Appendix 8.7

DRAFT LAKE MANAGEMENT PLAN

HILLINGDON WATERSPORTS FACILITY AND ACTIVITY CENTRE

Broadwater Lake SSSI: Lake Management Plan

V1.0 (for Planning)

1. Introduction

This document (Draft Lake Management Plan – LMP) presents the integrated and embedded lake management measures and monitoring that will be implemented for the operation of the proposed Hillingdon Water Sports Facility and Activity Centre (HWSFAC). This draft LMP sets out those measures that will minimise the risk of negative effects to surface and groundwater quality, flood risk and hydro-morphological features of importance associated with Broadwater Lake and other water bodies that are in hydrological continuity with it.

A more detailed final version of this operational LMP will be produced via planning condition and will set out all appropriate measures in detail. A further version of this plan will be produced upon completion of the construction phase of the works, focusing on the long-term management of the lake during the operation of the completed development.

This draft LMP should be read in conjunction with the separate Construction and Environmental Management Plan (CEMP), located in Appendix 6.1 of the Environmental Statement (ES) and the Mitigation and Ecological Management Plan (MEMP) that can be found in Appendix 7.4 and 7.5 of the ES

2. Scope of this Draft LMP

Chapter 8 of the ES identifies the potential operational effects of the Proposed Development on surface and groundwater quality, flood risk and hydro-morphology at Broadwater Lake. This draft LMP responds by setting out the measures that address the following issues.

The operational phase effects from the completed development that could directly or indirectly affect water quality, flood risk and hydro-morphology include:

- Change in site runoff and the risk of increasing flood risk on site and to downstream receptors;
- Changes in the risk of on-site flooding associated with fluvial, surface water and groundwater sources;
- Changes in the risk of water pollution from the operation of the site to surface and groundwaters, including from site surface water drainage and foul waste, and the potential for increasing nutrient contributions to associated water dependent habitats; and
- How the development affects the hydrological and hydrogeological aspects of the natural environment's ability to adapt to climate change.

River Basin Management Plan Objectives

Broadwater Lake, the Mid Chilterns Chalk, the River Colne and the Grand Union Canal are located within the Thames River Basin District. This covers over 16,200km^2 and encompasses all of Greater London, and extends from north Oxfordshire southwards to Surrey and from Gloucester in the west to the Thames Estuary and parts of Kent in the east. The Thames River basin has a rich diversity of wildlife and habitats, supporting many species of global and national importance from chalk streams to salt marshes.

Significant water management issues include:

- Physical modifications;
- Pollution from wastewater;
- Pollution from towns, cities and transport;
- Changes to the natural flow and level of water;
- Negative effects of invasive non-native species
- Pollution from rural areas; and
- Pollution from abandoned mines

Additionally, taking account of climate change is considered a significant water management issue.

Environmental objectives have been set for each of the protected areas and waterbodies in the river basin district. They were identified through a process involving technical and economic appraisals and formal public consultation. Achieving the objectives will optimise the benefits to society from using the water environment.

The environmental objectives are legally binding. All public bodies must have regard to these objectives when making decisions that could affect the quality of the water environment.

These objectives are as follows:

- Drinking Water Protected Areas:
    - under the water treatment regime applied, the drinking water produced meets the standards of the Drinking Water Directive plus any UK requirements to make sure that drinking water is safe to drink.
    - the necessary protection to prevent deterioration in the water quality in the protected area in order to reduce the level of purification treatment required.
- Economically significant species (shellfish waters)
    - Shellfish waters areas requiring protection or improvement to support shellfish life and growth in order to contribute to the high quality of shellfish for people to eat.
- Recreational waters (bathing waters):
    - to preserve, protect and improve the quality of the environment and to protect human health by meeting the ‘sufficient’ water quality standards of the Bathing Waters Directive and to take such realistic and proportionate measures considered appropriate with a view to increasing the number of bathing waters classified as 'excellent' or 'good'.
- Nutrient sensitive areas (nitrate vulnerable zones):
    - reduce water pollution caused by nitrates from agricultural sources and to prevent further such pollution occurring.
- Nutrient sensitive areas (Urban Waste Water Treatment Directive)
    - protect the environment from the adverse effects of waste water discharges.
- Natura 2000 sites: water dependent Special Areas of Conservation or Special Protection Areas:
    - to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of community importance.
- Surface water bodies
    - 596 water bodies have an objective of maintaining or aiming to achieve good ecological status between 2015 and 2027
    - 62 water bodies have already achieved their objective of moderate ecological status (a less stringent objective)
    - 13 water bodies have been set an objective of reaching moderate ecological status (a less stringent objective) by 2027 (an extended deadline)
- Groundwater bodies

