

FRIENDS OF THE CROMFORD CANAL

Proposed restoration of a section of canal at Smotherfly Opencast Coal Site in Amber Valley and at Pinxton in Bolsover

Design Statement

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Proposed restoration of a section of canal at Smotherfly Opencast Coal Site in Amber Valley and at Pinxton in Bolsover

Design Statement

1 Background

a) General

The Cromford Canal was constructed and an arm opened to Pinxton in 1792, primarily to serve the coal mines of the area. It was formally abandoned in 1944. The course of the Canal remains largely intact and protected in the Strategic Plans of the Districts concerned, and the majority of the Pinxton Arm (excluding Smotherfly) is currently managed by Derbyshire County Council as a Bridleway.

It is now Government policy [*'Waterways for Tomorrow'*, DETR, 2000] to reopen abandoned canals wherever possible, to realise their environmental, recreational and regenerative potential and to relieve pressure on Britain's increasingly popular inland waterways network. It is an established fact that reopening a section of canal brings with it enhanced employment, improved property values and helps to regenerate rundown communities – all issues relevant to the Erewash Valley. The Friends of the Cromford Canal is promoting the restoration of this waterway.

The length concerned amounts to 1.8 km, 1.1 km of which comprises the section within the Smotherfly OCC site, where, until recently, the River Erewash was diverted through a temporary channel excavated along the west side of the site. The river has now been returned to its original course and the redundant diversion channel is suitable for modification and re-use. The remaining 0.7 km comprises the existing section of canal to the terminus at Pinxton Wharf. The Smotherfly section is within Amber Valley Borough, and the Pinxton section is within Bolsover District.

The section of canal covered by the present application will, it is intended, eventually be linked back to the national waterway network, via the main line of the Cromford Canal from Ironville to Langley Mill – which is currently the subject of further investigations and feasibility studies. At a future date, the eventual connection of this section of Canal to the national waterway network will 'put Pye Bridge and Pinxton on the map', attract tourists, and facilitate further employment and training (e.g. boat building and maintenance – for which the communities are well equipped). However, a special situation has arisen as the restoration of the opencast coal site presents an immediate and unrepeatable opportunity to restore a section of the canal during the final stages of the site restoration works. . Even in its truncated form, with the water feature to be known as the 'Smotherfly Wide', it is considered that the potential benefits to be accrued to the local communities and Districts of Amber Valley and Bolsover are considerable.

b) Stand alone basis of this application

This application is therefore being submitted on a stand alone basis, which will benefit the local community even without any future links to other canals. These benefits include:

- Regeneration of the area, with short and longer-term opportunities to create employment and training and improve property values in the locality.
- Provision of greatly enhanced recreational and sporting facilities for e.g. angling (including from wheelchairs), bird watching, walking, running, cycling, rowing and canoeing, available to all persons irrespective of ethnic origin, gender or ability.
- A towpath offering level access to the open country – ideal for the less able and those with wheelchairs, pushchairs etc.
- It will facilitate the appreciation of the unique industrial heritage of the area and be a significant educational asset.
- Flood alleviation – which is a considerable issue in the Pinxton Wharf area.
- Provision of a deeper water habitat for waterfowl and larger aquatic species.
- It is proposed to dedicate the restoration of the Smotherfly Wide, as a ‘linear country park’, to all those who devoted their lives to the heavy industries of the area – benefiting the psychological / spiritual needs of the current community

2 Environmental Considerations – Smotherfly section

a) Restoration of the canalside wildlife area

The main part of the application covers the area designated T8 – Carr Woodland on the UK Coal restoration plan no.RJB 05/12978D (the approved restoration plan), and accompanying details as set out in RJB letter dated 1 April 1998

The land concerned lies between the original canal line as defined by footpath 61, the railway boundary to the west, and the Smotherfly site boundary to the north (which is coincident with the Amber Valley Borough Boundary).

T8 is subdivided into 3 sections:

3.6 Southern half of T8 - Ruderal Area

3.7 Northern half of T8 – Wetlands

3.8 Northern half of T8 – Woodlands

The species for planting in the above areas were to be as set out in the above letter. (relevant sections attached as appendix A)

The ground levels in area T8 will be as shown on drg. No FCC.S.11. The river diversion channel will be retained, but the bottom will be filled in to a level of 82.0, and the new water surface will be at a normal level of 82.6. Elsewhere within this block the ground generally will be slightly raised to a carefully prepared landscape plan (see section 2 m(e) below), with the finished ground surfaces closely following those previously proposed.

