



**LANDFILL ENVIRONMENTAL PERMIT APPLICATION
ENVIRONMENTAL SETTING AND INSTALLATION
DESIGN (ESID) REPORT**

**FOR THE DEVELOPMENT CONSENT ORDER
APPLICATION FOR THE ALTERATION AND
CONSTRUCTION OF HAZARDOUS WASTE AND LOW
LEVEL RADIOACTIVE WASTE FACILITIES AT THE EAST
NORTHANTS RESOURCE MANAGEMENT FACILITY,
STAMFORD ROAD, NORTHAMPTONSHIRE**

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**AN APPLICATION TO VARY ENVIRONMENTAL
PERMIT NUMBER EPR/TP3430GW FOR THE
HAZARDOUS WASTE LANDFILL SITE OPERATED BY
AUGEAN SOUTH LIMITED AT EAST NORTHANTS
RESOURCE MANAGEMENT FACILITY**

**ENVIRONMENTAL SETTING AND INSTALLATION
DESIGN (ESID) REPORT**

Report reference: AU/KCW/AW/5646/01/ESID
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1. Introduction

Report context

- 1.1** MJCA is commissioned by Augean South Limited (Augean) to prepare an application to vary Environmental Permit number EPR/TP3430GW (the permit) for the Hazardous Waste Landfill Site (the site) operated by Augean at East Northants Resource Management Facility (ENRMF), Stamford Road, Peterborough, PE8 6XX. The site location is shown on Figure ESID 1.
- 1.2** The structure of this Environmental Setting and Installation Design (ESID) report is based on a template produced by the Environment Agency entitled “Conceptual Model, Environmental Setting and Installation Design Report” Version 1 dated March 2010.
- 1.3** In addition to this ESID report the variation application includes a hydrogeological risk assessment (HRA) (Appendix C to the application), a stability risk assessment (Appendix H to the application) and an environmental nuisance risk assessment (Appendix F to the application). The HRA presented at Appendix C also comprises the HRA review required by Condition 3.1.5 of the current permit. A qualitative landfill gas risk assessment is provided in section 2 of this ESID report. To avoid repetition, the ESID report includes cross references to other reports and supporting information provided as part of the application rather than repeating the information in the ESID report.
- 1.4** The current landfill comprises 11 phases of landfilling as shown on Figure ESID 2. A number of the phases are subdivided into two or more sub-phases labelled A, B or C. Landfilling operations are completed in Phases 1 and 2 which are capped and partially restored. Landfilling operations are completed in Phases 3, 4, 5 and the southern part of Phase 6. Phase 3, the northern part of Phases 4 and 5 and the southern part of Phase 6 are capped with the remaining areas of Phases 4 and 5 covered with temporary capping. Currently landfilling operations are being carried out in the northern part of Phase 6 and in Phase 10. Phase 7 has recently been constructed and shortly will comprise the main area of filling while the remainder of Phase 6 and Phase 10 are capped. The construction of Phases 8 and 9 will commence during 2021.

1.5 The following changes are proposed in respect of the operation of the hazardous waste landfill site:

- Extension of the permit boundary to include a series of ten new hazardous waste landfill phases to the west of the currently permitted area (the western extension). The proposed western extension covers an area of approximately 26.3 hectares and will provide an additional landfill void of approximately 2.5 million cubic metres.
- An increase in the annual waste input limit from 249,999 tonnes per year to 300,000 tonnes per year.
- A change to the restoration profile for the existing landfill site in order to integrate the final profile of the existing site with the western extension.
- An extension in time from 2026 to 2046 for the leachate level limit of 5m above cell base specified in Table S3.1 of the permit for the currently permitted landfill phases at the site comprising Phases 1 to 11 inclusive. The 5m leachate level limit will not apply to Phases 12 to 21 in the western extension.

Further details of the proposed changes are presented in this ESID report and in the technical assessments and reports provided with the application.

1.6 There are no changes to the types of wastes received at the site, the general principles of the site containment design, the principles of the site operations including leachate and landfill gas management and site monitoring.

Installation details

1.7 The currently permitted site, which comprises 11 phases of landfilling, covers an area of approximately 33.0 hectares and is centred approximately at National Grid Reference (NGR) TF 008 000. The current permit boundary is shown on Figure ESID 2 and marked in blue on Figure ESID 3. The proposed western extension, which covers an area of approximately 26.3 hectares, is shown marked in red on Figure ESID 3. The overall proposed permit boundary, which covers an area of approximately 59.3 hectares centred on NGR TF 007 001 is shown on Figure ESID 1 and Figure ESID 4. The proposed permit boundary lies approximately 1.1km east south east of Duddington village and approximately 2km north of Kings Cliffe village

at its closest points. The setting is generally rural with the majority of the land surrounding the site comprising open farmland or woodland.

- 1.8** Augean are the operator and permit holder of a separate Environmental Permit (EPR/YP3138XB) for a waste treatment and recovery facility for the treatment of hazardous waste and non-hazardous waste by soil washing, waste stabilisation and bioremediation (the treatment facility). The treatment facility currently is located in the north western corner of the currently permitted landfill site in the area which ultimately will be landfilled as Phase 11 of the landfill site. The boundary of Environmental Permit number EPR/YP3138XB is shown on Figure ESID 3 for reference. A separate application to vary Environmental Permit number EPR/YP3138XB to amend the waste throughput rate and treatment activities is being progressed concurrently with this application to vary the landfill permit.
- 1.9** Low level radioactive waste (LLW) is deposited currently at the site under Environmental Permit number EPR/FB3598DD (the LLW permit) which will be the subject of a separate permit variation application to include the deposition of LLW in the western extension.
- 1.10** Leachate management, flaring of landfill gas and the storage and handling of drums containing hazardous waste are listed in the current permit as Directly Associated Activities to the landfill. A consented area for gas management including a flare stack is located in the north western corner of the current site as shown on Figure ESID 2. Site infrastructure including the site access, weighbridge and waste reception facilities, car parking areas, site offices, welfare facilities, storage areas, laboratories and wheel and vehicle body washing facilities are in place at the site as shown on Figure ESID 2.
- 1.11** The existing highway access to the site is from Stamford Road which runs adjacent to the eastern boundary of the site from the A47 to the north. The access road enters the reception area adjacent to and east of the current landfill. The existing highway access to the site will continue to be used for the western extension.
- 1.12** The western extension currently comprises two areas of arable land with grassy margins. A hedgerow forms the boundary between the two areas. There is an area of young scrubby woodland in the south eastern corner of the northern area. The topography of the western extension generally is gently sloping towards the central

boundary between the two areas. The ground elevation of the northern area ranges from 89m Above Ordnance Datum (AOD) in the north to 80mAOD in the south. The ground elevation in the southern area falls from a high point of 89mAOD along the western boundary in the south to 86mAOD in the south east and 81mAOD in the north of the southern area. The western extension is bordered by woodland and arable fields.

- 1.13** The currently permitted site is bordered by a dense continuous thorn hedge and/or 1.8m high chain link fencing on all boundaries. There are gates at the site entrance which are locked outside operating hours. A farm access track runs outside and adjacent to the southern boundary of the currently permitted site and joins an access track running north to south along the eastern boundary of the southern section of the western extension area. The access track then turns to the west to the south of the southern section of the western extension area.
- 1.14** There are scattered properties within 1km of the proposed extended permit boundary. The closest properties to the current site and the proposed extended permit boundary are the properties at Westhay Cottages located approximately 25m to the east of the currently permitted site and approximately 815m to the east of the proposed western extension area. Westhay Farm is located approximately 75m east of the currently permitted site and approximately 865m to the east of the proposed western extension area and is operated as a haulage yard and a farm with associated agricultural and commercial buildings. A cleared area in the centre of the woodlands located to the north of the currently permitted site was used formerly by the Ministry of Defence for storage associated with the Wittering Airfield. This area has been granted planning permission for development as a transport facility but is unused currently. Collyweston Quarry is located approximately 325m to the west of the boundary of the northern section of the western extension area at the closest point. The closest point of the boundary of the operational training airfield at RAF Wittering and associated accommodation is located approximately 840m to the north north east of the proposed extended permit boundary. The closest settlement to the site is Duddington the outskirts of which are located approximately 1.1km to the west north west of the boundary of the northern section of the western extension area. Collyweston is located approximately 1.6km to the north north west of the boundary of the northern section of the western extension area. The village of Kings Cliffe is located approximately 2km to the south of the boundary of the southern section of the western

extension area. The hamlet of Fineshade is located approximately 2.4km to the west south west of the southern part of the western extension area. A summary of the receptors located in the vicinity of the western extension is presented in Table ESID 1 and shown on Figure ESID 4 and Figure ESID 5.

- 1.15** The area of agricultural land to the south of the western extension is bordered to the south by woodland known as Little Wood (Figures ESID 4 and ESID 5). To the west of the western extension application boundary is woodland known as Fineshade Wood part of which is known as The Assarts. Fineshade Wood is a Local Wildlife Site (LWS) (Figures ESID 4 and ESID 5). The eastern boundary of the northern section of the western extension area is adjacent to Collyweston Great Wood. Beyond Collyweston Great Wood from the western extension area, to the east and north east of the currently permitted site, and east of Stamford Road is an area of woodland known as Easton Hornstocks. Parts of the Collyweston Great Wood and Easton Hornstocks comprise a Site of Special Scientific Interest (SSSI) and a National Nature Reserve (NNR). Collyweston Quarry Local Geological Site (LGS) is located approximately 500m west north west of the western extension at its closest point. The locations of the SSSIs, NNR, LGS and LWS within 2km of the western extension area are shown on Figure ESID 5.
- 1.16** There are no listed buildings or scheduled monuments within 500m of the western extension area.
- 1.17** The Public Rights of Way in the vicinity of the site are shown on Figure ESID 4. No Public Rights of Way cross the western extension area. There are rights of way to the west of the western extension area which run through The Assarts woodland (part of Fineshade Wood) to the west of the site. The closest right of way is Footpath MX15 which is approximately 100m to the west of the boundary of the western extension at its closest point. Footpath MX15 runs to the north west and south west from the closest point to the site and connects into the wider Public Rights of Way network. The Jurassic Way bridleway (NE12) is located approximately 845m to the west of the western extension area at its closest point.
- 1.18** There are a number of services which cross the western extension area and which are in the vicinity of the ENRMF site. The services at and in the vicinity of the site are shown on Figure ESID 6. A mains gas pipeline runs parallel to the southern boundary of the currently permitted site and crosses the southern section of the

western extension area in an east to west direction. Overhead power lines run along the eastern boundary of the southern section of the western extension area from south to north before turning north west across the northern section of the western extension area. Two water pipelines cross the northern part of the southern section of the western extension area. A short section of redundant, closed out pipeline owned by the MOD is present crosses the northern boundary of the western extension area. An oil pipeline is located in the woodland to the east of the northern section of the western extension area.

2. Source term characterisation

The development of the installation

Historical development

- 2.1** The historical development of the site was presented in the permit application for the site submitted to the Environment Agency in August 2008 and the permit variation application submitted to the Environment Agency in September 2014. As explained in the introductory note to Part C2 of the Environment Agency application form for varying a bespoke permit it is unnecessary to resend any information from original/previous permit applications if it is not affected by the proposed changes. Whilst the full details of the historical development have not been reproduced in this ESID report, the more recent updates to the key aspects of the historical development of the site are presented below.
- 2.2** Waste Management Licence reference WML73068 for the disposal of waste at the landfill was issued by the Environment Agency on 3 July 2001. Following several variations and transfers Environmental Permit Number EPR/TP3430GW was issued to Augean for the landfill site in the eastern area of the current site (Phases 1 to 5) on 11 May 2009 under the Environmental Permitting (England and Wales) Regulations 2007. Following several subsequent variations, V005 was issued on 5 October 2015 to extend waste deposit into Phases 6 to 11 in the western area of the current site. V005 comprises the most recent and current variation of the permit.
- 2.3** The facilities at ENRMF are an acknowledged part of the nationally significant infrastructure for the management of hazardous waste and LLW and are the subject of a Development Consent Order (DCO) which was granted in July 2013 and amended in June 2018. The DCO extends to 2026. In order to secure continuity of its operations beyond 2026, Augean is preparing to submit an application for a new DCO for the extension in the area and timescales for the operation of the site including the western extension the subject of this permit variation application.
- 2.4** As explained in Section 1 of this report, the western extension area currently comprises 2 areas of arable land with grassy margins. The details of a site investigation which was undertaken in the western extension area between November 2019 and March 2020 are presented in Section 4 of this ESID report.

Proposed development

- 2.5** The current landfill comprises 11 phases of landfilling as shown on Figure ESID 2. Ten new landfill phases (numbered 12 to 21) are proposed for the western extension area. The proposed western extension area has been designed based on principles similar to the current landfill area. The anticipated locations of the phases are shown on Figure ESID 10 however the final locations of the phases will depend on the final decisions following further assessment of the geology and hydrogeology in the area in which there may be solution features present in the underlying limestone as described below.
- 2.6** A site investigation was carried out in the western extension area to establish the geological and hydrogeological conditions. The scope of the site investigation was agreed with the Environment Agency before it commenced. Particular attention was paid to examining the geology in the vicinity of the swallow hole that is located close to the north western corner of the current landfill area and to the possible presence of further limestone solution features (known as dolines) in the vicinity of the swallow hole. It has been agreed with the Environment Agency that the final design of the proposed landfill extension in the vicinity of the swallow hole and potential other limestone solution features will be developed in detail following the issue of the Environmental Permit variation. Further targeted site investigations will be carried out in this central area prior to finalising the design in this area. To illustrate the potential scope of the development in this area and to ensure that all relevant impacts can be assessed, two options for the landfill design will be assessed. The options for this area of the site comprise:
- Retention of a 20m wide corridor to provide a route for surface water drainage from the land to the west of the proposed extension to the swallow hole.
 - Retention of a 150m wide standoff from landfill area boundaries if deemed necessary based on the planned further detailed assessment of the potential for solution features in this part of the site. As with the previous option, the central section of this standoff would also provide a route for surface water drainage from the land to the west of the potential extension to the swallow hole.
- 2.7** It is not intended that the gas pipeline which crosses the site from east to west as shown on Figure ESID 6 will be diverted and it will not be possible to landfill over the

pipeline as access must be maintained. The area to the south of the gas pipeline will be developed as a separately constructed, fully contained landfill area with suitable stand off distances from the gas pipeline as agreed with the pipeline authority.

- 2.8** It is not intended that the water pipelines which cross the site from the south east to the north west of the southern extension area as shown on Figure ESID 6 will be diverted. It will not be possible to landfill over the water pipelines as access must be maintained. The area between the water pipelines and the gas pipeline to the south will be developed as a separately constructed, fully contained landfill area with suitable stand off distances from the water pipelines as agreed with the water utility company.
- 2.9** The proposed design of the western extension area is presented in the Installation Engineering section of this ESID and is summarised in Table ESID2.
- 2.10** The permitted waste types will not change as a result of the variation. The waste types comprise principally treatment residues, contaminated materials including soils, materials containing asbestos and LLW. The wastes that are permitted for disposal are subject to a limit on their total organic carbon (TOC) or Loss on Ignition (LoI) content and on the solubility of specified contaminants.
- 2.11** The hazardous waste landfill site will continue to be operated based on the principle of containment. The principles of the containment engineering design and the operation of the landfill site will not change as a result of the variation to include the western extension area. This includes the retention of at least 2m of Rutland Formation or glacial till in situ beneath the base of the landfill site consistent with the agreed design of the current landfill areas.
- 2.12** The preliminary proposed restoration scheme design and the proposed restoration landform is shown on the Figure presented at Appendix ESID A. The design generally incorporates neutral/calcareous wildflower grassland interspersed with areas of scrub and trees which in time will extend naturally to provide more extensive woodland cover with glades and rides. The scheme also incorporates an extensive network of hedgerows with occasional trees, which would link areas of vegetation and mark field boundaries. Further details of the restoration are presented in the restoration and aftercare section of this ESID.

- 2.13** Information relevant to the chemical characteristics of the leachate and the presence of hazardous substances and non-hazardous pollutants in the leachate from the waste in the landfill site is presented in the HRA (Appendix C to the application). Consideration of changes in leachate quality with time are discussed in the HRA. Consistent with the existing site practices, and as permitted through Directly Associated Activity (DAA) A2 of Table S1.1 of the permit, leachate will continue to be collected and used in the waste treatment facility with any excess leachate removed by tanker for disposal off site at a suitably authorised facility.
- 2.14** Currently landfill gas generated in the site is managed actively. Landfill gas generated in the older landfill area comprising Phases 1A, 1B, 2A and 2B is extracted and flared. The older landfill area accepted non-hazardous waste between 2002 and July 2004 when the landfill was operated for the co-disposal of hazardous, non hazardous and inert waste including biodegradable materials. The flare will continue to operate as necessary to manage the landfill gas from the older landfill area. The volumes of landfill gas generated in the more recent areas of the site that were operated as hazardous waste landfill cells only following the changes to the legislation which restricted the organic component of the landfilled waste, are limited and to date no active gas management has been necessary in these areas.

Installation engineering

- 2.15** The proposed design of the western extension area at ENRMF has been prepared by MJCA for Augean. The proposed design is based on the design of the existing landfill area with a number of modifications. The proposed design of the western extension area is described in detail in the Stability Risk Assessment (SRA) presented at Appendix H to this application and specific aspects are described below. A summary of the proposed design for the western extension area together with a comparison between the proposed design and the design of the existing landfill area is provided in Table ESID2. Plans and sections showing the proposed western extension area design are presented as Figures SRA3, SRA4, SRA5, SRA6 and SRA7 in the SRA.

Groundwater management system

- 2.16** As the base of the landfill is above the regional groundwater level it is not necessary to manage groundwater at the site.

Basal lining system

- 2.17** Details of the basal lining system are summarised in Table ESID 2.
- 2.18** The basal lining system will comprise a minimum 1m thick compacted low permeability clay liner with a maximum hydraulic conductivity of $1 \times 10^{-9} \text{m/s}$ and a 2mm thick smooth high density polyethylene (HDPE) geomembrane. The basal liner will be overlain by either a geotextile protection layer or a 300mm thick sand protection layer and geotextile separator. The protection layer will be overlain by a minimum 300mm thick granular leachate drainage blanket or a tyre bale leachate drainage blanket with gravel pipe runs and leachate well areas. The leachate drainage system for each phase will incorporate 180mm external diameter leachate collection pipework radiating from a leachate collection sump and two remote leachate monitoring wells.
- 2.19** Inter-cell bunds will be constructed from compacted low permeability clay and will form part of the basal liner. The bunds will have maximum slope gradients of 1v:2h, a minimum vertical height of 2m measured from the top of the basal clay liner and a minimum crest width of 3m. Due to the variation in basal falls between phases, in order to accommodate the topography of the underlying geology it will be necessary to increase the inter-cell bund heights locally to a maximum vertical height of 3m. The bunds will be lined with 2mm thick double textured HDPE geomembrane. A geotextile protection layer will be placed over the geomembrane and a minimum 300mm thick granular leachate drainage blanket will be extended up the full height and over the crest of the bunds to form a continuous leachate drainage blanket between phases.

