Forestry England

# Hole Farm Waterbody Concept Plan

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# 1 Summary

This document sets out the proposal for pond creation at Hole Farm in coordination with the woodland design plan. The site characteristics and existing ponds have been taken into consideration and are detailed below. The requirements for surface water drainage have also been considered and coordinated with the 'Drainage Strategy'. In summary, Forestry England are proposing that:

- Ten seasonal wildlife ponds are to be created.
- Four ponds will form part of a wetland complex in the centre of the site.
- One additional dog use pond is proposed.
- One detention basin.
- A leaky dam is proposed in a site drainage channel.
- A 150m long reedbed is proposed for water quality improvement.

# 2 Site Characteristics

## 2.1 Geology

The geology is principally London Clay derived clay, silt and sands. With Bagshot Sands on the northern boundary.

## 2.2 Soils

The site soils are surface water gleys, considered moist to very moist. They are slowly permeable, seasonally wet and slightly acidic but with some base-rich loamy and clayey soils. The soils appear more slightly sandy and drier on the northern boundary.

## 2.3 Topography & Hydrology

The site gently slopes southward from 90m in the north to 40m. There is a head of a shallow SSE facing dry valley in the centre of the site. The topography aids drainage towards the South, via a series of field drainage channels, see Map 1.

## 2.4 Rainfall

Late autumn and early winter are the wettest months, with over 60mm of rain per month. February is the driest with about 40mm [see Fig 1.]. Average annual rainfall is 650mm (25.6”).

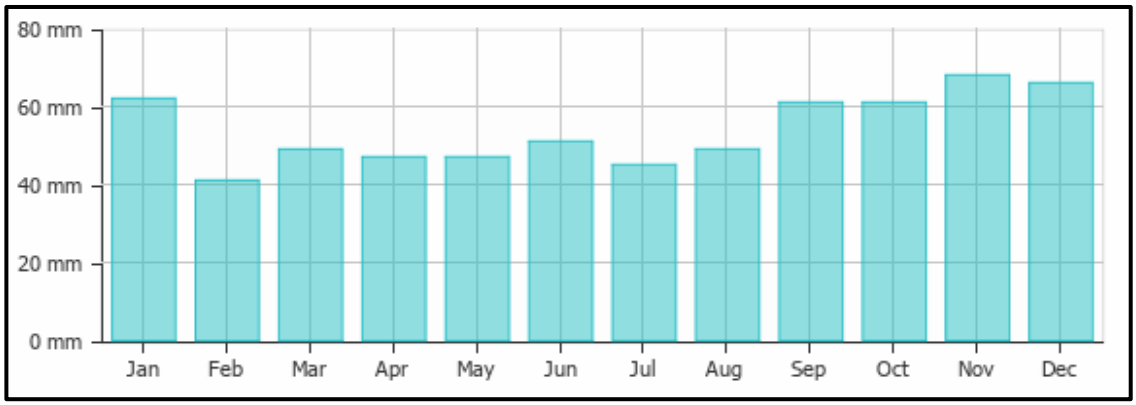



**Figure 1.** Showing monthly rainfall averages for Brentwood, Essex.

## 2.5 Site Ponds and Water Courses

The site is an arable farm on relatively heavy soil, prone to waterlogging in the winter. As such it has an extensive network of open field drainage channels on the field boundaries. The site has been extensively mole drained in the past.

There are currently five ponds on-site, the origin and historic function of these is unclear, but probably supported livestock and draught animals. Recent observation suggests these are seasonally dry. The OS Six Inch - Essex LXVII Revised 1895, Published 1898 map shows an additional five ponds previously existed on-site. This can be seen in Appendix II.

| Location | Surface area $m^2$ | Description |
|---|---|---|
| TQ 5824 9032 | ~113 | Woodland pond. Shaded. Dry 14/06/22 |
| TQ 5845 9002 | ~330 | Field pond. Deep. Shaded by surrounding *Salix*. Dry 14/06/22 |
| TQ 5840 8982 | ~333 | Field/track edge pond. Shaded by surrounding *Salix*. Dry 14/06/22 |
| TQ 5827 8949 | ~269 | Woodland pond. Shaded. Dry 14/06/22 |
| TQ 5826 8944 | ~275 | Woodland pond. Shaded. Dry 14/06/22 |