For a length of 800 metres along the west side of the canal (the railway boundary) a soft earth bed will be constructed beneath or just above the normal water level to provide a planting area and reed bed, as shown in drawing FCC/S/12. The new wet planting area will be approximately 2000 sq metres, which will more than compensate for the loss of two of the five ponds originally proposed for the area. (The two ponds which have already been constructed will be retained, and a third one added).

b) Objectives of landscaping:

The objectives remain the same as the approved plan, which are:

“The broad aim of the area is to create a nature conservation resource that will benefit local people, thus a balance must be struck between the desired ecological interest and the constraints generated by recreational use. For predominantly this reason it was decided that developing habitats for overwintering birds such as overwintering waders and wildfowl would not be a priority as it would be difficult to minimise disturbance in such a limited area with the existing network of footpaths. The emphasis will be on the establishment of a range of appropriate habitats that are declining or have already become scarce in the Erewash valley, particularly riparian grassland and carr woodland” (reference: *‘Smotherfly OCCS – Restoration Details for the Conservation Area’*, prepared by RJB mining for the Mineral Planning Authority, February 1998)

c) Current situation

The Smotherfly Site has been largely restored already as planned, and the area currently under consideration amounts to less than 8% of the total. The areas already restored will not be touched, apart from one small area on the interface. The objective in replanning the canal line is to follow the approved restoration plan as far as possible.

d) Changes from previous plan

The main visible change will be the creation of a body of water along the west side of the site, adjacent to the existing branch railway line, within an area previously designated mainly for grassland and carr tree planting. Although some 2.5 hectares of land area will be lost, it will be replaced with alternative aquatic and waterborne features. An advantage will be the moving the towpath (footpath 15), which is likely to become the main pedestrian access route, further away from the riverside wetlands, with a consequent reduction in disturbance to the wildlife breeding areas on these wetlands.

The mound of overburden that has currently been retained for filling the diversion channel will be used partly for filling the bottom of the channel and those parts of the channel not required for the new canal line, and the balance will be spread beneath slightly raised contours as indicated on FCC drawing FCC/S/11. The subsoil and topsoil will be spread as previously intended, and the revised contoured areas will be planted as set out in the next section. Visually, the slightly raised areas will be almost indistinguishable from the existing approved plan (RJB drawing no. 05/12978D)

e) Landscape Restoration

Advice on the restoration of the landscape in area T8 has been obtained from Anthony Darbyshire, *Dip Hor (Kew)*, *Dip LA, MLI*, Chartered Landscape Architect, and the outline proposals are shown in drawing FCC/S/12. The essential features of the proposals for habitat creation and recreational use are:

.i Surface Contours

- Designed so that no materials are taken off site.
- Varying steepness and aspect of slope to provide variety of habitats.
- Earthworks are also shaped for scenic qualities and variety for canal and towpath users.
- Mound in north west corner to correspond to previous restoration at Pinxton giving more uniformity to general landscape.
- Base lines of existing overburden mound at south end retained to minimise disturbance to existing vegetated ground. Regrading machinery restricted to within baselines.
- Tops of overburden mounds locally sculpted into series of depressions, and left bare and stoney for ground nesting species.
- Additional pond created through stream diversion.
- Wildlife viewing hide incorporated into ridge, access paths hidden in new semi-dry woodland.
- Ditches to be created parallel to towpath and footpaths (not shown at 1:2500 scale) to deter people from straying into wildlife areas.

.ii Canal creation from existing flood relief channel

- Existing channel partially filled and puddled with existing on-site materials,
- Towpath bank to be bio-engineered.
- Offside bank sculptured to form 650metres of linear wetlands habitat. Plant material will be obtained from dredging of the Pinxton length of waterway.
- The offside bank will be securely fenced to form secure linear nature reserve between canal and railway line.

.iii Habitat creation

- All ground will be restored and managed in accordance with Derbyshire Wildlife Trust's publication "Habitat Creation Guide for Lowland Derbyshire"
- The grassland restoration is for bio-diversity and not for agricultural purposes.

.iv Access

- Specification for towpath and access gates to be in accordance with Derbyshire County Council designs for multi user tracks.