Side slope lining system

- 2.20** Details of the side slope lining system are summarised in Table ESID 2.
- 2.21** The sideslope lining system will comprise a minimum 1m thick compacted low permeability clay liner with a maximum hydraulic conductivity of $1 \times 10^{-9} \text{m/s}$ overlain by a 2mm thick double textured HDPE geomembrane. A protection geotextile and a minimum of 300mm thick granular leachate drainage blanket will be installed to a vertical height of 2m up the sideslopes. A protection and drainage geocomposite sufficient to provide a pathway for perched leachate and to provide protection to the

underlying geomembrane will be placed over the remainder of the sideslope. Selected fine grained wastes containing clay, silt, sand and gravel up to 20mm in diameter will be used as the first layer placed against the protection and drainage geocomposite on the sideslope. The sideslope lining system will be constructed at the same gradient as the sideslope sub-grade and therefore will have a maximum slope gradient of 1v:2.5h. The sideslope lining system will be constructed with typical vertical heights of between 4m and 15.5m.

Capping system

- 2.22** Details of the capping system are summarised in Table ESID 2.
- 2.23** A 0.3m thick regulating layer will be placed over the completed top of waste level to provide a smooth, firm and inert sub-grade surface on which to construct the capping system. The cap will comprise either a 1mm thick HDPE or linear low density polyethylene (LLDPE) geomembrane, or a minimum 1m thick compacted low permeability clay capping layer with a maximum hydraulic conductivity of $1 \times 10^{-9} \text{m/s}$.
- 2.24** A suitable drainage geocomposite will be placed over the cap to act as a drainage pathway from the overlying restoration materials to the perimeter surface water collection system. The drainage geocomposite material selected will be sufficient to prevent the build up of perched water on the cap, and in the case of the geomembrane to improve stability of the restoration materials and to act as a separation and protection layer with the overlying restoration materials.
- 2.25** A 1m to 1.5m thickness of restoration materials will be placed over the cap. The thicker layers will be located in areas which will be restored to woodland. The restoration materials will be placed at the same slope gradients as the cap. The capping and restoration layers typically have average gradients of approximately 1v:6h with slope lengths of up to 150m. The capping and restoration layers have maximum gradients of approximately 1v:4h for lower slopes with heights of approximately 12m.

Restoration and aftercare

- 2.26** The preliminary proposed restoration scheme design and the proposed restoration landform is shown on the Figure presented at Appendix ESID A. The restoration scheme has been designed to integrate the final landscape of the existing site with

the western extension area. The proposed restoration landform for the western extension area is a raised profile extending generally from north to south, rising up to a level of approximately 98mAOD at the northern end of the area and dropping down to 93mAOD where the adjoining landform also drops in elevation, meaning the adjoining woodland canopy is correspondingly lower. The restored surface of the northern landfill area falls to the current ground level at the surface water drainage corridor which will be created as an open surface water drainage channel. This northern landfill area will form a separately engineered landfill area to the central landfill area. To the south of the surface water channel, the central landfill area then rises up to 97m AOD where it merges with the restored ENRMF site landform, and then towards the south the landform dips down to existing ground to take account of the two retained water pipelines.

- 2.27** Two distinct areas of land, one to the south west of the un-diverted water pipelines and one to the south of the gas pipeline to the southern boundary of the site will also be extracted and landfilled and restored to form two separate mounded landforms, rising up to 98.5mAOD.
- 2.28** The design of the restoration profile follows the best practice principles for the design of restored landfill sites including in particular that the landform should be raised with slopes designed to shed water in order to minimise rainfall infiltration through the low permeability cap and into the waste.

Leachate management and monitoring infrastructure

- 2.29** Leachate is generated as a result of infiltrating rainfall. After completion of the placement of the waste in each phase the landfill phase will be capped. This will reduce infiltration and will minimise the generation of leachate.
- 2.30** The management and monitoring of leachate at the site is, and will continue to be, the subject of conditions of the Environmental Permit. A Leachate Management Plan is in place and implemented through the Augean management system. No changes are proposed to the principles of the management or monitoring of the leachate in the landfill phases in the western extension area.
- 2.31** Leachate generated in the landfill drains to a drainage blanket at the base of the landfill and to a leachate collection sump or collection point in the lowest point of each

phase. Leachate levels are controlled by pumping leachate from leachate collection sumps or other extraction wells drilled as necessary. A summary of the leachate collection and drainage infrastructure is presented in Table ESID 2.

- 2.32** The existing and proposed locations of the leachate sumps and wells are shown on Figure ESID 10.
- 2.33** The leachate level in the landfill is monitored to facilitate early identification of trends in the leachate level and to identify the need to implement and adjust leachate control measures. Leachate levels will be controlled by pumping leachate from leachate collection sumps using extraction wells constructed progressively in each phase. At least two monitoring facilities will be installed progressively in each phase. If necessary leachate extraction or leachate monitoring wells will be replaced by drilling through the placed waste. To facilitate the drilling of replacement wells and to protect the basal liner, reinforced concrete target pads will be constructed on the basal liner in proximity to the progressively constructed leachate extraction sumps and monitoring wells. The monitoring wells facilitate the monitoring of leachate levels and the collection of leachate samples for laboratory analysis. The post closure monitoring will be agreed with the Environment Agency prior to closure of the landfill.
- 2.34** The efficiency of the leachate drainage system in controlling leachate levels is determined by monitoring leachate levels in leachate monitoring wells.
- 2.35** The leachate level compliance limits for the landfill phases in the currently permitted site are specified in Table S3.1 of the permit. The proposed leachate level compliance limits for the landfill phases in the western extension area are specified in the HRA.

Landfill gas management and monitoring infrastructure

Landfill gas generation

- 2.36** Landfill gas is generated as a result of the anaerobic degradation of biodegradable waste deposited in a landfill. LLW, hazardous waste and inert wastes have a negligible potential to generate landfill gas. Only the wastes types that are already authorised for acceptance at the site under the current permit will be accepted for permanent deposit in the western extension area. The deposit of these waste types is unlikely to generate significant quantities of landfill gas.

Landfill gas management

- 2.37** Certain wastes which generate quantities of landfill gas necessitate the operation of a gas management system in a section of the current landfill site. The waste types accepted in Phases 1A, 1B, 2A and 2B prior to July 2004, which is when the limit on the organic content of landfilled hazardous wastes was implemented, generate significant quantities of landfill gas. Landfill gas generated in this area of the site is extracted and flared. The flare will continue to operate as necessary to manage the landfill gas from this landfill area.
- 2.38** The hazardous wastes that have been permitted for disposal at the site since 2004 are subject to a limit on their total organic carbon content. The waste accepted at the existing landfill site is the subject of detailed waste acceptance procedures to minimise the risk that unauthorised wastes are deposited. The waste acceptance procedures adopted in the Environmental Management System will continue to apply at the western extension area.
- 2.39** Given that the waste types which will be accepted at the western extension area are LLW and hazardous waste materials only, which for the purpose of assessing landfill gas generation are treated as comprising inert materials having no significant gas generating potential, it is considered that no landfill gas management systems including gas collection or gas treatment systems are necessary in the western extension area.
- 2.40** In order to confirm that the hazardous waste deposited in phases 12 to 21 has a negligible potential to generate landfill gas the leachate wells in each of the phases will be monitored for landfill gas. The use of the leachate wells which are installed progressively will minimise the need to install in the hazardous waste additional gas monitoring facilities. The leachate wells will be fitted with headworks incorporating monitoring ports for gas monitoring, leachate level monitoring and leachate extraction. The wellheads will be designed to facilitate connection, if necessary, to the gas flare at the site. The necessity for the connection of the vertical wells to the active gas extraction system will be determined based on the results of the gas monitoring in the wells. The programme of in waste gas monitoring for the landfill areas in the western extension area is presented in Table ESID 3. The proposed locations for the combined landfill gas and leachate monitoring wells are shown on Figure ESID 10.

- 2.41** Monitoring of landfill gas surface emissions from Phases 1A, 1B, 2A and 2B will continue as specified currently in the permit. It is not necessary to carry out landfill gas surface monitoring in the landfill phases that contain hazardous waste only with no gas management systems.
- 2.42** The flare will continue to operate as necessary to manage the landfill gas from Phases 1A, 1B, 2A and 2B and the current scheme of monitoring of the performance of and emissions from the flare which is the subject of the permit will continue.

Surface water management and monitoring system

- 2.43** As there will be continuity of operation between the current ENRMF site and the western extension area the scheme for managing surface water during the operational period in the western extension will be based generally on the current surface water management practices at the site.

Post closure controls

- 2.44** From the time at which the sites cease permanently to accept waste, the management of the site will continue in accordance with the conditions of the permit. Following the cessation of waste disposal the site will be managed until the results of the topographical surveys of the waste mass and the environmental monitoring data demonstrate and the Environment Agency accept that the permit can be surrendered. The criteria on which the surrender of the permit will be considered will be discussed with the Environment Agency prior to the preparation of an application to surrender the permit.

3. Pathway and receptor term characterisation

Climate

3.1 A wind rose prepared by ADM Limited for the Wittering Airfield meteorological monitoring station located approximately 2.3km north east of the site for the period 2009 to 2019 is presented on Figure ESID 4. The location of Wittering Airfield is shown on Figure ESID 5. It is considered that the weather station at this location is the nearest to the site and most appropriate location for the landfill. Based on the windrose the prevailing wind direction in the vicinity of the site generally is from the west or west south west.

3.2 Rainfall data is available for a Met Office weather station located at Wittering Airfield approximately 3.9km north east of the site. Rainfall data for the period January 1974 to September 2004 from the Wittering Airfield rainfall monitoring station was used in the 2004 and 2014 HRAs. The monthly average and annual average rainfall data for the period 1974 to 2004 is presented at Appendix ESID B together with monthly and annual average rainfall data¹ for the period 1981 to 2010. The annual average rainfall for the Wittering Airfield Met Office weather station has increased from 587.7mm/annum for the period 1974 to September 2004 to 609mm/annum for the period 1981 to 2010. The HRA has been updated based on the annual average rainfall for the period 1981 to 2010 for the Wittering Airfield Met Office weather station.

Geology

3.3 Information on the geology of the site is taken from the British Geological Survey (BGS) 1:50,000 scale series Sheet 157 Stamford and the logs of boreholes drilled at the site. The geology at and in the vicinity of the site is shown on the geological map presented at Figure ESID 7 and the geological cross-sections presented at Figure ESID 8. Copies of the logs for the boreholes drilled in the vicinity of the proposed western extension in 2019 and 2020 are included in the site investigation report presented at Appendix ESID C.

3.4 Drift deposits comprising glacial till (formerly boulder clay) overlie the solid geology across a thin strip from east to west in the central section and the south west corner

¹<https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcrem99cb>

of the current ENRMF site and across the majority of the southern part of the proposed western extension. The solid geology comprises a thin layer of limestone comprising the Blisworth Limestone Formation of the Jurassic Great Oolite Group in the south eastern corner of the current ENRMF site and the northern corner the proposed western extension. The Blisworth Limestone Formation is underlain by clays and silty clays of the Rutland Formation (formerly referred to as the Upper Estuarine Series) of the Jurassic Great Oolite Group. The Rutland Formation overlies limestones and sandstones of the Lincolnshire Limestone Formation, sands, silts and clays of the Grantham Formation (formerly the Lower Estuarine Series) and sandstones and siltstones of the Northampton Sand Formation of the Jurassic Inferior Oolite Group. The Grantham Formation and the Northampton Sand Formation are not easily differentiated at the site. The Northampton Sand Formation is underlain by the fossiliferous mudstones and siltstones of the Whitby Mudstone Formation of the Jurassic Lias Group.

- 3.5** The current ENRMF site comprised in part a former clay quarry where the clays and mudstones of the boulder clay and Rutland Formation were extracted. The current landfill is located in the former clay extraction and void created by the extraction of clays for export and for use in the construction of the site engineered containment system.

Site investigation in western extension

Superficial deposits and Great Oolite Group

- 3.6** Based on the results of the 2019/2020 site investigation undertaken in and round the proposed western extension area the Blisworth Limestone Formation where it is present in the north of the northern part of the proposed western extension area is between approximately 0.5m and approximately 2m thick. The Blisworth Limestone Formation in the north of proposed western extension area comprises weak to strong light brown to grey coarsely crystalline limestone and sandy limestone with shelly material and crinoid fragments which is frequently moderately weathered.
- 3.7** The Rutland Formation is between approximately 5m and approximately 13.5m thick beneath the northern part of the proposed western extension area. Beneath the southern part of the proposed western extension area the Rutland Formation and/or

the glacial till is between approximately 5m and approximately 20m thick overlying the Lincolnshire Limestone Formation. As part of this combined thickness, the glacial till is between approximately 4m and approximately 20m thick and, where present, the Rutland Formation is recorded as between approximately 1m and approximately 9m thick beneath the southern part of the proposed western extension area. The glacial till comprises generally firm to stiff brown, dark brown and dark grey slightly gravelly clay with subangular to subrounded fine to coarse gravel and cobbles consisting of limestone, chalk, quartz, chert, siltstone and sandstone. The Rutland Formation comprises firm to very stiff dark grey, bluish or greenish grey and brown clay with subordinate silt and generally rare thin siltstone and sandstone bands together with prominent mud-filled and carbonaceous roots and frequent shelly laminae. The base of the Rutland Formation generally comprises very stiff light grey and orange brown silt, sandy silt and rare orange brown fine clayey and very clayey sand with thin weak red brown, grey and orange brown sideritic units in which foliated siderite cement nodules occur as gravel to cobble sized clasts in a clay, silt or sand matrix.

Inferior Oolite Group

- 3.8** The review of the information shows that the elevation of the top of the Lincolnshire Limestone Formation falls from approximately 76.6 metres above Ordnance Datum (mAOD) (borehole K27) in the north to approximately 71.7mAOD (borehole K30) along the mid-eastern boundary beneath the northern part of the proposed western extension area and from a high of approximately 78.0mAOD (borehole KCW_3/19) along the mid-western boundary to the low of 71.7mAOD (borehole K30) along the mid eastern boundary and to approximately 75.0mAOD (borehole KCW_5/19) close to the southern boundary of the northern part of the proposed western extension area. The top of the Lincolnshire Limestone Formation falls from approximately 76.0mAOD (boreholes K25 & K01) in the north to approximately 69.0mAOD (borehole K22) in the mid-south beneath the southern part of the proposed extension area with the top of the limestone rising again to approximately 74.9mAOD (boreholes K36 & K37) in the south west. A plan showing the contours of the top of the Lincolnshire Limestone Formation interpreted from the site investigation data across the western extension area is presented at Appendix ESID D.

- 3.9** The Grantham Formation beneath the Lincolnshire Limestone Formation includes a thin laminated clay unit observed in the majority of boreholes round the perimeter of the proposed western extension area. This clay unit is variable at approximately 0.1m to 1.5m thick where present and is considered to be laterally discontinuous beneath the current ENRMF site. Beneath the proposed western extension area this clay unit is generally laterally extensive but thinner typically ranging from 0.1m to 0.8m in thickness and absent near to the southern boundary of the proposed western extension area. The overlying Lincolnshire Limestone Formation is between approximately 14m and approximately 20m thick beneath the current ENRMF site and between approximately 8.5m and 16.4m thick beneath the proposed western extension area where it is assumed that the clay of the Grantham Formation is the base of limestone unit. Given the often thin and locally discontinuous nature of this clay unit and the Grantham Formation generally, the Lincolnshire Limestone, Grantham Formation (where present) and Northampton Sand Formation combined is between approximately 15m and approximately 22.5m thick.
- 3.10** The Lincolnshire Limestone Formation beneath the western extension can generally be divided into two parts with the upper part dominated by strong or very strong light grey brown oolitic limestones with subordinate fine sandstones. The lower part is dominated by variably very strong to medium strong light grey brown, light grey and orange brown fine silty to slightly silty sandstones, oolitic fine sandstones and generally subordinate oolitic limestones. Fractures are mainly very close to medium spaced, subhorizontal and low angle, rough and undulating, open to moderately wide with subordinate widely spaced, high angle or subvertical fractures. Although fracture spacing is variable, in general fracture intensity is highest where the Lincolnshire Limestone Formation is overlain by glacial till in the south of the western extension area.
- 3.11** The Grantham Formation can be divided into two parts with the upper part comprising generally weak to moderately consolidated orange brown fine sand. The lower part comprises mainly very stiff to firm very dark grey/black clay overlying dark grey, dark grey brown and orange brown sandy silt and sandy clay with rare orange brown and dark grey very fine grained clayey sand and weak to medium strong very fine very clayey or very silty sandstone. The lower section of the Lincolnshire Limestone Formation, Grantham Formation and the Northampton Sand Formation are not easily differentiated at the site. The uppermost part of the Grantham Formation is

transitional with the overlying Lincolnshire Formation with no consistent surface that can be reliably correlated between boreholes. The Grantham Formation is absent along the southern boundary of the western extension area. For the purpose of the geological correlation presented on the cross sections on Figure ESID 8, the top of the Grantham Formation and Northampton Sand Formation, correlated as one unit on the cross sections, is taken at the top of the dark grey/black clay unit. Where the clay unit is absent the top of the Grantham Formation/Northampton Sand Formation is taken at the top of the weakly consolidated sand. The Northampton Sand Formation comprises very strong to medium strong brown, light brown and grey brown fine sandstone and slightly silty sandstone with rare silty sandstones and rare shelly material overlying very strong to medium strong grey fine grained very silty sandstones and dark grey sandy siltstones and siltstones with abundant shelly material. A basal siltstone unit frequently contains mudstone gravel and cobbles. Fractures are medium to very closely spaced, subhorizontal, low angle and high angle, rough and undulating, open to wide fractures and subvertical and large high angle undulating and branching/reconnecting, rough and open to wide fractures. In the brown sandstones there are irregular branching/reconnecting subhorizontal subvertical and high angle siderite filled fractures and fissures.