    - 39 water bodies have an objective of maintaining or aiming to achieve good quantitative status between 2015 and 2027
    - 36 water bodies have an objective of maintaining or aiming to achieve good chemical status between 2015 and 2027
    - 3 water bodies have already achieved their objective of poor quantitative status (a less stringent objective)

The wider environmental objectives of the RBMPs that are relevant to physical works are:

- to prevent deterioration of the status or potential of surface waters and groundwater.
- to aim to achieve good status for all water bodies (or for heavily modified water bodies and artificial water bodies, good ecological potential) and good surface water chemical status.

Water Framework Directive Receptors and Objectives

The Water Framework Directive (WFD) imposes legal requirements to protect and improve the water environment (including our rivers, coasts, estuaries, lakes, ground waters and canals). Physical works can modify the size and shape of a watercourse, reduce or increase the flow of water, introduce artificial materials or remove sediment and/or vegetation. These can all affect the receptors below:

- physical habitat – the distribution and diversity of habitat including the physical processes that sustain and create new habitat. Physical habitat is essential for fish, macrophytes and invertebrates to live and thrive;
- water quality – particularly physico-chemical aspects of water quality - such as levels of dissolved oxygen, phosphorus and ammonia;
- fish and eels;
- macrophytes - water plants visible to the naked eye, growing in the river;
- invertebrates - insects, worms, molluscs, crustacea etc. living on the river bed;
- diatoms - microscopic diatoms (algae) found on rocks and plants.

The environmental objectives of the WFD are:

- to prevent deterioration of the status of surface waters and groundwater;
- to achieve objectives and standards for protected areas;
- to aim to achieve good status for all water bodies or, for heavily modified water bodies and artificial water bodies, good ecological potential and good surface water chemical status;
- to reverse any significant and sustained upward trends in pollutant concentrations in groundwater;
- the cessation of discharges, emissions and loses of priority hazardous substances into surface waters; and
- progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants.

The WFD Objectives for Broadwater Lake (Environment Agency Catchment Explorer 2019) are shown below.

Objectives

Classification Item	Status	Year	Reasons
Ecological	**Good**	2027 - Low confidence	Disproportionately expensive: Disproportionate burdens
Biological quality elements	**Not assessed**	2015	
Physico-chemical quality elements	**Not assessed**	2015	
Hydromorphological Supporting Elements	**Supports good**	2015	
Hydrological Regime	**Supports good**	2015	
Supporting elements (Surface Water)	**Good**	2027 - Low confidence	Disproportionately expensive: Disproportionate burdens
Expert Judgement	**Good**	2015	
Mitigation Measures Assessment	**Good**	2027 - Low confidence	Disproportionately expensive: Disproportionate burdens
Specific pollutants	**Not assessed**	2015	
Chemical	**Good**	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Priority hazardous substances	**Good**	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Benzo(a)pyrene	**Good**	2015	
Dioxins and dioxin-like compounds	**Good**	2015	
Heptachlor and cis-Heptachlor epoxide	**Good**	2015	
Hexabromocyclododecane (HBCDD)	**Good**	2015	
Hexachlorobenzene	**Good**	2015	
Hexachlorobutadiene	**Good**	2015	
Mercury and Its Compounds	**Good**	2015	
Perfluorooctane sulphonate (PFOS)	**Good**	2039	Technically infeasible: No known technical solution is available
Polybrominated diphenyl ethers (PBDE)	**Good**	2063	Natural conditions: Chemical status recovery time
Priority substances	**Good**	2015	
Fluoranthene	**Good**	2015	
Other Pollutants	**Does not require assessment**	2015	

The WFD Objectives for Mid Chilterns Chalk Water Body (Environment Agency Catchment Explorer 2019) are shown below.

