level Trigger	Reservoir Capacity	LFSAO Action
<b>26.00m AOD</b>	25% capacity used	Review conditions to see if the outflow of 75m <sup>3</sup> /s can be maintained for the entire event.
<b>26.75m AOD</b>	50% capacity used	Assess the scale of forecast flood to see if the outflow can be kept below 75 - 80m <sup>3</sup> /s to avoid flooding problems at East Peckham.  If likely to reach 27.7m AOD discuss issuing the flood warning for the River Medway (Penshurst to Leigh FSA) with the South FWDO.
<b>27.25m AOD</b>	67% capacity used	Review likelihood of reservoir filling based on all available information. If so revisit operating plan.
<b>27.7m AOD</b>	85% capacity used	Review the operating plan.  Contact the Supervising Engineer to let them know that the storage area is at 85% capacity. <b>Consider:</b> <ul style="list-style-type: none"> <li>Can the outflow be maintained at 75 - 80m<sup>3</sup>/s to avoid flooding the lower parts of Tonbridge (e.g. if the forecast shows that the inflow has already peaked) or will outflow need to be increased to reduce the risk of overtopping?</li> <li>Check with the FWDO South that the flood warning for the River Medway (Penshurst to Leigh FSA) has been issued.</li> </ul>
<b>28.05m AOD</b>	100% capacity used	<b>THIS IS OUR LEGAL MAXIMUM IMPOUNDING LEVEL - DO NOT ALLOW THE RESERVOIR LEVEL TO INCREASE</b>  Ensure that the outflow matches the inflow so that no further rise in reservoir level occurs.
<b>29.15m AOD</b>	Overtopping occurs	<b>DO NOT ALLOW THE RESERVOIR TO OVERTOP</b>  If this cannot be avoided make sure the Supervising Engineer has contacted the Inspecting Engineer.

**REMEMBER: At each trigger level identified above the following process must be followed.**

- 1 – Speak to the KSL MFDO and request that the Medway Flood Forecasting Model is run. Request a csv file of predicted inflows for the event. Make sure to ask for flows at the Medway/Eden confluence. Consider an appropriate timeframe that you require the data for (24 hours – 5 days). Speak to the KSL MFDO about their confidence in the model performance.
- 2 – Run the RBS as per steps 2-4 in Section 8.2 of the Forecasting and Operational Planning Procedure.
- 3 – Review the conditions in Tonbridge, East Peckham and Yalding. Speak to the NK FIDO/downstream inspectors for an update on the Tonbridge town streams.
- 4 – Carry out a formal review of the operational plan, in particular whether to continue with the current operational plan. If you are following a fixed outflow operational plan you should consider if a variable operating plan could maximize flood risk management benefits. Before moving from a fixed outflow operating plan to a varied outflow operating plan the LFSAO must consult with the duty ABC, NWK FIDO, South FWDO and MFDO.

## **10.6 INSPECTIONS DURING IMPOUNDING**

A visual inspection of the LFSA embankments and structure must be carried out twice a day during daylight hours. The inspections are initiated by the LFSAO and must be carried out by a competent person – a list of competent people can be found in Appendix M. The LFSAO should contact the ABC to facilitate a rota for people to undertake the visual walkover inspections.

An inspection guide, checklist, risk assessments and a sign out/in sheet can also be found in the event data template or in Appendix M. Prepared copies of the printed inspection pack to give to the inspectors which includes the checklist can be found on the cupboard in the Leigh FSA control room.

Any observations made during impounding inspections must be reported to the Supervising Engineer and ABC.