Lias Group

- 3.12** The elevation of the top of the underlying Whitby Mudstone Formation beneath the Northampton Sand Formation falls from approximately 55mAOD in the north to approximately 51mAOD in the mid section of the northern part of the proposed western extension area and from a high of approximately 54mAOD in the south to the low of 51mAOD in the mid section of the northern part of the proposed western extension area. The top of the Whitby Mudstone Formation is at approximately 54mAOD across the majority of the southern part of the proposed western extension area with the top of the Whitby Mudstone Formation falling to approximately 53mAOD in the south eastern corner of the southern part of the proposed western extension area. The top of the Whitby Mudstone Formation proved during the site investigation comprises very stiff to stiff dark grey clay tending to extremely weak mudstone. The thickness of the Whitby Mudstone Formation was not proved during the site investigation in the western extension.

Designated geological sites

- 3.13** There is a Regionally Important Geological Site (RIGS) in the vicinity of the site. The RIGS is located approximately 1.3km to the east north east of the current site as shown on Figure ESID 5. There is a Local Geological Site approximately 0.5km to the north west of the proposed western extension. The sites comprise quarries within the Lincolnshire Limestone Formation with the designations relating to the geological exposures in the quarries. There will be no impact on the RIGS or the Local Geological Site as a result of the proposed development.

Man-made subsurface migration pathways

- 3.14** Underground services at and in the vicinity of the proposed western extension area include a gas pipeline, an oil pipeline, two parallel potable water pipelines, a decommissioned water pipeline and a redundant MOD pipeline. The locations of the services in the vicinity of the site are shown in Figure ESID 6. The overhead electricity cable will be re-routed around the proposed landfill areas and will be placed in a trench to follow the route of the other buried services.

Hydrology

- 3.15** Information on the local hydrology is taken from Ordnance Survey base maps at 1:10,000 (Figure ESID 9), 1:25,000 (Figure ESID 11) and 1:50,000 (Figure ESID 5) scales and from information provided by the Environment Agency, East Northamptonshire Council, Rutland County Council and Peterborough City Council. The site is located in the catchment of the River Nene which flows generally eastwards and is located approximately 6km east south east of the current ENRMF site at the closest point (Figure ESID 5).

Existing surface water management

- 3.16** The current operational surface water management system is designed to retain all potentially contaminated surface water on site where it is stored in ponds and used for dust suppression, in the wheel wash and in place of mains water in the treatment facility. As the completed areas of the site develop, the surface water management system at the site is progressing towards the approved post restoration surface water management plan for the site which allows for the drainage of surface water from the

capped phases to a drainage point at the south eastern corner of the existing ENRMF site. This discharge point is the subject of consent under the Environmental Permit for the landfill. Surface water discharge from the site commenced in January 2021. The ditch to which site runoff is discharged flows generally to the south and after joining a stream outfalls to the Willow Brook approximately 2.5km south of the current ENRMF site. The Willow Brook joins the River Nene approximately 9km south east of the current ENRMF site (Figure ESID 5). An outline surface water management plan for the restored landform is currently being prepared for inclusion in the DCO application for the western extension.

- 3.17** The existing surface water management system for the operational site includes containment of the surface water from the waste treatment facility on the area of hardstanding which has an elevated kerbed edge. Surface water collecting in this area drains to a sump which is designed to have sufficient capacity to hold surface runoff from the treatment area. Fuel, lubricant and chemical reagents are stored in bunded areas to contain spillage. Vehicles are refuelled on areas of hardstanding with surface water drainage directed to a collection point or in the engineered and contained landfill area. Foul drainage from the site offices and welfare facilities is directed to a cess pit which is emptied by tanker as necessary and the contents are removed from site for treatment at a suitable sewage treatment works.

Surface water catchments

- 3.18** The proposed western extension to the landfill is located on a surface water divide with the majority within the catchment of the Willow Brook consistent with the current ENRMF site. Part of the northern section of the proposed western extension area drains to the east to a drainage ditch which runs along the western and southern boundaries of Collyweston Great Wood. It is understood that the drainage ditch continues eastwards from the site joining a tributary of the Wittering Brook where it issues approximately 2.0km north east of the current ENRMF site and approximately 2.7km east north east of the proposed western extension. The Wittering Brook joins the River Nene approximately 7.5km east of the current ENRMF site (Figure ESID 5).
- 3.19** Information on the surface water catchments at the site on the Environment Agency catchment data explorer website indicates that the majority of the proposed western

extension is within the catchment of the Wittering Brook consistent with the majority of the current ENRMF site. The information shows the southern part of the proposed western extension and the southern part of the current ENRMF site only are within the catchment of Willow Brook. However, contrary to what is shown on the Environment Agency catchment data explorer website, it is known from site observations that runoff from the southern part of the northern section of the extension area and the central area of the proposed western extension to the landfill drains via field drains and drainage ditches to the swallow hole located approximately 10m to the north of the north western corner of the current site boundary. A number of drainage ditches from the west of the extension area drain into the perimeter drainage ditches round the extension area with a drainage ditch from the south culverted under the central part of the extension area towards the swallow hole. A culvert approximately 175m north of the southern culvert is located under the central part of the extension area draining from the west towards the swallow hole. As it is likely that groundwater at the site feeds tributaries of the Willow Brook and the Willow Brook (see hydrogeology section below), for the purpose of this report it is considered that the majority of the proposed western extension to the landfill and the current ENRMF site are within the catchment of the Willow Brook.

- 3.20** The southern section of the proposed western extension area drains to the south and south east to a drainage ditch that runs from west to east along northern boundary of Little Wood approximately 50m south of the site. The drainage ditch continues eastwards to the east of Stamford Road and then south eastwards to where it joins a tributary of Willow Brook (Figure ESID 9).

Surface water bodies

- 3.21** In addition to the water bodies at the current site, there are a number of water bodies in the vicinity of the proposed western extension. A pond is located adjacent to the south west corner of the proposed western extension area. Three ponds are located north of the proposed western extension area with the closest pond approximately 80m from the northern boundary. A number of small ponds are located between approximately 200m and 400m east of the proposed extension area in the former MOD site within Collyweston Great Wood. A small pond is located approximately 450m south of the proposed extension area to the south of Little Wood. A number of waterbodies associated with the Lincolnshire Limestone Formation workings at

Collyweston Quarry are located approximately 500m west of the proposed extension area. Based on the 1:50,000 BGS map (Sheet 157, Stamford), with the exception of the Lincolnshire Limestone Formation workings at Collyweston Quarry, the waterbodies in the vicinity of the site are underlain by the glacial till (formerly boulder clay) or the Rutland Formation comprising mainly clays and silty clays. Surface water features in the vicinity of the site are shown on Figures ESID 9 and ESID 11.

Flood risk

- 3.22** The site is not located in an area of significant flood risk as designated by the Environment Agency and is not subject to flooding. The site is located in Flood Zone 1 which is defined as land having less than a 1 in 1,000 annual probability of river or sea flooding.

Surface water abstractions

- 3.23** Based on information provided by the Environment Agency and the relevant Local Authorities there is one licensed and one deregulated surface water abstraction within a 3km radius of the site including the proposed western extension area. The locations of the abstractions are shown on Figure ESID 11 with key details presented at Appendix ESID E. The licensed abstraction is located approximately 1.4km west north west of the site and is from the River Welland for hydroelectric power generation. The deregulated abstraction is located approximately 2.7km north west of the site and is from the River Welland for general farming and domestic use. The River Welland is in a separate surface water catchment from the site hence the abstraction is not located downstream of the site. An abstraction from the River Nene is located approximately 7km east of the site where water is pumped to Rutland Water for public water supply. The abstraction is located approximately 8km downstream of the confluence between the River Nene and Willow Brook and approximately 0.7km upstream of the confluence between the River Nene and Wittering Brook.

Water Framework Directive classifications

- 3.24** The quality of the surface water at and in the vicinity of the site is classified by the Environment Agency under the Water Framework Directive (WFD). The WFD classifications and objectives are presented in the River Basin Management Plans

(RBMP). The RBMP relevant to the site comprises the Anglian River Basin District. The Willow Brook (Nene) catchment which includes the tributary of the Willow Brook to the south of the site was classified by the Environment Agency in 2019 as “Moderate” for ecological quality and “Fail” for chemical quality with an overall classification of “Moderate”. It is understood that the failure of chemical quality is in respect of Macrophytes and Phytobenthos combined and phosphate from a continuous sewage discharge by the Water Industry. It is predicted in the RBMP that the ecological quality remains “Moderate” up to 2027 having achieved this objective in 2013 and that the predicted chemical quality objective of “Good” will be reached by 2027 having been “Good” up to 2016.

- 3.25** The Wittering Brook catchment which includes the tributary of the Wittering Brook to the east of the site was classified by the Environment Agency in 2019 as “Moderate” for ecological quality and “Fail” for chemical quality with an overall classification of “Moderate”. It is understood that the failure of chemical quality is in respect of phosphate from point source and diffuse emissions due to poor agricultural and rural land management, transport drainage and continuous sewage discharge. It is predicted in the RBMP that the ecological quality remains “Moderate” up to 2027 having achieved this objective in 2009 and that the predicted chemical quality objective of “Good” will be reached by 2027 having been “Good” up to 2016.

Discharge consents

- 3.26** Other than the permitted discharge at the site, there are no permitted water discharge consents within 500m of the site including the proposed western extension. There is one water discharge exemption within 500m of the site, which is located approximately 250m to the east of the current ENRMF site. The exemption was previously the subject of a discharge consent for the discharge of treated sewage effluent to an unnamed ditch.

Hydrogeology

- 3.27** Information on the hydrogeology of the site was provided by the Environment Agency, East Northamptonshire Council, Rutland County Council and Peterborough City Council and taken from logs of boreholes drilled at the site and groundwater level monitoring data for the period from 2003 to 2020.

Aquifer characteristics

- 3.28** The Blisworth Limestone Formation at the site was recorded as not water bearing during drilling of the boreholes at the site. The glacial till and the clays of the Rutland Formation have a low hydraulic conductivity and were recorded as not water bearing during drilling of the boreholes at the site. The underlying limestones and sandstones of the Lincolnshire Limestone Formation and the Northampton Sand Formation are water bearing. The Lincolnshire Limestone Formation has a low to moderate primary permeability and a moderate to high secondary permeability due to the presence of fissures and fractures. The Northampton Sand Formation is considered to have a low to moderate primary permeability and a moderate to high secondary conductivity locally due to the presence of fractures. Given the often thin and locally discontinuous nature of the Grantham Formation, the Lincolnshire Limestone Formation and Northampton Sand Formation, they are considered to be in hydraulic continuity at the site and are considered to form a single aquifer unit. Hydraulic properties of the strata are presented in the HRA as necessary.
- 3.29** Karst features such as swallow holes and doline depressions have been recorded in the vicinity of the site. A swallow hole is located approximately 10m to the north of the north western corner of the current site boundary. The swallow hole is one of a series of topographic depressions interpreted as dolines that trend east to west approximately 40m to the north of the current ENRMF site and that extend westwards beneath the proposed western extension area. During the site investigation in 2019/2020 in the limestone stratum occasional features were observed which are considered to be attributable to dissolution activity. Where observed these features are recorded on the borehole logs (Appendix ESID C). There are few discontinuities which are greater than 1cm and no discontinuities greater than 10cm were proven including in the area of the swallow hole and dolines. Three boreholes were drilled in the western extension in the strip of land to the west of the swallow hole using rotary coring techniques through the Lincolnshire Limestone Formation to the top of the Whitby Mudstone Formation to facilitate the assessment of the nature of the Lincolnshire Limestone Formation in proximity to the swallow hole. In addition an electromagnetic induction (EMI) survey was carried out in this area. A copy of the EMI survey report is provided at Appendix EDIS C. It is concluded in the EMI survey report that there is evidence of two areas of high electrical conductivity above the limestone suggesting trapped water hence vertical structures within the clay which

may be acting as sinks in the area of the survey aligned with the approximate location of the swallow hole. A larger area of very high conductivity in the south west of the survey area was interpreted as relating to drainage. The survey was carried out in the wet Autumn of 2019 when the ground was saturated.

- 3.30** The area between the site investigation area (boreholes and EMI survey) and the swallow hole was inaccessible for investigation due to the dense tree and scrub vegetation together with topography. A topographical survey of the western extension has been carried out (Figure ESID 10) and shows an area of depressions in the dense tree and scrub vegetation area to the west of the swallow hole. A small swallow hole feature was observed and surveyed in the north of the area of dense tree and scrub vegetation as shown on Figure ESID 10 at approximate coordinates 300250N 500400E. At the time of the survey the swallow hole was heavily vegetated and there was no evidence of surface runoff drainage entering the swallow hole. As stated in section 2.6, it has been agreed with the Environment Agency that the final design of the proposed landfill extension in the vicinity of the swallow hole and potential other limestone solution features will be developed in detail following further targeted site investigations in this central area after the Environmental Permit variation has been issued. It is proposed that an unfilled corridor will be retained in this area of the site to provide a route for surface water drainage from the land to the west of the proposed extension to the swallow hole. The width of the area which will not be the subject of landfilling with waste will depend on the further detailed assessment of the potential for solution features in this part of the site.
- 3.31** The hydraulic properties of the stratum at the site are presented in the 2014 HRA for the site and reproduced in the HRA (Appendix C to the application). As part of the 2019/2020 site investigation undertaken in and round the proposed western extension area a total of fourteen samples of the glacial till and Rutland Formation were collected and submitted to a laboratory for vertical hydraulic conductivity testing of the undisturbed core samples. The samples were taken at different depths near the base of the glacial till or Rutland Formation depending on which strata was present above the Lincolnshire Limestone Formation (Appendix ESID B). A total of five samples were taken from the glacial till with vertical permeability results ranging from 1.9×10^{-10} m/s to 8.4×10^{-12} m/s with a geometric mean of 2.6×10^{-11} m/s. A total of nine samples were taken from the Rutland Formation with vertical permeability results for seven of the samples ranging from 1.8×10^{-11} m/s to 5.2×10^{-9} m/s with a

geometric mean of 2.7×10^{-10} m/s. Two samples were recorded as being fractured resulting in vertical permeability results of 6.1×10^{-8} m/s and 2.2×10^{-7} m/s.

Aquifer designations

- 3.32** The Rutland Formation is designated a Secondary B Aquifer which is defined by the Environment Agency as:

“predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering, these are generally the water bearing parts of the former non-aquifers”.

- 3.33** The Blisworth Limestone Formation and the Lincolnshire Limestone are designated as Principal Aquifers. The glacial till and Grantham Formation are designated as Secondary (undifferentiated) Aquifers and the Northampton Sand Formation is designated a Secondary A Aquifer.

Groundwater abstractions

- 3.34** The site is not located in a Source Protection Zones (SPZ) for a public water supply. The closest SPZ is located approximately 2.9km north north west of the site at the closest point and comprises a total catchment area zone for public water supplies located approximately 5.3km north east of the site at the closest point.
- 3.35** There is one licensed groundwater abstraction which abstracts from two borehole locations, twelve deregulated groundwater abstraction licences at fifteen locations and six private water supply groundwater abstractions within a 3km radius of the site including the proposed western extension area. The abstraction locations are shown on Figure ESID 11 with key details presented at Appendix ESID E. The licensed groundwater abstraction is from a borehole approximately 1.6km east and a borehole approximately 2.5km south east of the site for general farming and domestic use with the borehole to the south east potentially down hydraulic gradient of the site in respect of groundwater flow (see next section). Of the deregulated abstractions three are located to the south and south east hence potentially down hydraulic gradient of the site in respect of groundwater flow. The closest deregulated abstraction to the site is located approximately 1.1km south east of the site at Law's Lawn and is for general

farming and domestic use. It is assumed that the deregulated abstraction at Law's Lawn is the private water supply for domestic use now registered with East Northamptonshire Council at similar location coordinates. Two of the remaining five private water supplies are located to the south east hence potentially down hydraulic gradient of the site at distances of approximately 2.5km and 2.8km.

Groundwater flow

- 3.36** Hydrographs showing the groundwater elevations recorded in the vicinity of the currently permitted site and proposed western extension area are presented on Figures HRA 4A and HRA 4B respectively (in the HRA at Appendix C to the application). Groundwater level data for boreholes installed round the perimeter of the currently permitted site to the east of the proposed western extension are presented from November 2003 to 2020 with groundwater level data for boreholes round the perimeter of the proposed western extension available from installation during the site investigation in 2019/2020.
- 3.37** The groundwater levels recorded at boreholes round the perimeter of the proposed western extension are within the range generally of groundwater levels recorded at boreholes round the perimeter of the currently permitted site albeit that limited data is available for the boreholes round the perimeter of the western extension installed in 2019/2020. Groundwater levels recorded in boreholes K34 to K37 along the southern boundary of the western extension generally are lower than round the currently permitted site consistent with groundwater flow towards the south as expected and the levels are between those recorded at the current ENRMF site and those recorded at borehole K09 located approximately 700m south east of the site. In general groundwater flows from north to south across the western extension area consistent with the current ENRMF site with an element of flow towards the west in the central area of the western extension (Figure HRA 5 - Appendix C to the application). The groundwater levels recorded at boreholes round the perimeter of the proposed western extension and southerly groundwater flow direction are consistent with the average regional groundwater level contour map provided by the Environment Agency (Appendix ESID F).
- 3.38** As a result of the fall in groundwater levels from north to south and of the general subhorizontal strata the saturated zone at and in the vicinity of the southern part of

the proposed western extension area is mainly within sandstones of the lowermost part of the Lincolnshire Limestone Formation and sands and sandstones of the Northampton Sand Formation. It is in the vicinity of the northern part of the proposed western extension area and in the area of the swallow hole generally that the saturated zone includes the limestones of the Lincolnshire Limestone Formation consistent with the boreholes round the currently permitted site.