**Table 1.** Showing details of extant on-site ponds.

There are also several ponds immediately adjacent to the site:

| Location | Surface area $m^2$ | Description |
|---|---|---|
| TQ 5845 9039 | ~281 | Ornamental pond. Eutrophic. |
| TQ 5810 8997 | ~481 | Woodland pond. Shaded. Holding water. 14/06/22 |
| TQ 5869 8988 | ~87 | Pond below sewage treatment plant. Shaded by surrounding *Salix*. Dry 14/06/22 |
| TQ 5859 8975 | ~262 | Pond below sewage treatment plant. Eutrophic. Dry 14/06/22 |
| TQ 5873 8928 | ~98 | Woodland pond. Shaded. Dry 14/06/22. |

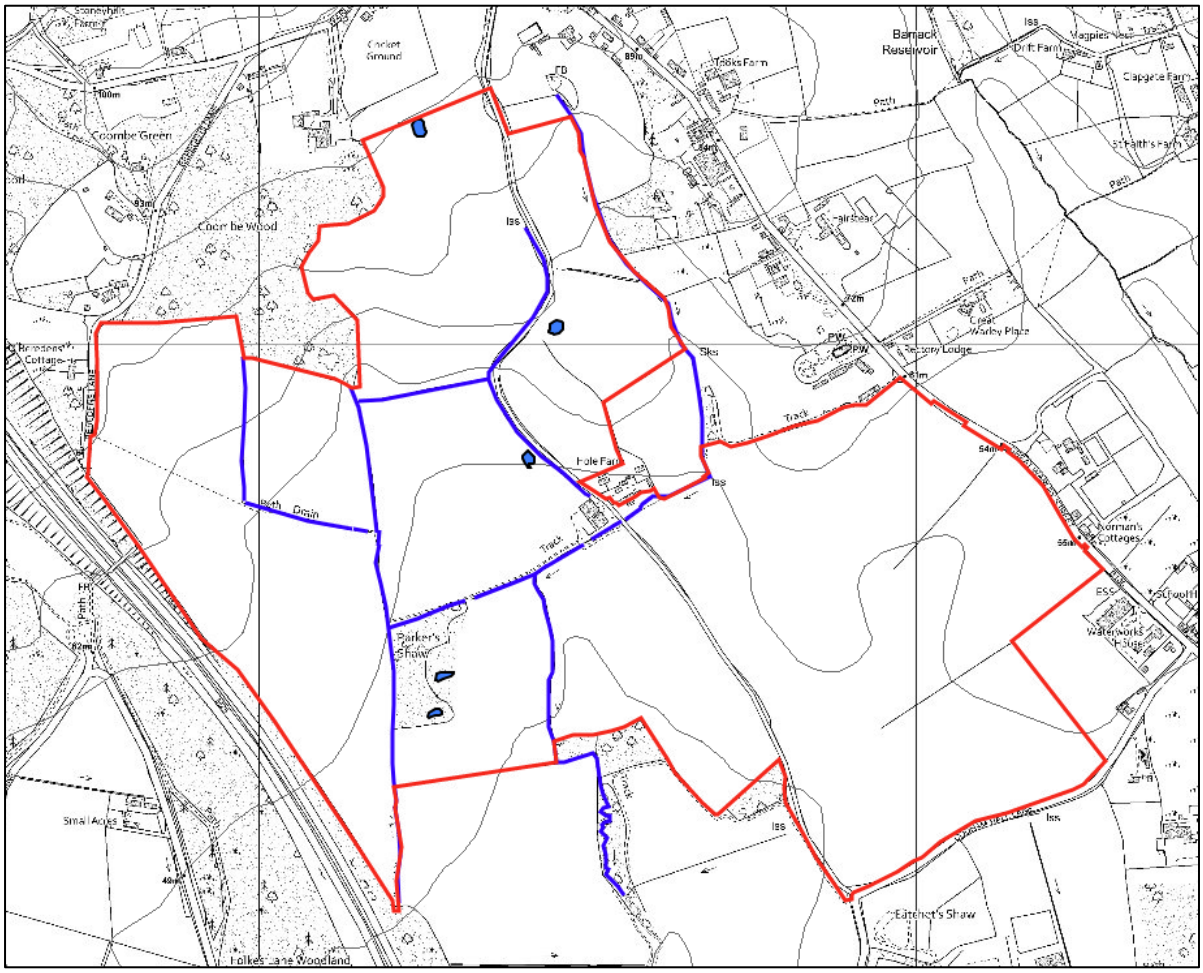
**Table 2.** Showing details of adjacent ponds.