Objectives

Classification Item	Status	Year	Reasons
Overall Water Body	**Poor**	2015	Disproportionately expensive: Disproportionate burdens; Disproportionately expensive: Unfavourable balance of costs and benefits
Quantitative	**Poor**	2015	Disproportionately expensive: Unfavourable balance of costs and benefits
Quantitative Status element	**Poor**	2015	Disproportionately expensive: Unfavourable balance of costs and benefits
Quantitative Dependent Surface Water Body Status	**Poor**	2015	Disproportionately expensive: Unfavourable balance of costs and benefits
Quantitative GWDTEs test	**Good**	2015	
Quantitative Saline Intrusion	**Good**	2015	
Quantitative Water Balance	**Poor**	2015	Disproportionately expensive: Unfavourable balance of costs and benefits
Chemical (GW)	**Good**	2027 - Low confidence	Disproportionately expensive: Disproportionate burdens
Chemical Status element	**Good**	2027 - Low confidence	Disproportionately expensive: Disproportionate burdens
Chemical Dependent Surface Water Body Status	**Good**	2015	
Chemical Drinking Water Protected Area	**Good**	2027 - Low confidence	Disproportionately expensive: Disproportionate burdens
Chemical GWDTEs test	**Good**	2015	
Chemical Saline Intrusion	**Good**	2015	
General Chemical Test	**Good**	2027 - Low confidence	Disproportionately expensive: Disproportionate burdens

The WFD Objectives for Colne (Environment Agency Catchment Explorer 2019) is shown below.

Classification Item	Status	Year	Reasons
Ecological	**Moderate**	2015	Disproportionately expensive: Disproportionate burdens; Technically infeasible: No known technical solution is available
Biological quality elements	**Good**	2021	Disproportionately expensive: Disproportionate burdens
Fish	**Good**	2021	Disproportionately expensive: Disproportionate burdens
Invertebrates	**Good**	2015	
Macrophytes and Phytobenthos Combined	**Good**	2015	
Physico-chemical quality elements	**Moderate**	2015	Technically infeasible: No known technical solution is available
Acid Neutralising Capacity	**Good**	2015	
Ammonia (Phys-Chem)	**Good**	2015	
Dissolved oxygen	**Good**	2015	
Phosphate	**Moderate**	2027	Technically infeasible: No known technical solution is available
Temperature	**Good**	2015	
pH	**Good**	2015	
Hydromorphological Supporting Elements	**Supports good**	2015	
Hydrological Regime	**Does not support good**	2015	Disproportionately expensive: Unfavourable balance of costs and benefits
Supporting elements (Surface Water)	**Good**	2027 - Low confidence	Disproportionately expensive: Disproportionate burdens
Mitigation Measures Assessment	**Good**	2027 - Low confidence	Disproportionately expensive: Disproportionate burdens
Specific pollutants	**High**	2015	
Arsenic	**High**	2015	
Copper	**High**	2015	
Iron	**High**	2015	
Manganese	**High**	2015	
Permethrin	**High**	2015	
Triclosan	**High**	2015	
Zinc	**High**	2015	

