

ROYAL ORDNANCE, BISHOPTON



REMEDIATION AND RECLAMATION EARTHWORKS

ENVIRONMENTAL STATEMENT NON TECHNICAL SUMMARY

October 2006

ROYAL ORDNANCE SITE, BISHOPTON

REMEDICATION AND RECLAMATION EARTHWORKS

**ENVIRONMENTAL STATEMENT
NON TECHNICAL SUMMARY**

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1 Introduction to the Non-Technical Summary

- 1.1 This non-technical summary provides a generally accessible account of the information that is set out in the Environmental Statement. In turn the Environmental Statement is a key component of a planning application for remediation and reclamation earthworks at the Royal Ordnance site, Bishopton. It is the outcome of an Environmental Impact Assessment (EIA) process.
- 1.2 There are direct associations between these engineering operations and proposals for the mixed use regeneration of the site as detailed in outline planning application reference : 06/0602/PP.
- 1.3 The purpose of the non-technical summary is to help the public and non-experts to understand the conclusions of the Environmental Statement.

2 Key Issues

- 2.1 There are many key environmental issues to be considered through the EIA process. The outcome of the assessment of these issues is reported in the Environmental Statement. Amongst the key environmental issues are:
- The effects on local employment
 - The potential for impacts on agricultural land
 - The effects on local roads arising from changing traffic flows around Bishopton.
 - The impacts on air quality arising from the remediation and earthworks activities on the site
 - The effects on the noise environment as a result of the remediation¹ and reclamation earthworks
 - The potential impacts on soils
 - The impacts on the water environment as the site is being remediated
 - The consequences for the landscape character and the visual environment arising out of the processes of site remediation and reclamation earthworks
 - The potential impacts on wildlife as a consequence of changes to different habitats on the site.
 - The impacts on important aspects of the architectural and archaeological heritage.

¹ Remediation in its widest sense includes preventing or minimising, remedying or mitigating the effects of land contamination or monitoring the condition of land.

3 Description of the Site and Surroundings and the Project

- 3.1 The existing topography over the majority of the site is represented by a relatively flat valley floor falling gradually from 15m Above Ordnance Datum (AOD) in the north to 5m AOD in the south, a gradient of around 1 in 400. Most of the developed part of the factory is located within this valley floor. This is where the remediation and reclamation earthworks activities will be concentrated (Figure 3.3).
- 3.2 The present landscape character of the site is heavily influenced by the extensive areas of woodland within it (Figure 3.2). These tend to limit views in and around the site to a maximum of one kilometre, and generally much less. Where longer range views are possible, the generally flat nature of the topography gives local landforms special prominence, both as viewing points and features. This is clearly demonstrated by the impact of the large number of bunds, which dominate many of the open areas of the factory site. These are to be removed as part of the remediation, which will have a considerable visual impact.

THE DEVELOPMENT PROPOSAL

- 3.3 Preparation of the site for future use will entail remediation and reclamation earthworks. These activities are essential for dealing with both the contaminated land issues and material changes to the 'shape' of the site necessary for providing the platform from which to progress new development. Remediation is the process of removing and dealing with derelict structures and contaminated land i.e. preventing or minimising, remedying or mitigating the effects of contamination, or monitoring of the condition of the land. Reclamation earthworks is the process of excavating soils in some areas and filling with soils in other areas to change the profile of the site's surfaces where required. The aim is to achieve this within the soils resource available on the site without importing or exporting material, a balance of cut and fill.

Surveys, investigations and risk assessment

- 3.4 Work carried out to gain an understanding of the condition of the site. Usually carried out in at least two Stages. Stage 1 to find sources of any contamination and Stage 2 to further delineate and fully quantify those sources. Includes historic research of the site, physical inspection, digging trial pits, sinking boreholes, sampling surface and subsurface materials including soils and water, physical inspection, carrying out laboratory analysis and performing risk assessments using the data collected from the surveys and investigations.

Design of the remediation process and method statements

- 3.5 This activity uses the data and information derived from the various surveys, site investigations, research and risk assessments and develops the methodology for physically remediating the site using identified criteria which are pertinent to the new uses proposed for the site. The design considers all aspects of the new scheme. Because of the size and scope of the scheme the remediation works will be undertaken in 'phases' allowing new development to follow on, also in a 'phased' manner. This means that sections of the site will be completed whilst others are still being remediated. The design of the remediation process looks at all the activities required to achieve the objectives (preparing the site for its proposed uses) and assembles them in a logical sequence detailing in Method Statements how they are to be carried out. The Method Statements consider all practical, technical and health, safety and environmental matters associated with the proposed remediation activities together with the mitigation action required. Due to the scale of the proposed works at Bishopton, specific management plans would be used for key issues such as environmental protection, ecology and archaeology. The remediation design emerges following each stage of site investigation and in this case comes in three stages a) Outline Strategy b) Stage 1 Strategy, c) Stage 2

Strategy (formulated and agreed after planning approval but before any works are started). These stages build on each other, each being more developed than the last.

Procurement of contracts

- 3.6 Having carried out all the site assessments and designed the remediation works, contractors have to be engaged. This will involve a process to test their competency and skill in specific areas of expertise. Only contractors with a proven track record in the field required would be engaged. The purpose of this process is to select the most appropriate skills from industry to carry out the works, using appropriate tried and tested Terms and Conditions.