## 2.6 Water Supply and Quality

There are two small springs at TQ 5840 9018 and TQ 5868 8980 that only intermittently flow through the drainage channels on the site. The water supply on the site is rainfall dependent. Impeded drainage and surface water pooling is evident during periods of high rainfall eg 23/03/2022 (see Appendix I.). However, the following dry spring has resulted in the site ponds all being dry when surveyed on 14/06/2022.

There is a small sewage treatment plant on the eastern boundary of the site. The outfall runs into the site drainage channel at TQ 5868 8979 and then into an off-site pond, adjacent to the farm buildings, at TQ 5859 8975 which is evidently highly eutrophic and of poor water quality.

It is expected that most ponds created on site will be largely seasonal, with a dry period in most years in mid-summer.




**Map 1.** Showing site boundary, contour lines, existing ponds, and field drainage channels.

# 3 Waterbody Proposals

## 3.1 Leaky Dams

### 3.1.1 Ecological Rational for Leaky Dam Creation

'Leaky' dams are designed to attenuate peak flows and their sediment conveying and erosion capacity in watercourses, they also provide temporary wetland habitat and can accumulate woody debris, an important aquatic habitat.

### 3.1.2 Leaky Dam Creation Proposal

It is proposed to create a leaky dam in conjunction with a small waterbody, that accommodates any backed up water, at TQ 5818 8971, just below the junction of two field drainage channels, where the topography is steepest.

The dam should be constructed using appropriate size round timber and allow for normal flow, throughflow and overflow scenarios, see Figure 2. below.

**Figure 2.** Showing example of field drainage channel leaky dam.

## 3.2 Reedbed

### 3.2.1 Ecological Rational for Reedbed Creation

The outfall from the off-site sewage treatment plant is evidently eutrophic as it runs into the on-site field drainage channel system and requires remediation if high water quality habitats are to be created on-site. Reedbeds are used extensively as natural solutions for wastewater management They are designed to uptake nutrients, especially nitrogen and de-nitrify ammonia, nitrite and nitrate rich water. The reed bed should also attenuate peak water flows. Reed is already present on-site, growing in the field drainage channel system.

### 3.2.2 Reedbed Creation Proposal

A 150m length of field drainage channel should be planted up with reed, between TQ 5854 8972 and TQ 5842 8965. This will intercept the treatment plant outfall, prior to entering any on-site waterbodies, see Map 2.

## 3.3 Waterbodies

### 3.3.1 Ecological Rational for Waterbody Creation

The creation of new wetland sites will extend the range of habitats available for wildlife to colonise at Hole Farm. Ponds and watercourses of varying sizes and hydrological regimes provide places for shelter, foraging and breeding for a variety of terrestrial, amphibious and aquatic species. A diverse range of aquatic habitats fulfils the 'Lawton' principles of better and more.

While the spatial arrangement can fulfil the 'Lawton' principle of connected if the ponds are within dispersal range of many organisms and with suitable quality habitat (eg grassland/scrub/woodland) between.

### 3.3.2 Waterbody Creation Proposal

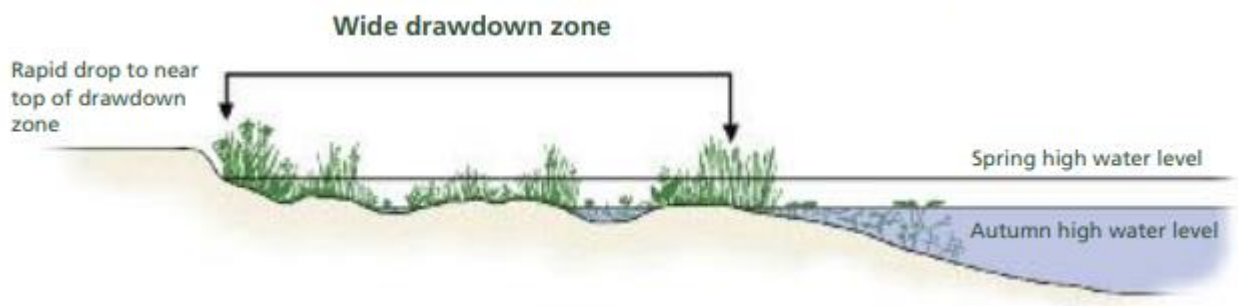
The proposal is to create a range of new waterbodies of differing hydrological characteristics that provide complementarity to the existing ponds and create a network across the site when combined with them.