Springs and issues

- 3.39** Based on the groundwater elevation data for the area at and round the site, locally the direction of groundwater flow in the Lincolnshire Limestone Formation and Northampton Sand Formation is to the south generally. A number of springs are shown on the 1:25,000 Ordnance Survey map (Sheet 234, Rutland Water) within a 3km radius of the site (Figure ESID 11). In general the springs coincide with valley features. A spring is shown approximately 850m south east of the current ENRMF site located approximately 400m east of Westhay Lodge, springs are located to the immediate south east of Kings Cliffe village approximately 2.6km south of the current ENRMF site, a spring is located approximately 2.8km south south east of the current ENRMF site, a spring is adjacent to Tixover Grange approximately 2.3km north west of the proposed western extension area and springs are located to the west and south west of Collyweston between approximately 2.0km and 2.7km north north west of the proposed western extension area.
- 3.40** On the 1:10,000 Ordnance Survey base data there are a number of issues identified in addition to the springs within a 3km radius of the site (Figure ESID 9). In general the issues coincide with valley features. Issues are shown at approximately 90m south of the proposed western extension in Little Wood as shown on Figure ESID 9, issues are located to the south of the site where the tributary of Willow Brook emerges and along the tributary at between 0.8km and 1.6km south of the site, issues are located between approximately 1.6km and 2.0km to the north east, east and south east of the current ENRMF site where tributaries of the Wittering Brook emerge, issues are located where a tributary of the River Nene emerges approximately 2.4km south east of the current ENRMF site, issues are located adjacent to Tixover Grange approximately 2.1km north west of the proposed western extension and along the Willow Brook approximately 2.9km south west of the proposed western extension.

- 3.41** Based on the general direction of groundwater flow in the vicinity of the site it is considered that the springs to the north west and north north west of the site are located up hydraulic gradient of the site, and the springs to the south, south south east and south east of the site are down hydraulic gradient of the site. All other springs and issues are neither up nor down hydraulic gradient of the site in respect of groundwater flow. Based on the 1:50,000 BGS map (Sheet 157, Stamford), of the springs and issues down hydraulic gradient of the site it is considered that the issue in Little Wood near the southern boundary is from the glacial till. It is considered that the northern most issue to the south where the tributary of the Willow Brook emerges and the issue along the tributary together with the springs to the south of the site near Kings Cliffe village issue from the base of the Lincolnshire Limestone Formation and/or the Grantham Formation and feed into Willow Brook. It is considered that the southern most of the issues to the south where the tributary of the Willow Brook emerges is from the Blisworth Limestone Formation. It is considered that the spring to the south east of the site near Westhay Lodge issues from glacial sand and gravel deposits or from the Blisworth Limestone Formation and feeds a tributary of Willow Brook and the spring to the south south east of the site issues from the Blisworth Limestone Formation and feeds another tributary of Willow Brook. The remaining issues to the south east are from the Blisworth Limestone Formation.
- 3.42** It is considered that the springs and issues from the glacial deposits and from the Blisworth Limestone Formation are hydraulically separate from the site as where these deposits are recorded at the site they are laterally discontinuous and were recorded as not water bearing during the site investigations. On this basis the issue to the south where the tributary of the Willow Brook emerges and the issue along the tributary together with the springs to the south of the site near Kings Cliffe village issue from the Lincolnshire Limestone Formation and are considered to comprise down hydraulic gradient receptors for the site.

Groundwater discharge

- 3.43** The Rutland Formation and Lincolnshire Limestone Formation and the Northampton Sand Formation to the south, east and south east of the site are cut by several valley features which are coincident with the River Nene and its tributaries. Based on the direction of groundwater flow and the valley features in the Lincolnshire Limestone Formation and Northampton Sand Formation to the south and south east of the site

it is likely that groundwater beneath the site discharges to the River Nene via tributaries. The influence on groundwater level of the valleys of the Willow Brook and the tributaries of Willow Brook to the south and south east of the site is illustrated by the average regional groundwater level contour map provided by the Environment Agency (Appendix ESID F).

Groundwater quality

- 3.44** The quality of the groundwater at and in the vicinity of the site is classified by the Environment Agency under the Water Framework Directive (WFD). The WFD classifications and objectives are presented in the River Basin Management Plans (RBMP). The RBMP relevant to the site comprises the Anglian River Basin District. The groundwater in the Northampton Sands in the Nene Catchment in which the site is located was classified by the Environment Agency in 2019 under the WFD as “Good” with respect to quantitative status and “Poor” with respect to chemical quality with an overall classification of “Poor”. It is specified that the reason for not achieving Good status with respect chemical quality is due to poor nutrient management under the agricultural and land management category. The quantitative status and chemical quality objectives are consistent with the current classifications with the current classifications predicted in the RBMP to remain up to 2027.
- 3.45** Groundwater has been sampled routinely from boreholes across the current ENRMF site for the purpose of groundwater quality monitoring. Data from groundwater samples up hydraulic gradient of the site are reviewed to provide an indication of groundwater quality up hydraulic gradient of the site. The groundwater quality up hydraulic gradient of the site reflects the land uses in the vicinity of and up hydraulic gradient of the site including agriculture, the former military storage facility in Collyweston Great Wood and the airfield at RAF Wittering. The monitoring data are provided to the Environment Agency and are reviewed regularly by Augean to identify spatial and temporal patterns and to provide assurance that there are no adverse trends with respect to groundwater quality. An electronic copy of the water quality data is presented at Appendix HRA B. A review of groundwater quality at the site is presented in the HRA.

Off-site landfill gas monitoring

- 3.46** Table S3.5 of the current permit specifies the monitoring requirements for landfill gas external to the waste at two borehole locations K03A and K10 (Figure ESID 10). The locations are in proximity to the phases of the site in which biodegradable waste was accepted at the site prior to July 2004 and are located between the landfill site and the receptors to the east of the site shown on Figure ESID 4. Monitoring external to the waste will continue at these locations. As described in Section 2 of this ESID in order to confirm that the hazardous waste deposited in the landfill phases in the western extension area has a negligible potential to generate landfill gas, gas monitoring will be undertaken internal to the waste in the leachate wells installed progressively at the site. There are no proposals to monitor for landfill gas external to the waste in the western extension area.

Receptors and compliance points

Groundwater and surface water

- 3.47** Potential receptors for contaminants migrating from the landfill are described in Section 2.24 to 2.27 of the HRA. The relevant locations of the compliance points are shown on Figure ESID 10.

Landfill gas

- 3.48** There are no residential properties located within 500m of the western extension area. As described in Section 2 of this ESID report the permanent deposit of the proposed waste types in the western extension is unlikely to generate significant quantities of landfill gas. As there is no significant source of landfill gas in the western extension are no potential receptors for landfill gas migrating from the landfill phases in the western extension are have been identified.

Amenity

- 3.49** Potential receptors for nuisance from the landfill activities are described in the nuisance and amenity environmental risk assessment (ERA). The approximate locations of the receptors are shown on Figure ERA 1, Figure ERA 2 and Figure ESID 4.

Habitats

- 3.50** Potential nature conservation receptors for impacts from the landfill are described in paragraph 1.15 of this ESID. The approximate locations of the receptors are shown on Figure ESID 4 and Figure ESID 5.

Heritage conservation

- 3.51** The nearest Scheduled Monument is Duddington Bridge which is situated to the west of the village approximately 1.6km west north west of the site. One other Scheduled Monument sits on the limit of the 2km search area north northwest of the site in Collyweston and is the site of a manor house and gardens. Based on the Zone of Theoretical Visual Influence (ZTVI) and the assessment of views from designated assets or groups of assets (such as within Conservation Areas) there would be no visual effects from the proposed development nor effects upon their historical context.
- 3.52** There are two locations of Grade II* listed buildings and structures and twenty eight Grade II listed buildings within 2km of the site. The closest are located within Duddington Village where there are twenty seven listed buildings located within a conversation area at a distance of over 1.2km west of the site. There are no views of the application site from the locations of the buildings.
- 3.53** There is no surviving archaeology within the existing ENRMF site as all areas of the site have been disturbed and were subject to previous investigation and recording. A desk based study including an assessment of archaeological potential and the potential impacts on the setting of cultural heritage assets has been undertaken. A geophysical survey has also been undertaken of the proposed western extension area to identify any features of potential archaeological interest. The geophysical survey found little that can described as of archaeological interest with any certainty. Trial trenching has also been undertaken in the western extension area to verify the findings of the geophysical survey and identify any features of archaeological interest which may be present below ground. It is concluded that the proposed development will have neutral, negligible or not significant effects on cultural heritage and archaeology.

Receptor summary

- 3.54** The receptors relevant to the Application are summarised in Table ESID1 and shown on Figure ESID 4 and Figure ESID 5.

4. Site condition report

- 4.1 A site investigation was undertaken in the western extension area between November 2019 and March 2020. The primary objective of the site investigation was to determine the elevation and depth to the boundary between the base of the Rutland Formation and the top of the Lincolnshire Limestone Formation across the western extension area and to assess the nature of the Rutland Formation. The site investigation comprised the installation of sixteen combined groundwater and landfill gas monitoring boreholes round the perimeter of the western extension area.
- 4.2 The full details are presented in a factual report² of the site investigation which was provided to the Environment Agency on 19 June 2020 as part of the pre-application process and is presented at Appendix ESID C.
- 4.3 For the purpose of section 4 of this ESID report the factual report of the site investigation comprises the site condition report for the western extension area.

² Factual report of a site investigation in a potential extension to East Northants Resource Management Facility and Construction Quality Assurance Verification report for the installation of groundwater and landfill gas monitoring boreholes drilled during the site investigation report reference AU/KCW/JRC/2936/01. Dated June 2020.

TABLES

Table ESID 1

Summary of the amenity receptors in the vicinity of the western extension area

The locations of the receptors are shown on Figure ESID 4 and Figure ESID 5.

Reference	Name or description	Type of receptor	Approximate distance from the western extension area (m)	Direction from western extension area
R1	Properties at Westhay Cottages	Domestic dwellings	815	E
R2	Westhay Farm	Domestic dwellings	865	E
R3	Collyweston Great Wood and Easton Hornstocks NNR and SSSI	Sensitive habitat	Adjacent	NE
R4	Fineshade Woods Local Wildlife Site	Sensitive habitat	Adjacent	W
R5	Footpath MX13	Leisure	230	W
R6	Footpath MX15	Leisure	100	W
R7	Footpath MX18	Leisure	300	W
R8	Footpath NE13	Leisure	200	SW

Table ESID 2

Summary of the proposed design for the western extension area and comparison with the design of the existing landfill area at ENRMF

Element	Current design of the existing landfill area ³	Proposed design for the western extension area
Excavated slopes		
Strata	The sideslope will be excavated in glacial clays, brown clays and clays of the Rutland Formation to a formation level 2m above the top of the Lincolnshire Limestone.	The sideslope will be excavated in glacial clays, brown clays and clays of the Rutland Formation to a formation level 2m above the top of the Lincolnshire Limestone.
Gradient	Sideslope gradients: maximum 1v:2.5h. Basal gradients: typically up to 1v:50h, minimum 1v:100h	Sideslope gradients: maximum 1v:2.5h. Basal gradients: typically up to 1v:25h, minimum 1v:100h
Height	Typically 5m to 12m. Maximum of approximately 16.5m located along a 10m length of the eastern boundary of Phases 6 and 10 which reflects stockpiled materials and made ground which was removed prior to construction.	Excavated slopes range from approximately 1.5m to 16.5m. Where the excavated slopes are less than 5m the excavation boundary shall be adjusted and a perimeter bund constructed to maintain a minimum equivalent excavated perimeter side slope depth of 5m. Maximum anticipated slope height of approximately 16.5m.
Perimeter bunds		
Gradient	Not in current design	Maximum 1v:2.5h internal face and 1v4h external face.
Height	Not in current design	Up to a maximum of 5m to provide a minimum equivalent excavated perimeter side slope of 5m.
Crest width	Not in current design	Minimum 3m.
Basal lining system		
Mineral barrier	Minimum 1m thick engineered clay liner with a hydraulic conductivity of no more than 1×10^{-9} m/s. Intercell bunds with a maximum vertical height of 3m, side slopes of 1v:2h and crest width of 3m.	Minimum 1m thick engineered clay liner with a hydraulic conductivity of no more than 1×10^{-9} m/s. Intercell bunds with a maximum vertical height of 3m, side slopes of 1v:2h and crest width of 3m.

³ In accordance with the current site permit requirements or as agreed through the CQA Plans in accordance with the current site permit requirements

Geomembrane	2mm thick smooth HDPE geomembrane with either a protection geotextile or a 300mm sand protection layer.	2mm thick smooth HDPE geomembrane with either a protection geotextile or a 300mm sand protection layer.
Leachate drainage blanket	Either a 300mm thick granular a tyre bale leachate drainage blanket layer on the base with a 300mm thick granular layer installed up and over the inter-cell bunds and up the first 2m vertical height of the sideslopes. Containing 180mm external diameter HDPE leachate collection pipework draining to a sump in the low point of each phase.	Either a 300mm thick granular or a tyre bale leachate drainage blanket layer on the base with a 300mm thick granular layer installed up and over the inter-cell bunds and up the first 2m vertical height of the sideslopes. Containing 180mm external diameter HDPE leachate collection pipework draining to a sump in the low point of each phase.
Sideslope lining system		
Mineral barrier	Minimum 1m thick engineered clay liner with a hydraulic conductivity of no more than $1 \times 10^{-9} \text{m/s}$.	Minimum 1m thick engineered clay liner with a hydraulic conductivity of no more than $1 \times 10^{-9} \text{m/s}$.
Geomembrane	2mm thick double textured HDPE geomembrane.	2mm thick double textured HDPE geomembrane.
Leachate drainage blanket	Suitable drainage geocomposite to act as a pathway for perched leachate to drain to the basal leachate drainage blanket and provide protection to the underlying geomembrane.	Suitable drainage geocomposite to act as a pathway for perched leachate to drain to the basal leachate drainage blanket and provide protection to the underlying geomembrane.
Inter-cell bunds		
Gradient	1v:2h.	1v:2h.
Height	Minimum 2m.	Minimum 2m but up to a maximum of 3m to accommodate basal level differences between phases.
Crest width	Minimum 3m.	Minimum 3m.
Waste mass		
Gradient	1v:3h.	1v:3h
Depth of waste	Approximately 17m depth of waste. 15m maximum temporary waste slope.	Up to approximately 20m depth of waste. 18m maximum temporary waste slope.
Waste placement	Waste placed progressively in horizontal layers across the full width of the landfill cell. Selected fine grained wastes containing clay, silt, sand and gravel up to a grain size of 20mm in diameter will be used as the first layer placed against the sideslopes.	Waste placed progressively in horizontal layers across the full width of the landfill cell. Selected fine grained wastes containing clay, silt, sand and gravel up to a grain size of 20mm in diameter will be used as the first layer placed against the sideslopes.

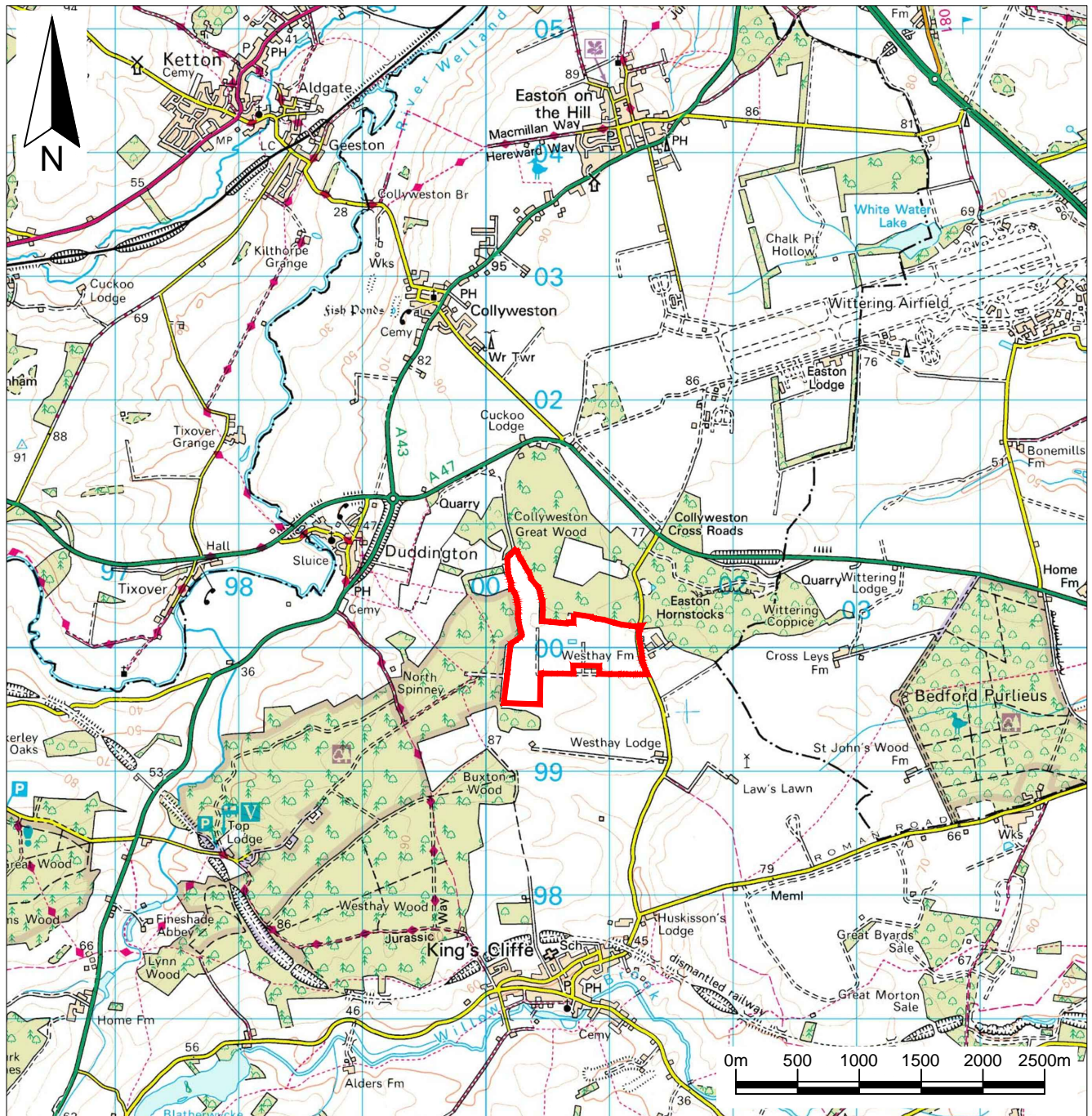
Capping and restoration system		
Components	<p>A 0.3m thick sub-grade layer placed over the completed and profiled waste surface.</p> <p>1mm thick HDPE geomembrane or linear low density polyethylene (LLDPE) geomembrane with a suitable protection and drainage geocomposite.</p> <p>Subsequently amended through a CQA Plan and stability risk assessment to 1m thick low permeability engineered clay layer with a suitable protection and drainage geocomposite</p> <p>1m to 1.5m thickness of restoration materials. The thicker layers are located in the areas which will be restored to woodland .</p>	<p>A 0.3m thick sub-grade layer placed over the completed and profiled waste surface.</p> <p>Either: 1mm thick HDPE geomembrane or linear low density polyethylene (LLDPE) geomembrane with a suitable protection and drainage geocomposite.</p> <p>Or: 1m thick low permeability engineered clay layer with a suitable protection and drainage geocomposite.</p> <p>And: 1m to 1.5m thickness of restoration materials. The thicker layers are located in the areas which will be restored to woodland.</p>
Gradient	<p>Typical gradients of between approximately 1v:10h and 1v:20h with slope lengths of between 150m at 1v:10h and greater than approximately 200m at 1v:20h. Steeper slopes are present along the northern boundary with the steepest at a gradient of 1v:3h over 10m in the eastern section of the northern boundary.</p>	<p>Typical maximum average gradient of 1v:6h for slope lengths of up to 150m.</p> <p>Maximum gradient of approximately 1v:4h for lower slopes with heights of approximately 12m.</p>
Height	<p>Maximum of approximately 14m.</p>	<p>Maximum of approximately 18m.</p>