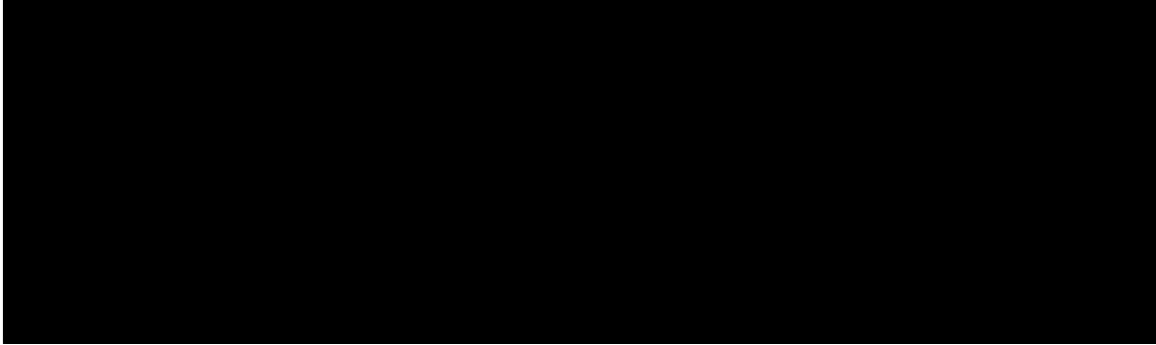
Ask the inspectors to manually record the upstream reservoir level on the gauge board located on the pier of the centre gate.

## **10.7 LEIGH PUMPING STATION**

Leigh pumping station ensures that surface water from Leigh village is collected and pumped over the Leigh embankments and into the storage area. The pumps operate whilst impounding is underway. It has the following SETEL alarms: site power fail, pump 1 and 2 overload. There is also an act con ops alarm for the water level (set to the ground level at the base of the embankments) and act ops alarms for the just below the top of the embankment. Whilst impounding check that the pumps are operational on SETEL for looking up Leigh PS using the search icon and reviewing the water levels.

### **10.8 CALCULATING RESERVOIR CAPACITY**

To identify how full the reservoir is as a percentage enter the current reservoir level and outflow into the Gate Opening Calculator (GOC). The percentage full will then appear as per the red box below.





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## **11 LEIGH FLOOD STORAGE AREA RESERVOIR DRAWDOWN PROCEDURE**

### **11.1 CALCULATING DRAWDOWN TIME**

It is likely the ABC/ADM and our partners will want to know how long we will be impounding for and how long it will take to empty the reservoir.

To calculate impounding time, this can initially be identified from the forecasting mode of the RBS (selecting the fixed flow of variable flow tab as appropriate) and reviewing the time the reservoir level initially rises past 24.7m AOD, until the time it falls back to 24.7m AOD.

To calculate reservoir drawdown rates once the flows coming into the reservoir start to fall, calculate the average rate of fall in the reservoir level (preferably over the last hour). Using this average rate of fall you can then calculate how many hours it will take to go from the current reservoir level to 24.7m AOD i.e. when the River Medway is back in bank.

Following a flood the LFSAO should consider downstream conditions when determining how to drawdown the reservoir. There may be silt and debris in the channel downstream which could impact on flow conditions in Tonbridge.

### **11.2 REOPENING ENSFIELD ROAD & OPENING POWDERMILL PENSTOCK**

Contact the NWK FIDO [REDACTED] to arrange for the field team to inspect and reopen Ensfield Road once the upstream reservoir level has gone back below 24.7m AOD and the River Medway is back in bank. Remember to contact BBC Radio Kent (see Appendix F) to inform them to remove the road closure message.

Reopen the Powdermill Penstock to 12-14%. Use the guidance in section 10.1 for how to operate in SETEL, or Appendix H for manual operation.

### **11.3 POST EVENT - WHEN TO CEASE MONITORING (IMPOUNDING EVENT)**

**NOTE:** When considering ceasing to monitor at Leigh FSA the rainfall forecast must be taken into account. Check also that the peaks have both passed through at Colliers Land and Vexour.

Once monitoring has ceased the upstream water level will need to be monitored to ensure that it does not go above the indicator for impounding (u/s level value 24.7m AOD) or fall below L1 (value 24.0m AOD).