## 3.4 Waterbody and Wetland Design

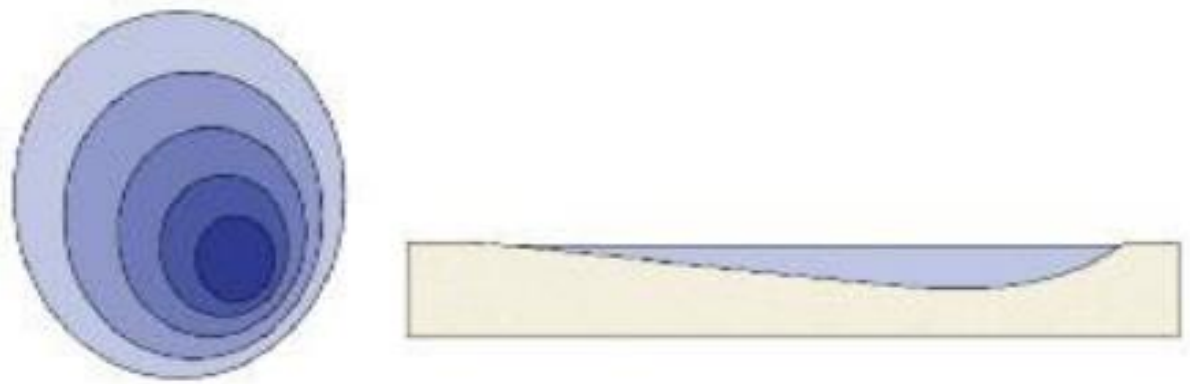
The waterbody design follows guidance found in the Freshwater Habitats Trust Pond Creation Toolkit.

Key design principles are:

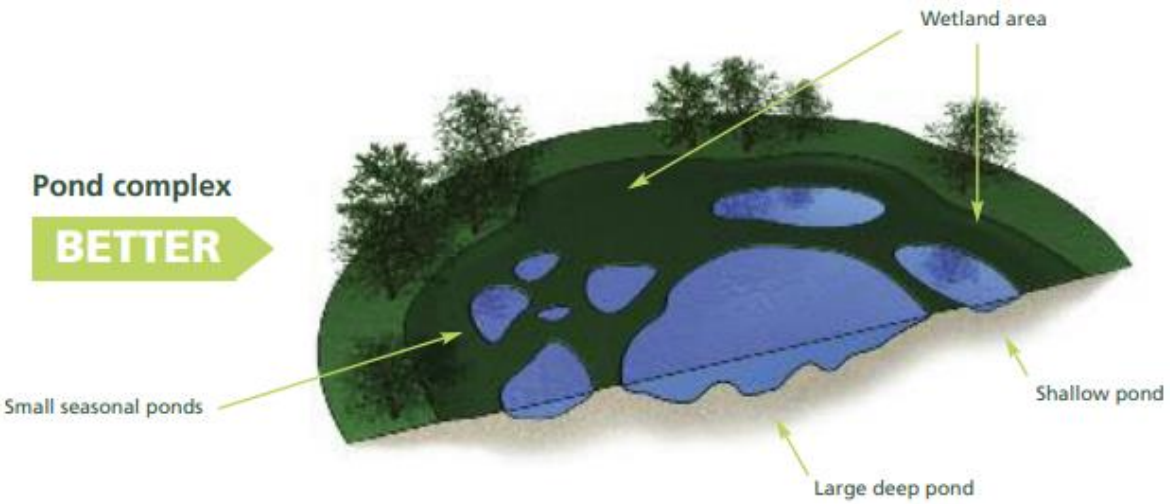
- Ponds should have >300m$^2$ surface area to accommodate a large perimeter drawdown zone.




- Ponds should have edge gradients of 1:10 - 1:20 to create large 'drawdown' zones.
- Pond should be <1.5m deep with an asymmetric profile.