Firm up methodologies, health, safety and environmental strategies and plans

- 3.7 To ensure the best possible value and quality is achieved, contractors would be invited to engage in the final development of methodologies. This uses their expertise and knowledge of methods and technologies to fine-tune the methodologies. Over-arching documents such as a programme of works, Construction Phase Health and Safety Plan, Ecological, Archaeological and Environmental Management Plans, Community Liaison Plan etc. would be finalised and agreed prior to any physical works commencing.

Commence landfill construction

- 3.8 A 'permitted' non-hazardous landfill is proposed to take some wastes generated by the remediation process. These wastes will only be those that cannot be treated, reused or recycled. Some of these wastes would be pre-treated to stabilise before deposition in the landfill. Stable non-reactive cells would be included to accommodate stable wastes such as asbestos containing materials. This facility would be designed and constructed by suitably qualified professionals as soon as practicable in the first phase of the remediation works. We would obtain clay soils from a 'borrow area' on the site to use (with impermeable membranes) for constructing the base and cover of the landfill. The borrow area would be restored and landscaped on completion of the works. Further information about the landfill is provided later in this exhibition.

Ecological mitigation - measures to conserve flora and fauna

- 3.9 An Ecological Management Plan is being developed to provide all those engaged in the project with information and guidance on how to deal with issues relating to flora and fauna. The Plan will contain actions required to comply with current legislation in this respect. It is inevitable that the site would be disturbed by remediation and development. Plans will be in place to provide mitigating action, licensed where appropriate and guided by professionals in this field throughout the whole process. An example of mitigating action is the provision of new badger setts to translocate the animals from those areas affected by the essential works.

Essential tree removal to facilitate decontamination and remediation works

- 3.10 In order to decontaminate different parts of the site and carry out essential earthworks, there would be tree losses to facilitate access, remove risk of fire, and in relation to new development. This process would use advice from professionals who have surveyed the site to ensure particularly valuable examples of mature trees are retained wherever possible. The great majority of trees with significant amenity, ecological or heritage value would be retained.

Asbestos removal

- 3.11 Formal 'Type 3' surveys (specific intrusive and searching investigations) would be undertaken to determine the extent and methodology for asbestos removal. Asbestos remaining in the site infrastructure would be removed by professionals who would comply with strict regulatory

regimes. The materials removed would be deposited in the site's designated landfill. These works would take place before any decontamination or demolition is undertaken in each building.

Phased decontamination of former manufacturing and storage buildings, including controlled burning of buildings

- 3.12 Approximately 500 of the structures on this site were used for explosives manufacture or storage. It is essential that these are decontaminated before they are demolished. The recognised process is to prepare the building and burn in a controlled fashion. This destroys residual energetic material such as dusts and deposits lodged in the fabric of the structure and in redundant manufacturing plant. This process has been agreed with the Health and Safety Executive, tried and tested elsewhere and proven to be effective. It reduces risks to personnel carrying out the works by ensuring their contact with the hazards is minimised. The structure can then be demolished and recycled in the traditional way.

Phased demolition of all structures

- 3.13 In the development zone all structures would be demolished, their foundations removed and the materials arising such as brick and concrete would be crushed and recycled as usable aggregate in the development. In the rest of the site (Community Woodland Park area) the structures would be demolished to ground level only and the foundations left insitu to be covered with soil fill to enhance the landscape. As with all other activities these works would be carried out in phases to enable progress of activities that follow such as earthworks.

Phased remediation of contaminated ground

- 3.14 This is generally the earthworks element of the scheme. Areas of unsuitable ground identified by the investigations and surveys would be removed for treatment and reuse or disposed of to landfill. Other below ground elements such as drains would be removed to a predefined depth in the development zone to ensure foundations of new buildings are not impeded by hard obstructions. Contaminated drains would be totally removed in the development zone. Voids in the ground resulting from removed drains, soils and foundations would be refilled with appropriate material sourced from different parts of the site, for example the 'earth mounds' surrounding buildings. Surplus soils, deemed unsuitable for filling work, would be used to create landscape features outside of the development zone providing visual character, screening, recreational amenity and new habitats.

Verification of the completed remediation works

- 3.15 A verification plan would be agreed with Renfrewshire Council. This would contain the principles and definitions of how each part of the remedial work would be verified as complete. It would involve a process of soil and water sampling and laboratory testing to demonstrate that contamination levels have been removed or reduced to acceptable levels that are appropriate for the type of proposed use for the particular area of land. Development could not commence until this process has been completed and approved by Renfrewshire Council. It is proposed to verify the works in phases to allow development to follow in defined phases.

Final groundworks to prepare for new development (e.g. reprofiling)

- 3.16 Further earthworks would be undertaken to 'reshape' or smooth out the landscape in certain areas to provide an acceptable landform to develop upon, or to reshape the landscape to accord with new designs for features such as drainage ponds. Surplus soils arising from this process would be used to create landscape forms to enhance the visual character of the site and its biodiversity.