Table ESID 3

Landfill gas monitoring proposals for the western extension area

Monitoring point reference	Parameter	Monitoring frequency	Monitoring standard or method
Leachate wells in Phases 12 to 21 Locations shown on Figure ESID 10.	Methane Carbon dioxide Oxygen Carbon monoxide Atmospheric pressure Differential pressure Meteorological data	Monthly	In accordance with Agency Document "Guidance on the Management of Landfill Gas, LFTGN03" dated September 2004

FIGURES



Key / Notes



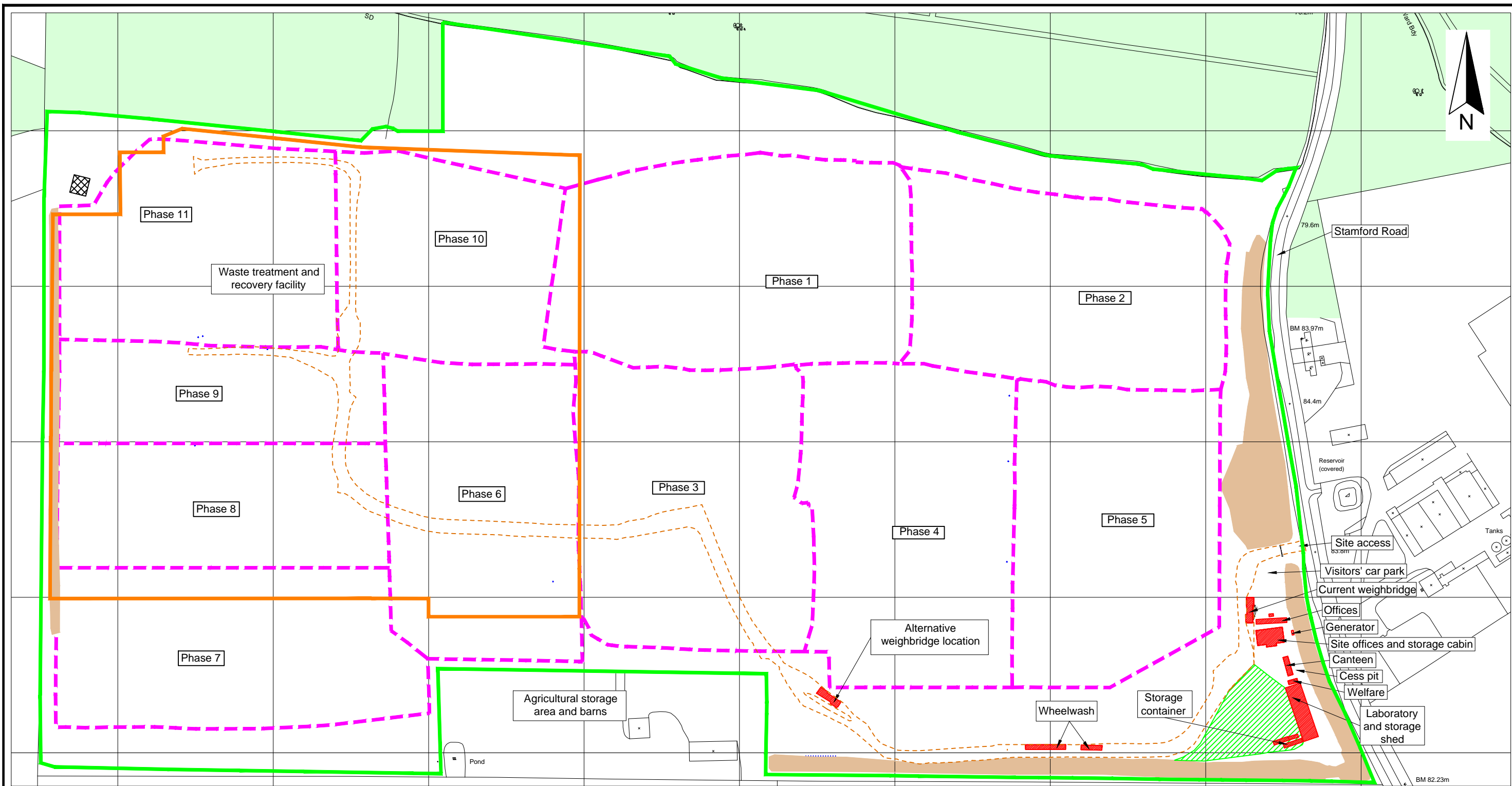
Boundary of the site

	Final	KR	AW	LH	26/03/21
Rev	Status	Drn	App	Chk	Date
Site EAST NORTANTS RESOURCE MANAGEMENT FACILITY					
Client 					
Title The site location					
Figure ESID 1				Scale 1:50,000@A4	
Drawing Ref AU/KCW/12-20/22118					



Baddesley Colliery Offices,
Main Road, Baxterley, Atherstone,
Warwickshire, CV9 2LE.
Telephone : 01827 717891
Fax : 01827 718507

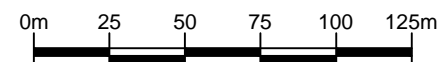
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Key / Notes

- Approximate boundary of Environmental Permit number EPR/TP3430GW/V005
- Approximate phase boundaries for the landfill site
- Approximate boundary of Environmental Permit number YP3138XB for the waste treatment facility
- Building or structure
- Approximate route of haul roads
- Approximate area of hardstanding
- Approximate location of bunds
- Woodland
- Gas flare compound

Note:
Drawing based on survey reference AU-US-15426.LSS dated 29 May and 2 June 2020



Rev	Final	SRW	AW	LH	26/03/21
Status		Drn	App	Chk	Date

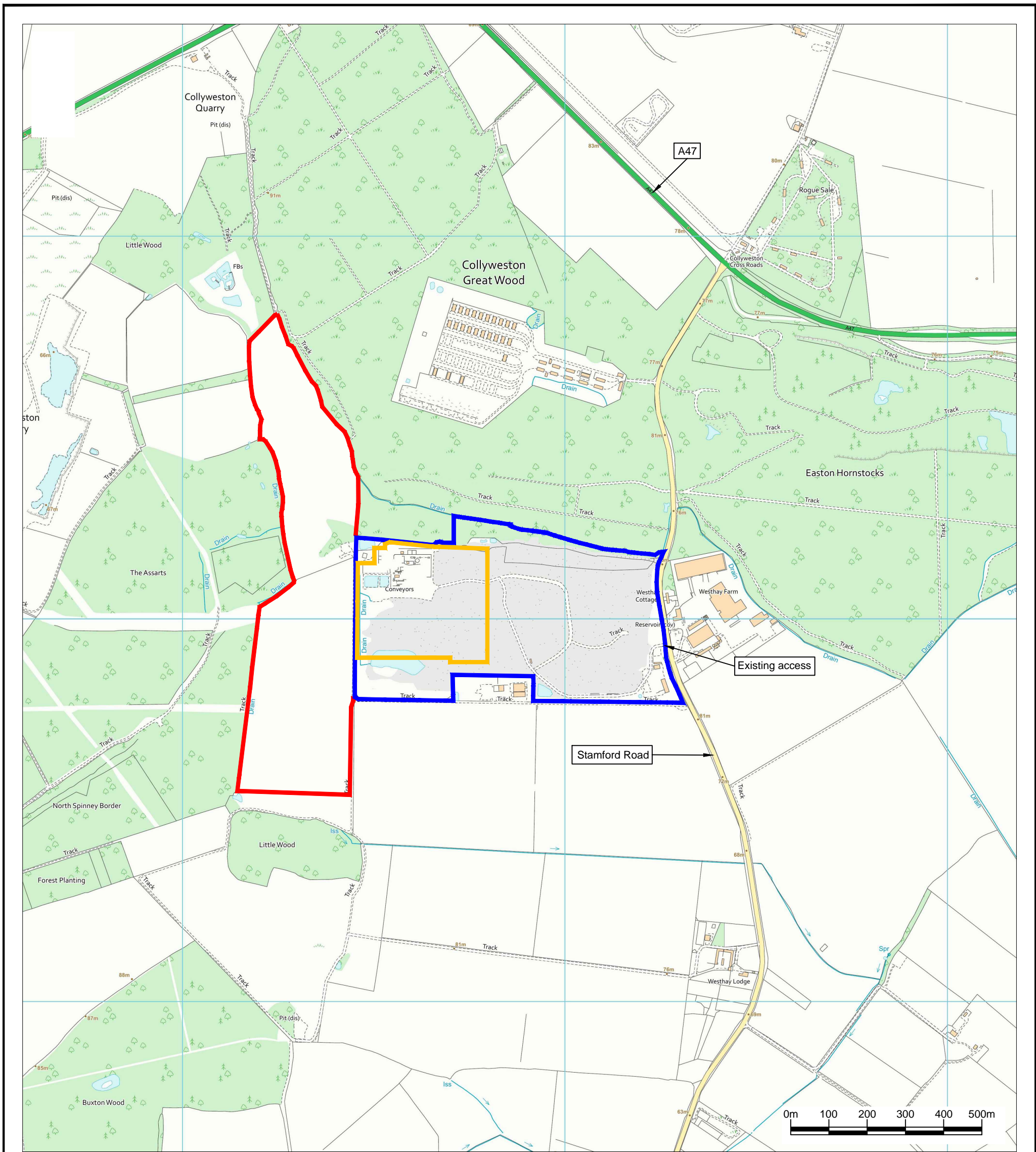
Site	EAST NORTHANTS RESOURCE MANAGEMENT FACILITY	Client	
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Title
The current site layout

Figure ESID 2 Scale 1:2,500@A3

Drawing Ref AU/KCW/12-20/22132

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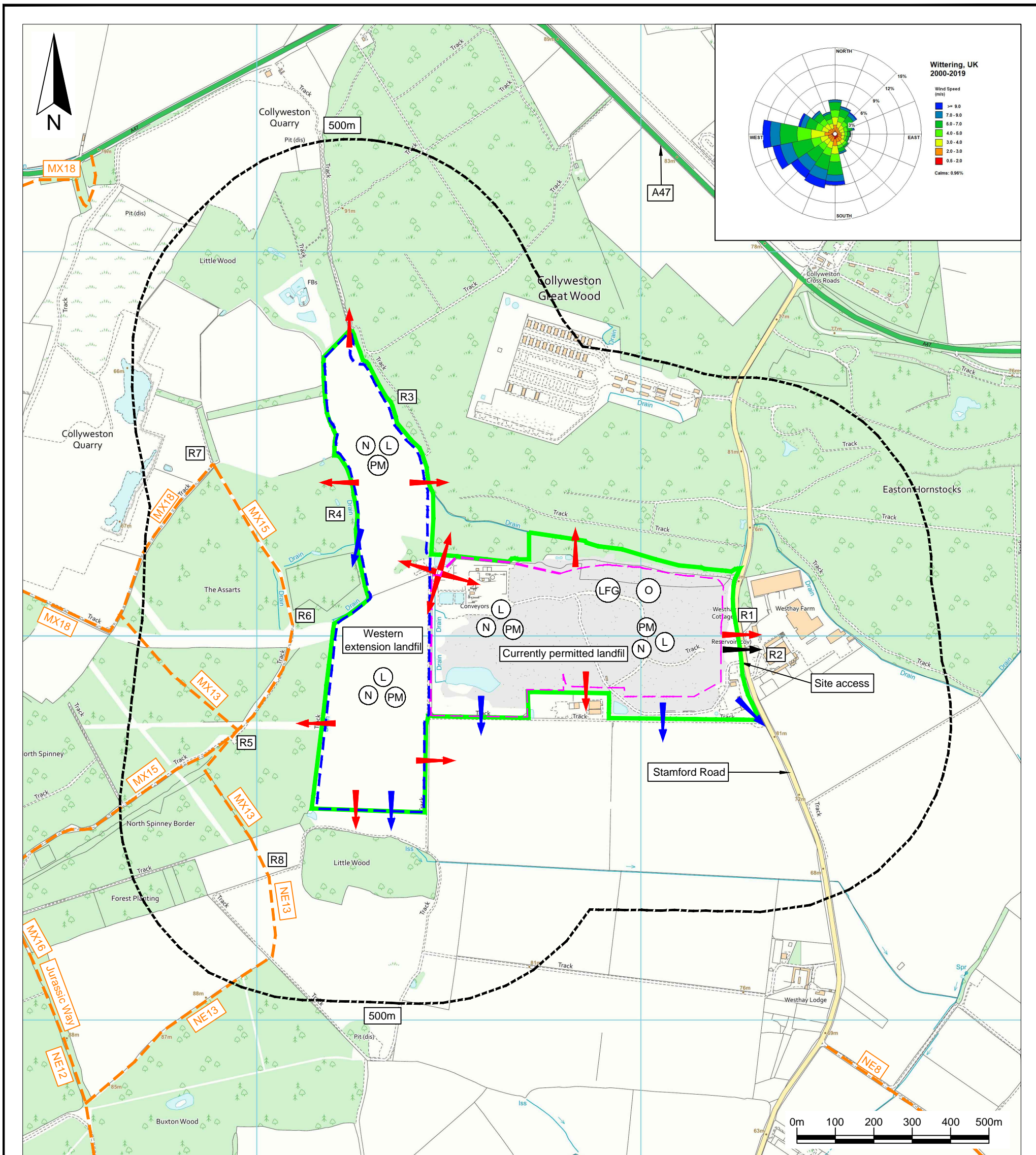
Key / Notes

- Proposed western extension to the ENRMF hazardous waste landfill Environmental Permit

- Approximate current boundary of Environmental Permit number EPR/TP3430GW/V005 for the ENRMF hazardous waste landfill

- Approximate boundary of Environmental Permit number YP3138XB for the waste treatment facility

	Final	SRW	AW	LH	26/03/21
Rev	Status	Drn	App	Chk	Date
Site		Client			
EAST NORTHANTS RESOURCE MANAGEMENT FACILITY					
Title					
Environmental permit boundaries					
Figure ESID 3				Scale	
				1:10,000@A3	
Drawing Ref					
AU/KCW/12-20/22125					



Key / Notes

- Environmental Permit boundary of the proposed extended site
- Approximately 500m distance from the proposed Environmental Permit boundary
- Approximate footprint of the phase boundaries in the current permitted landfill
- Approximate footprint of the phase boundaries in the proposed western extension landfill
- Public rights of way

- Sources**
- O Odour
 - PM Particulate matter
 - N Noise
 - L Leachate
 - LFG Landfill gas
- Receptors**
- R1 Potential amenity receptor location listed in Table ESID1

- Potential pathways**
- ← Groundwater
 - ← Air
 - ← Vehicles

Note:
Public rights of way taken from the Northamptonshire County Council Interactive Mapping <http://maps.northamptonshire.gov.uk>

Rev	Final	KR	AW	LH	26/03/21
Status	Drn	App	Chk		Date

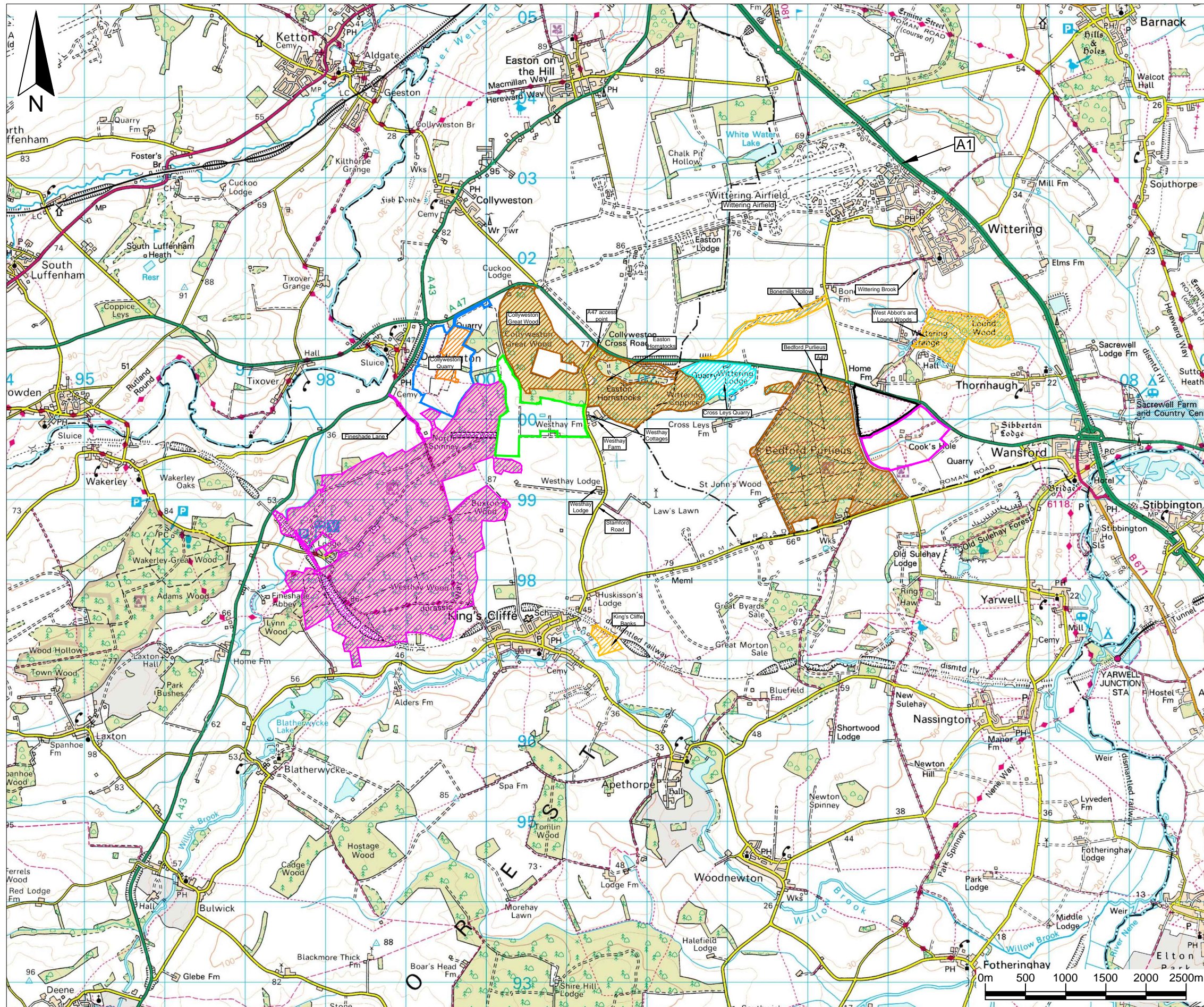
Site: EAST NORTHANTS RESOURCE MANAGEMENT FACILITY

