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Flo-Gro Systems Limited

Proposed aquaculture development, Decoy Farm, Spalding Road, Crowland, Lincolnshire, PE6 0LU

Surface Water Drainage Design Phase 1 & 2

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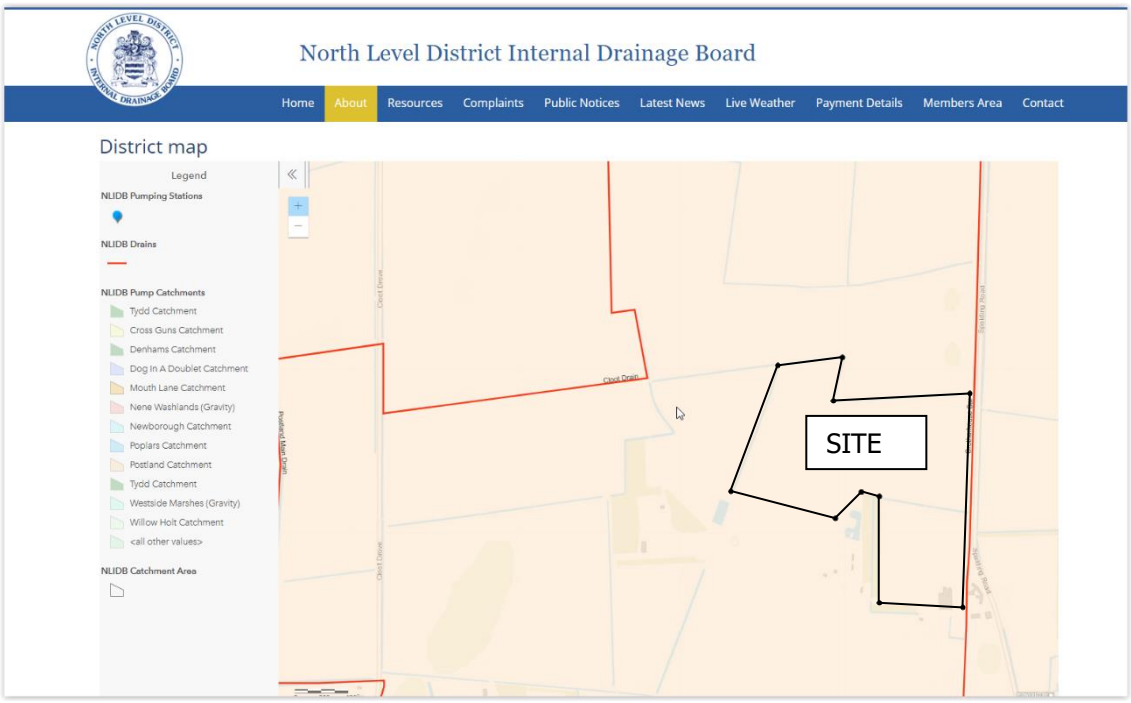
DRAINAGE DESIGN

SUMMARY
Flo-Gro Systems Ltd. are proposing to develop an aquaculture site over three Phases on a parcel of land adjacent to Decoy Farm, Spalding Road, Crowland, Lincolnshire.

This design is based on the strategy prepared in September 2022 for Phase 1, taking into account the design of all of the future phases to ensure it will all work as expected.

THE SITE

The site sits directly off Spalding Road and is approximately 15.6ha with ground levels ranging from 1.81mOD in the south-east to 0.46mOD in the north-west.



It has open riparian watercourses to the western and northern boundaries and North Level IDB's Brotherhouse Drain to the East, between the site and Spalding Road. It should be noted that the IDB will be asked to consent the culverting of this entrance crossing.

The phase 1 & 2 works include the southern access, the main lorry turning area, the Process Building, Hatchery and Grow Out Units 1 & 2 along with some access roads, staff and disabled parking and the attenuation pond, connecting pipework and surface water pumping station.