Chemical	**Good**	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Priority hazardous substances	**Good**	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Benzo (b) and (k) fluoranthene	**Good**	2015	
Benzo (ghi) perelyene and indeno (123-cd) pyrene	**Good**	2015	
Benzo(a)pyrene	**Good**	2015	
Cadmium and Its Compounds	**Good**	2015	
Dioxins and dioxin-like compounds	**Good**	2015	
Heptachlor and cis-Heptachlor epoxide	**Good**	2015	
Hexabromocyclododecane (HBCDD)	**Good**	2015	
Hexachlorobenzene	**Good**	2015	
Hexachlorobutadiene	**Good**	2015	
Hexachlorocyclohexane	**Good**	2015	
Mercury and Its Compounds	**Good**	2015	
Nonylphenol	**Good**	2015	
Perfluorooctane sulphonate (PFOS)	**Good**	2039	Technically infeasible: No known technical solution is available
Polybrominated diphenyl ethers (PBDE)	**Good**	2063	Natural conditions: Chemical status recovery time
Tributyltin Compounds	**Good**	2015	
Trifluralin (Priority hazardous)	**Good**	2015	
Priority substances	**Good**	2015	
1,2-dichloroethane	**Good**	2015	
Atrazine	**Good**	2015	
Cypermethrin (Priority)	**Good**	2015	
Fluoranthene	**Good**	2015	
Lead and Its Compounds	**Good**	2015	
Nickel and Its Compounds	**Good**	2015	
Pentachlorophenol	**Good**	2015	
Simazine	**Good**	2015	
Trichlorobenzenes	**Good**	2015	
Trichloromethane	**Good**	2015	

The WFD Objectives for Grand Union Canal Maple Lodge to Uxbridge Water Body (Environment Agency Catchment Explorer 2019) is shown below.

Classification Item	Status	Year	Reasons
Ecological	**Moderate**	2015	Disproportionately expensive: Disproportionate burdens; Disproportionately expensive: Unfavourable balance of costs and benefits
Biological quality elements	**Not assessed**	2015	
Physico-chemical quality elements	**Moderate**	2015	Disproportionately expensive: Unfavourable balance of costs and benefits
Acid Neutralising Capacity	**Good**	2015	
Ammonia (Phys-Chem)	**Good**	2015	
Dissolved oxygen	**Good**	2015	
Phosphate	**Poor**	2015	Disproportionately expensive: Unfavourable balance of costs and benefits
Temperature	**Good**	2015	
pH	**Good**	2015	
Hydromorphological Supporting Elements	**Not assessed**	2015	
Supporting elements (Surface Water)	**Good**	2027 - Low confidence	Disproportionately expensive: Disproportionate burdens
Mitigation Measures Assessment	**Good**	2027 - Low confidence	Disproportionately expensive: Disproportionate burdens
Specific pollutants	**High**	2015	
Arsenic	**High**	2015	
Chromium (VI)	**High**	2015	
Copper	**High**	2015	
Iron	**High**	2015	
Zinc	**High**	2015	
Chemical	**Good**	2063	Natural conditions: Chemical status recovery time
Priority hazardous substances	**Good**	2063	Natural conditions: Chemical status recovery time
Benzo(a)pyrene	**Good**	2015	
Cadmium and Its Compounds	**Good**	2015	
Dioxins and dioxin-like compounds	**Good**	2015	
Heptachlor and cis-Heptachlor epoxide	**Good**	2015	
Hexabromocyclododecane (HBCDD)	**Good**	2015	
Hexachlorobenzene	**Good**	2015	
Hexachlorobutadiene	**Good**	2015	
Mercury and Its Compounds	**Good**	2015	
Perfluorooctane sulphonate (PFOS)	**Good**	2015	
Polybrominated diphenyl ethers (PBDE)	**Good**	2063	Natural conditions: Chemical status recovery time
Priority substances	**Good**	2015	
Atrazine	**Good**	2015	
Fluoranthene	**Good**	2015	
Lead and Its Compounds	**Good**	2015	
Nickel and Its Compounds	**Good**	2015	
Simazine	**Good**	2015	
Other Pollutants	**Does not require assessment**	2015	

Embedded Measures To Protect And Improve Ground And Surface Water

This draft LMP sets out the embedded measures that have been introduced to the Proposed Development to protect and improve the surface and groundwater quality and hydro-morphological attributes of the following receptors/important features set out below.