.v Other features

- Existing sandstone blocks of suitable quality (as found within overburden) to be used wherever possible for waterway construction and possible features.

.vi Site works management

- Ground movement to be kept within area of existing overburden, subsoil and topsoil mounds, and machinery routes.
- Machinery access to site and working conditions to be in accordance with previously agreed restoration plan.
- Works area to be fenced to protect existing restored ground..
- Landscape works to be undertaken outside breeding times.

3 Environmental Considerations – Pinxton section**a) General**

The Pinxton Section comprises the canal from the end of the Smotherfly site up to the terminus at Pinxton Wharf, and lies within Bolsover District. It largely exists already, and is in water apart from a short length at the District boundary. The work proposed consists of enhanced maintenance work to the existing section, involving cleaning the channel and where necessary dredging to provide a navigational depth of 1.4 metres, and width of 5 metres. A number of small trees which have self set on the canal bed adjacent to the former colliery loading basins will be removed. The short section which has been filled in will be re-excavated to its original dimensions.

b) Accommodation Bridge

Trial excavations have located the foundations of the former Colliery Office Bridge no. 11, but these are no longer complete and unsuitable for re-use. A new lift bridge (see drawings FCC/P/02 to 04) will therefore be constructed on an adjacent site to accommodate local farm traffic, and maintain the existing access to the adjacent truck breakers yard. The original Pinxton Colliery loading basin, which has been partially filled in but retains its original stone side walls, will be re-excavated so that it can be used as a mooring basin in the future. A sewer which crosses the canal line at shallow depth in this section will be diverted.

The terminal basin at Pinxton wharf has previously been enlarged into what are now known locally as Pinxton Ponds, which are relatively shallow in depth and used extensively for fishing. These will be retained, but that part which formed the original terminal basin will be dredged to provide some future visitor moorings, and to form a “winding hole” for turning boats. The modern footbridge at the entrance to the basin will be provided with a pivoting section to enable it to be opened for the passage of boats.

c) Palmerston Swing Bridge no 13

This extremely interesting cast iron structure (which deserves to be listed in its own right) will be fully restored and brought back into use.

d) Wildlife

The Derbyshire Wildlife Trust has advised that water voles are present at Pinxton wharf, badgers are active in the area, and there is also potential for great crested newts. Before any work is commenced on the watered section an appropriate survey will be undertaken and mitigation plans prepared. Checks will also be made for other protected species.

e) Retention of plant material

It is anticipated that the dredged material from Pinxton will be rich in local species of plant material, and thus be excellent for the seeding of the Smotherfly reed beds. Waterborne transport will be used as far as possible for the movement of material between the two areas.

4 Other Considerations**a) Archaeology**

The land comprising the Smotherfly site has already been completely disturbed by the opencasting works and no features of archaeological importance remain, although a number of early tramways led down to the basin adjacent to the Birchwood brook. The Pinxton section contains remains of the canal side walls, including the coal loading basin

of Pinxton colliery. The side basin at the wharf used for goods transfer to the Mansfield and Pinxton Tramway has been filled in, and a number of former rows of workers cottages have been demolished. The Pinxton Pottery site at the end of the canal has been largely demolished, as has the former gasworks at the canal basin, but the Boat Inn remains. This is a public house dating from the construction of the canal, and is reputed to have sold tickets for the Mansfield and Pinxton Tramway, which gives it a claim to be the oldest railway booking office in the world. The Palmerston Swing Bridge, bridge no 13, situated about 300 m from the end of the canal is a particularly interesting cast iron swing bridge and will be fully restored and interpreted.

Overall, the complete restoration will be of immense benefit to the archaeology and industrial history of the region.

b) Listed structures

There are no listed or scheduled structures on the Smotherfly or Pinxton Wharf site or their curtilages.

c) Amenity impact and contamination

The amenity value of the proposals will be considerable and very positive. Besides the wide local and regional benefits of the canal restoration in terms of recreation and regeneration of the upper Erewash Valley (as set out in FCC document 'Vision for the Cromford Canal'), the Smotherfly site, even on a 'stand alone' basis, will provide greatly enhanced recreational and sporting facilities including walking, jogging, cycling, canoeing, and fishing, for the benefit of the local community. Pinxton Wharf will benefit from the improvements to the canal and the enhancement of its recreational facilities, and will provide a generator for further social and economic development of the surrounding area, and will tie in with the development of the former Pinxton Pottery site, which has been independently promoted by others.