## Leigh Flood Storage Area Operational Procedures

Following an Impounding event, monitoring can be reduced when the upstream level has fallen below 24.7m AOD.

The Structure should be taken out of Manual and returned to Automatic when the upstream level is between 24.2m AOD and 24.1m AOD.

### **11.4 POST EVENT – AFTER CEASING MONITORING**

After the weather event has passed and formal/continuous monitoring has ceased it is the responsibility of the closing LFSAO to carry out the following tasks:

1. Ensure all data recorded is saved in the following location: at

[REDACTED]  
[REDACTED]

The file naming convention is **YYYYMMDD** – where this date reflects the date monitoring ceased.

2. Push the LFSAO BT One Number back to your mobile phone number.

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## 12 GATE COMMISSIONING AND SUPERVISING ENGINEER VISITS

The appointed Reservoir Engineer requires the Leigh Flood Storage Area gates to be lifted once a year through their full travel. Also following any necessary maintenance or repair work to the gates, they must be tested to ensure smooth operation. Before this can be undertaken the pen level upstream of Leigh FSA will need to be lowered.

This procedure documents the various considerations that need to be made before, during and after operation of the gates during commissioning and Supervising Engineer (SE) visits.

### 12.1 HEALTH AND SAFETY, ENVIRONMENTAL AND AMENITY CONSIDERATIONS:

There is a historic agreement in place between the EA (and its predecessors) to maintain the flow through the Powder Mills Industrial site, unless we are impounding.

There is fish stock both upstream and downstream of the Leigh FSA in the River Medway. If there was a sudden drop in level the following impacts could occur:

- Fish could pass through the structure into the downstream pen – this would mean that the downstream ecology could become overstocked causing fish distress and reducing stock upstream.
- Sediment may be stirred up causing a reduction in dissolved oxygen (DO) levels.
- Bacteria may be disturbed causing a reduction in dissolved oxygen (DO) levels.
- Water levels in the Haysden Lake and adjoining streams may be affected.
- Disruption to anglers both up and downstream.
- Existing habitat for wildlife such as water voles and nesting birds may be affected.

The river is navigable on the River Medway downstream of Lucifer Bridge (for motorized craft), between May and October. A change in flow / levels could result in:

- Moored boats to overturn causing significant damage to their structural integrity.
- Increased flows downstream endangering non-powered craft users.
- Loss of pen causing boats to strike unseen submerged objects or run aground.

## **12.2 TESTING PROCEDURE**

***This procedure has been produced taking into account the risks mentioned.***

### **12.2.1 PRE TESTING ACTIVITIES**

Before any work commences, the Medway and North Kent Asset Performance Team (APT) must inform the Medway Operations Field Team Leader and the Medway Navigation Team Leader at least seven days before.

When the Reservoir Engineer requests the gates to be lifted for the annual test, the Medway Operations Field Team Leader should be informed with at least seven days notice.

The Medway and North Kent APT are responsible for ensuring that the duty LFSAO is informed when they will be required to lower the upstream pen and undertake gate movements. They will provide the duty LFSAO with details of timings and duration of the proposed work.

The LFSAO will need to contact upstream landowners in advance of lowering the pen to inform them about the work and how long the pen will be lowered for. The contacts can be found in Appendices folder on the N drive Procedure Live folder.