Receptor	Sensitivity (Value)
Existing	
Mid-Chilterns Chalk WFD Groundwater Body	High
Source Protection Zone Type 1 (Inner Catchment)	High
Source Protection Zone Type 2 (Outer Catchment)	High
Tarmac Aggregates Ltd abstraction licences (Gravel Pits A and B)	Medium
Principal Bedrock Aquifer	High
Secondary Superficial Aquifer	High
Affinity Water borehole on site	High
Broadwater Lake WFD Surface Water Body	High
Broadwater Lake SSSI	High
Other Water Dependant Habitat	High
Grand Union Canal	Moderate
Colne (Chess to Confluence with Thames) Water Body	High
Thames River Basin District Management Plan	High
On-site flood sensitive receptors	Low
Off-site flood sensitive receptors	High
Downstream water treatment works and receiving watercourses	Moderate
Future	
Mid-Chilterns Chalk WFD Groundwater Body	High
Source Protection Zone Type 1 (Inner Catchment)	High
Source Protection Zone Type 2 (Outer Catchment)	High
Tarmac Aggregates Ltd abstraction licences (Gravel Pits A and B)	Medium
Principal Bedrock Aquifer	High
Secondary Superficial Aquifer	High
Affinity Water borehole on site	High
Broadwater Lake WFD Surface Water Body	High

Receptor	Sensitivity (Value)
Broadwater Lake SSSI	High
Other Water Dependant Habitat	High
Colne (Chess to Confluence with Thames) Water Body	High
Grand Union Canal	Moderate
Thames River Basin District Management Plan	High
On-site flood sensitive receptors	High
Off-site flood sensitive receptors	High
Downstream water treatment works and receiving watercourses	Moderate

Section 5 of this draft LMP highlights proposed measures to manage Non-Native Invasive Species. Section 6 outlines proposed monitoring measures.

Please refer to the separate MEMP for further actions that support achieving the ecological objectives for the RBMP and the WFD.

3. Measures integrated and embedded into the development proposals

A range of measures associated with water quality, flood risk and hydro-morphological protection and enhancement have been integrated and embedded into the development proposals. These form the basis of the draft LMP and will be defined in detail through consultation and agreement with the Environment Agency, Natural England and London Borough of Hillingdon (including their role as Lead Local Flood Authority).

The following embedded measures as associated with the operational phase of the Proposed Development.

Surface and Groundwater Bodies

1 Implementation in accordance with all legal requirements such as SSSI Assents;

2 Surface runoff from buildings, car parks and all other operational areas (including green infrastructure) will be directed through suitable SuDS features that will include hydrocarbon separators, sediment forebays, and suitable vegetated and permanently wet basins managed to attenuate runoff and maintain the growth of suitable plants that will be inspected and maintained to remove nutrients and other potential contaminants prior to discharge back to Broadwater Lake;

3 The maintainance of a suitably designed/specified impermeable barrier over (e.g., clay) and appropriate overlying clean cover (located where future detailed SI indicates this is required) will prevent percolation of rainwater and surface runoff into underlying areas of regulated and potentially unregulated waste, thereby reducing residual contaminant mobilisation and transport to groundwater and surface water providing the opportunity for water quality betterment;

4 All potential contaminants will be adequately stored and monitored with minimised use and on-site storage of chemicals. All operational staff will be made aware of pollution responsibilities and be adequately trained. Continued monitoring will be used to demonstrate that groundwater is unaffected by the Proposed Development and to provide early warning of potential pollution;

5 All foul waste to be directed to Thames Water sewage system and waste water treatment works for treatment to acceptable and permitted quality standards (including for nutrients) prior to discharge to the receiving watercourse. Implementation in accordance with all legal and permitting requirements; and

6 No surface or groundwater abstraction is required as part of these proposals. Consequently, there is no reduction in groundwater quantity available for recharge from the lake for abstraction due to ongoing discharge of clean surface water runoff to lake. As part of the ongoing maintenance, all surface water drainage features (SuDS) will be maintained and inspected on a frequent and regular basis to prevent sediment entry to the lake and increased turbdity.