Client:







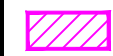


Title: Source, Pathways and Receptors

Figure ESID 4 Scale: 1:10,000@A3


Drawing Ref: AU/KCW/12-20/22119



Key / Notes

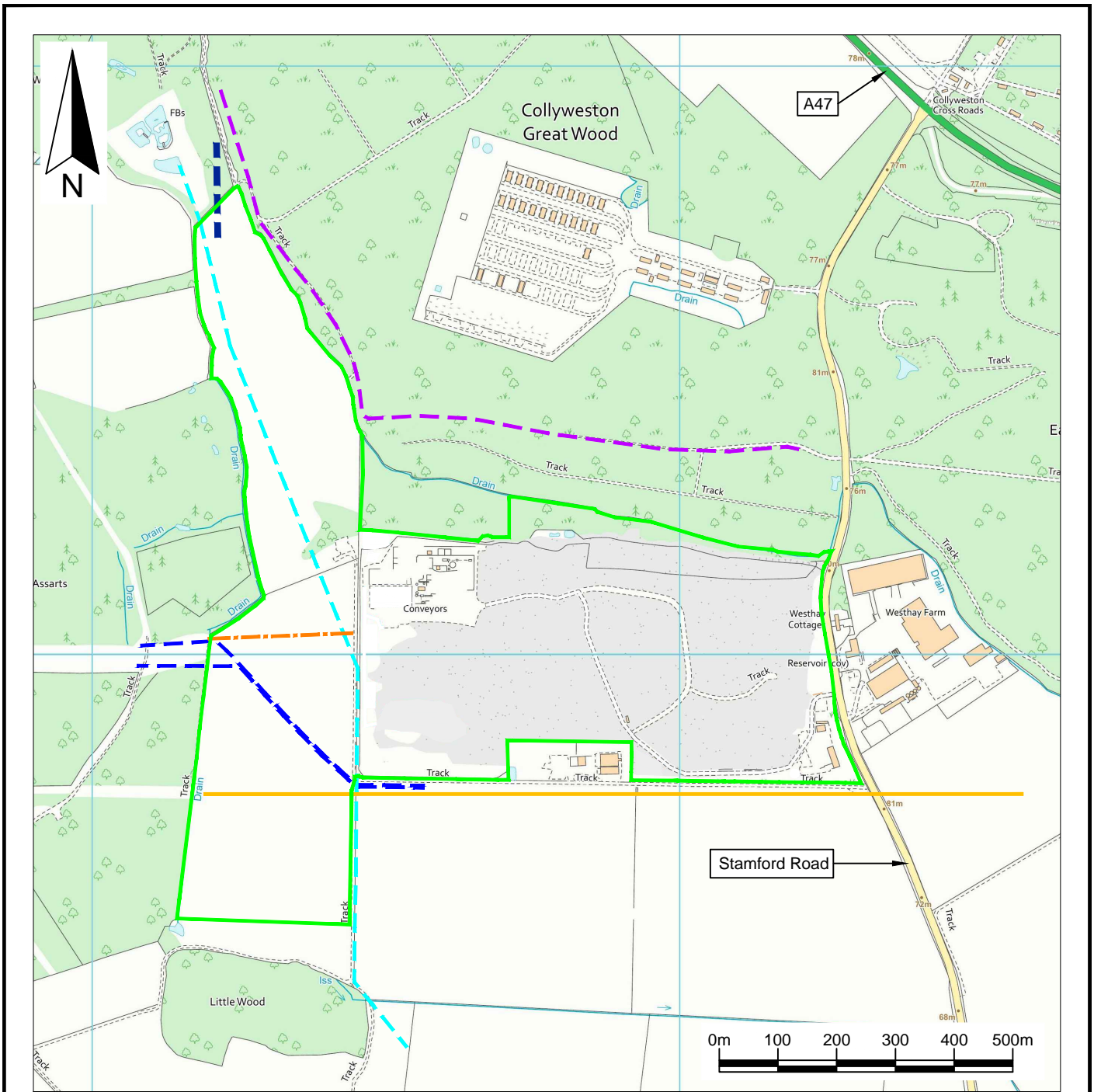
-  Approximate boundary of the proposed extended boundary of Environmental Permit number EPR/TP3430GW
-  Boundary of Cooks Hole Quarry
-  Boundary of Thornhaugh Landfill Site
-  Approximate boundary of Collyweston Quarry
-  Approximate location of a Site of Special Scientific Interest (SSSI)
-  Approximate location of a Site of Special Scientific Interest (SSSI) and a National Nature Reserve (NNR)
-  Approximate location of a Local Wildlife Site
-  Approximate location of a Regionally Important Geological Site
-  Approximate location of a Local Geological site

Rev	Final	SRW	AW	LH	26/03/21
	Status	Drn	App	Chk	Date

Site	EAST NORTHANTS RESOURCE MANAGEMENT FACILITY	Client	
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Title	Designated sites in the vicinity of the site and the western extension area
Figure ESID 5	Scale 1:50,000@A3

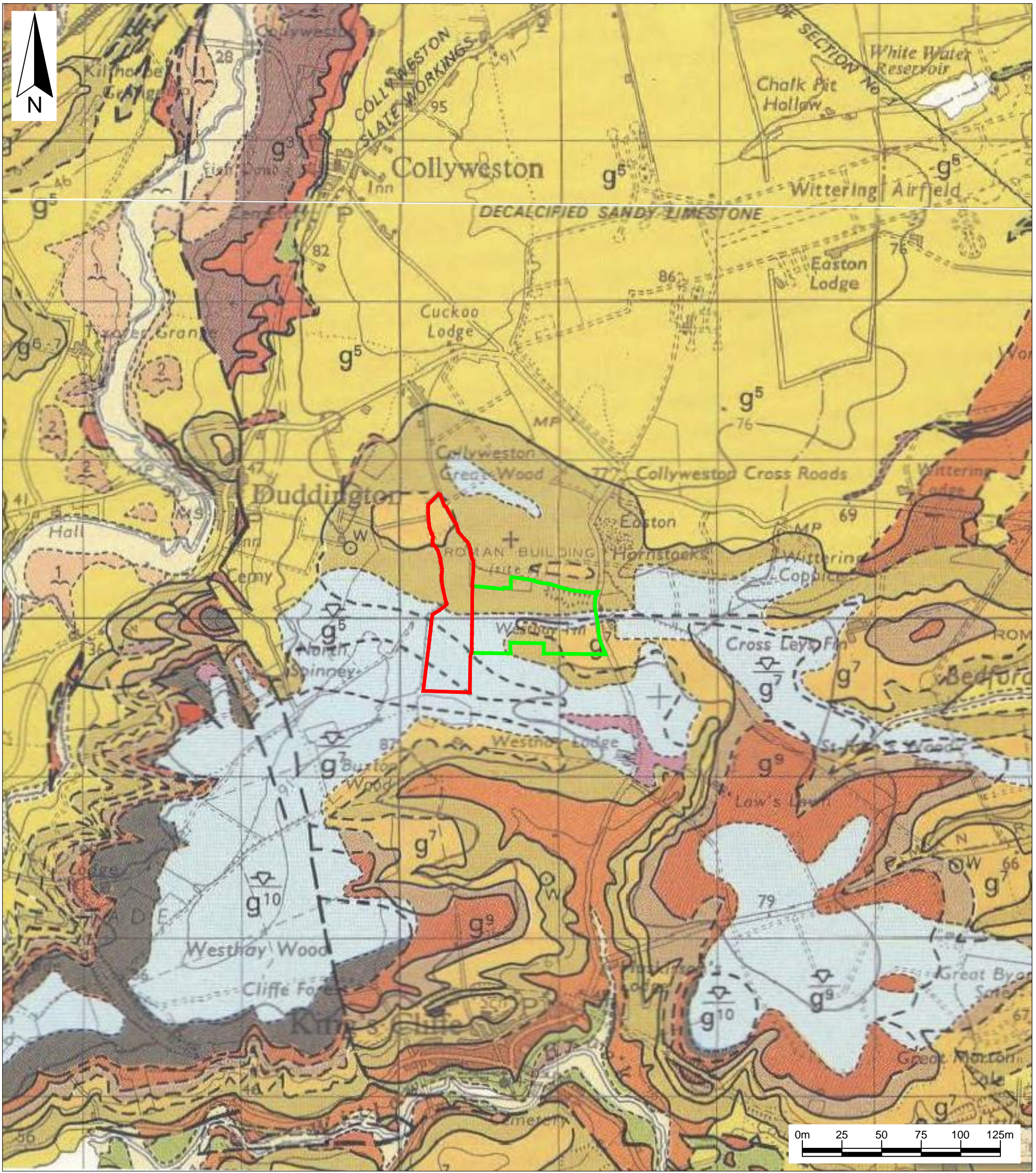
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Key / Notes

- Approximate proposed extended boundary to Environmental Permit number EPR/TP3430GW
- Approximate route of overhead electricity cables
- Approximate route of water pipelines
- Approximate route of a disused water pipeline taken from DXF file supplied by Tigergeo Limited on 27 May 2020
- Approximate route of an oil pipeline
- Redundant and closed MOD pipeline
- Approximate location of a high pressure gas pipeline

Rev	Final	SRW	AW	LH	30/03/21
	Status	Drn	App	Chk	Date
Site EAST NORTANTS RESOURCE MANAGEMENT FACILITY		Client 			
Title The services at and in the vicinity of the western extension area					
Figure ESID 6				Scale 1:10,000@A4	
Drawing Ref AU/KCW/12-20/22134					
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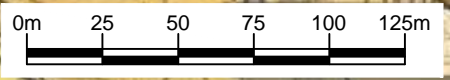


Key / Notes

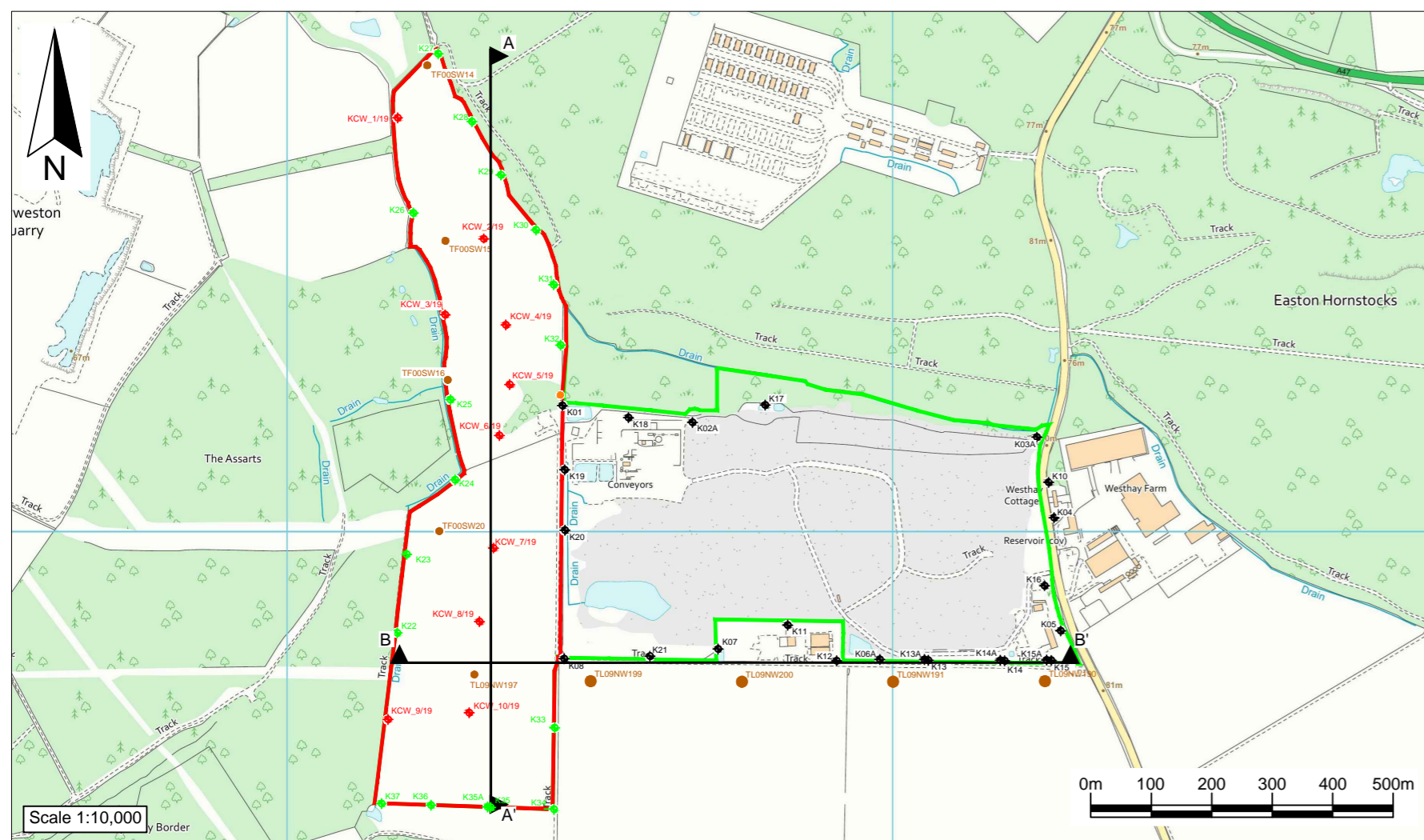
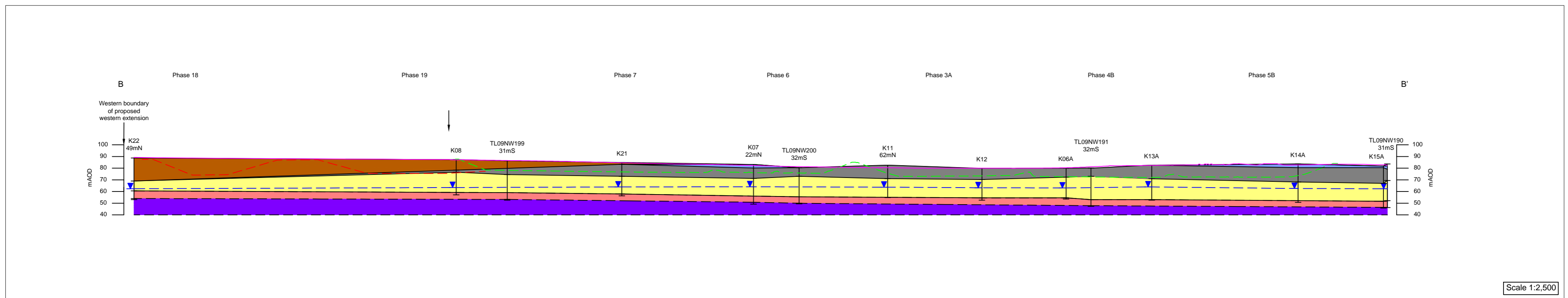
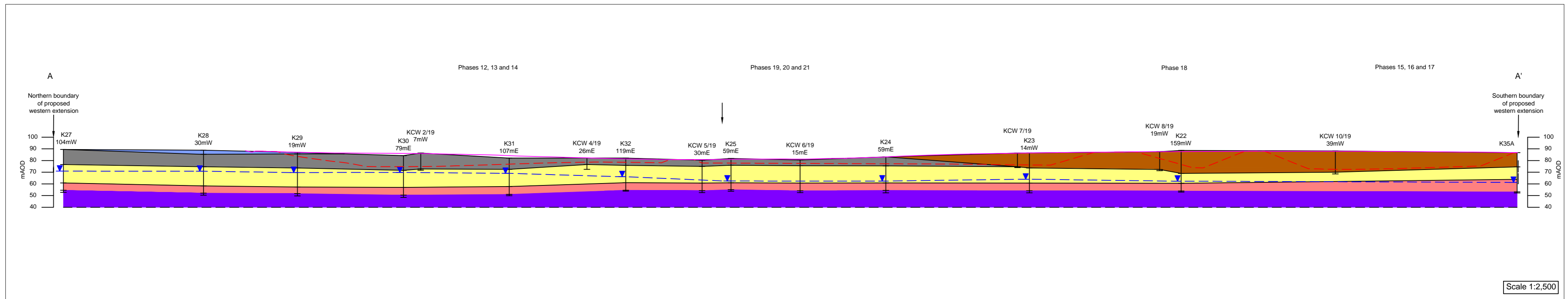
- Proposed western extension to the ENRMF hazardous waste landfill Environmental Permit
- Approximate current boundary of Environmental Permit number EPR/TP3430GW/V005 for the ENRMF hazardous waste landfill
- SUPERFICIAL DEPOSITS**
- Alluvium
- River Terrace Deposits (First Terrace)
- River Terrace Deposits (Second Terrace)
- Glacial Till
- Glaciofluvial Deposits

- JURASSIC BEDROCK**
- g¹⁰ Kellaways Formation and Oxford Clay Formation
- g⁹ Cornbrash Formation
- g⁷⁻⁸ Blisworth Clay Formation
- g⁷ Blisworth Limestone Formation
- g⁶⁻⁷ Rutland Formation
- Upper Member of the Lincolnshire Limestone Formation
- g⁵ Lower Member of the Lincolnshire Limestone Formation
- g⁵ Grantham Formation