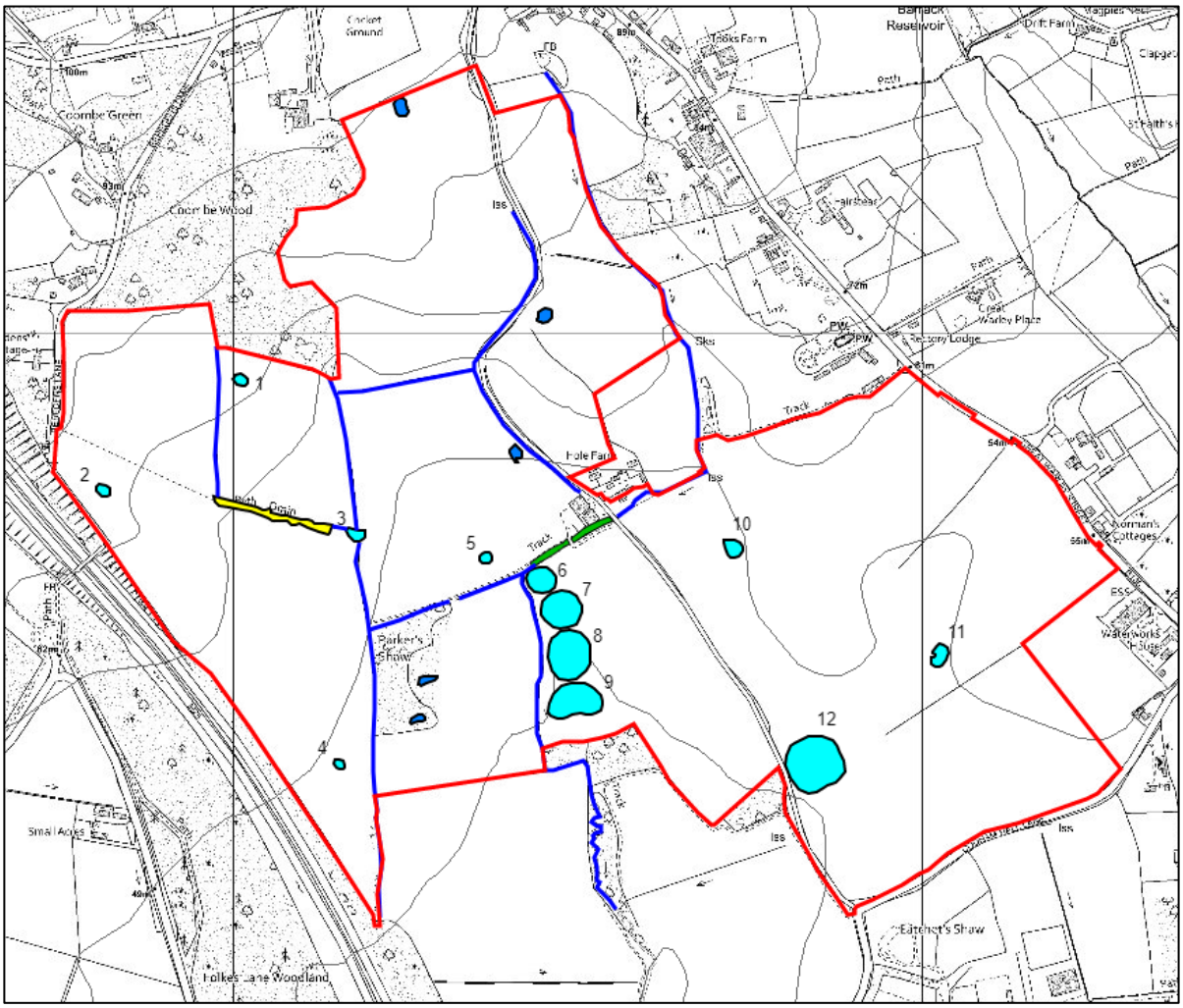
- Ponds should be complex shapes and include smaller ‘satellite’ ponds to maximise edge habitats and hydrological regimes.




- Spoil should be spread thinly (10-20cm) across the site ‘downstream’ or >20m from ponds where it will not run back into waterbodies or create obstacles for tractor-based site management.
- Water levels should be monitored over several seasons and ponds should be re-profiled where required.
- Dogs should be excluded from wildlife ponds and provided with an alternative pond.