Flood Risk

7 The ground level of the extension to the peninsula has been set at a minimum of 37.89 m AOD. This is the peak modelled in-channel water level during a (defended) 1 in 100 AEP event +20% climate change;

8 The finished floor level of all proposed buildings have been set at a minimum of 38.19 m AOD, i.e. 300 mm above the peak modelled in-channel water level during a (defended) 1 in 100 AEP event +20% climate change, and at least 0.15 m above adjacent ground levels following any reprofiling of the site, with ground levels sloping down from the buildings;

9 The buildings have been designed in resilience to flooding up to a minimum level of 38.23 m AOD e.g. raised power sockets, non-return valves on ground floor drainage, in line with government guidance. This is the peak modelled in-channel water level during a (defended) 1 in 1,000 AEP event;

10 Aa Flood Warning and Evacuation Plan is prepared in consultation with Hillingdon Council emergency planning team. The Site is included in an Environment Agency flood alert and warning area. This provides the opportunity for the relevant response procedures set out in the plan to be invoked in response to receipt of a flood warning from the Environment Agency;

11 Measures will enable any potential overland flows to be conveyed safely across the peninsula without affecting property;

12 Surface water drainage from buildings and areas of hard standing will be directed to a series of SuDS features designed to provide hydrocarbon separation, sediment interception and water quality treatment through managed and vegetated wet basins before discharging back into Broadwater Lake;

13 An introduced impermeable barrier (e.g. clay) and a suitable depth of clean cover will be placed over the existing surface where regulated and potentially unregulated waste exists. This will ensure that the pathway between rainfall and surface runoff does not continue to mobilise any contaminants into the lake or groundwater. Rain falling on these areas will be intercepted by vegetation and percolate into the clean cover before draining to Broadwater Lake;

14 All foul waste will be directed via the public sewer to a suitable Thames Water waste water treatment works

Marginal Habitats and Hydromorphology

15 Early phase work to enhance the marginal habitats of the lake will be implemented and the remaining widespread ecological habitat creation and enhancement will be carefully managed and monitored throughout the life of the site (see Chapter 7 – Biodiversity). This will ensure that the banks of the lake and its islands are protected from physical damage from unauthorized site uses during operation;

Authorised Recreational Activities and Areas

16 The development will permit small sailing boats, rafts and canoes and other small watercraft that in the main will be are non-motorised; on a daily basis 1-2 small motorized craft for instructors will also use the lake (accompanying the children within the designated sailing areas and for safety / rescue reasons). All boats / craft will be small and have a very shallow draft. The defined sailing course / area will be physically defined by chains of floating reedbeds, new islands and emergent planting areas, creating sheltered refuge areas where boats cannot gain entry. Boats will only be able to sail close to the lake bank along the eastern lake edge towards the north-east corner; elsewhere the boats will be physically kept away from the lake edge. The minimally intrusive action of these small craft, combined with their operations being restricted to location over deeper water in the centre and north of the lake, and away from the margins and islands will ensure no change to the morphology or water quality (including turbidity) of the lake. Effects on habitats undergoing restoration enhancement and management will be restricted to those placed at the edge of the sailing area, these have been designed and carefully placed to shield more sensitive habitats further away. The provision of the new islands will also serve to break up the large fetch in the lake, contributing to likely bank erosion from wind generated waves.

Angling

17 The operational site will have clear facilities for anglers, regulating numbers, location for fishing and duration/closed seasons. The scheme will provide enhanced fishing pegs and conditions. The on site LBH staff will supervise the use of the angling facilities and liaise closely with clubs and individuals. Any irregular activity will be reported to the Environment Agency.

Unauthorised recreation/trespass

18 The site will be managed, supervised and maintained by LBH. Its dedicated staff will provide a robust presence on site and seek to maintain secure perimeters and deter unauthorised access and trespass. This will reduce the risk of introduction of fish and non-native 'pet' species, activities that may cause unexpected disturbance to the SSSI features of interest (e.g. use of motorised craft/motorcycles) and damage and poaching of banks and effects on lake bank morphology.

Conclusions

Through the implementation of this LMP, it is considered reasonable to conclude that the operation of the completed development will support the achievement of both the RBMD and WFD objectives for all water bodies.