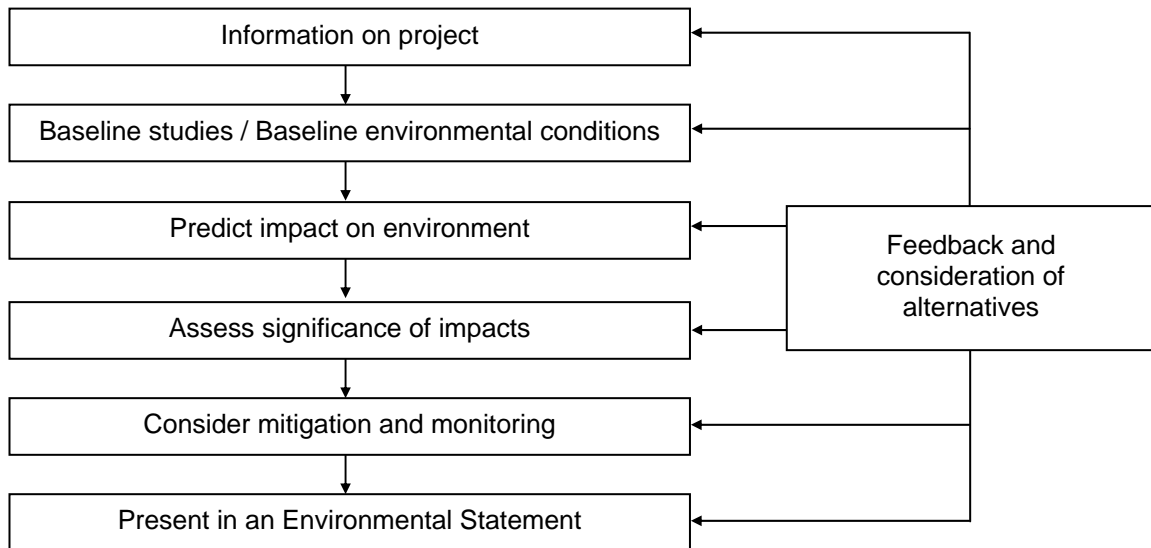
4 Plans and Policy Context

- 4.1 The national and regional strategic policy context embodies the principles of sustainable development, including recycling previously used land. Fundamentally, the principle of remediating the former Royal Ordnance site fits well with the general thrust of recycling brownfield land and offering opportunities for environmental improvement on vacant and derelict land. It is therefore important to bear in mind that the remediation proposals for the site are directly linked with the regeneration of the site set out in the outline planning application ref. 06/0602/PP, which proposes post-remediation after-uses of a community expansion area and a new Community Woodland Park.
- 4.2 The single most significant component in the overall programme of environmental enhancement for the site is the reclamation and remediation of derelict and contaminated land. The comprehensive regeneration of the site will be founded on the renewal of an extensive area of derelict land, which is acknowledged in the Structure Plan as being substantially vacant and derelict. This will have significant and wide-ranging environmental benefit but will also facilitate public access to a swathe of land which has been secured and generally inaccessible for many years.
- 4.3 The national and regional planning policy context also makes clear that in assessing proposals such as this, a balance will need to be struck between the proximity principle, regional self sufficiency, local amenity and guiding principles for sustainable development (particularly relating to transport). The proposals contained in this remediation and earthworks application are underpinned by sustainable remediation techniques, such as recycling and local treatment wherever possible. The movement, treatment and final destination of nearly all waste material is confined to the site itself.

5 Introduction to the Assessment of Environmental Effects by Topic

5.1 This Environmental Statement is an integral part of the Environmental Impact Assessment (EIA) process. It is a document which brings together the results of the EIA process.

5.2 The EIA process which has been followed can be summarised in a flow diagram :



5.3 For each environmental topic there has been a period of collecting baseline information. This has involved desk studies, field surveys and consultation with other experts and bodies. For many of the environmental topics this process has extended over many years.

5.4 The predictions of a range of impacts has been undertaken for each environmental topic. This has involved the analysis of potential causes of change to the existing environment and the determination of likely effects.

5.5 In the instance of each environmental topic there is an evaluation of the relative significance of the impact taking into account matters such as the extent of the impact, the time scale, the frequency of the impact, the relative sensitivity of the receptor and the capacity of the receiving environment to absorb impacts.

5.6 Consideration is given to the mitigation measures which can be introduced to avoid, reduce or remedy any significant adverse effects. It is recognised that the most satisfactory form of mitigation is avoidance (often through project design) but where this is not possible mitigation proposed is by way of reducing the severity of an impact or providing a form of compensation. In some instances, enhancement or improvement of aspects of the environment will provide a net benefit.

6 Socio-Economic Impacts

- 6.1 Bearing in mind the scope of works associated with remediation and reclamation earthworks, the socio-economic impacts of the scheme which is the subject of this planning application will be relatively limited. The employment impacts on the local economy are likely to be negligible. The majority of the new employment associated with remediation and reclamation earthworks will be temporary in nature and will have a negligible impact, in its own right, on the population of Bishopton.

7 Effects on Major Land Uses

- 7.1 There is projected to be limited impact on the primary land uses of agriculture, active forestry and recreation and leisure. Of these three uses, agriculture is dominant.
- 7.2 Within the bounds of the planning application site but beyond the factory security fence are a number of fields used for agriculture. In addition, there is contiguous land in agricultural use which is in the ownership of BAE Systems (around 84 hectares in total).
- 7.3 Impacts on agriculture as a consequence of the remediation and reclamation earthworks will be negligible. There is the opportunity to enhance the bio-diversity value of agricultural land within the application boundary through measures such as enhanced hedgerow planting and appropriate land management. However, these measures do not exclude continued agricultural use.