Locations and details of the eleven proposed ponds are shown in Map 2 and Table 3 below. Ponds 1-9 & 11 are wildlife ponds and pond 10 is a dog pond. Note ponds 6-9 form a cascade in a 1.5ha wetland complex, see Figure 3 below.

# Hole Farm Waterbody Concept Plan




**Map 2.** Showing site boundary, contour lines, existing ponds, field drainage channels, reedbed, leaky dams and new waterbody locations

| Pond Number | Location | Surface Area ($m^2$) | Maximum Depth (m) | Fencing Requirement (m) | Notes |
|---|---|---|---|---|---|
| 1 | TQ 5799 8995 | 268 | 1.5 | 120 | In area of natural regeneration. |
| 2 | TQ 5781 8976 | 268 | 1.5 | 120 | Location of historic pond. |
| 3 | TQ 5818 8971 | 370 | 1.5 | 120 | Intersection of drains with leaky dam installed on downstream side. |
| 4 | TQ 5815 8934 | 400 | 1.5 | 120 | Edge of woodland block. |
| 5 | TQ 5836 8966 | 231 | 1.5 | 100 | |
| 6 | TQ 5845 8963 | 1,343 | 2.0 | 750 | Deeper 'header' pond at top of 'wetland cascade'. Inflow via culvert connection to diverted field drain at TQ 5842 8964. |
| 7 | TQ 5848 8956 | 2,586 | 1.5 | See pond 6 | Large wetland pond. Inflow from pond 6 via wide shallow wetland channel. |
| 8 | TQ 5850 8950 | 3,715 | 1.5 | See pond 6 | Inflow from pond 7 via wide shallow wetland channel. |
| 9 | TQ 5851 8944 | 3,152 | 1.5 | See pond 6 | Inflow from pond 8 via wide shallow wetland channel. Outflow via culvert to lower drain. |
| 10 | TQ 5873 8972 | 570 | 1.5 | N/A | Dog pond with concrete ramp for access. |
| 11 | TQ 5909 8955 | 542 | 1.5 | 120 | Wildlife pond on the all-abilities access route with viewing platform. |
| 12 | TQ 5884 8937 | 5,490 | 1.5 | 300 | Detention basin to capture runoff from all-abilities loop. |