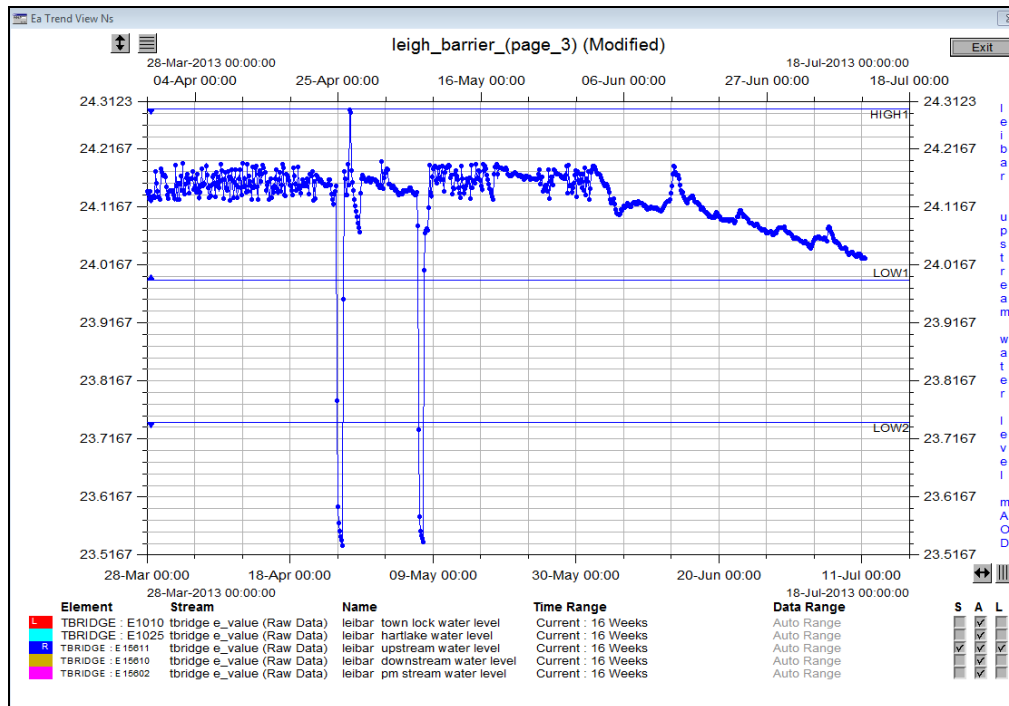
The Leigh FSAO will review the weather forecast in advance of any planned maintenance works or gate testing procedure being carried out. They will then advise the North Kent APT if the forecast suggests that the works may need to be cancelled.

### **12.2.2 LOWERING THE PEN**

In order to lower the pen the upstream level will need to be lowered to approximately 23.55mAOD. These figures were taken from two occasions during 2013 when the pen was lowered.

The print screen in Figure 12.1 shows the upstream level dropping to approximately 23.55mAOD when the pen was lowered for a reservoir inspection and emergency lift procedure during April and May 2013. This was the point at which the north and south gates were clear of the water.

## Leigh Flood Storage Area Operational Procedures



**Figure 12.1 The upstream level showing the pen lowered twice in 2013**

The Fisheries and Biodiversity Team will be available to advise / monitor during the testing period, including during any preparation period prior to testing (such as lowering water levels).

To commence pen lowering the structure will be set to manual operation by the Leigh FSAO. The upstream pen will be lowered by undertaking initial gate movements of no more than **300mm/hour**, so that by the next day no or little flow will be passing over the outer gate sills and the outer gates are clear of the water. The LFSAO should monitor the downstream level and level at Tonbridge Town Lock (taking into account the travel time from Leigh FSAO of approximately 1 hour), whilst undertaking this activity.

**Note:** Prior to lowering the pen you should contact the Duty Navigation Officer on [REDACTED]. If flows are likely to exceed 20m<sup>3</sup>/s you will need to let them know so that the strong current signs can be put out.

### 12.1.3 GATE TESTING

Gate testing will then take place in accordance with the method statements and risk assessments agreed by the Medway and North Kent APT. The Leigh FSAO should undertake the required gate movements from the structure. As soon as testing is completed the LFSAO will lower the outer gates, leaving one gate open 100mm, to allow a sweetening flow downstream. This opening can be reduced if flows are low and the upstream level does not start to rise. Additional flow to the River Medway will pass through Haysden Culvert and the Powdermill Stream. When the upstream level reaches 24.1m AOD, the LFSAO should put the structure back into automatic mode. The LFSAO should check Leigh SETEL functionality for all gates after putting the structure back into automatic mode.