- Northampton Sand Formation
- Whitby Mudstone Formation
- Symbol indicates the superficial deposit at the surface and the bedrock formation at rockhead, other superficial deposits may intervene
- Geological boundary (superficial)
- Geological boundary (bedrock)
- Fault at surface, the crossmark on the downthrow side
- Worked out open cast ironstone area



Rev	Final	KR	ML	LH	30/03/21
	Status	Drn	App	Chk	Date
Site EAST NORTANTS RESOURCE MANAGEMENT FACILITY					
Client 					
Title The geology at and in the vicinity of the current ENRMF site and proposed western extension					
Figure ESID 7				Scale 1:25,000@A3	
Drawing Ref AU/KCW/10-20/22019					



Key / Notes

	Proposed western extension to the ENRMF hazardous waste landfill Environmental Permit		Grantham Formation and Northampton Sand Formation
	Approximate current boundary of Environmental Permit number EPR/TP3430GW/V005 for the ENRMF hazardous waste landfill		Whitby Mudstone Formation
	Approximate location of a swallow hole		Approximate ground level at the location of the boreholes
	Location of a monitoring borehole		Ground level at line the of section within the site boundary
	Location of a new groundwater and landfill gas monitoring borehole		Borehole position relative to the line of section (140m to the west)
	Location of a site investigation borehole		Base/termination depth of borehole
	Approximate location of a British Geological Survey (BGS) borehole		Groundwater level recorded on 3 June 2020
	Glacial Till		Base of extraction levels in the Western Extension
	Blisworth Limestone Formation		Top of clay liner in the current permitted landfill with an offset 120m to the north of the line of section
	Rutland Formation		Approximate location of swallow hole relative to the line of section
	Lincolnshire Limestone Formation		Location of cross section

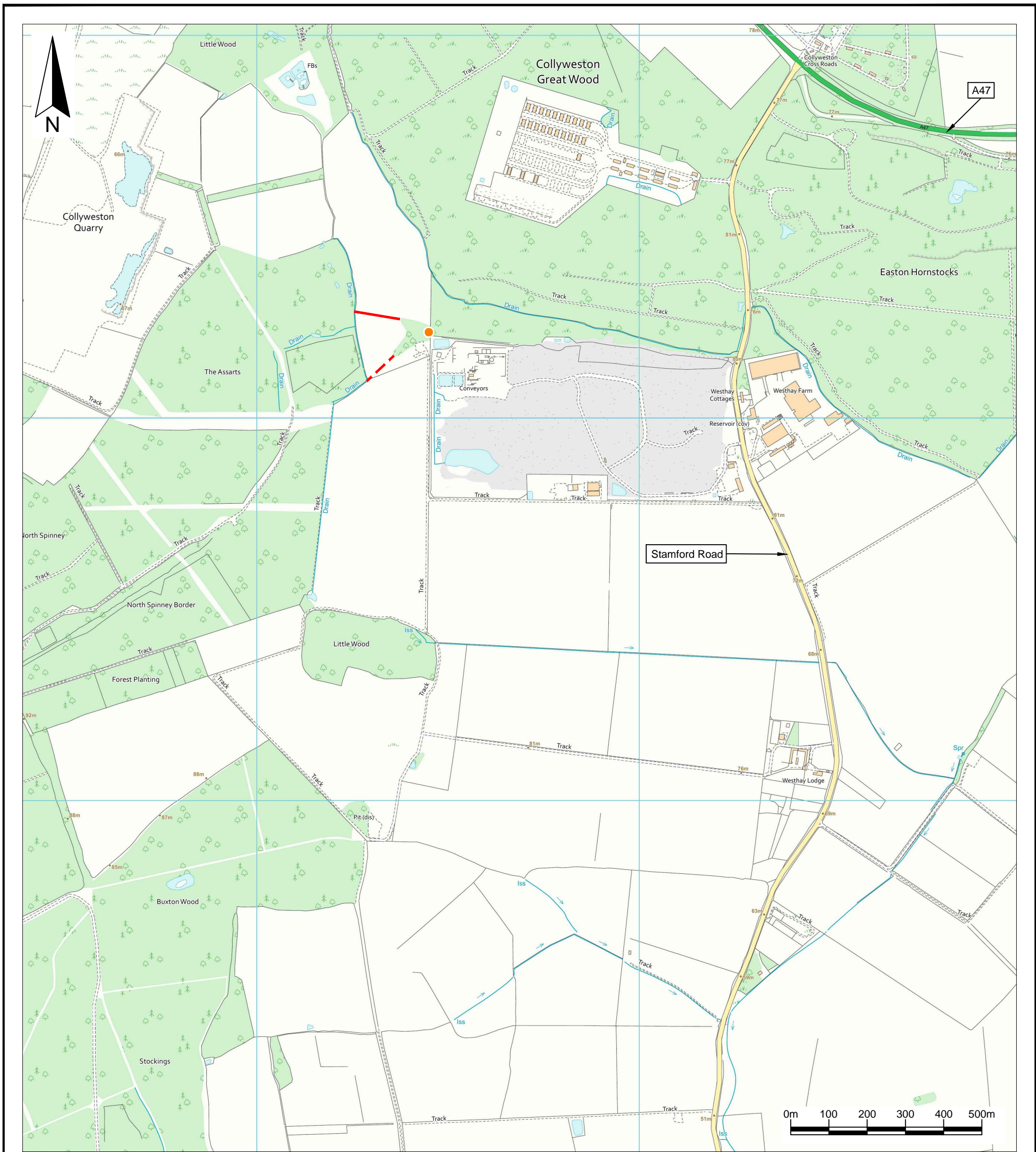
Notes:
 Top of the Grantham Formation/Northampton Sand Formation generally is interpreted as the top of the clay layer in the Grantham Formation comprising the maximum depth below ground level and may be higher than shown in some areas where sandstones of the Lincolnshire Limestone Formation directly overlie sandstones of the Grantham Formation/Northampton Sand Formation.

The base of the Whitby Mudstone has not been proven in any boreholes drilled in the vicinity of the site. It is reported as being up to 55m thick.

Rev	Status	Drn	App	Chk	Date
	Final	KR	ML	LH	30/03/21

Site: EAST NORTANTS RESOURCE MANAGEMENT FACILITY
 Client: Augean SOUTH LTD
 Title: North to south and east to west geological cross-sections through the proposed western extension
 Figure ESID 8 | Scale: 1:2,500@A2
 Drawing Ref: AU/KCW/10-20/22042
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MJCA Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE. Telephone: 01827 717891 Fax: 01827 718507
 Technical advisers on environmental issues



Key / Notes

- Approximate location of a swallow hole
- Drainage pipeline
- - - Inferred route of culvert

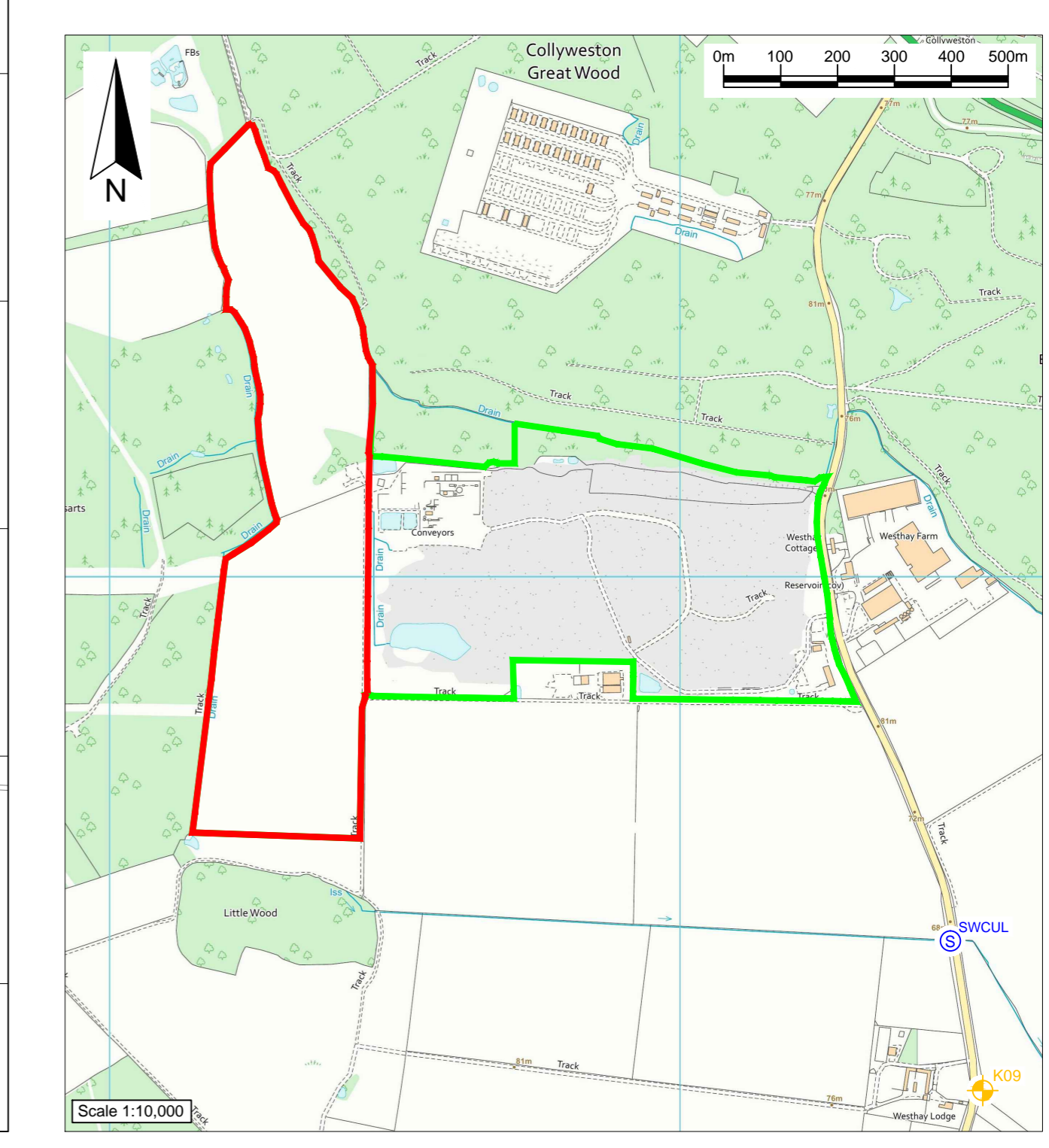
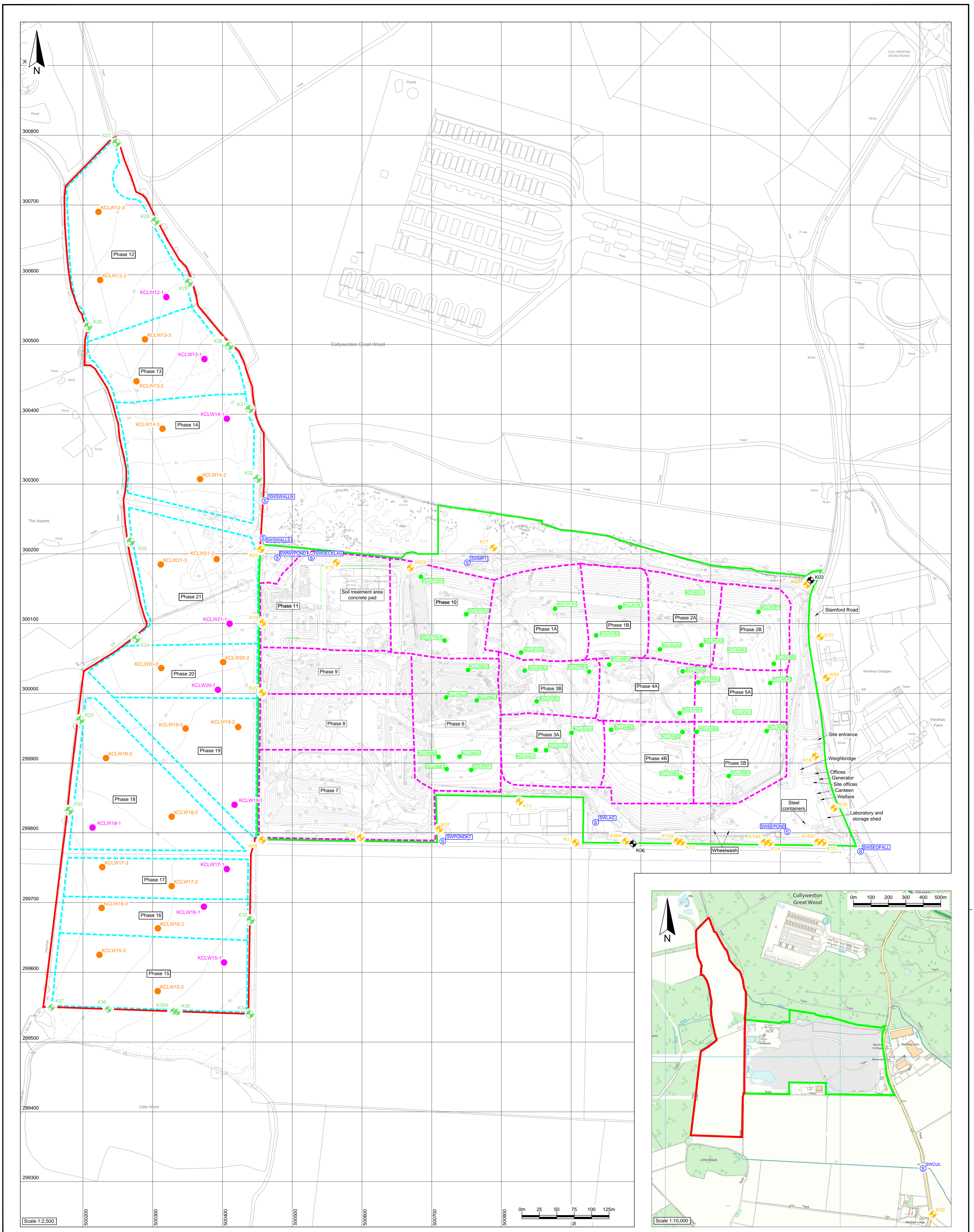
Note:
The site boundaries are not shown on this figure so that the perimeter ditches are not obscured by the boundaries. Please refer to the other ESID figures for the location of the site boundary.

Rev	Final	KR	ML	LH	30/03/21
Status	Drn	App	Chk		Date
Site	EAST NORTHANTS RESOURCE MANAGEMENT FACILITY			Client	
Title	Surface water features at and in the vicinity of the site				
Figure ESID 9	Scale 1:10,000@A3				
Drawing Ref	AU/KCW/01-21/22188				



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Warwickshire, CV9 2LE.
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Key / Notes

- Proposed western extension to the ENRMF hazardous waste landfill Environmental Permit
- Approximate current boundary of Environmental Permit number EPRTP4300WV005 for the ENRMF hazardous waste landfill
- Approximate location of the phase boundaries in the current permitted landfill
- Approximate phase boundaries in the Western Extension
- Leachate monitoring location
- Lincolnshire Limestone Formation/Northampton Sand Formation groundwater monitoring location
- Location of a decommissioned Lincolnshire Limestone Formation/Northampton Sand Formation groundwater monitoring borehole
- Location of a new Lincolnshire Limestone Formation/Northampton Sand Formation groundwater and landfill gas monitoring borehole
- Surface water monitoring location
- Indicative location of a proposed combined leachate sump and in-waste gas monitoring well
- Indicative location of a proposed combined leachate monitoring well and in-waste gas monitoring well

Key: Final, Status, KR, ML, Drn, App, Chk, Date

Site: EAST NORTANTS RESOURCE MANAGEMENT FACILITY

Client: Auegan

Title: Phase layout and environmental monitoring locations

Figure: ESID 10

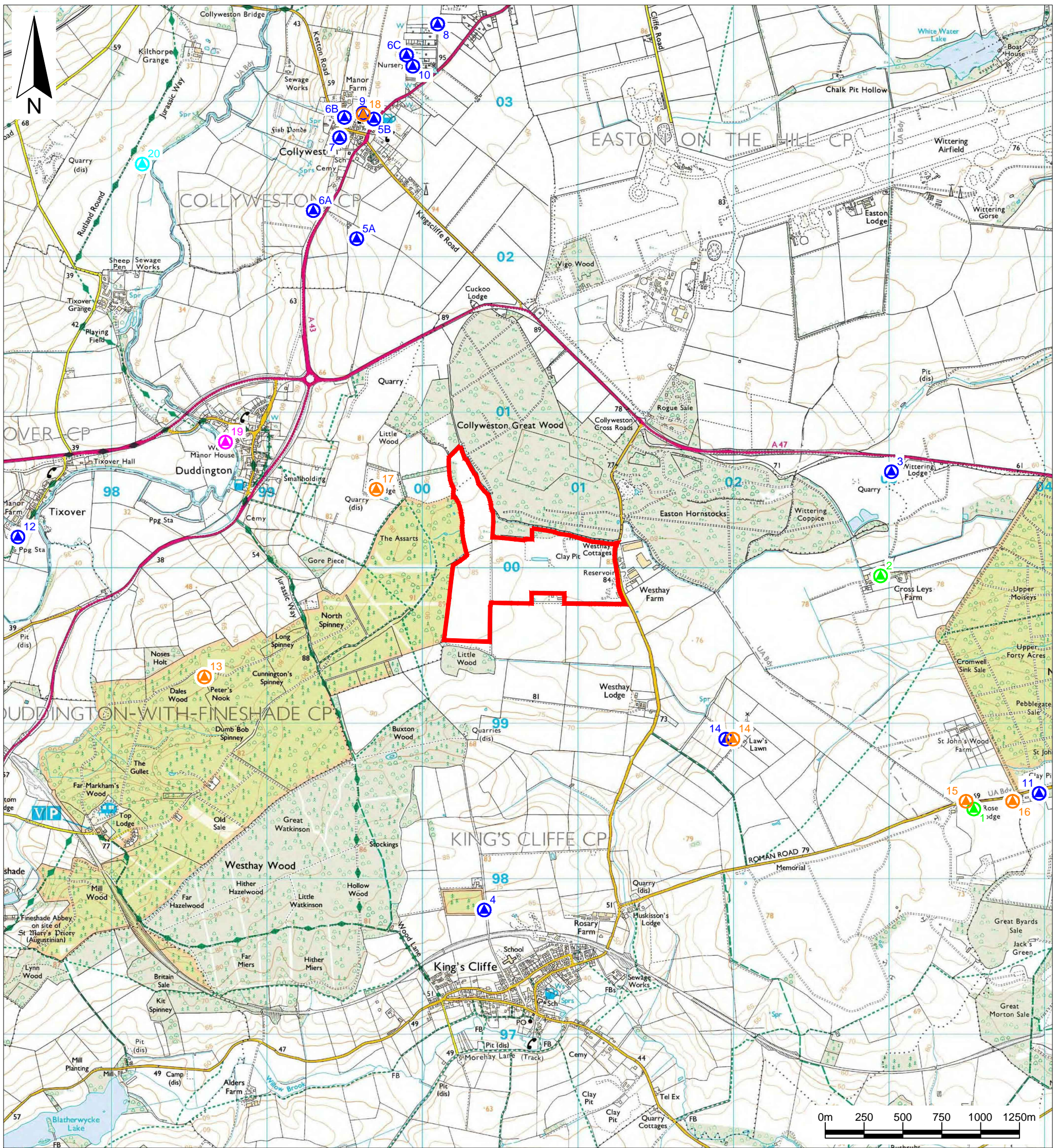
Scale: As shown @ A1

Drawing Ref: ALUKCW02-2122247

Note: Drawing based on LSS model reference 'AU-KCW-15688 LSS' and 'FULL SITE SURVEY UPDATE 24.05.2005.lss' (topographical data to the north of the current ENRMF site) provided by Egnil in 2005