The contaminated land previously on the site at the former Pye Bridge acid works has been remediated as part of the coal extraction works, and no contamination will result from the proposed changes to the restoration works.

d) Water environment

The proposed works will be of considerable benefits in terms of flood alleviation in Pinxton and the Erewash Valley. This has already been discussed and confirmed with the Environment Agency, and the modifications to the overflow weir location they recommended have now been incorporated in the proposed scheme.

The Smotherfly section of canal has deliberately been left the full width of the diversion channel (apart from the reed bed along the west side) to provide a wide area that can be used for training for water sports, a facility in short supply in the region. The deeper water will attract water fowl and larger aquatic species.

A long section of the offside (west) bank of the Smotherfly Wide, approximately 650 metres long, adjacent to the railway embankment, will be provided with a shallow edge to create a reed bed and encourage bio-diversity.

5 Proposed alterations to existing Smotherfly Landscaping Plan

The retention and reuse of the existing redundant river diversion channel will require some modifications to the existing approved Smotherfly restoration landscaping plan (Drawing RJB 05/12978D). The detailed alignment of the channel has been deduced from a UK Coal plc detailed site survey, assuming a normal water level of 82.6 AOD.

The aim has been to retain the approved landscaping features as far as possible. A number of points have been taken into consideration:

- i The adoption of the old diversion channel will result in the minimum disturbance to the site restoration works completed so far.
- ii An area of water substantially the full width of the excavated channel is very attractive for recreational use.
- iii The Environment Agency has indicated its preference for an overflow weir opposite the exit of the Birchwood Brook. This weir will allow for a regulated compensation flow from the Smotherfly Wide to water the ponds area around the extension of the Birchwood Brook, to the east of the channel.
- iv The Environment Agency has also indicated that it would like the retained channel to benefit flood relief in the Pinxton Wharf area and the Erewash Valley generally. This will be achieved by providing sufficient freeboard for the Smotherfly Wide to overflow after high rainfall and then to discharge the excess water in a controlled manner over the Birchwood weir.
- v) A flood risk assessment has been made for the project by specialist consultants Halcrow Group Ltd, which shows that the proposals will reduce the frequency of overtopping at Pinxton Wharf and provide a small reduction in flood risk in the river Erewash downstream. A copy has been given to the Environment Agency who have raised a number of comments which are being addressed. Their principal concern was the amount of fill which had been shown within the flood plain area on preliminary plans. These plans have in fact now been modified with the advice of the Landscape Architect, and the proposal drawings now meet the EA requirements.
- vi) The surplus overburden previously retained for completely filling in the diversion channel will be disposed of in the following areas:

- *The bottom of diversion channel* - this will be filled-in to a level of 81.0 AOD, leaving a normal depth of water of 1.5 m. for navigation and recreational purposes.
- *A substantial embankment at the Pye Bridge Turn* - this is required to cut off the channel south of the Smotherfly Wide. This will be subject to detailed design, and will require the selection of fill with suitable engineering properties.
- *The area to the north-west of the channel* – this is the area currently used for subsoil and topsoil storage, and will be raised with overburden and mounded to correspond to previous tip restorations at Pinxton and give more uniformity to the general landscape.
- *The area beneath the existing overburden mound* – this will be raised by variable amounts up to 2.5 m. above the original plan. The surface will retain the gently undulating profile of the original concept, except that the two ponds which were to be located beneath the mound – and which have not yet been started – will not now be constructed.

In the above, the following considerations have been made:

- Because the original diversion channel is being retained, deep backfill in the channel will not be required, which reduces the risk of future settlement and avoids the need for additional ground compaction. Elsewhere, the overburden is spread to much lesser depths, which will simplify placing.
- Roughly one third of the existing overburden mound will be completely undisturbed under the proposed new re-profiling and the handling of much of the remainder will be simplified.
- The areas of topsoil and subsoil will be slightly reduced by the area of the water surface. Selected clay subsoil will be used for the cut-off embankment and any shortfall in subsoil spread will be compensated by the available topsoil.