4. Monitoring

A comprehensive suite of environmental monitoring will be implemented (in agreement with the Environment Agency and Natural England and the LPA), prior to the commencement of the operational phase of the proposed development to ensure the measures are effective and that they can be reviewed and modified should this be necessary, and to demonstrate the effectiveness of the embedded measures. The suite of monitoring is outlined below.

Proposed Monitoring - Groundwater

A suitable groundwater monitoring programme covering the operational phases will be developed and implemented as a planning condition. This will involve (as a minimum) the following components:

1. Installation of Monitoring Wells: Depending on the site conditions, it may be necessary to install monitoring wells (or re-use any existing ones) strategically around the operational area. These wells should be properly designed, constructed, and equipped with appropriate instruments to measure groundwater levels and quality accurately;
2. Regular Sampling and Analysis: Periodic sampling of groundwater should be conducted at designated intervals to assess changes in water quality throughout the operational period. The samples will be analysed in a laboratory to detect any potential contamination or changes in groundwater chemistry;
3. Operational Activity Tracking: It is important to document operational activities that may have a potential impact on groundwater or surface water such as drainage maintenance, storage of any chemicals/cleaning products, appropriate segregation of storage of waste and its removal, operation of the pumped foul drainage system etc. Keeping a detailed record of these activities will help correlate any changes in groundwater conditions with specific construction actions;
4. Response and Mitigation Measures: If the monitoring program detects any adverse impacts on groundwater, appropriate response and mitigation measures will be implemented promptly. These will include adjusting management techniques, altering methods, or implementing additional pollution control measures (including the cessation of related activities until resolved, if required);
5. Post-construction Monitoring: Once construction is completed, post-construction monitoring will be conducted to evaluate the effectiveness of any mitigation measures and ensure that groundwater conditions return to pre-construction levels; and
6. Documentation and Reporting: A comprehensive record of the monitoring program, including data collected, analysis reports, and any mitigation measures taken, will be maintained. This documentation is critical for regulatory compliance, future reference, and potential legal requirements.

The specific design and requirements of the groundwater monitoring program will be defined by suitably qualified hydrogeologists and/or environmental consultants with expertise in groundwater monitoring to

ensure the program's effectiveness and compliance with applicable standards, which will be agreed with the Environment Agency, Thames Water, the LPA and Affinity Water.

Proposed Monitoring – Surface Water

A suitable surface water monitoring programme covering the operational phases will be developed and implemented as a planning condition. This will involve (as a minimum) the following components:

1. Spill and Runoff Monitoring: Implement measures to monitor and prevent spills, leaks, or accidental releases of pollutants from the operational site. Regularly inspect pollution control measures, drainage, sediment management systems, foul sewage containment/pumping systems to ensure their effectiveness;
2. Measure and record various water quality lake parameters post works, in the. Including temperature, pH, turbidity, dissolved oxygen, total suspended solids and nutrient levels. Conduct turbidity measurements using dataloggers (e.g. 15 minute intervals) adjacent to parts of the lake used for watersports and bank erosion/effectiveness of islands and restored vegetation to track changes over time and to trigger intervention if required;
3. The implementation of the MEMP (please refer to Appendix 7.4 of the associated ES) provides a range of natural-process based measures to improve surface water in Broadwater Lake. A detailed suite of monitoring is proposed as part of this;
4. Reporting and Mitigation: Document and report the monitoring data collected throughout the operational period. Analyse the results to identify any trends or deviations from the baseline conditions. If adverse impacts are detected (e.g reduced oxygen, increased turbidity, further changes to lake hydromorphology), implement appropriate mitigation measures; and
5. Compliance and Regulatory Requirements: Ensure compliance with local and national environmental regulations and policy related to surface water protection. Remain updated on any permit requirements or guidelines set by regulatory bodies and incorporate them into the monitoring program.

The specific design and requirements of the surface water monitoring program will be defined by suitably qualified individual to ensure the program's effectiveness and compliance with applicable standards, which will be agreed with the Environment Agency, Thames Water and Affinity Water.