8 Effects from Traffic

- 8.1 The establishment of a dedicated site entrance and internal 'haul road' at the outset of remediation and reclamation earthworks activities will ensure that traffic associated with these engineering operations will not need to penetrate the village of Bishopton to gain access to the site. The haul road will be operational in advance of the construction of the southern and northern links from Greenock Road to the planned new development. Once the southern and northern link roads are constructed they provide optional routes for traffic associated with engineering operations. Again, traffic using these roads will be enabled to enter and leave the site without penetrating the village of Bishopton.
- 8.2 The daily number of vehicle movements to and from the site associated with engineering operations is not significant. In the main, the larger vehicles and plant to be utilised for remediation and reclamation earthworks will remain on the site for considerable periods. These two factors will militate against any significant environmental impacts.

9 Effects on Air and Climate

- 9.1 Air quality implications resulting from the decontamination and earthworks phases have been assessed. Specific reference is made to the site's location in relation to nearby sensitive locations, the planned processes, the duration of the construction period, site characteristics, the prevailing wind direction, and the risks posed by contamination in dusty materials. The assessment concluded that if construction activities were not controlled for dust emissions, the redevelopment could have a significant, adverse impact on local air quality. To minimise this potential impact, a set of mitigation measures was specified. Provided these measures are effectively applied to eliminate dust nuisance, the assessment indicates that these measures will also provide sufficient control of trace contaminants which are present on some parts of the site. These measures should be set out in a dust management plan, to be agreed between the developer and the local authority.
- 9.2 The forecast increase in vehicles accessing the site as a result of the earthwork activities is relatively small and would not result in any significant adverse effects on air quality.
- 9.3 A detailed modelling assessment was undertaken to assess whether there are likely to be any adverse impacts on air quality arising at nearby sensitive locations as a consequence of the building burning programme. The investigation identified a set of mitigation measures, and concluded that provided these measures are implemented, the remedial burning is unlikely to result in adverse impacts on air quality at sensitive locations.

10 Effects on Noise and Vibration

- 10.1 Noise and vibration from the remediation and earthwork phases of the Bishopton redevelopment has been assessed and the following conclusions have been made in terms of the potential impact on both existing and future residential properties.
- 10.2 Construction noise levels are unlikely to be significant at most of the identified noise sensitive receptors for the potentially temporary nature of the construction phase activities. However, where predicted noise levels exceed recognised criteria, it is recommended that both active and passive noise control measures are in place during each phase and working task of the development.
- 10.3 In all cases, the best practical methods of minimising noise on the site will be adopted. Such methods may potentially include general restrictions on construction activities and the regular maintenance of plant to ensure the control of undue noise. In addition, any machinery which is idle will be switched off, as a passive control measure to reduce undue construction noise.

11 Effects on Geology and Soils

- 11.1 Included in the proposals to regenerate the site is the requirement for land contamination issues to be assessed and appropriately addressed. This is a result of the site's 80 year industrial history when the factory was subjected to a range of activities resulting in a number of contamination sources being identified across the site.
- 11.2 A comprehensive Stage 1 Site Investigation was undertaken across the site in 2005 in order to characterise the contamination at the site. This, together with information from previous more targeted investigations, has provided information on the extent of the contamination present on the site and allowed an assessment to be made as to what remediation is required to make the site suitable for its proposed new uses. The investigations have also provided a more detailed insight into the site's geological conditions. Such information is important in assessing how contaminants might move and behave in the environment.
- 11.3 In undertaking a large scale remediation/development project, and by the very nature of the activities involved, impacts to the soils and geology is unavoidable. However, it should be noted that with the contamination that has been identified on the site it is expected that the overall impact from the remediation will be positive.
- 11.4 The magnitude and significance of all potential impacts, both positive and negative, have been identified and assessed. Appropriate mitigation measures have been identified for all those activities where there is the potential of a negative impact whether they are considered significant or not.
- 11.5 It should also be noted that the impacts identified are all commonly encountered on brownfield land redevelopment and mitigation measures are well established and within the normal capacity of the construction industry to implement. Notwithstanding this, a Management Plan will be produced to ensure the successful implementation of the mitigation measures in line with key regulations and good practice guidance.
- 11.6 The primary objective of the Management Plan is to establish a protocol to ensure that health and safety standards are maintained throughout the site works and to minimise the impact of the site works on the surrounding environment.
- 11.7 More specifically, and in relation to the effects on geology and soils, the Management Plan will include the following subject areas:
- General Environmental Management (including regulatory approvals)
 - Ecological Management
 - Archaeological Management
 - Woodland Management
- 11.8 In conclusion, following the implementation of the Management Plan and associated mitigation measures it is expected that the overall impact on the site will be positive resulting in the safe and successful management of the contamination that is currently impacting on the soils and geology.
- 11.9 The impacts will be measured through the implementation of a verification plan which will be adopted to demonstrate the effectiveness of the remediation in terms of meeting the remediation objectives. This will be reported in a series of verification reports as each phase of the remediation is completed.

