Flood Gate Control Philosophy

An automatically controlled flood gate shall be installed in the proximity of the site exit at Afan WwTW in order to provide sludge containment in the event of a catastrophic failure of the digesters or associated equipment.

Flood gate suppliers have advised that the maximum number of times the gate should operate, in order to be reliable in their function, is 12 times in a day (6 openings and 6 closings). With DCWW seeing on average between 25 to 30 openings per day, it is not practicable to have the floodgate in the usually closed position at all times.

Due to the nature of the works with Operational attendance and frequent vehicle movements during the daytime. It is proposed that the flood gate is in the usually open/closed position as in the table below

Day	Open Time	Open Hrs	Closed Time	Closed Hrs
Mon	07:00-17:00	10	17:00-07:00	14
Tue	07:00-17:00	10	17:00-07:00	14
Wed	07:00-17:00	10	17:00-07:00	14
Thu	07:00-17:00	10	17:00-07:00	14
Fri	07:00-15:00	8	15:00-07:00	16
Sat	07:00-13:00	6	13:00-07:00	18
Sun	07:00-13:00	6	13:00-07:00	18
		60		108

During normal operation the flood gate will get a signal to close automatically at the times specified in the table above. This will provide a visual warning at the point of the gate 1 minute in advance that the floodgate is about to close. If the gate is required to open in this period under normal operating conditions it will be operated via the key pass system allowing the gate to open then return to closed once passed.

When in the open position, the floodgate shall be automatically controlled in line with the following philosophy:

The two existing digester tanks both have duty and standby pressure transducers as level monitoring devices, these levels will be used to detect a rapid change in digester level. Additionally, DCWW will install an additional laser level device within the containment area to monitor levels outside the digester. These additional sensors will providing triple validation of any digester failure but also detecting any other sludge asset failures.

This will be achieved by modifying the existing control software to monitor each digesters level and the external containment area level using Welsh Water standard program block (Rate of Change) which will detect a fast rate of change within each digester or a rise in the external containment area. Once this condition has been detected the system will immediately send a signal to automatically close the floodgate and provide a visual warning the gate is closing.

It will take approximately 45 seconds for the gate to go from the fully open position to the fully closed position and then a further 15 seconds to create the water-tight seal (based on water). As the floodgates close the sites automatic gates will be inhibited to prevent further vehicle access/egress to site.

At the same time as the signal to activate the closure of the gate a level 6 alarm, which is the highest level for waste water operations will be sent via the site Scada System and through our Prism SmartHub remote monitoring system/team. This will raise the alarm and inform operations personnel both on site and remotely the alarm has been activated.

At this point operations will investigate the cause of the alarm. If a failure has occurred, the operations team will initiate the appropriate emergency response in line with our emergency response manual.

If a false alarm or a minor leakage occurs, operations will carry out the appropriate actions to rectify the situation. Permission will then be obtained from site supervisor or above to reset the system and put the flood gates back into the appropriate position and record this in the site WOF008 log books.

If a more serious failure has occurred operational staff will follow DCWW emergency response plan, as outlined in the permit application, including escalation to bronze, silver or gold management as applicable.

Once appropriate actions/measures have been completed on site (which will vary dependant on volume/impact of spill) to ensure the risk is removed and no harm to the environment can occur the Bronze/silver/gold manager can authorise opening of the gates and the system can be reset.

Each incident will be recorded in site log books WOF007 and where appropriate a SECTION 5 NOTICE ISSUED TO THE NRW, additionally an incident review will be carried out.

As Level 6 alarms these would fall under DCWW Wastewater Unannounced Telemetry Alarm Dynamic Testing PM (3) 15w level 3 procedure. This would mean if the Level 6 alarm has not been activated within a set period it will be reported on and must then be dynamically tested end to end to ensure operation.

The following table provides the potential rate of loss of volumes lost per minute:

Number of minutes since failure	Volume Lost (m3)	Volume lost (%)	Flow rate (m3/s)
1 min	33.6	1%	0.56
2 min	67.3	2%	0.56
3 min	100.7	2%	0.56
4 min	134.1	3%	0.56
5 min	167.2	4%	0.55

Based on the calculation, no sludge would make it to the floodgate thus in the event of failure with the floodgates changing from an open to closed position as per the proposed philosophy would achieve full containment and prevent any loss from the works. As an additional control measure, some ground area post the flood gate will be elevated to create a low level containment area, this will act to retain any potential leakage via the gate in a non-permeable area on site.

The site is fed by a ring main power supply that is able to be fed from either side of the ring main. This would also provide assurance that the alarms and gates would operate as designed in the event of a power failure or outage.