Proposed Monitoring – Flood Risk

A suitable flood risk monitoring programme covering the operational phases will be developed and implemented as a planning condition. This will involve (as a minimum) the following components:

1. Rainfall and Water Level Monitoring: Either install a rainguage at site or use a suitable Met Office station that is local to Broadwater Lake. Additionally, install water level monitoring stations in nearby rivers, streams, or other water bodies to monitor changes in water levels during rainfall events;

2. Water level Measurement: Regularly measure and record water level in Broadwater Lake. This includes monitoring post-development levels to assess any changes caused by altered drainage patterns or increased runoff;
3. Real-Time Monitoring: Implement a real-time monitoring system that provides continuous data on rainfall and water levels. This system should be equipped with automated sensors and telemetry to allow for timely flood risk assessment;
4. Warning Systems: Establish flood warning systems that utilise the real-time monitoring data, including signing up to the EA's Floodline Service to provide timely alerts and notifications to relevant stakeholders, including residents, emergency services, and local authorities. These systems should have clear protocols for issuing warnings and instructions for appropriate actions;
5. Drainage Infrastructure Monitoring: Monitor the performance of drainage infrastructure within the development, including SuDS and the foul sewer system. Regular inspections and maintenance should be conducted to ensure these systems are functioning effectively and not contributing to increased flood risk;
6. Post-Development Assessment: Conduct regular post-development assessments to evaluate the effectiveness of flood risk management measures implemented during and after construction. Compare actual flood events and impacts to predictions made during the pre-development assessment and adjust mitigation measures as necessary; and
7. Community Engagement and Education: Engage with the local community and stakeholders to raise awareness about flood risks, preparedness, and emergency response procedures. Provide educational materials and workshops to inform residents about the monitoring efforts, flood risk management strategies, and ways they can protect themselves and their property.

Proposed Monitoring – Ecology

Please refer to the MEMP (Appendix 7.4 and 7.5 of the ES) for the ecological mitigation, monitoring and management associated with the Proposed Development.

5. Invasive Non-native Species Monitoring and Management

Pre-construction

Prior to any works taking place, the current presence and extent of Invasive and Non-Native Species of Plants (INNS) will be re-confirmed. This will support the development of the detailed version of this LMP and the management strategy for INNS recorded as present or at risk of colonising Broadwater Lake.

Operation

Appropriate and agreed measures to manage INNS will be agreed through planning condition.

Biosecurity best practice measures be implemented, as below, to reduce and minimise the risk of spreading invasive non-native species, diseases and pathogens even if invasive non-native species are not apparent. Non-native species can be spread in a variety of ways, for example in water, on clothing, equipment or other materials.

A suitably qualified person will be responsible for biosecurity of the operational area including ensuring that Check, Clean, Dry principles are followed:

- Check, Clean, Dry measures shall be put in to practise. This involves checking and cleaning equipment, clothing and footwear before leaving the site, using hot water where possible. This should then be dried as some species can live for over 2 weeks in damp conditions;
- Induction in INNS for all staff including identifying INNS such as Himalayan Balsam, Rododendron, New Zealand Pigmyweed and Canadian Pondweed; and the causes and risks of it spreading;
- Appropriate signage in the site offices warning of the presence of INNS; and identifying the necessary areas;
- Ensuring sites have the appropriate equipment and designated areas for biosecurity;
- Areas of infestation to be fenced off from other operational areas (idf subsequently found to be present);
- No material shall be taken from areas of infestation (unless for disposal at a suitably licenced facility);
- Ensuring that staff, contractors and visitors are aware of what biosecurity measures they are required to do when arriving and leaving the site;
- Making use of facilities provided on the site to clean footwear/equipment;
- All vehicles must use designated access routes;
- Keeping access to a minimum and avoiding areas that are known to be infested with invasive species;
- No treatment measures, such as herbicide treatment, to take place in these areas without prior agreement with the Environment Agency or the supervision of an appropriately experienced individual; and

6. Duration of LMP

The LMP will come into effect pre-construction, be live throughout construction and for at least 30 years from the commencement of the completed development at Broadwater Lake. A detailed schedule of works, roles, responsibilities etc will be agreed in the detailed LMP to be required by planning condition.

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11/10/23