12 Effects on Water

- 12.1 The Dargavel Burn runs through the centre of the site flowing into the River Gryfe at the southernmost tip of the site. Along its length the Burn is joined by numerous ditches, drainage pipes, former process water drains and small streams, some of which emanate from outside the factory boundary.
- 12.2 Craigton Burn enters the site at the eastern boundary just south of Bishopton village and flows in a northeast to southwesterly direction. It is joined by Cordite Burn, which flows from the northern boundary, before meeting Dargavel Burn near the centre of the site.
- 12.3 Groundwater is generally present at shallow depths across the site within superficial deposits (1-2 metres below ground level) although deeper bedrock aquifers have also been identified in some parts of the site.
- 12.4 In order to establish the current quality of the water environment, surface water and groundwater monitoring was incorporated into the Stage 1 Site Investigation. This supplements a period of three years monitoring of historic boundary boreholes and surface water monitoring locations.
- 12.5 In summary, the quality of both the groundwater and surface water has seen a marked improvement since the cessation of manufacture at the factory in 2002. However, there are indications that some contamination may be continuing to impact on the water environment although the significance of this impact is to be determined during the proposed Stage 2 Site Investigation.
- 12.6 In undertaking a large-scale remediation project, and by the very nature of the activities involved, impacts to the water environment are possible. The most significant impact is considered to be due to silt entering watercourses. In addition, there is the possibility of mobilisation of contaminants as they are disturbed. However, much of the remediation planned to deal with soil contamination is associated with source removal or treatment and as such will also have an overall positive impact on the quality of the water environment where it was being affected previously.
- 12.7 The magnitude and significance of all potential impacts, both positive and negative, have been identified. Appropriate mitigation measures have been identified for all those activities where there is the potential of a negative impact, whether they are considered significant or not.
- 12.8 The mitigation measures relating to the protection of the water environment will be adopted through the implementation of the Management Plan (referred to in the previous section).
- 12.9 To ensure the protection of the water environment a number of pollution prevention measures and emergency procedures are to be incorporated into the Management Plan.
- 12.10 In conclusion, following the implementation of the Management Plan it is expected that the impact of the remediation on the water environment will not be significant. In addition to this, it is expected that the overall quality of the water environment will continue to improve following the safe and successful management of the contamination across the site.
- 12.11 The actual impacts will be measured through the gathering of further baseline water quality data and through the implementation of an appropriate water quality monitoring programme (both surface water and groundwater monitoring) during the project. The results from the remediation phase will be incorporated into the verification reports.

13 Effects on Landscape and Visual Impacts

- 13.1 One of the reasons why the site was developed as a factory was that it is well concealed by the natural shape of the landscape. The site lies within the alluvial plain of the Clyde Valley. The majority of the site is fairly flat with the land rising to the north and west. Considering the large size of the site, there are relatively few views into the site. These are generally limited to the local transport network, a limited number of rural properties and parts of Bishopton village which lies on the northern edge of the site.
- 13.2 Many trees have been planted in the site and following the substantial decommissioning of the factory the vegetation has developed giving the site a generally wooded character. The derelict buildings can be seen at times with the taller structures visible above the trees. The existing landscape character of the site contrasts sharply with that of the surrounding area. The dominant features of the site are the woodland and derelict features whereas the surrounding area is dominated by well maintained fields with rural properties and settlements.
- 13.3 The proposals work with the grain of the landscape and as far as possible to restore the industrialised landscape back to its previous rural character and to minimise the impact on the positive elements of the landscape resource. Landscape and visual assessment work has heavily influenced the proposals. However, there are negative impacts of the development which include: the changes in topography to facilitate development of the village expansion area and to accommodate fill; the operational stages of the borrow area; the loss of vegetation including mature trees; the visual impact from the burning out and demolition process of the factory infrastructure and the impact of the existing aquatic and riparian zone from fluctuations in silt levels.
- 13.47 The negative impacts on the landscape and visual resource need to be balanced against the repair brought about as a result of the removal of the derelict factory infrastructure, including the removal of artificial landforms and the majority of the security fence, the improvements made to the watercourses, and the improved management, and hence long term landscape and visual resource, of the Community Woodland Park which covers the majority of the site. These positive changes to the landscape help to enhance the landscape and visual resources in the long term.
- 13.48 The repair to the landscape aligns with the guiding principle set out in the Glasgow and Clyde Valley landscape assessment which aims to reinforce rural character and pursue strategies to reduce the visual influence of existing urban developments. This planning application will reduce the extent of buildings over the site and restore the majority of the factory site back to open land uses.