It is considered that by making these adjustments the overburden and soils can all be retained on site.

vii Water to the Smotherfly Wide will be supplied by the existing streams from the north and west of the site – including those already supplying the watered section at Pinxton Wharf, the Birchwood Brook and another small stream further south. Where possible, silt traps will be constructed to each of these inflows.

viii The two ponds already constructed around the Birchwood Brook will be retained as existing. A third pond will be relocated. The loss of two further ponds will be fully compensated by the creation of the long shallow reed bed along the west bank of the Smotherfly Wide, from its south end up to the Birchwood Brook.

ix Footpath number 28, alongside the Birchwood Brook, will be restored to its original routing along the north-west bank of the Canal, in a north-easterly direction as far as Colliery Office Bridge no 11 – where it will cross the bridge and join footpath no. 61, the proposed Erewash Valley Trail.

x Footpath no 61, the proposed Erewash Valley Trail, has already been partly constructed along the line of the original towing path, and will be completed as previously planned, but path 15 (not yet constructed) will be arranged to run alongside the Smotherfly Wide and form the new towpath. It is anticipated that, in practice, users will prefer to use the water-side route and this will become the main through route. Being sited further away from the River Erewash this will have the benefit of moving any disturbance – due to humans, dogs etc. – further away from the sensitive riverside areas.

6 Other construction works

In addition to the foregoing earthworks and landscaping, the following works will be required:

a) Storm overflow weir

This will be on the east side of the Smotherfly Wide, on the line of the Birchwood Brook, and will provide a storm water overflow, and function as a flood relief measure for Pinxton Wharf area. It will be constructed in reinforced concrete, timber and reinforced grass as shown in drawing FCC/S/15 & 16, and be carefully designed to release excess water in a controlled manner, to mitigate flooding in the River Erewash downstream of the site.

b) Drawdown valve

This will be located at the south end of the Smotherfly Wide, and will comprise a drawdown valve in a buried concrete chamber at the south end of the site, together with associated discharge pipework, as shown on drawing FCC/S/17. It will be available for lowering the water in the Wide for maintenance purposes and can be used to assist the circulation of water in the Wide.

c) Existing Pinxton section weir and outlet.

The existing weir at the end of the watered section will be removed as part of the connection to the Smotherfly section. Removable stop planks will be provided at the new swing bridge to enable the Pinxton section to be isolated, and a draw down valve will be installed at the existing outlet point for maintenance purposes.

7 Engineering Design

a) Navigable Dimensions

The Smotherfly Wide conforms to British Waterways' engineering standards to permit possible incorporation at a future date into the main canal system. The Pinxton section will retain its original dimensions, which already conform to the current standards.

b) Levels

A levels survey undertaken by Derbyshire County Council has shown that there has been no significant settlement within the fixed structures along whole length of the Pinxton Canal – which makes the restoration quite feasible. A normal water level of 82.6 m. AOD will be adopted for the Smotherfly Wide, with a towpath level of 83.15m. AOD Under maximum flood conditions, the water level might increase by 0.25 m. – providing a good flood storage capacity.

c) Water channel

The site is largely of undisturbed clay material of good impermeability. The lower part of the diversion channel was lined, for added security, with an impermeable membrane, which will be retained. Where necessary permeable sections will be lined with traditional clay puddling or geotextile membrane. In general the waterway is cut through virgin ground with no stability problems. The cut-off embankment at the south end of the diversion channel will be subject to geotechnical design. Bank protection will be by environmentally friendly bio-engineered methods, supplemented by timber or lightweight galvanised sheet piling where more severe engineering considerations dictate.

d) Water supply

The existing canal at Pinxton is fed by two small streams, entering from the higher ground to the north and east. The Birchwood Brook will feed into Smotherfly Wide. A small compensation flow will be provided to maintain water to the Birchwood Ponds ponds between the Wide and the River Erewash. The flood overflow weir will be designed with sufficient capacity to accommodate flood flows and alleviate flooding problems at Pinxton Wharf.

e) Structures

All structures will comply with the appropriate British/European Standard Specifications and codes of practice. Part of the spillway weir is designed to CIRIA report 116: Design of reinforced grass waterways.

8 Construction**a) Smotherfly section**

In general there is no change to the construction procedures already agreed for the completion of the existing Smotherfly restoration scheme. The approved timing, construction plant and equipment, access arrangements and planting procedures will be retained. All operations take place at least 500 m from the nearest house, and are screened from them by the main line railway embankment, so that noise and dust pollution are not issues.