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### 13 MECHANICAL RISK

The potential mechanisms where mechanical failure of Leigh FSA could occur and the contingencies in place to manage these risks are outlined below. Should the LFSAO receive an alarm from SETEL indicating a power or mechanical failure, or this is identified whilst undertaking a gate movement the LFSAO will contact the duty MEICA officer.

- [REDACTED]
- [REDACTED]  
[REDACTED]
- [REDACTED]  
[REDACTED]  
[REDACTED]
- [REDACTED]  
[REDACTED]  
[REDACTED]
- [REDACTED]  
[REDACTED]
- [REDACTED]  
[REDACTED]
- [REDACTED]  
[REDACTED]
- [REDACTED]  
[REDACTED]

## Leigh Flood Storage Area Operational Procedures

- [REDACTED]  
[REDACTED]
- [REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]
- [REDACTED]

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## 14 CONTINGENCY ARRANGEMENTS - GATE REPAIRS OR MAINTENANCE

Investigational works may be periodically carried out on the gates, which will mean that the normal operating procedures will have to be deviated from. During times when a gate is temporarily out of action and cannot be used, the procedures set out below should be adhered to.

All Leigh FSAOs should be informed that work is being carried out on the gates, and that these procedures must be followed.

The Medway APT asset owner is responsible for ensuring that a LFSAO is made aware for their standby week for the period that the works are being undertaken and for informing the NWK FIDO.

The timing of the works should be carried out when there is no or very little rain forecast. These procedures should only be used in a **minor flood event** where outflow is between 10- 50m<sup>3</sup>/s.

**For events beyond this outflow you must use the Operating Procedures outlined in section 1-5, operating with the Centre Gate and the remaining operational outer gate.**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

#### **14.1.1 DURING/AFTER RAINFALL**

When the u/s level reaches 24.30m (H1) the Leigh FSAO should start monitoring the rise in u/s level. The operator should take into consideration the weather forecast, for example, how much rain will fall in the next 12 hours.

For further information on the forecast, the operator can contact the Monitoring and Forecasting Duty Officer (MFDO), to gain flows from the Medway Forecasting Model (at the Medway/Eden confluence) if required.

The operator should then input these flows into the default forecast mode in the reservoir balance sheet to determine the predicted outflow. The operator should also monitor the river level trends at Summerford, Colliers Land and Vexour.

Once the operator has a better understanding of the catchment conditions, they should decide whether to open the gates. If the river level is predicted to peak around the upper u/s/ limit of 24.70m and fall again, there will be no need to open the south gate. However, if the levels are predicted to rise further, follow the procedures below for opening the gates.

#### **14.1.2 OPENING THE GATES**

If the upper upstream limit is predicted to rise above 24.70mAOD the Leigh FSAO must follow the following procedure. The procedures vary slightly depending on whether the structure is to be operated in daylight or darkness (due to navigational requirements downstream) as follows:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

#### **14.3.1 DURING/AFTER RAINFALL**

When the upstream level reaches 24.30m (H1) the operator should start monitoring the rise in u/s level. The operator should take into consideration the weather forecast, for example, how much rain will fall in the next 12 hours.