**Table 3.** Showing details of the eleven proposed ponds and attenuation basin.

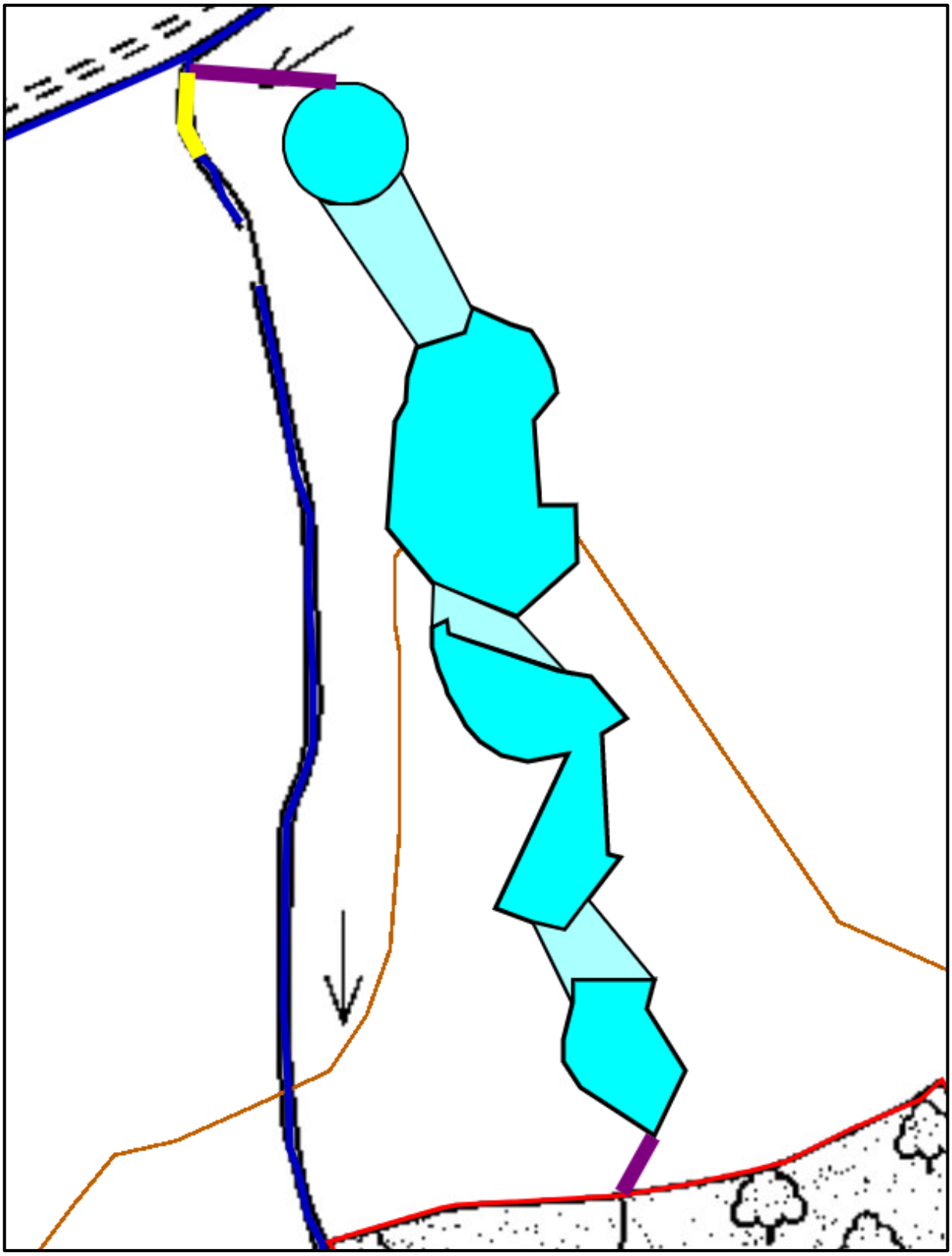


**Figure 3.** Schematic map of wetland pond cascade detail. Showing site boundary, contours, field drainage channels, drainage channel infill, culverts, ponds and wetland outflow/inflow connecting channels.

### 3.4.1 Ponds and Dogs

Dogs disturb ponds in several ways reducing the biodiversity potential of ponds: Direct disturbance of wildlife prevents the use of ponds by taxa sensitive to the presence of dogs, such as birds; Erosion of bank edges causes sedimentation; Turbidity, caused by stirring up sediment into the water column, prevents the growth of aquatic plants. Neonicotinoid and imidacloprid insecticides, are widely used as flea treatments (but banned from agricultural use), are now proven to be present in many aquatic systems and kill aquatic invertebrates.

Standard stock netting should be used to exclude dogs from the nine wildlife ponds (ponds 1-9, & 11) with the provision of a new accessible alternative pond (10). Experience from Forestry England's Jeskyns Community Woodland (Kent, DA12 3AN) suggests a concrete ramp should be installed. This will allow dogs access into and out of the pond without eroding the banks. Pond 10 will be a waterbody for dogs to enjoy which will allow the remaining ponds on site to be left for wildlife.

Approximately 1,750 m of fencing is required to secure the wildlife ponds and detention basin. Each pond should be gated to allow plant machinery to access the ponds for maintenance.

### 3.4.2 All-abilities loop

Pond 11 will be a wildlife pond on the all-abilities loop. To aid accessibility and access to the edge of this pond a 'reviewing platform' is proposed. An exaggerated kidney-shaped pond will create a spur of land that will allow visitors to get closer to the water's edge. Post and rail fencing will be required around this point to stop entrance into the pond but still allow visitors to view over it.

## 3.5 Monitoring

Water levels should be photographically monitored on a monthly basis for the first two years after creation. This will inform any reprofiling of the drawdown zones required.

Natural colonisation by plants should be photographically monitored and assessed on a seasonal basis.