The major earthworks will be completed under the provisions allowed in the existing approvals granted by the Mineral Planning Authority, who have confirmed that the hours of working are monitored in accordance with condition xiv and noise in accordance with conditions xxxiv – xl, and that if the site was restored under the OCC permission the number of vehicles on site would be 2 articulated dump trucks (40 tons), 1 back actor and 1 blade (D8). There would be about 6 weeks work using this plant to restore the site to the approved scheme. The only traffic generation would be from the private cars of drivers operating the machinery and the removal of the plant off site when the works are complete. As the site access onto Birchfield Lane has been removed, no traffic movements other than the above would now be considered acceptable under the opencast permission and large plant would normally require police escorts.

The only additional plant necessary for the modified earthworks will be a towed roller to compact the cutoff embankment.

There will be additional operations at Smotherfly for the construction of two small structures, the overflow weir and drawdown valve, and bank protection comprising bio-engineering work or small sheet piles driven by lightweight equipment. Much of the protection would be laid by hand. There will be no earth moved off site, and deliveries will be limited to four loads of readymixed concrete, and bank protection materials.

b) Pinxton section

On the Pinxton section, a new lift bridge will be constructed to replace bridge 11, and a sewer diversion will be required alongside. None of these operations are major, and they take place well away from the nearest habitation, so no nuisance noise will be created. For these additional works plant used will be normal small construction plant, including a JCB 3CX or similar excavator, 1t site dumpers, small plant and equipment and light commercial vehicles. A small crane will be required on approximately 3 visits for the erection of the drawbridge superstructure. There will be no earth moved off site, and deliveries will be limited to six loads of readymixed concrete, and bank protection materials.

Appendix A

Restoration brief for Conservation Area - (Area T8)

(Extract of approved specification for Smotherfly site, dated 18 February 1998)

3.6 Southern Half of T8 – Ruderal Area

3.6.1 Aim

To achieve a dynamic community reflective of ruderal vegetation.

The objective for this area is to try to create a ruderal community based on very free-draining and infertile substrates (shales and spoils from within the site can be utilised). This is a habitat that was once common on derelict land but is now declining rapidly as land is “restored”, the areas of bare ground are important for pioneer plant species particularly xerophytes, and also for ectotherms such as invertebrates and reptiles. This must be balanced against the desire of the majority of the public for tidiness, hence tree and shrub planting is proposed around the periphery and along the footpath. This planting will also diversify the microhabitats available. This area would be soiled to a depth of 250mm

The central part of the area would have sparse planting of resilient species (*Betula pendula*, *Crataegus monogyna*, *Salix caprea*) that do not cast heavy shade so that the hot, dry conditions can be maintained for the robust plant and animal communities. These areas would not be soiled.

The success of the development of this community could be judged by balance of vegetation cover, eg. a minimum of 20% bare ground should be preserved for the invertebrate and reptile populations. Additionally, it would be possible to list the desirable plant families that might be achieved. The very nature of ruderal communities and their complex associations caused by levels of disturbance makes it hard to set targets to specific level. The following are the families that might be expected to inhabit a ruderal site, a target of eg. 75% of families to be represented would be realistic

Representatives of:

Papaveraceae

Fumariaceae

Urticaceae

Chenopodiaceae (*Chenopodium spp*, *Atriplex spp*, *Iberis spp*, *Lepidum spp*, *Brassica spp*,)

Resedaceae

Polygonaceae (*Polygonum spp*, *Rumex spp*.)

Caryophyllaceae (*Stellaria spp*, *Holostea spp*, *Cerastium spp*, *Silene spp*)

Polygonaceae

Malvaceae

Brassicaceae (*Sisymbrium spp*, *Alliaria spp*, *Barberia spp*)

Crassulaceae (*Crassula spp*, *Sedum spp*)

Rosaceae (*Potentilla spp*, *Rosa spp*, *Prunus spp*, *Crataegus spp*)

Fabaceae (*Lathyrus spp*, *Cytisus spp*, *Lupinus spp*, *Medicago spp*, *Trifolium spp*, *Lotus spp*,

Vicia spp, *Ulex spp*,)