14 Effects on Fauna and Flora

- 14.1 Aspects of the site ecology have been examined over several years with a focus on particular species and particular habitats.
- 14.2 The information gathered points to the general picture of an extensive, secure site relatively undisturbed by the public providing refuge, feeding habitat and breeding ground for a number of protected species - badgers, bats, barn owls, otters and water voles. With the exceptions of Barochan Moss (a designated site of local conservation interest), some areas of higher ground to the western boundary and some large avenue trees and trees associated with Dargavel House, the site would appear to be unexceptional floristically, principally because the vast majority of the site – primarily the level ground - has been part of an active factory, with the spaces between buildings hard surfacing or close-mown grass and amenity planting. Areas of the site, particularly around the perimeter, but with some areas toward the north and centre of the site, have been planted with conifer (and, latterly, with broadleaved trees) plantation over the last twenty to thirty years. It is apparent that the increasing value to the wildlife has arisen out of the gradual running down of Royal Ordnance activity, and the cessation of maintenance of the remaining grassed areas.
- 14.3 The baseline information gathered over a considerable period, allows an ecological characterisation of the site to be established. In this overall characterisation key species and habitats have been identified. These include :
- (a) Bats: An active roost for bats has been identified at Dargavel House in the centre of the site. There is the potential (although unidentified) for other roosts on the site and, as a consequence, the demolition of certain buildings and the felling of mature trees will need to be progressed in a precautionary way. Artificial roosts could be required as mitigation.
 - (b) Otters: There is evidence of an otter holt on the site. Future work on waterbodies and watercourses should make provision for otters.
 - (c) Badgers: There has been a gradual colonisation of the site by badgers from the south of the site to the north. There is a number of main setts and many subsidiary setts. The possibility arises of a need to create artificial setts and to translocate badgers.
 - (d) Reptiles, Amphibians and Associated Habitats: The survey and desk study have not shown the presence of great crested newts. There is no record of reptile activity. Notwithstanding this, measures will need to be put in place to ensure that water habitats suitable for amphibians and reptiles is either protected or created.
 - (e) Water Voles: Only a small population of water voles is likely to be present on the site. The future well being of this species will be dependent on the active management of habitat along the margins of watercourses.
 - (f) Barn Owls: There is an indication of breeding barn owls in the north of the site. There will be disturbance to suitable nesting and roosting sites (which include derelict buildings) and to feeding habitat.
 - (g) Kingfishers: There is limited evidence of kingfishers on the site. There is, however, an opportunity to improve habitats for the benefit of kingfishers in the future.
 - (h) Breeding Bird Habitat: There will be a loss of bird-breeding habitat but the timing and phasing of remediation and development should minimise the net impacts.

- 14.4 The potential physical changes engendered by the site remediation include:
- (a) Loss of terrestrial habitat (including loss of trees adjacent to buildings which have to be felled) and the disturbance from noise, smoke and vibration, arising from building decontamination and demolition.
 - (b) Potential impacts arising from damage to terrestrial habitats associated with remediation and land reclamation. In many instances disturbance will arise from the need to gain access to structures.
 - (c) The impacts arising from changes in water quality through run off and disturbance of sediment at the remediation / reclamation stage and the changes in flow rates, relocation of channels and water tables in both the short and long-term.
- 14.5 A priority is the protection and maintenance of some of the more valuable site features, including, for instance, mature avenue trees. There are a few of these relict landscape elements. This aside, the simplest and most effective mitigation centres on the main drainage channel (Dargavel Burn) running north-south through the site. Wetland areas (carr/wet/woodland) are amongst the most biodiverse of native habitats. In the local area, wet woodland (carr), swamp, reedbed, marsh, fen and raised bog are all priority biodiversity habitats. In practical terms, wetland is one of the easiest to achieve and maintain given the site conditions. This range of habitats may be achieved either by the lowering of ground levels and/or the raising of water table by impeding of drainage.
- 14.6 A second strand of the mitigation strategy would be in the proposed enhancement of farmland (within the planning application boundary). This land could be enhanced by, for instance, the creation of species-rich hedgerow with trees. The landscape could be further enhanced in the provision of nesting boxes and feeding perches. This would help not only in mitigation for species on site but also in the creation of a more biodiverse buffer strip between the site and the surrounding land.

15 Effects on Material Assets and Architectural/Archaeological Heritage

15.1 Within the site boundary, there are three issues concerning heritage. They are:

- Known buried archaeology
- Unknown buried archaeology
- Standing buildings

Known Below Ground Archaeology

- 15.2 The known remains indicate that the site has been utilised across both prehistory and history.
- 15.3 Known prehistoric archaeology includes enclosures of probable prehistoric date and a variety of artefacts and findspots including axes, hammer stones, flint arrowheads and Roman coins. These remains demonstrate that the site was utilised between c.4000 BC and AD 400.
- 15.4 The next period of known archaeological remains covers the medieval and post-medieval periods (AD 400 to 1900) and includes Dargavel House, designed landscape and the numerous farmsteads that have been located within the development area.

- 15.5 Finally the modern 20th century remains include the 'Georgetown' armaments factory, from which Bishopton factory took its lead, and the various earlier phases of the Bishopton factory.

Mitigation

- 15.6 Given the known location of below ground archaeological sites in the area, trial trenching should target these areas. Additionally, given the known previous disturbance on this site, trial trenching should also be targeted on those areas that have been least disturbed.

Unknown Below Ground Archaeology

- 15.7 The known archaeological record for the area strongly suggests that unknown archaeological remains from across prehistory and history could be present within the site. The state of preservation of such remains is unclear. However, the fact that the site contains areas that have not been subject to intensive agriculture within the 20th century indicates that any remains could be quite well preserved.

Mitigation

- 15.8 Unknown archaeological sites are an inherent risk with any new development where groundbreaking work is to take place. However, if a currently unknown site is discovered then a specific mitigation strategy will be implemented depending upon the nature, condition and significance of the site. This may include trial trenching.

Standing Buildings Within the Development Area

- 15.9 There is one listed building within the planning application area, that of Dargavel House. Any alterations to this building, or its setting, will require listed building consent but there are no plans to alter this building or its setting at the present time.
- 15.10 The remainder of the standing buildings constitute the factory. This factory was a significant example of the infrastructure and investment required to equip a nation's armed forces during the 20th century, indeed, ammunition from here would have been at the sharp end of British foreign policy during the majority of Britain's modern conflicts. The factory buildings also represent the last tangible remains of the many individuals who made up the workforce, a workforce drawn from families throughout Scotland and the greater British nation as a whole.
- 15.11 The complex has both community and historic value and forms an element of Scotland's industrial narrative. Equally, the complex holds considerable significance for the local community.