Continued

Whilst there is an IDB drain immediately adjacent to the site, the layout, once all three phases have been developed, does not allow the main surface water attenuation to sit anywhere else other than in the north-west corner.

There is no practical way to move the pond to a location adjacent to this drain because this is also the highest part of the site.

There is another IDB drain off to the west called Cloot Drove and this currently has an invert of -0.98mOD. It is also the drain to which the site naturally drains.

Ground water monitoring was carried out monthly between November 2022 and November 2023. The results of this are shown on the long sections.

FOUL WATER DISPOSAL

The domestic foul water from the site will be taken to a package treatment plant and the treated effluent will be discharged adjacent to the new surface water outfall.

It will be designed and maintained in accordance with the manufacturer's recommendations.

Other flows from the washdown operations inside the buildings will be taken to a specialist treatment package plant within the site and processed for reuse.

Continued

SURFACE WATER DISPOSAL

Information received recently from the IDB gave the maximum retained water level in their network as +0.8mOD. This has required a rethink of the discharge mechanism.

At this level, if we were to connect directly to the IDB system with normal gravity pipework, as originally suggested, the site attenuation would be overwhelmed.

It is therefore necessary to separate the two systems and use a pump to control the offsite flow from the site.

We would not normally suggest this because a power failure just when you need the pumps most would not be helpful, but in this case the site has significant onsite electrical generation and storage that this will not be an issue.

The pond base will be set at -0.61mOD. This is about 300mm lower than originally envisaged, this is to increase the vertical separation of the base of the permeable pavements and the pipes near the top of the system.

In order to facilitate the storage in the pavements and the operation of the underdrain, it is proposed to have a constant surface level of 1.3mOD on the new permeable pavement across the current and all future phases.

This then puts all building FFL's at 1.45mOD instead of just some as originally shown.

Even with this extra depth, this is still insufficient to allow the installation of a traditional piped drainage network.

As we are still unable to use traditional pipework, even with this additional fall, it is proposed that all of the site roads and parking on all three phases shall be constructed using permeable blockwork, the sub-base of which can be used to attenuate surface water run-off from the roads and roofs. That and the volume in the pond will all use the one pumped control discharge.

The pumps will be set at the greenfield runoff rate for the FSR storm i.e. 18.8l/s for the whole site. The calculations for Phase 1 & 2 show that the maximum discharge rate will be 5.9l/s for the FSR storm, and 6.9l/s for the FEH storm.

In the 100yr+40% storm event using these rates, the top water level in the pond & throughout the pavement will be -0.024mOD [FSR] & +0.028mOD [FEH]

Continued

To aid the transport of flows in the pavement down to the pond, it is intended to lay perforated concrete pipes below the base of the permeable pavement within the stone sub-base at the best possible gradient.

As the system will attenuate all storm flows the pipes will be full, or partially full, of standing water so self-cleansing velocities will not be crucial.

To aid maintenance of the underdrain system, catchpit chambers would be located at all changes in direction and be no further apart than 100m.

Pipes under buildings will all be solid and manhole covers inside buildings will be double-sealed and bolted down.

When fully developed, the depth of maximum attenuation in the pond will slightly exceed the usual 1.0m, and normally, in line with ROSPA recommendations, we would usually suggest that it be fenced, with warning signage and life buoys, but in this instance, given its location and the lack of nearby housing, I don't believe this to be necessary.

With the top of the bank at a level of 1.3mOD and the Emergency Overflow at 1.1mOD this gives an overall total pond depth of 1.71m.

This design will have the added advantage of providing source control to the access road and parking area runoff, help slow and cleanse the flow, and aid with attenuation volumes, before being taken from the sub-base and piped into the downstream pond.

All pavements will have 125mm kerb faces except where the proposed overflow will be located. As the FEH rainfall does result in some small surface ponding the depth of kerb at the proposed overflow will be designed to operate once that design level is reached. Currently showing as 10mm overall on Phase 1 & 2 with the worst case FEH rainfall.