## Leigh Flood Storage Area Operational Procedures

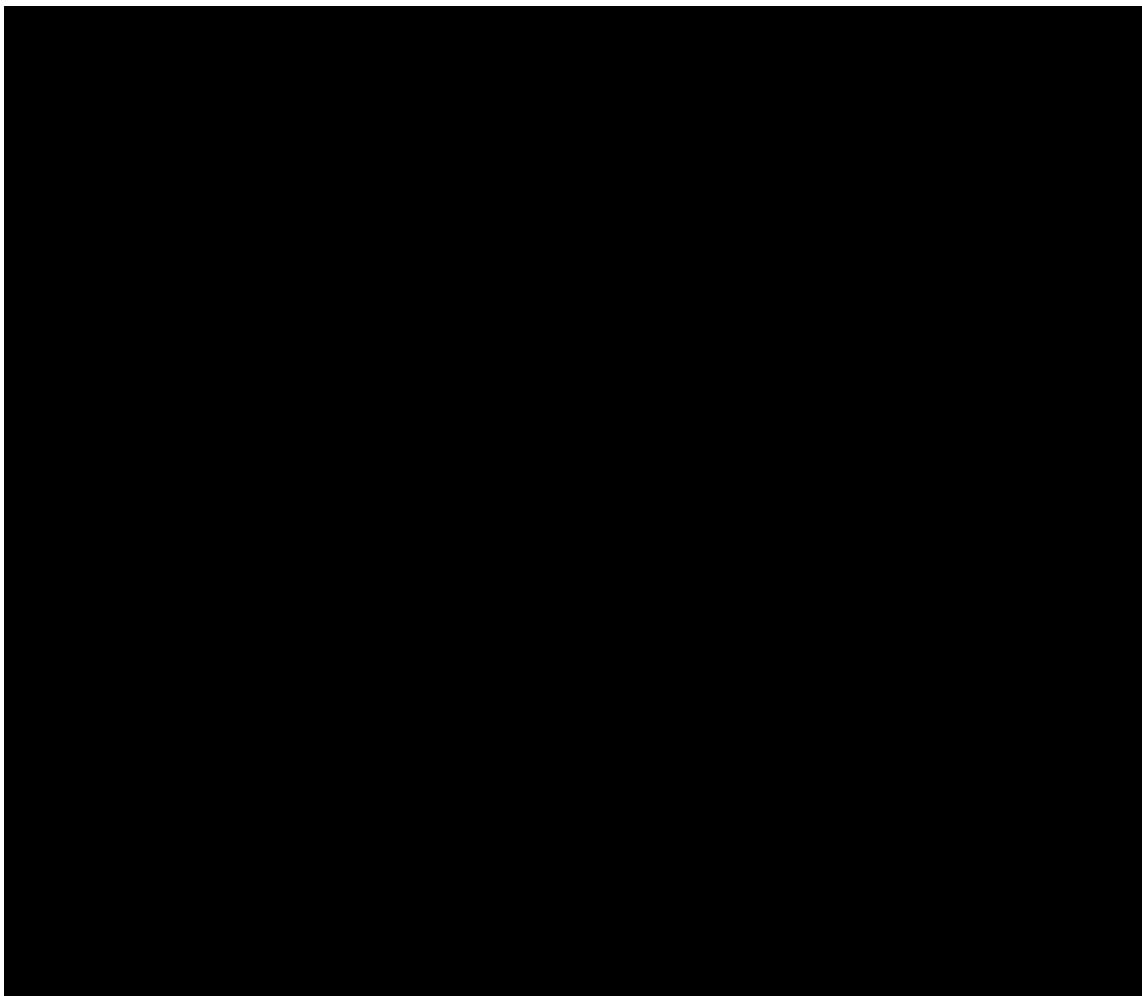
For further information on the forecast, the operator can contact the Monitoring and Forecasting Duty Officer (MFDO), to gain flows from the Medway Forecasting Model (Medway/Eden confluence) if required.

The operator should then input these flows into the default forecast mode in the Reservoir Balance Sheet to determine the predicted outflow. The operator should also monitor the river level trends at Summerford, Colliers Land and Vexour.

Once the operator has a better understanding of the catchment conditions, they should decide whether to open the gates. If the river level is predicted to peak around the upper u/s limit of 24.70m and fall again, there will be no need to open the south gate. However, if the levels are predicted to rise further, follow the procedures below for opening the gates.

### 14.3.2 OPENING THE GATES

If the upper u/s level is predicted to rise above 24.70m, then the operator should follow the following procedure. The procedures vary slightly depending on whether the Structure is to be operating in daylight or darkness (due to navigational requirements d/s) as follows:



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