MJCA Basildon Colliery Office, Main Road, Basildon, Essex, Sandoth, Chy4 5LE, Telephone: 01227 717851 Fax: 01227 719507

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Key / Notes

- Boundary of the site
- ▲ Approximate location of a licensed surface water abstraction within 3km of the site
- ▲ Approximate location of a deregulated surface water abstraction within 3km of the site
- ▲ Approximate location of a licensed groundwater abstraction within 3km of the site
- ▲ Approximate location of a deregulated groundwater abstraction within 3km of the site
- ▲ Approximate location of a private groundwater abstraction within 3km of the site

Rev	Final	KR	ML	LH	30/03/21
	Status	Drn	App	Chk	Date
Site EAST NORTHANTS RESOURCE MANAGEMENT FACILITY					
Client 					
Title Plan showing the surface water features and locations of surface water and groundwater abstractions within 3km of the site					
Figure ESID 11				Scale 1:25,000@A3	
Drawing Ref AU/KCW/02-21/22248					

APPENDICES

APPENDIX ESID A

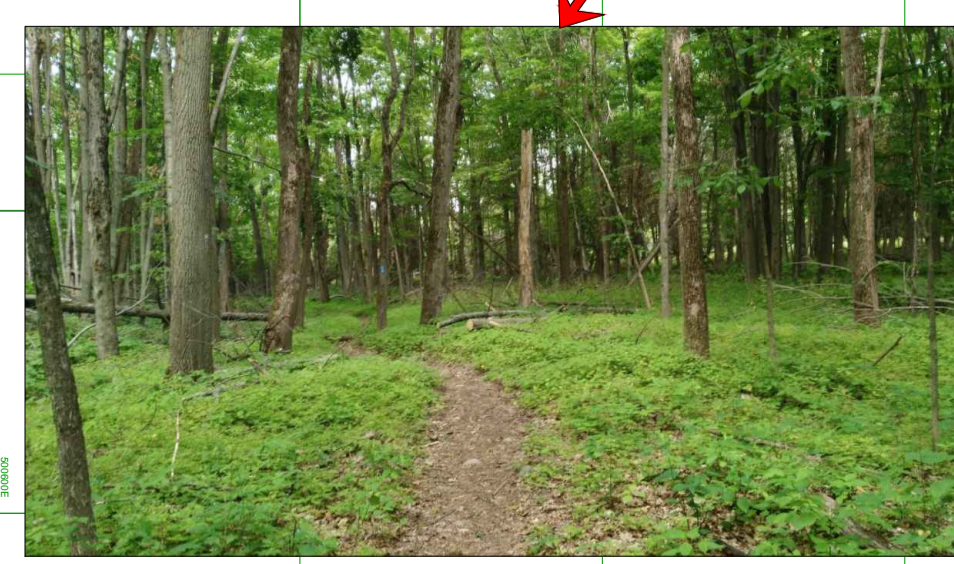
**A COPY OF A PRELIMINARY DRAFT VERSION OF DRAWING NUMBER
ENORTH028REVA ENTITLED FINAL RESTORATION PLAN DATED MARCH 2021**



- KEY**
- PROPOSED RESTORATION CONTOURS (At 1m intervals)
 - EXISTING FOOTPATH
 - PROPOSED FOOTPATH
 - PROPOSED 4m WIDE TRACK FOR SITE AFTER CARE/MAINTENANCE
 - PROPOSED LOCALLY NATIVE BROADLEAVED WOODLAND
 - PROPOSED SCRUB/NATURAL REGENERATION BROADLEAVED WOODLAND WITHIN GRASSLAND AREAS
 - PROPOSED INDIVIDUAL TREE OR SMALL TREE GROUP
 - EXISTING HEDGEROW REINFORCED WITH TREES/SHRUBS
 - PROPOSED HEDGEROW
 - PROPOSED HEDGEROW WITH TREES
 - EXISTING AGRICULTURAL LAND TO REMAIN AS UNDISTURBED STANDOFF TO PROVIDE A NUMBER OF ECOLOGICAL FUNCTIONS
 - EXISTING SPECIES-RICH NEUTRAL/CALCAREOUS GRASSLAND TO BE RETAINED
 - PROPOSED NEUTRAL/CALCAREOUS GRASSLAND (Depending on soil type)
 - EXISTING POND TO BE RETAINED
 - PROPOSED POND (With surrounding marshy vegetation where possible)
 - INDICATIVE CROSS SECTIONS (Refer to Drawing No. ENORTH029)

Proposed Tree and Shrub Planting Palette
 The proposed planting blocks across the restored site landscape would be planted with a selection of the following tree and shrub species which are characteristic of the surrounding landscape:

- Trees:**
 Ash (Cultivar resistant to dieback) - *Fraxinus excelsior*
 Field Maple - *Acer campestre*
 Pedunculate Oak - *Quercus robur*
 Silver Birch - *Betula pendula*
 Small leaved lime - *Tilia cordata*
 Wild Service Tree - *Sorbus torminalis*
 Wych elm - *Ulmus glabra*
- Shrubs/Scrub/Climbers:**
 Black bryony - *Tamus communis*
 Blackthorn - *Prunus spinosa*
 Bramble - *Rubus fruticosus*
 Buckthorn - *Rhamnus cathartica*
 Dewberry - *Rubus caesius*
 Dog-rose - *Rosa canina*
 Dogwood - *Cornus sanguinea*
 Elder - *Sambucus nigra*
 Goat willow - *Salix caprea*
 Gorse - *Ulex europaeus*
 Grey willow - *Salix cinerea*
 Hawthorn - *Crataegus monogyna*
 Hazel - *Corylus avellana*
 Ivy - *Hedera helix*
 Spindle - *Euonymus europaeus*
 Spurge laurel - *Daphne laureola*
 Traveller's joy - *Clematis vitalba*
 Wayfaring tree - *Viburnum lantana*
 White bryony - *Bryonia dioica*
 Wild privet - *Ligustrum vulgare*



0 10 20 30 40 50 60 70 80 90 100 METRES
 SCALE 1:2500
 DRAFT VER. 3 FOR COMMENT

Client:

Site: EAST NORTHANTS RESOURCE MANAGEMENT FACILITY
 Project: PROPOSED WESTERN EXTENSION
 Drawing Title: FINAL RESTORATION PLAN

Date: MARCH 2021
 Scale: 1:2,500 @ A1
 File Ref: 2703_008_008_ENORTH029RevA

Drawing No.: ENORTH029RevA
 Revision: A

DB Landscape Consultancy
 T: 01454 624 709
 M: 07796 063 380
 email@db-llc.co.uk
 www.db-llc.co.uk

APPENDIX ESID B

**SUMMARY RAINFALL DATA RECORDED AT THE RAINGAUGES AT WITTERING
AIRFIELD APPROXIMATELY 3.9KM NORTH EAST OF THE SITE**

Rainfall summary data for Wittering Airfield rainfall monitoring station

Source	January	February	March	April	May	June	July	August	September	October	November	December	Annual average
2004 HRA - Met Office data for period 1973 to September 2004	46.8	36.4	42.1	49.8	51.0	51.8	49.9	54.8	51.7	57.6	51.4	51.1	587.7
Met office 30 year averages for period 1981 to 2010 ¹	48.0	36.8	42.0	49.6	54.9	52.0	52.4	55.8	55.2	59.3	55.8	47.2	608.9

Notes

1. Met office 30 year average values from <https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcrem99cb>

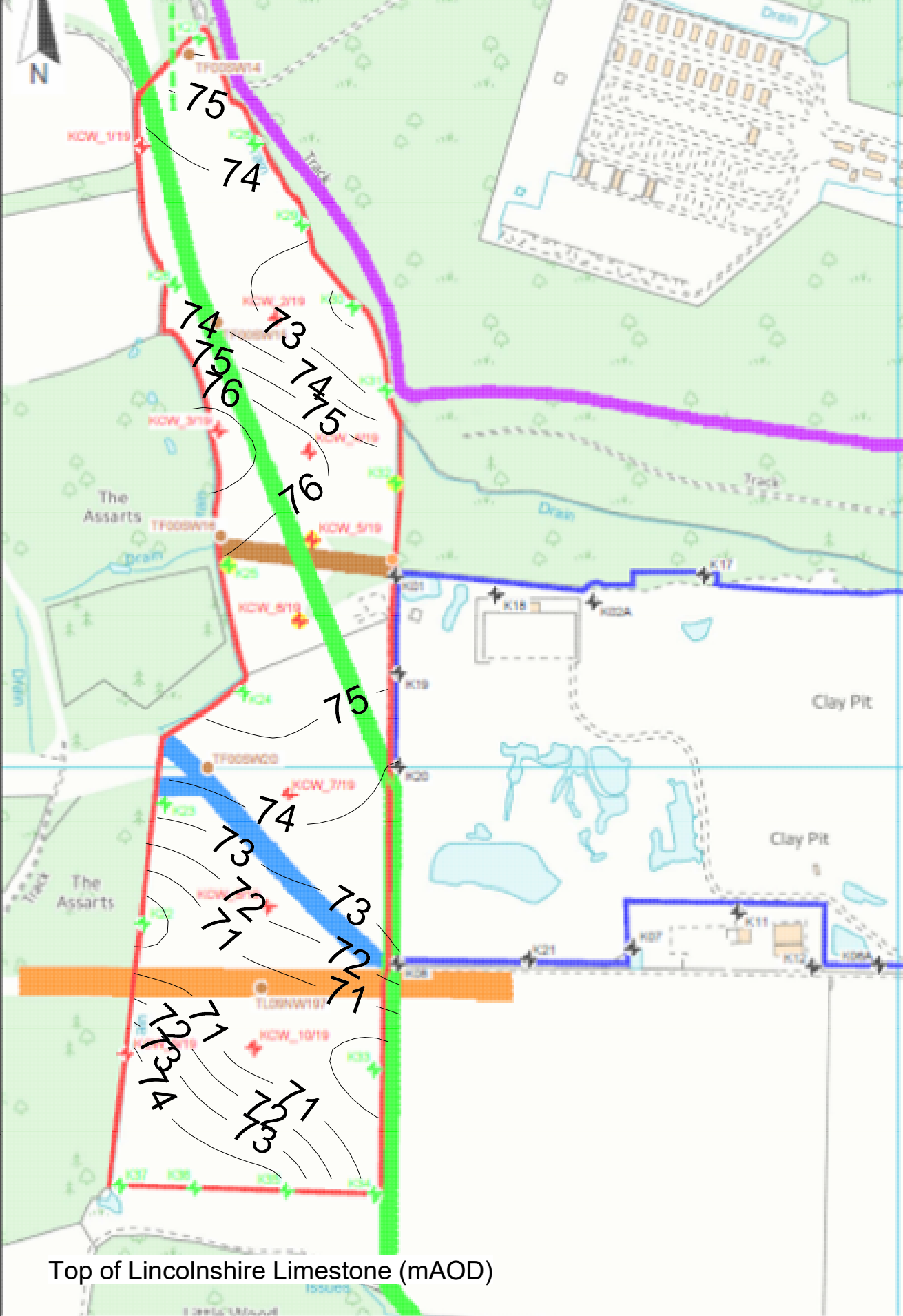
APPENDIX ESID C

**SITE INVESTIGATION REPORT REFERENCE AU/KCW/JRC/2936/01 DATED JUNE
2020 AND ELECTROMAGNETIC INDUCTION GEOPHYSICAL SURVEY REPORT
PROJECT REFERENCE KCP191 DATED NOVEMBER 2019**

APPENDIX ESID D

**A PLAN SHOWING THE CONTOURS OF THE TOP OF THE LINCOLNSHIRE
LIMESTONE FORMATION INTERPRETED FROM THE SITE INVESTIGATION DATA
ACROSS THE WESTERN EXTENSION AREA**

300800
300600
300400
300200
300000
299800
299600
299400
299200



Top of Lincolnshire Limestone (mAOD)

APPENDIX ESID E

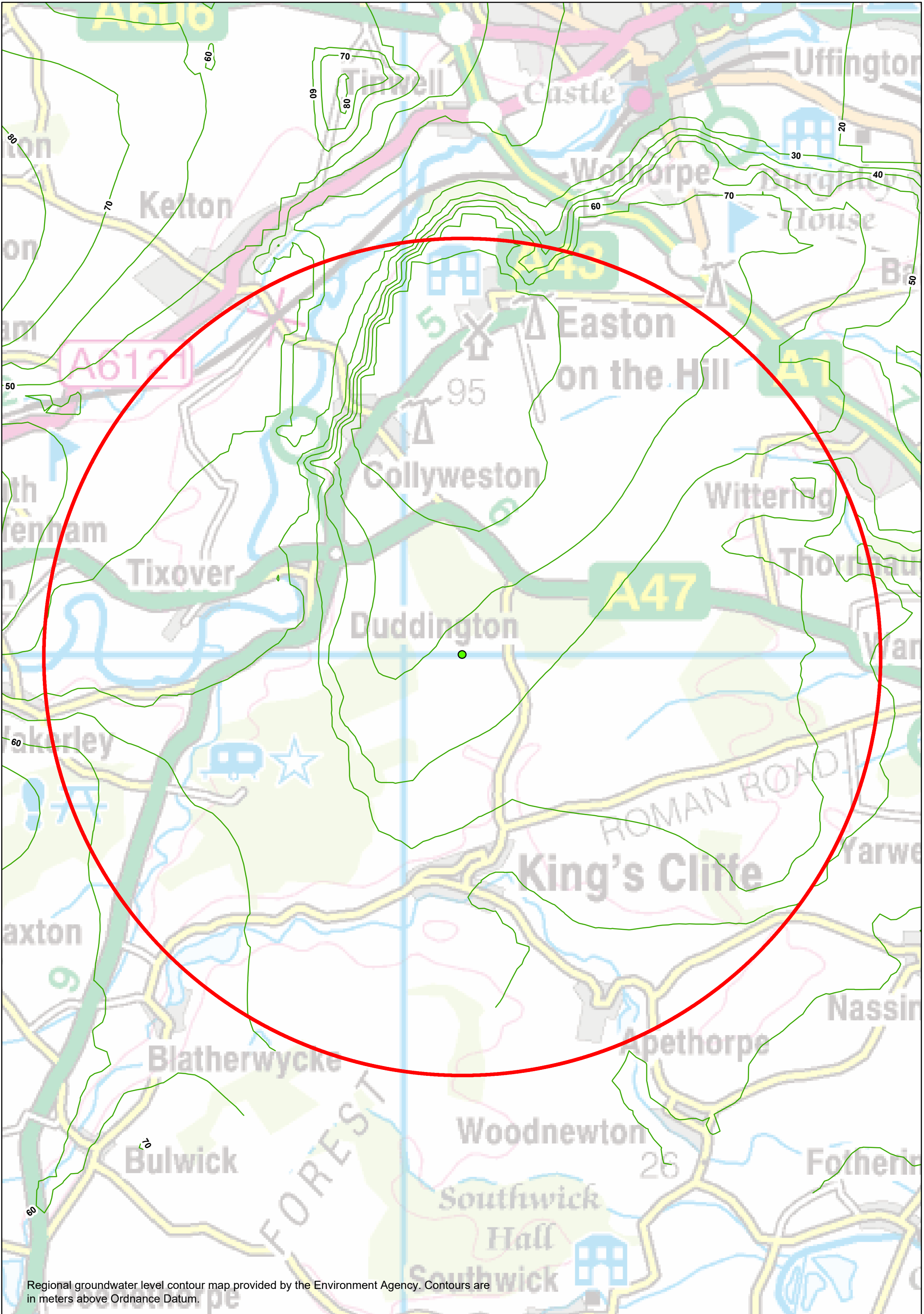
**KEY INFORMATION ON ABSTRACTION LICENCES AND PRIVATE WATER
SUPPLIES PROVIDED BY THE ENVIRONMENT AGENCY AND EAST NORTHANTS
COUNTY COUNCIL**

List of private water supplies within 3km of the site

Fig ESID11 Ref	Type	NGR	X	Y	Use	Source type	Aquifer ASSUMED
13	Private groundwater abstraction	SP9860099299	498600	299300	Domestic	Borehole	Blisworth Limestone
14	Private groundwater abstraction (deregulated groundwater abstraction)	TL0199998900	502000	298900	Domestic	Borehole	Blisworth Limestone
15	Private groundwater abstraction	TL0350098500	503500	298500	Domestic	Borehole	Blisworth Limestone
16	Private groundwater abstraction	TL0380098499	503800	298500	Domestic	Borehole	Blisworth Limestone
17	Private groundwater abstraction (deregulated groundwater abstraction)	SK9970500507	499706	300507	Agricultural	Well	Unknown
18	Private groundwater abstraction	SK9962402918	499625	302919	Agricultural	Well	Unknown

APPENDIX ESID F

**REGIONAL GROUNDWATER LEVEL CONTOUR MAP PROVIDED BY THE
ENVIRONMENT AGENCY**



Regional groundwater level contour map provided by the Environment Agency. Contours are in meters above Ordnance Datum.