Mitigation

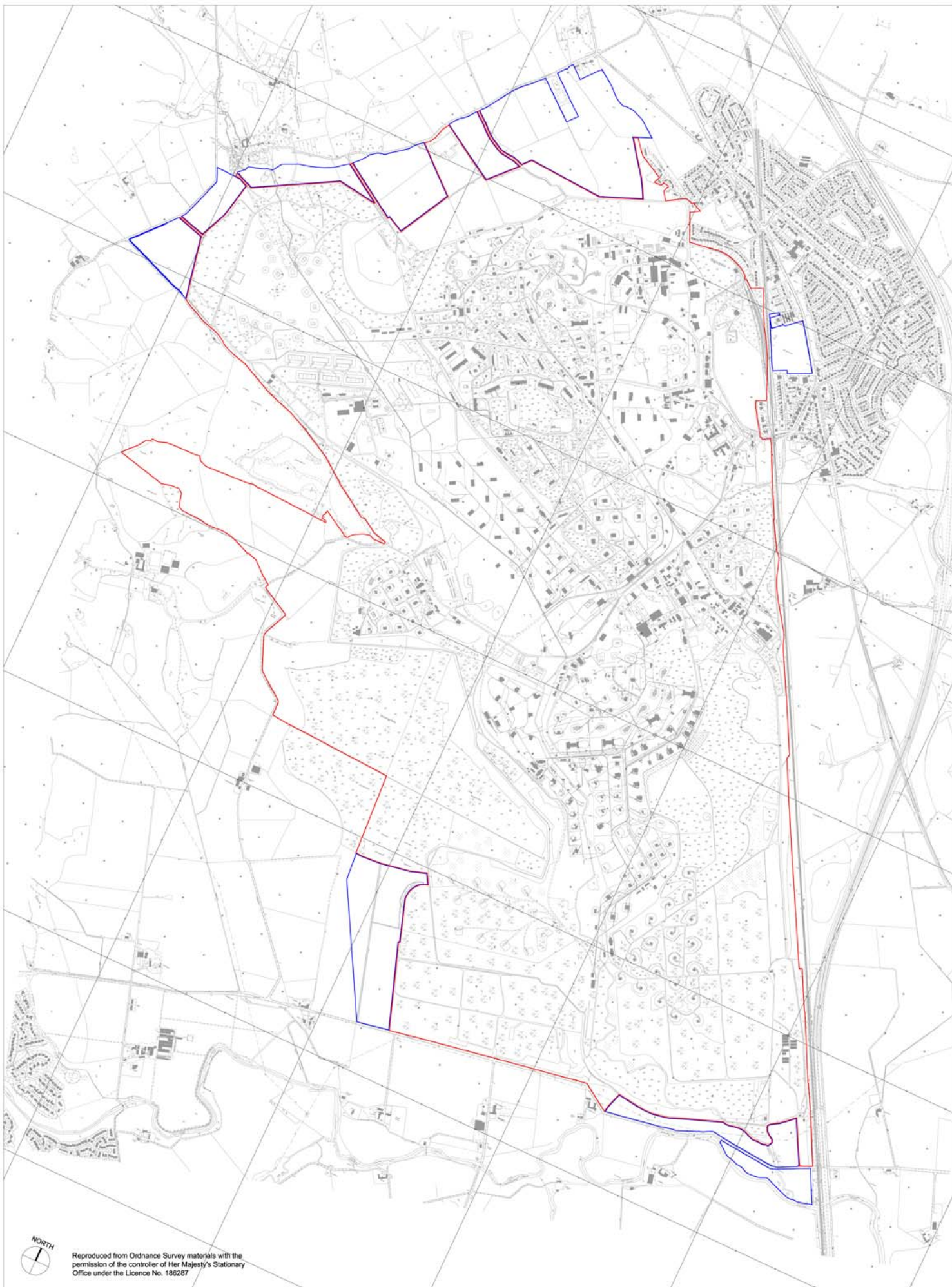
- 15.12 It is recommended that sample recording be undertaken of the types of buildings across the site. This will inform the Industrial Archaeological record of the types of processes involved at Bishopton as well as indicating changes in the production methods throughout the 20th century.

General Mitigation

- 15.13 A Site Archaeological Handbook (SAH) should be adopted as the management system for this development. In it, each of the three archaeological elements would be dealt with separately and in a systematic manner in line with the time-frame for the development.
- 15.14 The SAH applies an overarching strategy for handling the archaeological elements of the site so that work can be structured and managed efficiently and more effectively. The advantage that the SAH has over a more fractured approach is that the archaeological mitigation for the whole development is clearly defined at the beginning of the project.

16 Inter-Relationships and Conclusions

- 16.1 The regeneration of the site, given its scale and diverse character, will bring environmental consequences. No one environmental topic can be considered in isolation. There will be complex inter-relationships between environmental issues through the course of remediation and reclamation earthworks.
- 16.2 Remediation will be progressive and will take place over a long period. There will be remediation activity in different parts of the site at different times. This activity has the potential to impact directly on soils and the water environment. It is important that a remediation Management Plan is produced to give guidance on the procedures and actions that will minimise the potential for adverse impact on soils and ground / surface water.
- 16.3 Remediation and earthworks will have a particular impact on the flora and fauna at the site. The scale of the site, and the fact that engineering operations will be progressed in phases, presents opportunities to create replacement habitats for displaced species. The ecology of the site, however, is dynamic and, as a consequence, measures to preserve the bio-diversity of the site will need to be adapted and refined over the full life of the project.
- 16.4 Remediation tasks will also cause an impact on the noise environment and on air quality. Measures will need to be in place to reduce or minimise these impacts, particularly in the early phases of remediation when activity is closest to Bishopton.
- 16.5 There will be an impact on landscape character and the visual resource of the site. This will be caused by the removal of buildings and structures and through the felling of trees. The essential wooded character of the site, however, will be retained.
- 16.6 In those parts of the site which were not disturbed when the factory was built there is potential for below ground archaeological remains. These could be disturbed through the process of remediation and a limited amount of trial trenching is recommended as a precautionary measure.