Onagraceae (Epilohium spp, Chamerion spp, Oenothora spp,)
Euphorbiaceae (Euphorbia spp,)
Geraniaceae (Geranium spp, Erodinm spp)
Apiaceae (Heraclium spp, Daucus spp)
Convolvulaceae (Convolvulus spp, Calystegia spp)
Boraginaceae (Symphytum spp, Myosotis spp,)
Lamiaceae (Stachys spp, Lam ium spp, . Galeopsis spp)
Plantaginaceae
Buddlejaceae
Scrophulariaceae (Verbascum spp. Antirhinuin spp,Chaenorhinum spp, Linaria spp,
Veronicasp)
Campanulaceae
Rubiaceae
Dipsaceae
Asteraceae (Senecio spp, Artemisia spp, Hypochaeris spp Leontodon spp, Teraxacum spp,
Centaurea spp, Tanacetum spp, Matricaria spp, Aster spp, Tussilago spp)
Poaceae (Most genera)
Orchidaceae

3.6.2 Management

Periodic management of this bare area (20% each year with no management for 1 year, thus creating a 6 year rotation) would need to be undertaken to maintain pioneer and ephemeral communities and to prevent scrub encroachment. This could be achieved by chain harrowing, or blading with a bulldozer. The robust nature of the ruderal communities means that access by the public is acceptable, and is probably desirable as a tool for disturbing the vegetation.

3.6.3 Monitoring

Transects would again be appropriate to monitor ingress of species. The route of the transects should cross the range of substrate conditions. Each new species should be recorded, and changes noted from year to year

3.6.4 Potential Issues

Availability of local seed will affect rates of colonisation, thus it may emerge that the 6 year rotation is too short for the families above to become represented. Alternatively, some genera may be over-represented at the expense of others. Decisions on the timing of disturbance would need to be made if this were the case.

3.7 Northern Half of T9 - Wetlands

3.7.1 Aim

To establish wetlands and a brook course.

The wetlands in T8 will be designed to hold a variety of water levels in order to maximise opportunities for colonisation by wildlife, they will also perform a function of filtering the water before it crosses the riparian grassland. The 2 southern-most ponds will be seasonally wet and

thus will be appropriate for marshy species, particularly around the inlet of the brook. Soft rush (*Juncus effuses*), hard rush (*Juncus inflexus*) and meadowsweet (*Filipendula ulmaria*,) around the southern margin in a shallow excavation of 0.1-0.2m will discourage investigation of the area by visitors. The establishment of hawthorn (*Crataegus monogyna*,), blackthorn (*Prunus spinosa*,), goat willow (*Salix caprea*,) and dog rose (*Rosa canina*,) immediately adjacent to the footpath should also have this effect, the result will be less disturbance of the developing faunal communities.

The ponds to the north will hold water throughout the year although the excavation of margins varying in slope from 15°- 45° from horizontal will create fluctuations in level that will encourage a wide zone of aquatic and emergent species. The widest, shallowest margins will be situated on the western side so that an impenetrable marsh community develops that will discourage fishing. The transition between the marsh and drier land will be affected by the nutrient-rich silts and will probably develop as a nettle (*Urtica dioica*) community that will be very effective at discouraging visitors.

The nursery ponds are currently dry in the summer and are filled by bowser, **it** would be possible to reduce them in number and to have a small inflow and outflow siphoned off part of the Brook course. The wetlands would still probably be seasonal as levels in the brook are very variable, but this may make them attractive to amphibians as fish populations would not build up. The ponds in T8 would be established with vegetation from the nursery ponds where possible, but it is anticipated that further material would be needed.

The measure of success for the wetlands would be the establishment of acceptable levels of plant cover, in terms of both floating and emergent aquatic plants, also of swamp-type marginal communities. Communities reflective of A9 *Potamogaton natans* and S 14 *Sparganium erectum* might be appropriate for this area, as follow. Where possible the plants would be introduced from other wetlands in the area, the advice of the Derbyshire Wildlife Trust would be sought on availability, otherwise they will be sourced commercially

A9 type

Broadleaved pondweed	<i>Potamogaton natans</i>
Duckweed	<i>Lemna minor</i>
Water plantain	<i>Alisma plantago - aquatica</i>
Common starwort	<i>Callitriche stagnalis</i>
Floating sweetgrass	<i>Glyceria fluitans</i>
Branched bur-reed	<i>Sparganium erectum</i>