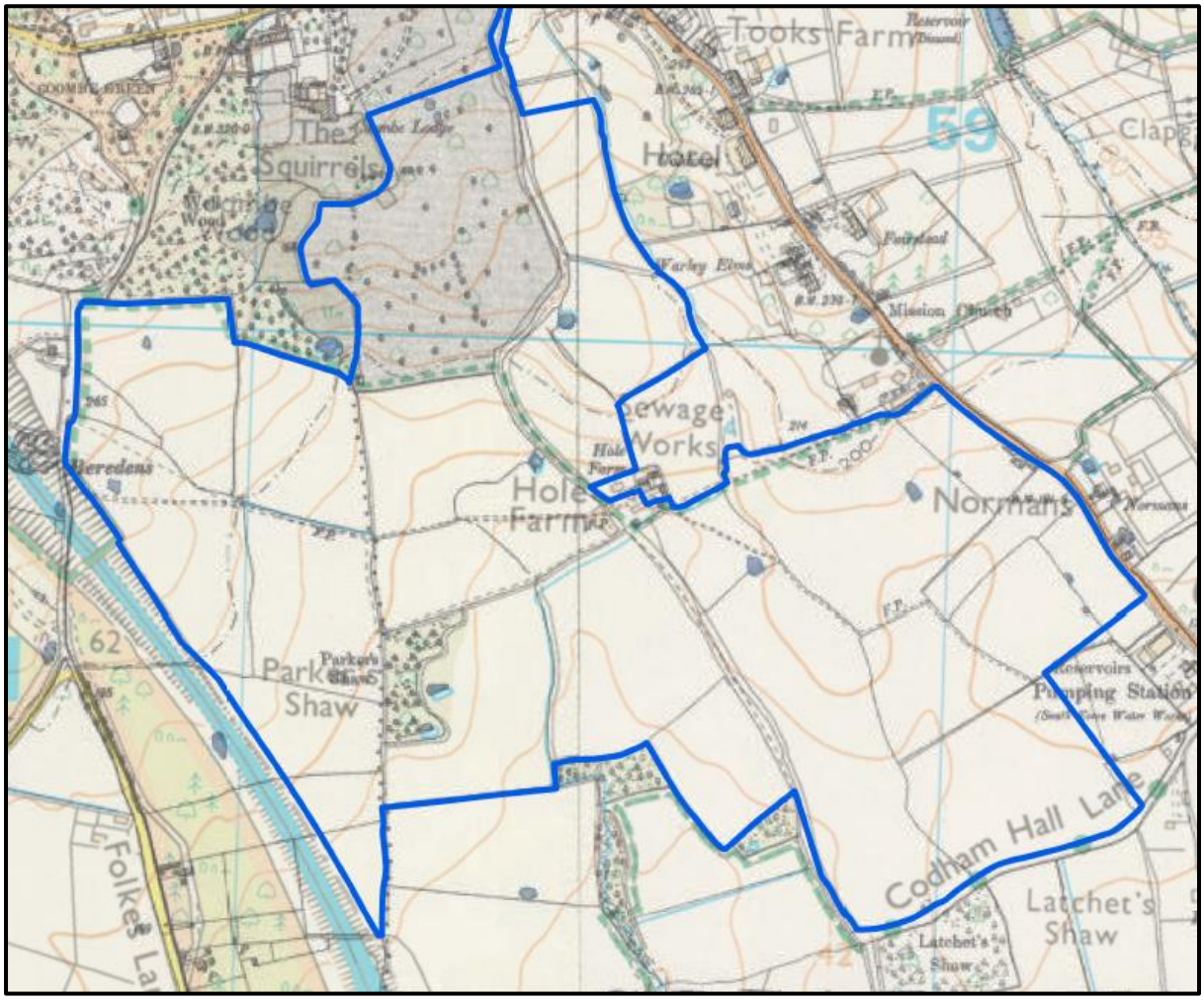
Multi-taxa eDNA monitoring should be carried out annually to assess colonisation by fauna.

## **Appendix I -** Showing surface pooling and running field drainage channels during heavy rain (March 2022).

Surface pooling at TQ 5850 8945

Junction of field drainage channels at TQ 5841 8965

## Appendix II - Historic Ponds




**Map showing site boundary and ponds present in 1895.**

| Location | Status |
|---|---|
| TQ 5824 9032 | Extant |
| TQ 5845 9002 | Extant |
| TQ 5840 8982 | Extant |
| TQ 5827 8949 | Extant |
| TQ 5826 8944 | Extant |
| TQ 5781 8976 | Disappeared |
| TQ 5786 8997 | Disappeared |
| TQ 5873 8972 | Disappeared |
| TQ 5894 8982 | Disappeared |
| TQ 5894 8919 | Disappeared |

**Table detailing location and status.**