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ROYAL ORDNANCE BISHOPTON
 REMEDIATION AND RECLAMATION EARTHWORKS


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FIG 3.1



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NOTE:
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AERIAL PHOTOGRAPH OF THE SITE

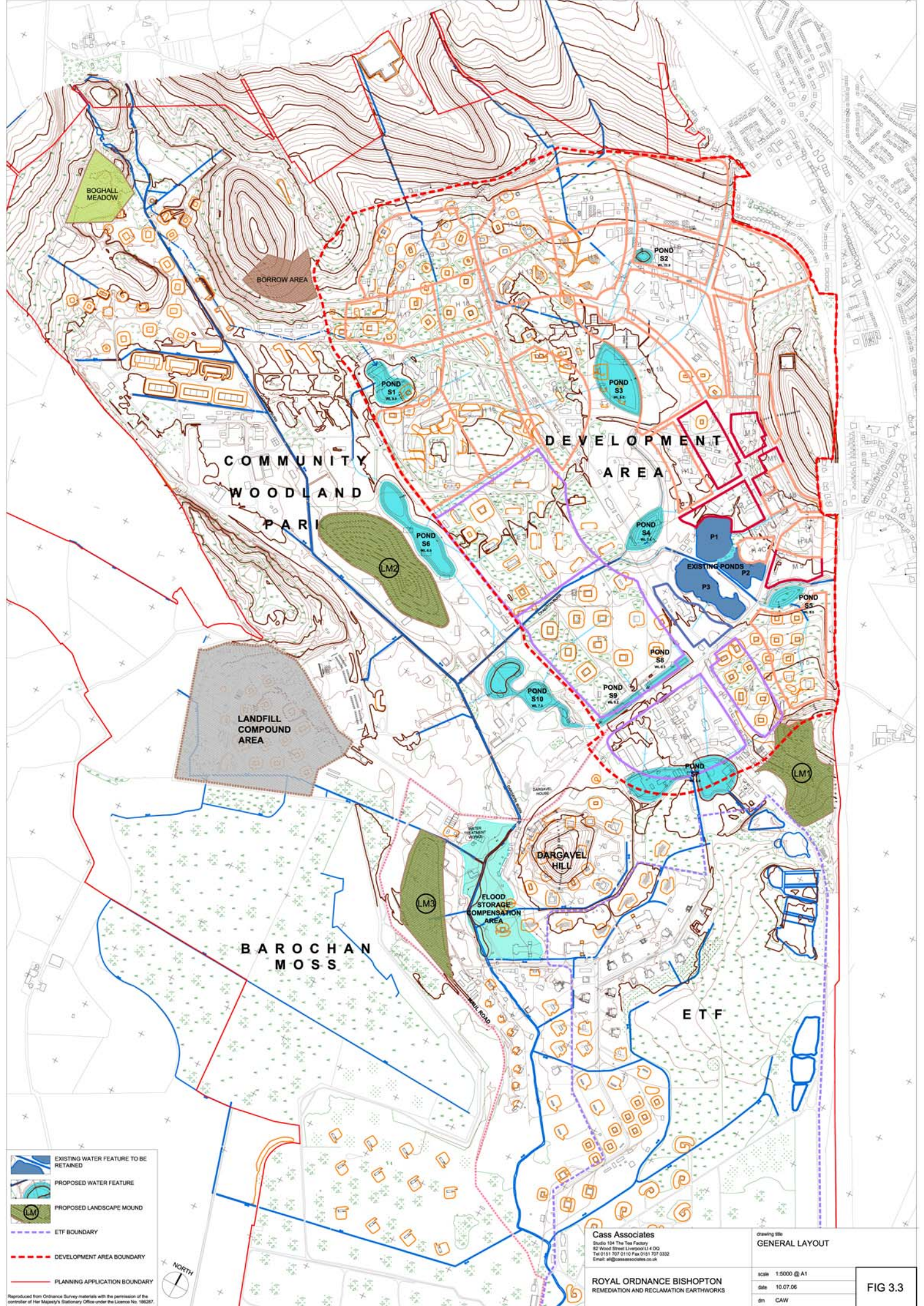
scale 1:22,500 @ A4


date 10.10.06

dm ES

ROYAL ORDNANCE, BISHOPTON
 REMEDIATION AND RECLAMATION EARTHWORKS

FIG 3.2



-  EXISTING WATER FEATURE TO BE RETAINED
-  PROPOSED WATER FEATURE
-  PROPOSED LANDSCAPE MOUND
-  ETF BOUNDARY
-  DEVELOPMENT AREA BOUNDARY
-  PLANNING APPLICATION BOUNDARY



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 GENERAL LAYOUT

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FIG 3.3

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