S14 type

Branched bur-reed	<i>Sparganium erectum</i>
Flowering rush	<i>Butomus umbellatus</i>
Common spike-rush	<i>Eleocharis palustris</i>
Water plantain	<i>Alisma plantago-aquatica</i>
Common starwort	<i>Callitriche stagnalis</i>
Watercress	<i>Nasturtium officinale</i>
Fools watercress	<i>Apium nodiflorum</i>
Water mint	<i>Mentha aquatica</i>
Soft rush	<i>Juncus effusus</i>
Water forgetmenot	<i>Myosotis scorpioides</i>
Bittersweet	<i>Solanum dulcamara</i>

Yellow flag	<i>Iris pseudacorus</i>
Meadow sweet	<i>Filipendula ulmaria</i>
Lesser spearwort	<i>Ranunculus flammula</i>
Reed canary grass	<i>Phalaris arundinacea</i>
Great willowherb	<i>Epilobium hirsutum</i>
Common reedbed	<i>Typha latifolia</i> (limited)

The wetlands would be excavated and the new inflow and outflow channels established in 1999. The channels and the brook course would be allowed to colonise naturally as carriers of seed this should happen rapidly.

3.7.2 Management

Shallow water bodies inevitably need management once established to prevent succession through vegetation growth. Within the 5 year aftercare period it is unlikely that cover will reach unacceptable levels. In the longer term, winter clearance of 20% of the vegetation on a two-yearly basis will create a 10 year management rotation that will not cause undue disturbance to fauna.

3.7.3 Monitoring

The plants transferred to the wetlands can be directly monitored for successful establishment. Botanical surveys of the ponds could be undertaken, in terms of species recording around the periphery of each wetland. The rate and nature of colonisation would then be known. This would need to be undertaken each summer, once again consistency of timing month would ensure that the results have value for future use.

3.7.4 Potential Issues

The rate of colonisation by new species may be slower than is desirable, due to availability of natural seed sources. After 4 years it would be possible to identify those species that had not colonised at all and to decide whether introducing plug-grown stock would be useful. It would be inevitable that species such as *Typha latifolia* and *Phalaris arundinacea* would be strong competitors in the community. If it was considered that they were becoming too invasive action would need to be taken either in the form of water level management or, more straightforwardly, by clearance.

3.8 Northern Half of T8 - Woodlands

3.8.1 Aim

To establish woodland to the planting mix approved in the BCO document.

The mix of woody species has been decided for T8, the objective would be to ensure acceptable rates of establishment and growth through good forestry practices. The development of a varied indigenous ground flora would also be encouraged outside the weed control areas. However this would inevitably change as the canopy closed. A realistic measure of success might be to hope to achieve a basic community of “hedgebottom” species that are tolerant of a range of conditions, and will adapt and change dominance as the woodland develops. Such a community might consist of the following species

Red fescue	<i>Festuca rubra</i>
Rough meadow grass	<i>Poa pratensis</i>

Crested dogstail	<i>Cynosurus cristatus</i>
Sweet vernal grass	<i>Anthoxanthum odoratum</i>
Cocksfoot	<i>Dactylis glomeratus</i>
Yorkshire fog	<i>Holcus lanatus</i>
Common bent	<i>Agrostis capillaris</i>
Self heal	<i>Prunella vulgaris</i>
Hedge woundwort	<i>Stachys sylvatica</i>
White campion	<i>Silene latifolia</i>
Herb robert	<i>Geranium robertianum</i>
Red campion	<i>Silene dioica</i>
Cow parsley	<i>Anthriscus sylvestris</i>
Wood sage	<i>Teucrium scorodoma</i>
Greater stitchwort	<i>Stellaria holostea</i>
Tufted vetch	<i>Vicia cracca</i>

An initial stabilising mix of 50% *Festuca rubra* and 50% *Poa pratensis* would be sown into the planting area.

This area would be partly planted in 1999 and partly in 2000.

3.8.2 Management

The usual forestry procedures would be carried out to establish the woody species successfully. Weed control to all COSHH regulations would be used to ensure clear areas were maintained around each tree, and spot treatment would be used to prevent invasion by undesirable species into the other areas.

3.8.3 Monitoring

Transects of the plantation could be monitored to record ingress of species. After 5 years an assessment of success could be made

3.8.4 Potential Issues

The establishment of the trees would be straightforward, however the sward development may be more complex. After the 5th year, gaps in the species list that were felt to be desirable could be remediated by plug planting.