These pavements and open attenuation have all been designed using a 100 year plus 40% climate change event and tested against FSR and FEH rainfall profiles as required by the LLFA.

In the event of exceedance conditions, when the maximum design storm has been attenuated and the freeboard taken up, the pond will be designed to safely allow the overflow to overtop the bank via the Emergency Overflow and enter the adjacent open drainage network.

From Phase 1 & 2, any flood flow will be directed into the field.

Once the whole site has been developed the flood flow will run off the pavement directly adjacent to the pond.

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MAINTENANCE STRATEGY

Maintenance Responsibility

1. All areas of private access roads, lighting, drainage, SW pumping station and planting will be maintained by the Management Company.

2. The existing watercourse to the East of the site will continue to be maintained by the IDB.

3. All other open watercourses surrounding the site are to be maintained by the Management Company or riparian owner in accordance with notes on Receiving Ordinary Watercourse.

Recommended Private Area Maintenance Requirements

Access Roads

All access roads are to be swept quarterly to clear leaves and to ensure they are clean, tidy and free from dust and debris.

At times of sweeping, inspections to take place to assess any damage to road, kerbs, lighting etc., and any maintenance carried out to ensure user safety is maintained.

Areas of permeable paving are to be maintained in accordance with CIRIA guidelines.

It should be noted that vacuum sweeping of the blockwork drives should not be carried out unless it is proposed to immediately replace the grit removed from between the blocks.

If grit loss is noticed, this should be topped up with grit to the original specification as soon as practicable.

Continued

General Drainage Areas

A system of regular inspections should be established. Initially these inspections should be carried out in October and March, however, this may be modified to suit observations over time.

Items to be observed and cleared are high levels of grit, leaves and other such detritus along with levels of grit between the blocks.

The main aim of these inspections will be to prevent siltation of the surface water system, which, if allowed to develop will reduce the effectiveness of the system and may, over time, reduce the attenuation volumes provided.

The following elements should be inspected and cleaned as part of this preventative routine:

Chambers, particularly catchpits

Headwalls and control chamber

Pumping Station wet well

Landscape

Generally, pond areas and watercourses are to be cut and maintained regularly so that grass remains reasonably short, chambers and headwalls are to be kept free of silt and debris at all times.

Maintenance of the pond is NOT to be carried out if the depth of standing water in the main channel exceeds 300mm.

Please refer to schedules below.

Additional Maintenance Requirements

It is recommended that the 'Bag it and Bin it' leaflet is posted in all toilet areas to help ensure unsuitable items are not flushed into the foul drainage system.

Operation and Maintenance Requirements for Permeable Pavements [CIRIA]

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Operation and Maintenance Requirements for Swales and Ponds

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly or as required
	Cut/strim wet swales to retain grass height 100 -150mm min cut	Bi-monthly
	Manage other vegetation and remove nuisance plants	Bi-monthly
	Inspect discharge pipes, headwalls and orifice plate and control weir for blockages, clear if required	Monthly
	Inspect infiltration surface for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	When required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years then half yearly
Occasional Maintenance	Reseed areas of poor vegetation on growth, after plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or re-seeding	As required
	Re-level uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove and dispose of oil residues using safe standard practices	As required

Operation and Maintenance Requirements for Receiving Ordinary Watercourse

Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular Maintenance	Walkover inspection of receiving ordinary watercourse	6 monthly (or as required)
	Maintenance dredge the receiving ordinary watercourse from the Control headwall Weir to the confluence with the main channel to remove silt build up and restore design bed level	First maintenance dredge on completion of SuDS swales and then 5 yearly (or as required)

‘Bag it and Bin It’ Leaflet

DO NOT FLUSH IT, BAG IT AND BIN IT



Pet Faeces



Paint



Engine Oil



Bandages





Rags



Cotton Wool



Cooking Fat



Condoms



Kitchen Waste



Medicines



Nappies/incontinence products



Needles



Razor Blades